Enhancing Life Effectiveness: The Impacts of Outdoor Education Programs

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STATEMENT OF AUTHENTICATION

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in whole or in part, for a degree at this or any other institution.

……..
James T. Neill

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ABBREVIATIONS AND SYMBOLS

Abbreviation / Symbol	Description
-2 log Λ	2 x loglikelihood ratio
χ^2, S-Bχ^2	chi-square, Satorra-Bentler chi-square
d, ES, ES_n, ES_m	Cohen's *d*, standard deviation unit effect size, ES based on normalised scores, ES based on multi-level data
α	Cronbach's alpha
df	degrees of freedom
Δ	delta (change)
DV, IV	dependent variable, independent variable
FCr, FCv, FV, FL, NF	factor correlations, factor covariance, factor variance, factor loading, number of factors
γ	Gamma
GFI, RNI, PRNI, TLI	goodness-of-fit index, relative noncentrality index, parsimony index based on the RNI, Tucker-Lewis Index
MD	Mahalanobis' Distance
♂ / ♀	male / female
M, *Mdn*, *Mo*, *Kurt*, *Sk*	mean, median, mode, kurtosis, skewness
MANOVA, MDANOVA, MDMANOVA, RMMANOVA	multivariate analysis of variance, mixed-design analysis of variance, mixed-design multivariate analysis of variance, repeated measures multivariate analysis of variance
MIs	modification indices
MLA, MLM	multi-level analysis, multi-level model
k	number of items per factor
ω	omega
OB, OBA, OBI, OE	Outward Bound, OB Australia, OB International, outdoor education
η_p^2	partial eta-squared
r, r_p	product-moment correlation, partial correlation
σ	sigma
SD, *SE*	standard deviation, standard error
T0, T1, T2, T3	Time 1, Time 2, Time 3, Time 4
U	Uniqueness

LEQ Abbreviation	Description
LEQ	Life Effectiveness Questionnaire
EC	Emotional Control
HR	Hardiness Resourcefulness
IF	Intellectual Flexibility
OD	Organisational Self-discipline
PT	Productive Teamwork
SC	Self Confidence
SO	Social Competence
AM	Achievement Motivation
AI	Active Initiative
TL	Task Leadership
TM	Time Management

ABSTRACT

Outdoor education offers a promising method for developing life skills, however this field is undermined by ad hoc theory and limited research. This thesis offers a critical synthesises of theoretical and empirical outdoor education literature, develops instrumentation to measure life effectiveness, and reports on a large, longitudinal study of outdoor education program life effectiveness outcomes.

Outdoor education was reviewed as consisting of seven theoretically interactive domains (participant, environment, program, activity, group, instructor, and culture) within a dynamic, experiential milieu. A theoretical systems framework is proposed, drawing on Dewey's theory of experience, to illustrate how participants' experiences of outdoor education might be understood as arising within a "complex system". A critical review of traditional and meta-analytic reviews of empirical outdoor education research indicated small-moderate positive impacts on typically measured outcomes (e.g., self-concept, locus of control, and social skills; ES ~ 0.35). However, this research has been limited by a lack of appropriate dependent measures, low statistical power, over-reliance on inferential statistics, a lack of control and comparison groups, a lack of longitudinal data, and a lack of investigation of independent variables. To address such issues, Study 1 developed new measurement instrumentation and Study 2 conducted a large, longitudinal study.

"Life effectiveness" was proposed to refer to generic life skills which facilitate surviving and thriving across a variety of situations. Life effectiveness skills were further proposed to be enhanceable through intervention. Study 1 investigated the psychometrics of the 11-factor, 64-item Life Effectiveness Questionnaire version G (LEQ-G) through congeneric and confirmatory factor analyses (N = 1,164). Three problematic factors and several weaker items were removed, leading to an 8-factor, 24-item model (LEQ-H) with an excellent fit (TLI = .984; N = 1,892). A global second-order model also provided an excellent fit (TLI = .980), with evidence for factorial invariance of the second-order factor across gender and age, and promising evidence for factorial invariance of the first-order model. Further development of the LEQ was recommended to consider construct validity, other life effectiveness factors, and ongoing item development (e.g., to reduce skewness).

Study 2 involved a large-scale, longitudinal study of outdoor education outcomes. There were moderately positive short-term changes in overall life effectiveness ($ES_n = 0.47$, $N = 3{,}640$), and small-moderate long-term changes ($ES_n = 0.31$, $N = 663$). These results were comparable to the affective outcomes of other educational and psychological training interventions. The largest changes were evident for emotional control, self confidence, social competence, task leadership, and time management.

Study 2 also examined the six naturally-occurring predictors of change, of which program type was the main explanatory variable, mostly due to relatively strong outcomes for challenging programs with young adults. The other independent variables (program length, group gender, group size, participant, and participant age) explained little variance in life effectiveness outcomes. Future investigations are recommended to consider the role of more dynamic predictors (such as personal empowerment, openness, and coping strategies) to better understand and to further develop mechanisms by which outdoor education methodologies enhance life skills.

CHAPTER 1

INTRODUCTION

A key task for humanistic social psychology is the development of methods which can help people to acquire life skills for meeting the demands of surviving and thriving in post-industrial societies. A myriad of personal and social development theories and methodologies have emerged, with considerable expansion since the mid-twentieth century. Many are further encouraged by the recent "positive turn" in the social sciences, with "positive psychology" renewing interest in the science of human potential. Wilber (2000) has observed that:

> Never have all of the world's "growth technologies" been fully available to a single culture: we have access not only to all of the forms of Western psychotherapy and human potential techniques, we have access to virtually all of the world's great wisdom traditions as well. And we are all now engaged in this "simple yet complex" experiment in how best to balance all of these approaches. (p. 2)

Amongst the promising intervention program methodologies are those that combine psychological and physical (i.e., mind-body) training, including outdoor education. Outdoor education programs (as conceptualised in this study) involve organised, small-group, multi-day expeditions in relatively natural environments, with an emphasis on experiential "stress-innoculation" philosophy. The goal of such programs is most commonly to foster participants' personal and social development, but also sometimes includes physical, recreational, environmental, and/or therapeutic goals.

Traditional and meta-analytic reviews of research on the effects of outdoor education programs have indicated, on average, small-moderate impacts across a variety of personal and social outcomes such as self-concept, locus of control, and social skills. However, there is considerable variability in outcomes and there are several notable methodological limitations including low statistical power, lack of

comparison and control groups, lack of sensitivity in dependent measures, over-reliance on inferential statistics, and a lack of investigation of independent variables. The current thesis aims to address such inadequacies in the context of seeking to understand life effectiveness impacts of outdoor education programs.

To help address the need for greater rigour in theory and research about the psychosocial processes and effects of outdoor education programs, Chapter 2 provides a critical review of major theoretical perspectives. Although theory development in outdoor education has been somewhat ad hoc, this chapters suggests several common themes. A new theoretical synthesis is proposed, in the form of a systems framework, to help conceptualise the interactive roles of seven salient theoretical domains (Participant, Environment, Program, Activity, Group, Instructor, and Culture). These domains are considered as operating within an experiential milieu, much as described by Dewey's theory of experience (1938/1963), Lewin's field theory (1951), and Kolb's (1984) theory of experiential learning. It is suggested that this dynamic framework could help guide future outdoor education theory and empirical enquiry.

Chapter 3 provides a literature review of life effectiveness and outdoor education research. In the first part of Chapter 3, life effectiveness is conceptualised as the capacity to survive and thrive in a variety of situations. Life effectiveness is further proposed as comprising of multiple, generic life skills which match typical goals of personal and social development intervention programs. Eleven proposed life effectiveness dimensions are discussed in light of related psychosocial and outdoor education theory and research. The second part of Chapter 3 critically reviews and synthesises previous traditional and meta-analytic research reviews of the psychosocial outcomes of outdoor education programs. This section also reviews recent multi-level studies of the effects of outdoor education and related intervention programs. As with the major review of outdoor education theory in Chapter 2, this research review provides a much-needed synthesis of outdoor education outcome literature.

Recommendations emerging from the literature reviews in Chapters 2 and 3 inform the primary purpose of two subsequently reported studies which were to: (a) develop psychometrically-sound instrumentation to measure multiple dimensions of life effectiveness (Study 1); and (b) elucidate the extent to which "psychosocial

effectiveness" can be developed through outdoor education programs and the extent to which outcomes can be predicted by naturally-occurring program-, group-, and individual-level independent variables (Study 2). Chapter 4 provides detailed explanation of each study's aims, hypotheses, research questions, and rationale.

Chapter 5 outlines the research methodology for Study 1 and Study 2. For Study 1, development of the Life Effectiveness Questionnaire (LEQ) is described, and the use of congeneric and confirmatory factor analysis to examine its psychometric properties is explained. For Study 2, the sample, intervention program, procedure, research design, and the application of multivariate, effect size, and multi-level analyses for the analysis of change are described.

Chapter 6 presents the Study 1 results. The psychometric properties of the LEQ-G are used to redevelop and re-test the instrument, culminating a refined instrument, the LEQ-H. The LEQ-H is psychometrically-sound, consisting of eight factors and a global second-order life effectiveness factor, with structural invariance of these measurement models across participant age and gender.

Chapter 7 presents the results of Study 2, the largest primary study of outdoor education outcomes to date (N = 3,640). This study examines the extent to which outdoor education programs impact on participants' life effectiveness, and the extent to which outcomes vary according to six naturally-occurring independent variables (Program Type, Program Length, Group Gender, Group Size, Participant Gender, and Participant Age). Most of the data were drawn from programs conducted by Outward Bound Australia (OBA) during the 1990's, with comparative data from approximately 600 participants in outdoor education programs conducted by approximately six other organisations. Findings indicate consistently positive outcomes for each of the program types, with the strongest outcomes for Young Adult programs. Approximately 80% of the short-term gains appear to be retained up to at least approximately six months after program completion, although the long-term data were based on a somewhat limited sample.

Chapter 8 discusses the Study 1 and Study 2 results in relation to life effectiveness and outdoor education theory, with implications and recommendations for future research and practice. The LEQ-H appears to be suitable for widespread use, however, the instrument's concurrent and cross-cultural validity could be strengthened through further item development and exploration of other possible

factors. The impacts of outdoor education programs on personal and social development are approximately comparable with other affective, psychosocial intervention programs. Other than Program Type, the naturally-occurring independent variables explained little variance in participants' life effectiveness outcomes. Thus, it is suggested that future outdoor education research focus on understanding dynamic individual difference (e.g., engagement, openness, and coping skills) and "process" variables which could help to account for variability in outcomes. The longitudinal Study 2 results also indicated that caution should be exercised in interpreting pre-post outdoor education research findings due to possible biases arising from depressed pre-scores and inflated post-scores. Further investigation of the processes involved in the particularly impressive short-term outcomes for Young Adult OBA programs is also warranted, as well as investigation into how positive short-term effects might be better retained in the longer-term.

In summary, this thesis offers a substantial theoretical and empirical review and investigation of the effects and mechanisms of outdoor education programs. The scope and rigour of the two studies contributes a solid research platform for further development of theoretically-oriented, evidence-based outdoor education studies, and for further exploration of possible methodologies for life skill development. Ongoing investigation in these areas could help to facilitate experiential development of human capacities for surviving and thriving through the twenty-first century and beyond.

CHAPTER 2

REVIEW OF THEORY ABOUT THE DEVELOPMENTAL EFFECTS OF OUTDOOR EDUCATION PROGRAMS

Introduction

This chapter reviews the aims of outdoor education programs and finds that personal and social development of participants is the major purpose of such programs. Theoretical perspectives and models about how outdoor education programs may effect desired developmental outcomes are reviewed. Finally, common theoretical elements are synthesised into a systems framework. This framework offers a conceptualisation of outdoor education which may be helpful for guiding future research into processes and effects of outdoor education programs.

Scope of Outdoor Education

Introduction

This section examines definitions, classifications, aims, and researched outcomes of outdoor education. Outdoor education is considered as a cultural phenomenon, with personal and social development as the major purpose. Other goals typically relate to physical, recreational, educational, therapeutic, and environmental outcomes.

Definitions

The term "outdoor education" is used quite broadly to refer to a range of organised activities which take place in predominantly outdoor environments for a variety of purposes. Strict definitions of outdoor education are cautioned against because conceptualisations, interpretations, and practices of outdoor education vary according to culture, philosophy, and local conditions (Brookes, 2006; Ford, 1986; Freakley, 1990; Lugg, 1999; Neill, 2008). Arguably synonymous terms include

adventure education, outdoor learning, outdoor adventure education, and adventure programming. Historically and conceptually the term outdoor education has also been closely connected with adventure education, environmental education, and experiential education (Priest, 1999; Wikipedia, 2008b).

The birth of Outward Bound, in 1941, is often considered to be the contemporary beginning of outdoor education (e.g., Priest & Gass, 1997). Outdoor education has subsequently spread around the world, with considerable diversification of concepts and practices. There are currently thousands of organisations and institutions which collectively provide a kaleidoscope of outdoor education experiences for millions of participants each year, with a wide range of philosophies, goals, methods, target groups, and cultural practices. Thus, it is important to recognise that definitions and understandings of outdoor education are at least somewhat relative to time and place. Taken too literally, universalist or abstract definitions (without local contextualisation) may be inappropriate, misleading, or even dangerous (Brookes, 1991, 2004). Thus, the following sections seek to ground discussion of outdoor education by systematically reviewing classifications of outdoor education purposes and researched outcomes.

Classifications

A common way of describing outdoor education programs is with regard to their pre-stated goals, often consciously expressed via a program's explicit philosophy (e.g., vision, mission, and core values), but also often revealed via implicit philosophy or "hidden curriculum" (Wikipedia, 2008a; e.g., see case studies by Fabrizio & Neill (2005) and James (1995)). More specifically, each program usually has stated purposes, aims, and/or objectives, with further contextualisation and interpretation at the level of the specific group and specific individuals.

Several classification schemes have typified outdoor education programs with regard to their purposes. The most notable schemes are summarised in Table 2.1. Priest's scheme, in particular, has become popular in the outdoor education research and theory literature since the mid-1990's. Priest distinguished adventure programs with regard to four purposes: Recreational, Educational, Developmental, and Redirectional (Priest & Gass, 1997, 2005). Priest's classification of adventure programming purposes, however, did not include Environmental outcomes which are

part of Abbott's (1987, 1990) and Ewert's (1989a) classification schemes. Conversely, Abbott and Ewert's classifications do not include Educational or Therapeutic / Redirectional outcomes. Combining these models leads to five major outdoor education purposes (Table 2.1). These purposes are also evident in the measured outcomes of outdoor education programs and industry surveys, which are explored in the next section.

Table 2.1 *Classifications of Major Purposes and Expected Outcomes of Outdoor Education*

Purposes / Expected outcomes	Description	Abbott	Ewert	Priest
Recreational, Physical	Leisure (fun, relaxation, enjoyment), Physical fitness, Outdoor skills training	•	•	•
Educational	Direct (subject knowledge) and indirect (e.g., Academic self-concept)			•
Developmental	Personal and social development, life skills and functionality of behaviour	•	•	•
Therapeutic, Redirectional	Improve dysfunctional personal and group behaviour patterns			•
Environmental	Environmental attitude, knowledge, and behaviour	•	•	

Note. Based on Abbott (1987, 1990), Ewert (1989a), and Priest (2004; Priest & Gass, 1997, 2005)

Researched Outcomes and Industry Surveys

Introduction. Several industry surveys have examined expected outcomes and purposes of outdoor education programs. In addition, meta-analytic studies organise typically measured outdoor education outcomes. Together, industry survey and meta-analytic studies empirically summarise the perceptions and practices of outdoor education, and thus complement the theoretical categorisations of program purposes reviewed in the previous section.

Hattie et al. (1997). Meta-analytic studies have provided empirically-based summaries of the range of effects which have been formally investigated in outdoor education programs. Hattie, Marsh, Neill, and Richards' (1997) major meta-analysis of 97 adventure education outcome studies involved 997 measured effects classified into 40 outcome categories (see Table A-6). These outcomes can be further classified into five main purposes of outdoor education programs (see Table 2.2), revealing a high frequency of measurement of Developmental outcomes (76% of measured effects), followed by Therapeutic (12%), Physical/Recreational (6%), Educational

(5%), and Environmental (1%) effects. This clearly indicates a predominant interest in the personal and social development effects of outdoor education programs, a conclusion also supported by other observers (e.g., White & Hendee, 2000).

Table 2.2 *Breakdown of Major Outcome Categories in 97 Empirical Outdoor Education Program Studies (Hattie et al., 1997)*

Outcome	No. of effects	Percentage of effects
Developmental	759	76
Therapeutic / Redirectional	124	12
Recreational / Physical	55	6
Educational	54	5
Environmental	5	1
Total	997	100

Note. Adapted from Hattie et al.'s (1997) Table 13, which specified 40 outcomes within six domains (Leadership, Self-concept, Academic, Personality, Interpersonal, and Adventuresome domains) for 997 measured effects. For a more detailed list of measures in each outcome category, see Table A-6.

Mackay (1981). Mackay (1981) conducted an industry study of 90 teachers (primary (n = 45), intermediate (n = 18), and secondary (n = 27)) from New Zealand. Twelve possible outdoor education outcomes were ranked by participants, relating to four outcome domains: Recreational, Developmental, Therapeutic, and Environmental (Educational outcomes were not included). Results indicated that Developmental outcomes were considered to be most likely (6.97), followed by Environmental (5.23), Recreational (2.95), and Therapeutic (1.96) outcomes (see Table 2.3).

Table 2.3 *New Zealand Teachers' Perceived Likelihood of Outdoor Education Outcomes Occurring for School Students (Mackay, 1981)*

Type of Outcome	Mean Rank (/ 12)
Developmental	6.97
Environmental	5.23
Recreational / Physical	2.95
Therapeutic / Redirectional	1.96

Note. Adapted from Mackay (1981). Ranks ranged from 1 (least likely to be achieved) to 12 (most likely to be achieved). The data for this table was based on weighted mean ranks for 12 expected outcomes by primary (n = 45), intermediate (n = 18), and secondary (n = 27) school outdoor education teachers.

Richards et al. (1997). In an industry survey study, 113 outdoor educators attending the 10th National Outdoor Education Conference completed a questionnaire designed to profile the outdoor education profession in Australia (a 34% response rate; Richards, Neill, & Butters, 1997). The survey asked respondents about which program objectives they had worked with (in the last 12 months) and the

main program objective that they had worked with (in the last 12 months. Results indicated that: (a) Developmental goals were the most common (84% of outdoor educators reported working with personal and/or social development objectives in the previous 12 months); and (b) 39% reported that developmental objectives were the *main objective* with which they had worked in the previous 12 months (see Table 2.4). The second most frequent main objective was Physical / Recreational (28.4%), followed by Therapeutic / Redirectional (17.4%), and Educational (8.2%). Environmental objectives were the least frequent main objective (1.8%), but had been worked with as *an objective* by 58.2% of respondents.

Table 2.4 *Australian Outdoor Educator Program Objectives (Richards et al., 1997)*

Objective	In the last 12 months, worked with this as	
	an objective	the *main* objective
Developmental	84.5%	38.9%
Physical / Recreational	78.2%	28.4%
Therapeutic / Redirectional	27.3%	17.4%
Educational	29.9%	8.2%
Other	8.8%	5.6%
Environmental	58.2%	1.8%
N	109	110

Note. Program objectives which delegates surveyed at the 10th National Outdoor Education Conference in Australia (1997) had worked with in the previous 12 months.

Lugg and Martin (2001). In another industry survey study, 143 principals and teachers at secondary schools in Victoria, Australia (83 Government, 29 Independent, 28 Catholic, and 3 unspecified) rated their perceptions of the importance of 12 outdoor education outcomes (31% response rate; Lugg & Martin, 2001). As with previous studies, the top outcomes were Developmental, leading the authors to conclude that the findings "essentially paint outdoor education as personal development education" (p. 44; see Table 2.5).

Table 2.5 *Outdoor Education Learning Outcome Ranks (Lugg & Martin, 2001)*

Objective	Overall Rank
Developmental	10.0
Environmental	5.0
Physical / Recreational	2.7

Note. Outdoor education learning outcome ranks (N = 143; derived from Figure 1, Lugg & Martin, 2001). Ranks ranged from 1 (least important) to 12 (most important); Lugg and Martin did not include Educational or Therapeutic / Redirectional learning outcomes.

McRae (1990). McRae (1990) examined objectives of junior secondary school outdoor leisure education courses by analysing curricula from 43 Australian

schools (84.3% response rate). Results were consistent with other industry studies. McRae's comments illustrated that developmental goals form a primary objective in explicit and hidden outdoor education curricula:

> objectives relating to the enhancement of personal qualities and capacities and of relations with other persons were stated in three out of every five documents. Survey informants suggested that these objectives were intended even when they were not stated in curriculum documents. It was thought that many outdoor education teachers considered that "it was not necessary to state the obvious". (p. 25)

Summary. All reviewed industry survey studies (Lugg & Martin, 2001; Mackay, 1981; McCrae, 1990; Richards et al., 1997), and the major meta-analysis in the field (Hattie et al., 1997), indicate that the major purpose of outdoor education programs is developmental. There were a diverse range of other less frequently emphasised purposes, including physical / recreational, educational, therapeutic, and environmental goals and outcomes.

Summary

The term "outdoor education" is used quite broadly to refer to programs with a variety of purposes. Five major purposes have been identified in classification schemes, researched outcomes, and industry surveys: physical / recreational, educational, developmental, therapeutic, and environmental. Industry surveys of expected outcomes and program objectives, as well as previous empirical research studies, and the work of other theorists and researchers, indicate that although there are a wide range of outdoor education outcomes, the most common and popular focus is on personal and social development objectives. Thus, although the meaning and purpose of outdoor education may theoretically vary according to time, place, and culture (Brookes, 1991, 2004, 2006), developmental goals are the most frequently expected and researched outcomes.

Theoretical Perspectives

Introduction

This section reviews major theoretical perspectives used to explain how outdoor education programs may achieve their various claimed purposes, particularly personal and social development. Outdoor education theory and research has developed in a somewhat ad hoc manner, attracting numerous critiques about the lack of well-tested theoretical explanations (e.g., Baldwin, Persing, & Magnuson, 2004; Hattie et al., 1997). Ewert (1982) commented that, "we have discovered an educational black box; we know something works, but we don't know how or why" (p. 126)[1].

Some observers have noted that there is nothing particularly unique about outdoor education programs. Hahn (1960), for example, promoted the fact that he considered Outward Bound to not be at all original, but rather to be the combined application of well-proven educational and psychological practices from other sources (James, 1995b; Richards, A., 1999). Others have similarly viewed outdoor education as unique only in its particular combination of various educational, psychological, and social principles.

This section reviews four major theoretical perspectives about outdoor education processes and outcomes: (a) *environmental theories* which focus on the restorative effects of nature and aspects of psychoevolutionary theory; (b) *experiential theories* which emphasise the psychological and phenomenological processes of experiential learning; (c) *psychosocial theories* which include stress-inoculation, social support, and group development; and (d) *multi-element theories* which seek to identify and describe generic components of outdoor education programs. The selection of models and theories in this section is far from exhaustive, but key theoretical perspectives used to account for the developmental potential of outdoor education are emphasised and critically reviewed.

A novel synthesis of major features in outdoor education theories is then offered, in the form of a *systems framework*. The framework suggests a dynamic

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[1] Baldwin et al. (2004), Handley (1993), McKenzie (2000b), and Neill (2004b) also discuss OE as a "black-box". Also see Karachi, Abbott, Catalano, Haggerty, and Fleming (1999).

organisation of interrelationships between theoretical elements involved in outdoor education programs. Seven interactive domains are proposed: Individual, Environment, Activity, Program, Group, Instructor, and Culture. The systems framework is then used to help structure the review of empirical research findings and in the formulation of the research questions and hypotheses in Chapter 4.

Environmental Theories

Introduction. This section outlines environmental perspectives and theories of outdoor education. Outdoor education tends to rely upon an implicit "nature is good" perspective. This quasi-philosophy is supported by psychoevolutionary theory, the biophilia hypothesis, and the more recent notion of nature-deficit disorder. Research on positive and negative direct and indirect effects of natural environments on humans is reviewed, leading to a final section which explores dynamic connections between humans and nature which have been elucidated in outdoor education philosophy, theory, and research to date.

"Nature is good" theory. Several outdoor education theorists have argued that the outstanding feature which characterises outdoor education is direct engagement with natural environments, and with adventurous activities within natural environments (e.g., Beringer, 2004; Beringer & Martin, 2003; Greenway, 1995; Martin, 1998, 1999a; Miles, 1986; White & Hendee, 2000). Wilderness environments[2], it is argued, provide rich potential for enjoyment, learning, personal and social growth, and therapeutic outcomes (e.g., Kaplan & Talbot, 1983; Miles, 1986), as well as extending our understanding of, and relationship with, nature (Martin, 1996, 2005).

An assumption that "nature is good for the soul" is deeply embedded within much outdoor education philosophy and practice. This draws upon reactions to living in increasingly industrialised societies, such as expressed by wilderness philosophers in the eighteenth (e.g., Rousseau), nineteenth (e.g., Thoreau), and twentieth (e.g., Muir, Leopold, and Nash) centuries. More recently, a "nature is good" *weltanschauung* has emerged from a variety of sources including deep ecology,

[2] The term 'wilderness' is used to broadly refer to environments which are relatively unaffected by human development, but also bearing in mind that wilderness is ultimately understood to be a subjective perception and a state of mind (Nash, 1982).

ecopsychology, ecosophy, ecophilosophy, sociobiology, social ecology, and Indigenous knowledge (e.g., see Drengson, 1999; Roszak, Gomes, & Kanner, 1995; Ulrich, 1979). These perspectives rest implicitly and/or explicitly on psychoevolutionary theory, the biophilia hypothesis (Kellert & Wilson, 1993; Wilson, 1984), and nature-deficit disorder (Louv, 2005).

Psychoevolutionary theory, biophilia, and nature-deficit disorder. From a psychoevolutionary or sociocultural point of view, outdoor education has emerged as a cultural response to help ameliorate the consequences of nature-deficit disorder (prolonged and institutionalised disconnection from natural environments; Neill, 2004a). Essentially the psychoevolutionary argument is that cultural evolution has outstripped genetic evolution, resulting in humans not being optimally designed for domestic life styles in urban environments (Gullone, 2000; Maller, Townsend, Brown, & St Leger, 2002). Ongoing urbanisation[3] has drawn people away from the types of environments which guided their genotypic evolution. Such mass disconnection from relatively natural environments seems to be problematic for physical, social, and psychological health and well-being (Maller et al., 2002; World Health Organisation, 2001).

Roszak et al. (1992) combined psychoevolutionary theory and the Jungian notion of a collective unconscious to propose an *ecological unconscious* residing within the collective unconscious, arguing that expression of the ecological unconscious is integral to the mental health, welfare, and ultimately to the survival of the human species. Wilson (1984; Kellert & Wilson, 1993) proposed a *biophilia hypothesis*, that humans, like all animals, have an inbuilt affiliation with lifelike processes due to their evolutionary history in relatively natural environments. Kahn (1997) has proposed expanding the meaning of biophilia to refer to both positive and negative affiliations and has challenged researchers and theorists to "take up the task of integrating both within a larger framework" (p. 53; also see van den Born, Lenders, de Groot, & Huijsman, 2001). According to Kahn (1997), biophilia "is

[3] Approximately half of the world's human population currently lives in urban areas and this is projected to rise to 60% by 2030. In developed countries, currently 75% of the population live in urbanised areas and this is projected to rise to 85% by 2030 (United Nations Human Settlements Program, 2001). In Australia, 85% of the population live in urban settings (Australian Bureau of Statistics, 1996). Furthermore, urbanised humans in developed countries are estimated to spend approximately 90% of their time indoors.

clearly a nascent framework, and some of its potential lies in charting a stronger ontogenetic course" (p. 2).

Building on the biophilia hypothesis, Louv (2005) coined the term "nature-deficit disorder" to describe the effects of alienation from nature experienced by individuals, families, and societies. Amongst the effects of nature-deficit disorder described by Louv are diminished use of the senses, attentional difficulties, and increasing rates of physical, psychological, and social disorder. Nature-deficit disorder nevertheless implies the potential for a "cure" via re-engaging urbanised humans with natural environments and lifelike processes.

Negative effects of nature. Any environment, built or natural, can have harmful or salutary effects, and any such effects may be temporary or long-term (Kahn, 1997; Ulrich, 1993; Wilson, 1993). For example, nature can provoke a range of distressing emotional reactions including dislike, fear, disgust, and psychiatric symptoms (Bixler, Carlisle, Hammitt, & Floyd, 1994; Bixler & Floyd, 1997; Cawte, 1967; Nicholls & Gray, 2006). Ultimately, engagement with nature can cause disablement or death (Brookes, 2003e, 2003f, 2004). On the other hand, experiencing discomfort in nature can also serve educational, developmental, and therapeutic goals (Fletcher & Hinkle, 2002; Varley, 2006).

Whether an experience in nature is ultimately beneficial or harmful seems likely to depend, at least in part, on the balance between personal competence and the environmental demands. Martin's (2005) research, for example, found that relationships with nature were more likely to develop when the participants' outdoor living and traveling skills enabled a sense of comfort and competence in relation to nature.

Positive effects of nature. Despite the potential for negative effects, there is a growing body of research demonstrating that exposure to natural environments has salutary short- and longer-term psychological and physical effects. For example, Kahn (1997) observed that "the idea of biophilia becomes compelling not by any single study, but by the confluence of research from diverse fields" (p. 2). Outcomes which have been found to be affected by exposure to nature include improvements in enjoyment, relaxation, mood, anxiety, attention, physical health and health-oriented behaviour, hospital recovery, self-constructs such as self-esteem and self-concept, life satisfaction, and mental illness (Burns, 1998; Clay, 2001; Frumkin, 2001, 2003;

Hartig, 2004; Hartig, Mang, & Evans, 1991; Kaplan, 1995, 2001; Kaplan and Kaplan, 1989; Louv, 2005; Maller, Townsend, Brown, & St Leger, 2002; Pretty, 2004; Pretty, Griffin, & Sellens, 2003; Pretty, Griffen, Sellens, & Pretty, 2003; Rubenstein, 1997; Stilgoe, 2001; Ulrich, 1993). Despite the varied areas of investigation, the theoretical mechanisms for the positive role of nature in human well-being are in need of further research and theory-testing (Hartig, 2004; Kaplan & Talbot, 1983; Pretty, 2004; Scherl, 1986).

Direct and indirect effects of nature. One potentially useful way of conceptualising the effects of nature on human beings is in terms of direct and indirect effects (Rubenstein, 1997). Research to date has tended to focus on *direct* effects, such as physiological and psychological impacts of viewing natural versus urban or abstract scenes (e.g., Hartig, Evans, Jamner, Davis, & Gärling, 2003; Tennessen & Cimprich, 1995; Kweon, Ulrich, Walker, & Tassinary, 2008). Ulrich, 1979, 1981, 1984, 1993; Ulrich et al., 1991). Direct effects of nature is undoubtedly an important area of research (e.g., Attention Restoration Theory; Kaplan, 1995), but there are also increasing efforts to theorise and research many possible *indirect*, *interactive*, or *transactional* effects, which may be particularly relevant to understanding the theoretical mechanisms of outdoor education (e.g., McIntyre & Roggenbuck, 1998). For example, being in natural environments tends to encourage more physical exercise (Caulkins, White, & Russell, 2006; Maller et al., 2002; Miles, 1986; Pretty, 2004; Pretty, Griffin, Sellens, & Pretty, 2003; Rubenstein, 1997), healthier diets and greater exposure to sunlight than is typically experienced in twenty-first century urban lifestyles in developed countries. The synergistic effects of exercise and nature (created by exercising *in* nature) has been termed *green exercise* (Pretty, Peacock, Sellens, & Griffin, 2005). Exercising in natural environments appears to have greater positive mental and physical health effects than exercising indoors or in urban areas, or by viewing nature without exercising (e.g., Pretty et al.; Pretty et al., 2007). Outdoor education can be viewed as a form of green exercise, conducted over an extended period, during which participants are likely to

experience enhanced mobility and fitness levels[4], effects which are likely to contribute to improvements in psychological well-being (Bacon & Kimball, 1989).

Miles (1986) suggests the relevance of Drengson's notion of "mindful walking"[5], as well as emphasising that physical exercise can have cathartic emotional and behavioural effects. Pretty (2004) offers the additional observation that several studies of wilderness experiences have identified the role of *physical hardship* in triggering profound psychological effects. Thus, adventurous physical activity in relatively natural environments appears to offer a conducive context for physical and psychological restoration and development.

Natural environment in outdoor education theory. The use of (relatively) natural environments is central to the psyche of outdoor education. There is a core philosophical belief within outdoor education that natural environments play a vital role in outdoor education as illustrated, for example, by Donaldson and Donaldson's (1958) popular definition of outdoor education as "education 'in', 'about', and 'for' the out-of-doors". A common view within outdoor education is that "the natural environment imposes a set of natural consequences on the clients" which are "real" and "engaging", "allowing staff to step back from traditional positions of authority" (Trevlou, 2006, p. 16), thus fostering "natural learning".

Despite the natural environment being revered almost as a *raison d'etre* for outdoor education, there has been lack of research and theoretical development in understanding human-nature relationships in the context of outdoor education. Most of the work in this area has been philosophical rather than empirical (Martin, 2005). The significance of the role of natural environments emerges more in qualitative studies of participants' experience (e.g., Scherl, 1982, 1986, 1988) than in empirical studies. However, much in this area appear to be undiscovered. Levitt (1991), for example, suggested that:

> we still do not understand what is therapeutic about camping in a wilderness or wilderness-like setting. The flora and fauna of wilderness, the uniqueness of wilderness, the low level of stimulation

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[4] Hattie et al. (1997) identified 29 effects measuring changes in physical fitness during OE programs, with a strong average ES of .40 (CI_{95} = .17; .62).

[5] Meditative walking, providing mind-body relaxation and psychological flow benefits similar to yoga or tai chi (see Drengson, 2004).

> of wilderness, the aesthetic or spiritual value of wilderness, the isolation of wilderness from the city, or the ability of wilderness to evoke coping behaviours have been cited as the possible factors. (p. 167)

Scherl (1986) similarly observed that "there have been very few conceptual attempts to explain how and why wilderness promotes psychological well-being, and why individuals change as a consequence of being in that setting" (p. 1). Hattie et al. (1997), likewise, reported surprisingly little outdoor education theory and research which drew in a substantial way on the role of the natural environments in human well-being. Hattie et al. suggested that "it may be that a model based on enhancing environmental concerns and relationship with nature could be valuable in explaining the substantial changes that can result from adventure programs" (p. 76).

Further to Hattie et al.'s (1997) suggestions to examine the restorative and learning potentials within natural environments, it would seem that a psychoevolutionary framework is implicit in much theorising about the role of wilderness in outdoor education. Psychoevolutionary theory may offer a broadly useful context in which to situate various elements of nature-based theories of outdoor education. Dewey (1915/1990), for example, observed that young children seem to inherently pursue reconstruction of evolutionary history in their play, and suggested that this should be used to guide learning and development:

> Many anthropologists have told us there are certain identities in the child interests with those of primitive life. There is a sort of natural recurrence of the child mind to the typical activities of primitive peoples; witness the hut which the boy likes build in the yard, playing hunt, with bows, arrows, spears, and so on…What are we to do with this interest - are we to ignore it…? Or shall we got hold of it and direct it to something ahead? (pp. 48 - 53)

Dewey's (1915/1990) psychoevolutionary reconstruction suggests an unfolding, transactional relationship between humans and environments, a theme which has been developed in ecopsychological and wilderness experience theory and research. McIntyre and Roggenbuck (1998), for example, describe five modes in which people experience the environment: focus on nature as object or place; focus on self and internal thoughts; focus on others; focus on emotions and affect; and

focus on task or activity: “At any given moment during a nature-based leisure experience, one or more of these experiential modes may be dominant, and the recreationist would describe the environment and his or her experience in the context of the person-environment transaction” (p. 403).

In the context of outdoor education, there seems to be a salient interaction between perceptions of *self* and perceptions of the *natural environment*. In a mixed methods study of the perceptions of adult participants in Outward Bound programs, Scherl (1982) reported that “quite often the prospect of being in a wilderness setting and engaging in activities which are specific to that setting are perceived as vehicles through which one can find something out about oneself” (p. 5). Similarly, Rossman and Ulehla’s (1977) factor analysis of US college student responses to 30 possible wilderness benefits revealed a primary factor which involved seeing nature as a source of renewed and expanded self-identity. The second factor represented rewards associated with challenging aspects of survival in natural settings. In another study, Scherl (1988) used a repertory grid technique to investigate the role of various elements of Outward Bound programs and their effects on adult participants. Scherl found that that three aspects of the wilderness which were predominant: emotional responses and level of arousal; a distinction between self and group (mostly related to activities done alone compared to activities requiring group cooperation); and recognition that effort (either physical or mental) was part of the experience. Thus, it seems that self-environment (or human-nature) relations might not only be facilitated by experiencing natural environments themselves, but also by experiencing a combination of adventurous activities and periods of reflection, guided by a supportive group environment and the philosophy and values of the program and instructors.

Another environmental mechanism which has been theorised to have psychological effects in the context of outdoor education is the *novelty* and *unpredictability* of remote, wilderness environments (Barret & Greenaway, 1995; Beard & Wilson, 2002; Kesselheim, 1974; Kimball & Bacon, 1993; Mitchell, 1983; Nadler, 1993; Varley, 2006; Walsh & Golins, 1976). Being outside of normal, familiar contexts is theorised to potentially free up previous habitual constraints by heightening arousal and focus (Gibson, 1979), and encouraging participants to experiment with “new psychological strategies or a fresh sense of identity” (Kimball

& Bacon, 1993, p. 26; also see Varley, 2006). In addition, natural environments tend to provide neutral, immediate, unambiguous feedback which encourages adaptive coping rather than reliance on defense mechanisms (Gibson, 1979; Hattie et al., 1997; Scherl, 1986). The potentially greater effects of intervention programs which take place in unfamiliar environments are indicated by Hattie, J. M.'s (1992) meta-analysis of self-concept change programs which found larger effects for off-site (ES = .50) compared to school-based programs (ES = .36), particularly for camping and outdoor education programs. A sense of being in a "place apart" is often further cultivated within outdoor education program culture and philosophy (Fabrizio & Neill, 2005; Grayson, 2002; Kaplan & Talbot, 1983; Seaman, 2005). Being in a distinctly different place, away from familiar contingencies, disorients participants but they are quickly re-oriented to a new normative culture (Fabrizio & Neill, 2005), such as one which encourages tackling challenges, giving and receiving social and emotional support, and reflecting on one's experiences.

The place apart philosophy seems to contrast with an alternative, ecopsychological, or Indigenous, "relationship-to-place" view. By returning to the same places on many occasions (e.g., different times of the day, different seasons, and in different weather conditions) one develops greater familiarity and deeper relationships with natural places (Baker, 2005; Baker & Knapp, 2005; Knapp, 2005; Martin, 1996, 1999b; Wattchow, 2005). Thus, there is a philosophical tension between the place apart and relationship-to-place philosophies; a tension which is poignantly captured by Winton (2003):

> Aborigines sometimes question the "European" urge to climb high and look across land from a bluff or peak. I suppose if you know what's there, if you're intimate with it in a bodily, spiritual way, you don't need to look. (p. 266)

Other elements of outdoor education programs which may interact with the natural environment to have positive physical and/or psychological effects include periods of intense physical activity followed by relatively unstructured contemplation or reflections activities in nature (e.g., "solo"; Gibson, 1979; Martin, 2005; Nicholls, 2004), environmental education (e.g., see Association for Experiential Education, 2000a), development of Indigenous skills and knowledge, and/or environmental service and restoration (e.g., see Association for Experiential Education, 2000c).

Summary. A central tenet in outdoor education theory relates to the role of experiencing and living in relatively natural environments. Psychoevolutionary and sociocultural theory suggests that industrialised humans' experiencing of (relatively) natural outdoor environments is salutary due to biophilia (and its various associated physical and psychological processes, including immediate feedback about the consequences of one's actions). The exact processes involved, however, are unclear. Some effects may be direct, such as illustrated by research on the restorative effects of viewing nature scenes. Natural environments also seem to have interactive effects in the context of outdoor education, such as with challenging adventure activities, physical exercise, and periods of contemplation. Many outdoor education programs cultivate a sense of novelty (being in a place apart) in order to heighten arousal and to facilitate participation in a new normative culture. More ecopsychologically-based approaches to outdoor education emphasise developing deeper relationships with nature such as by experiencing many visits over time to particular places.

Experiential Theories

Introduction. Principles of experiential learning and experiential education provide an important, defining basis for most outdoor education theories and models (e.g., see Knapp, 1994; Kraft & Kielsmeier, 1995; Warren, Sakofs, & Hunt, 1995). Two of the most commonly used experiential theories are Dewey's (1938/1963) theory of experience, and variations of experiential learning cycle and experiential wave models (e.g., Kolb, 1984). These two theoretical perspectives are briefly reviewed in the following section in order to illustrate the role of experiential learning processes in outdoor education.

Dewey's theory of experience. Dewey is widely recognised as the most significant influential thinker on education in the twentieth century and is commonly touted as the modern philosophical founder of the roots of experiential education (Kraft, 1995; Smith, 2007c). Dewey's educational philosophy is the best known amongst several other contemporary experiential education theorists including Boal, Freire, and Krishnamurti. Dewey's work was influenced by Greek philosophers including Aristotle, Socrates, and Plato (Chambliss, 1990), as well by William James' pragmatism (Priest & Gass, 1997; Smith, 2007c). In "Experience and Education" Dewey (1938/1963) articulates a *theory of experience* which

subsequently provided a theoretical basis for many important experiential educational experiments, including outdoor education.

The ultimate goal of education, for Dewey, was to enable people to become active, healthy participants of democratic society (1916/1966). Dewey (1938/1963) critiqued both progressive and traditional educational movements, arguing that in order for any such education methods to succeed, it needed to be based on an underlying theory of experience. Dewey argued that the progressive educational method of allowing students maximum freedom was not a sufficient panacea for the restrictive limitations of traditional, didactic education. A balance needed to be struck, between the freedom of individuals and the educative structure of the learning environment:

> The child is already intensely active, and the question of education is the question of taking hold of his activities, of giving them direction. Through direction, through organized use, they tend toward valuable results, instead of scattering or being left merely impulsive expression. (Dewey, 1933/1997, p. 36)

In order to strike an optimal balance between freedom and direction, Dewey argued that it was necessary to have a theory of experience. According to Dewey, experiences have the capacity to be educative, but only under certain conditions; otherwise experiences can be mis-educative (Ziniewicz, 2000). Dewey (1938/1963) proposed that a student's experiences derive from two main sources: (a) a student's accumulated past experiences (continuity); and (b) the interaction between past experiences and the present situation (interaction). All of an individual's past experiences combine to uniquely affect the individual's current and future experiences. Consequently, Dewey emphasised that students' experiences need to be taken seriously because these experiences have ongoing effects on the nature of students' future experiences.

Dewey warned that not all experiences are genuinely educative. Mis-educative experiences restrict students' future capacity for growth. Thus, it is important for teachers to structure learning situations in ways that take into account students' past experience and maximise students' future likelihood of being able to actively engage in developmental experiences. The particular lessons or skills that a

student may need are dependent on context, including an individual's developmental needs and interests as well as the broader cultural situation.

For Dewey, it was the teacher's responsibility to construct situations which led to enabling each student to be able to thrive and play a meaningful role in democratic society. Dewey famously likened the role of the teacher to that of a mid-wife, that is, someone who facilitates and supports the birth process, but who does not (and cannot) actually do the birthing herself. Thus, the experiential learning process fundamentally relies upon the active involvement of the student. According to Dewey (1938/1963), learning occurs to the extent that a student engages in behavioral experimentation and consciously reflects upon, and analyses, that experience (reflective thinking). Dewey defined reflective thinking as

> active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends [that] includes a conscious and voluntary effort to establish belief upon a firm basis of evidence and rationality. (1933/1997, p. 9)

Dewey further commented that, "were all instructors to realize that the quality of mental process, not the production of correct answers, is the measure of educative growth, something hardly less than a revolution in teaching would be worked" (1916/1966, p. 176).

Dewey also emphasised the need to overcome artificial mind-body dualisms in education. Dewey's emphasis on the active nature of experiential learning influenced a range of other educational and psychosocial theories. For example, his work provided important background for personal growth and group work theory and practice such as field theory (Lewin, 1951), client-centred counseling (Rogers, 1957/1992; Smith, 2007a), and adventure-based counseling (Fletcher & Hinkle, 2002; Schoel & Maizell, 2002; Schoel, Prouty, & Radcliffe, 1988). The nature of the experiential learning process has attracted further elaboration such as in the work of Boud (Boud, Keogh, & Walker, 1985), Kolb (1984) and Schön (1983, 1987, 1991), and in the development of various experiential learning cycle models. Interestingly, while critics argue that progressive education had died out, it also seems that it co-evolved with, and helped give birth to, outdoor education (Knapp, 1994).

Experiential learning cycles and waves. Experiential learning processes have come to be commonly described as "cycles" (Neill, 2004c) or "waves" (Schoel et al., 1988). Such models emphasise the iterative nature of learning through the action-reflection process described by Dewey. According to Fielding, "an understanding of learning styles is a necessary component in the groundwork of an emancipatory pedagogy" (1994, p. 394).

Kolb (1984) proposed a cyclical learning process which drew on Dewey's theory of experience (Dewey, 1938/1963), Piaget's model of cognitive learning and development, and Lewin's field theory (1951; Smith, 2007b). Kolb took the view that experience is the primary substance for learning, but that cognitive processing, analysis, and reflective elaboration upon experience is needed for deep learning. For Kolb this was a holistic, integrative perspective on learning that combined experience, perception, cognition, and behaviour.

Kolb (1984) proposed that the experiential learning process could be usefully conceptualised as consisting of four stages: the experience itself; reflection upon experience; extracting/abstracting knowledge; and the transfer of learning utilising and applying the learning in new situations (see Figure 2.1). Kolb and Fry (1975) suggest that learning can begin at any one of the four steps and that the process should be approached as an ongoing spiral (e.g., see the three-stage spiral model in Figure 2.3). Kolb's four-stage model has become the most popular experiential cycle model, but is also the most critiqued (e.g., Seaman, 2005), with only partial empirical support (e.g., De Ciantis & Kirton, 1996).

Several other experiential learning cycle models have been proposed, ranging between one (experience) and six stages, with three stages arguably providing a handy, practicable summary by collapsing Kolb's distinction between stages 3 (Concluding) and 4 (Planning; Neill, 2004c; see Figure 2.2) [6]. Wave models offer a further adaptation (Martin, Leberman, & Neill, 2002; Schoel & Maizell, 2002; Schoel et al., 1988; see Figure 2.4; further described in the section on multi-element outdoor education theories).

[6] Also see Itin's (1999) double-diamond model, which combines the four-stage Kolb (1984) cycle with Erikson's four therapeutic components: Goal-setting, Tailoring, Gift-wrapping, and Processing.

The extent to which outdoor education programs embrace experiential learning principles and models varies. Nevertheless, experiential learning theory provides a common rallying point, a sense of theoretical identity, and a valuable source of guidance for much outdoor education practice. However, there is a need for more indepth consideration of how experiential learning principles interact with other theoretical components to create the phenomena involved in outdoor education.

Summary. This section discussed the centrality of experiential learning theories to theoretical understandings of outdoor education. Outdoor education can arguably be considered to be experiential learning in the outdoors. Two key theoretical developments in experiential theory which have impacted understandings of outdoor education are Dewey's theory of experience, and experiential learning cycles and adventure waves. These conceptualisations of experiential learning have provided a basis for many subsequent outdoor and adventure-based education programs (Itin, 1999; Sakofs & Armstrong, 1996).

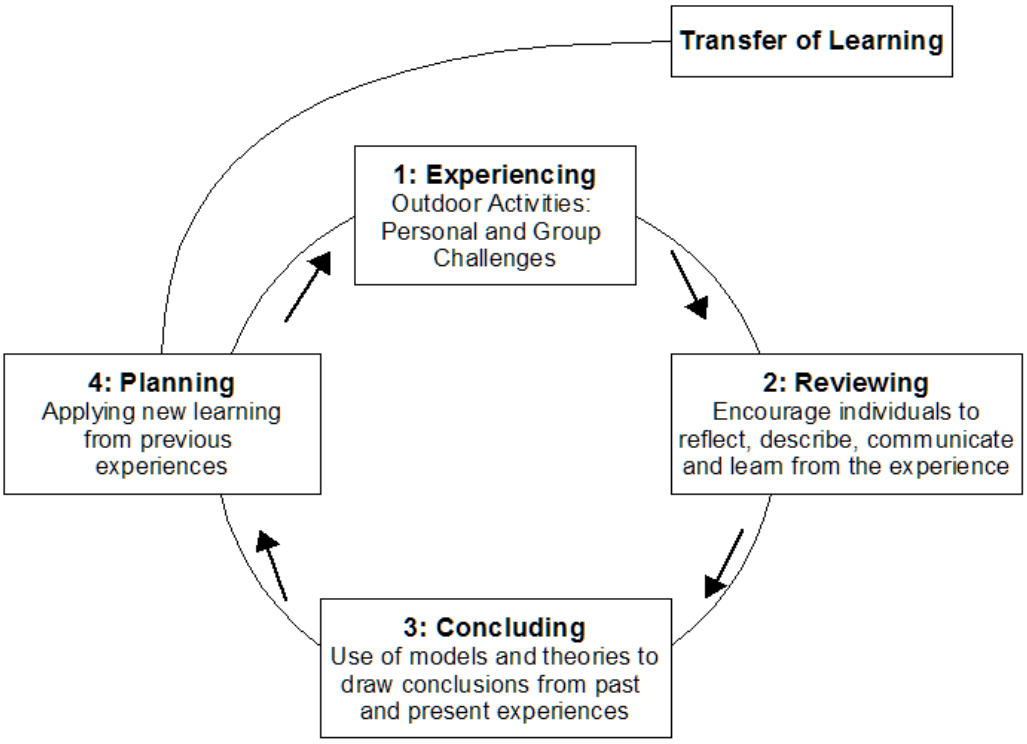


Figure 2.1 A four-stage experiential learning cycle with transfer of learning (adapted from Kolb, 1984).

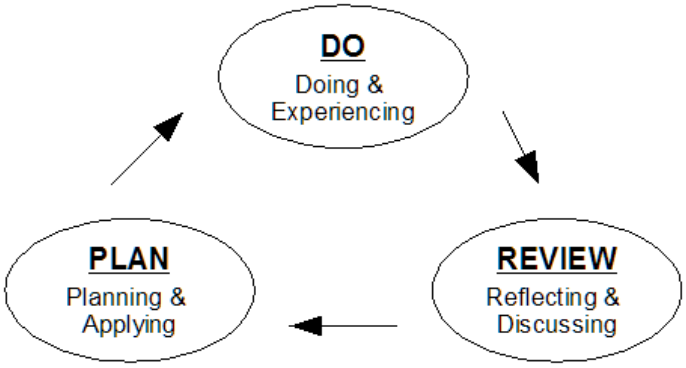


Figure 2.2 A three-stage experiential learning cycle.

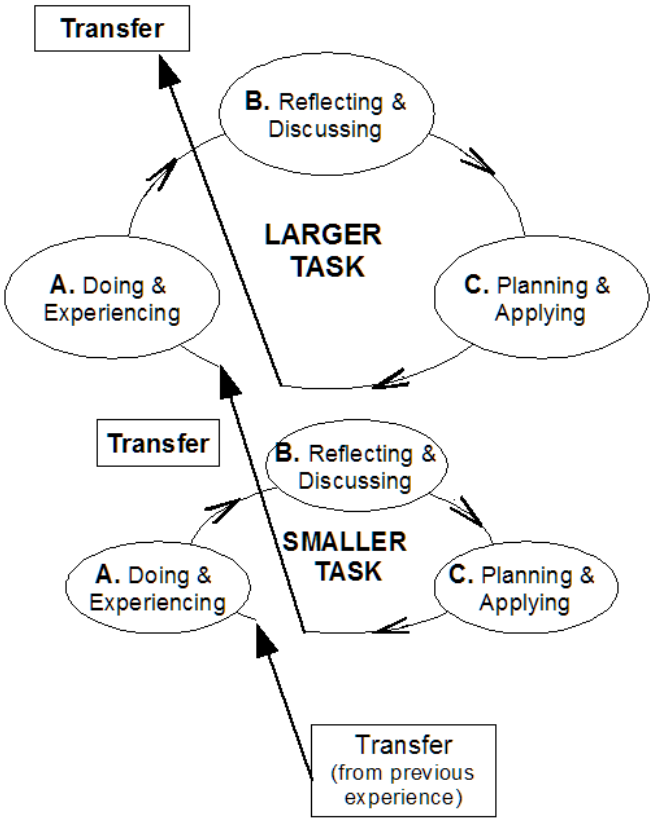


Figure 2.3 A three-stage experiential learning cycle spiral.

Psychosocial Theories

Introduction. A wide array of social science perspectives can potentially be meaningfully applied to understanding outdoor education. This section considers three such theoretical perspectives: Learning theory and group psychodynamics;

stress-inoculation; and several aspects of psychoeducational theory[7]. One of the underlying assumptions is that the behaviours, feelings, and cognitions which manifest in the outdoor education setting are representative of strategies typically used by participants in back-home environments. Thus, outdoor education programs can be understood as creating controlled microcosms of daily life in which many previous constraints are removed, and in which participants are encouraged and supported in experimentation with, and development of, more effective ways of behaving and responding (Bacon & Kimball, 1989; Richards, 1977).

Learning theory and group psychodynamics. Humanistically-oriented behavioural reinforcement contingencies (Marsh & Richards, 1988; Richards, 1977; Richards & Richards, 1981), social learning (Harmon & Templin, 1980), and group psychodynamics (Gemmill & Wynkoop, 1991; Gibson, 1979) appear to serve important roles in most outdoor education programs. Wilderness-based therapy programs for youth at risk, for example, employ a variety of behavioral techniques such as modeling, contracting, positive and negative reinforcement, and token economies (Bacon & Kimball, 1989; Gibson; Handley, 1994; Miles, 1986). Such theories help to explain, predict, and influence desirable patterns of behaviour and cognition.

Group psychodynamics in outdoor education exhibit many parallels with encounter groups, T-groups, and marathon groups (Richards, 1977; Ringer, 2002; Rogers, 1970). This includes an emphasis on the role of the facilitator(s) in understanding and fostering psychodynamics which may be uncomfortable in the short-term and meet with resistance, but which can ultimately contribute to healthy psychosocial development. Group psychodynamic perspectives have been further developed and applied as the adventure-based counseling (ABC) model (Fletcher &

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[7] Other potentially relevant psychosocial concepts include attribution theory (Ewert, 1989), expectancy theory (Ewert, 1989), gestalt psychology (Richards, 1977), learned helplessness (Newman, 1980), optimal arousal and flow (Boniface, 2000; Csikszentmihalyi & Csikszentmihalyi, 1999; Ewert, 1989), psychoanalytic theory and transactional analysis (Gibson, 1979; Medrick, 1977), self-actualisation (Leiweke, 1976; Richards, 1977; Vogel, 1988-89), self-categorisation and social identity (Morrison, 1996), self-determination (Wang, Ang, Teo-Koh, & Kahlid, 2004), self-efficacy (Ewert, 1989; Harmon & Templin, 1980; Klint, 1999; Martin, 1999c; McGowan, 1986; Parle, 1986a, 1986b; Paxton & McAvoy, 1998; Propst & Koesler, 1998; Richardson, 1998; Sibthorp, 2003), self-esteem and self-concept (Ewert, 1982b; Marsh et al., 1986a, 1986b; Richards, 1977), and self-regulation (Gouvernet, 1988). Also see discussions of psychosocial aspects of OE by Richards (1976a, 1976b) and Boyle (2002).

Hinkle, 2002; Schoel & Maizell, 2002; Schoel et al., 1988), a foundational model for Project Adventure programs, an offshoot program developed from Outward Bound programs in the 1970s (Neill et al., 2003; Prouty, 1999).

It is generally seen as an important aspect of outdoor education programs that well-functioning groups evolve (Ewert & Heywood, 1981; see also Association for Experiential Education, 2000b). Group members are generally expected to develop meaningful interpersonal bonds, adopt normative group behaviours, and to contribute to solving group problems (Oakes, Haslam, Morrison, & Grace, 1995). It has been further theorised that participating in a group which successfully evolves through stages of development (e.g., Ewert, 1992; Kerr & Gass, 1995; Tuckman, 1965) provides a conducive environment for individual development (Fabrizio & Neill, 2005; Neill & Dias, 2001). Thus, outdoor education programs offer a rich milieu of learning contingencies, social learning opportunities, and small-group psychodynamics which can be conducive to personal and social development.

Stress-inoculation. Much outdoor education practice relies upon a development-by-challenge philosophy. Intentional use of stress is central to many outdoor education theoretical models (Bacon & Kimball, 1989; Smith, Roland, Havens, & Hoyt, 1992). This approach can be understood using psychological theories of arousal, coping, and resilience. In this sense, outdoor education can viewed as a generalised form of stress-innoculation training (Jaremko, 1984; Meichenbaum, 1996, 2007).

A basic analogy for the psychological stress-inoculation process can be drawn with the training and strengthening of a muscle. Subjecting a muscle to an appropriately challenging exercise regime causes it to strengthen; so too, it is argued, psychological fitness can be effectively developed through engaging one's faculties with challenging problems (Richards, 1977). Outdoor education provides a conducive setting for undertaking a condensed, developmental sequence of challenging, real life problems.

In order for a development-by-challenge philosophy to be applied successfully, individual differences need to be understood. To this end, the transactional model of stress, appraisal, and coping is instructive (Lazarus, 1993; Lazarus & Folkman, 1984). This process-oriented model breaks down the components of an individual's stress response. Initially there is a cognitive appraisal

(which determines whether a situation is a threat based on whether the stimuli is perceived to tax or exceed existing personal coping resources). When threat is perceived, coping resources are invoked. If the coping response is ineffective, distress ensues. However, when coping is successful, this can lead to eustress (Selye, 1976; Suedfeld, 1997) and a subsequent strengthening of one's coping repertoire and capability.

This process of educative encountering with stress has been described as *educative disequilibrium* and *adaptive dissonance* (Walsh & Golins, 1976), invoking connection with cognitive dissonance (Festinger, 1957) and *constructive anxiety*. As such, outdoor education environments can provoke healthy disequilibriums which trigger educative searches for more effective coping strategies (Handley, 1994; Langer, 1969; Luckner & Nadler, 1997; Nadler & Luckner, 1992; Walsh & Golins). To the extent that adaptive success is experienced, this can lead to a genuine sense of competence, mastery, and thriving (Nadler, 1993; Walsh & Golins). By overcoming disequilibrium, through mastery of novel tasks in a supportive environment, participants are believed to experience positive, short- and long-term benefits (Fletcher & Hinkle, 2002; McKenzie, 2000a, 2000b, 2003).

Outdoor education offers a rich context in which to explore stress, arousal, coping, and resilience theoretical and research issues (Martin, 1999c; Neill, 2004e; Neill & Dias, 2001; Neill & Heubeck, 1997; Skehill, 2001; Ungar, Dumond, & Mcdonald, 2005) within a strength-based framework (Smith, 2006). In so doing, outdoor education research can inform positive psychological perspectives on the developmental potential of stress and challenge, and perhaps also counter cultural trends towards medicalisation, legalisation, and fear of risk (Cline 2004, 2007; Doublet, 2000; Furedi, 2002).

Psychoeducational theory. Educational psychology has identified a number of explanatory factors for academic and non-academic outcomes, several of which bear consideration in the context of outdoor education. In reviewing the outdoor education research literature, Hattie et al. (1997), for example, recommended further investigation of: immediacy of experience; specific and difficult goals; feedback; and reassessment of coping strategies. These factors are discussed in this section, along with the role of social support.

Outdoor education programs have an *immediate quality of experience*. The sense of being in a place apart, separated from everyday routines, combined with the novel activities, engenders the experiences with a salient intensity. This, in turn, arouses motivation towards and helps participants to focus on dealing with real problems (Fabrizio & Neill, 2005; Hattie et al., 1997). Participants' actions during outdoor education programs attract direct feedback from the natural environment, peers, and instructors.

Pursuit of *challenging but achievable goals* is key to high achievement (Locke & Latham, 1990). Outdoor education programs are generally structured around clear, difficult goals. Journey-based expedition programs involve travelling through challenging terrain for sustained periods, encountering unfamiliar activities, such as abseiling/rappelling and rockclimbing, along the way. These tasks are structured so as to be difficult, but achievable, with adequate preparation and support provided. Goal-setting operates on several levels, ranging from "micro-tasks" (e.g., cooking a meal) to "medium-tasks" (e.g., navigating to a campsite) and "macro-tasks" (e.g., planning and completing a multi-day expedition).

Feedback is a vital part of the experiential learning process (Kolb, 1984) and thus also outdoor education. Hattie has reported that feedback is the most powerful single moderator that improves affective and achievement outcomes (Hattie, 1987, 1992a, 1993, 1999; Hattie & Jaeger, 1998; Hattie & Timperley, 2007). Outdoor education programs immerse participants in feedback-rich settings. Individual actions occur in close proximity to relatively immediate and natural consequences (Reser & Scherl, 1988). Opportunities for feedback are enhanced by the immediate quality of the experience, the pursuit of specific and tangible goals, small group sizes, the natural environment, challenging problem solving tasks, group processing and debriefing, and feedback from the instructor(s) (also see Propst & Koesler, 1998).

As outdoor education programs take place in unfamiliar environments, much *reassessment of coping strategies* is required by participants (Hattie et al., 1997; Neill & Heubeck, 1997). Many strategies previously used no longer work (Richards, 1977). Non-productive coping strategies, such as ignoring the problem or responding aggressively, do not solve the problems faced, whereas strategies such as planning ahead and communicating tends to help (Neill & Heubeck). Such realisations can

catalyse a powerful cycle of re-evaluating and refining one's habitual coping responses. Participants also learn about effective coping through observation (e.g., of instructors and peers). Thus, outdoor education provides considerable opportunity for participants to improve their coping skills.

Positive social support within outdoor education groups has been suggested as an important factor in contributing to developmental outcomes (McKenzie, 2000b). In a study of the characteristics of adventure programs valued by experts and adolescents in treatment, adolescents endorsed "helping/assisting others" as the top characteristic (Witman, 1995)[8]. Similarly, Greenaway (1995) found that strong group support for risk taking was reported by participants to be important for their learning in outdoor management programs. Neill and Dias (2001) found that *a lack of negative social influence from peers* was a more positive predictor of growth in the psychological resilience of Outward Bound participants *than positive social support*. Such findings have led to the formulaic summary that "challenge + support = growth" (Neill, 2005b; Neill & Dias).

Summary. This section discussed psychosocial and psychoeducational theoretical perspectives which offer useful approaches to understanding outdoor education programs. Humanistically-oriented learning theory, social learning, small group psychodynamics, stress-inoculation, coping, immediacy of experience, goal-setting, and the role of social support were considered.

Multi-Element Theories

Introduction. Most outdoor education training programs are founded on a belief that several key elements need to be present for developmental changes to occur. Programs take place in novel, outdoor settings, participants face challenging goals and problems, a supportive group atmosphere is developed, and participants are encouraged to reflect on and learn from their experiences. This section reviews several of the best known, multi-element, practice-oriented, outdoor education

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[8] The other top six characteristics (out of 16) for adolescents were also closely related to social support: "realising the importance of caring about self and others," "doing trust activities,", "getting support of other participants" and "feeling like part of the group". The only non-social support characteristic ranked in the top six by participants was "taking risks/meeting challenges" (ranked 2nd). Experts in Witman's (1995) study rated social support items as less important than adolescents; "helping/assisting others", for example, was rated 8th by experts, and 1st by adolescents.

theories. Where possible, connections are made between these multi-element outdoor education theories and the environmental, experiential, and psychosocial theories discussed earlier in this chapter.

Outward Bound theories. Outward Bound programs, which began in 1941 (James, 1961), have become the best-known worldwide brand of outdoor education program. More importantly, the ideas hot-housed within Outward Bound generated many theoretical models and principles which have given rise to a number of other notable experiential and adventure education projects[9]. Of particular relevance are Hahn's educational principles, neo-Hahnian critiques, Outward Bound process models, and dramaturgy.

The Outward Bound movement continues to owe much of its distinctive nature to Hahn's educational principles. Hahn's principles were based on his diagnosis of human nature's response to post-industrial lifestyles. Hahn considered that young people in modern society were vulnerable to six diseases, declines, or decays (Hahn, 1960, 1961; Richards, A., 1999) which he characterised as:

1. Decline of Fitness due to modern methods of locomotion;
2. Decline of Initiative and Enterprise due to the widespread disease of spectatoritis;
3. Decline of Memory and Imagination due to the confused restlessness of modern life;
4. Decline of Skill and Care due to the weakened tradition of craftsmanship;
5. Decline of Self-discipline due to the ever-present availability of stimulants and tranquilisers; and
6. Decline of Compassion due to the unseemly haste with which modern life is conducted or as William Temple called "spiritual death".

[9] Other well-known Hahnian educational projects include the United World Colleges, the Round Square Conference Schools, and the Duke of Edinburgh Award Scheme. Well-known OB off-shoot programs include the National Outdoor Leadership School (Raiola & O'Keefe, 1999), Project Adventure (Prouty, 1999), and Expeditionary Learning Outward Bound (Campbell et al., 1996).

Central to Hahn's educational endeavours was a desire to ameliorate these social ills. Thus, Hahn (1960) proposed four antidotes (or pillars) for helping society to escape these post-industrial ills:

1. Expeditions (e.g., via sea or land, to engage in long, challenging endurance tasks);
2. Craft/Skill (e.g., involving crafts and manual skills);
3. Community Service (e.g., Surf Lifesaving, Firefighting, First Aid, etc.); and
4. Physical Fitness (e.g., to compete with one's self in physical fitness; in so doing, train the discipline and determination of the mind through the body).

These four antidotes reflect Hahn's pragmatic emphasis on the types of activities he believed were necessary to deal with the post-industrial social diseases, and provided the basis around which many of Hahn's educational experiments were structured. The Outward Bound formula, devised by Hahn and Holt in 1941, for example, consisted of five basic components (James, 1980b):

1. Students pledged themselves to personal goals;
2. Control of time and activity;
3. Adventure and risk in order to cultivate a passion for life;
4. Operating in small groups to develop natural leadership; and
5. Dedication to community service.

After World War II, the principles of Outward Bound were expanded to include foci on fitness, initiative and enterprise, memory and imagination, skill and care, self-discipline, and compassion (Fletcher & Hinkle, 2002). Expeditionary Learning Outward Bound schools have subsequently developed a schooling model based on ten Hahnian principles (Campbell et al., 1996; Miner & Boldt, 2002):

1. The primacy of self-discovery;
2. The having of wonderful ideas;
3. The responsibility for learning;

4. Empathy and caring;
5. Success and failure;
6. Collaboration and competition;
7. Diversity and inclusion;
8. The natural world;
9. Solitude and reflection; and
10. Service and compassion.

Such has been the popularity of Hahn's influence, that it has also provoked a what Brookes has termed "neo-Hahnian" beliefs (2003a, 2003b, 2003c, 2003d, 2006). According to Brookes, the neo-Hahnian view is that short-term adventure experiences can "build character", "develop persons", and "actualise selves". Brookes contends that outdoor adventure education programs do not build character, but may provide situations that elicit particular behaviours or teach knowledge and skills.

Earlier critiques of neo-Hahnian beliefs were evident during the evolution the first Outward Bound school in the USA (in Colorado, 1961; Miner, 1999). In its early years, the school was pioneered by strong adventurers who emphasised skills training, stress and hardship, problem solving, community service, and reflection and evaluation, with training, expedition, solo, final expedition, and concluding phases (Bacon, 1983). Then, in the 1970s, the school underwent a cultural transition, challenged by educators who paid more attention to identifying and explicitly utilising psychoeducational processes (James, 1980a, 1980b). Several theoretical models of the Outward Bound process were subsequently developed (Bacon, 1983, 1987; Kesselheim, 1974; Walsh & Golins, 1976).

Kesselheim (1974) isolated five common elements in experiential learning models such as Outward Bound. These elements were: (a) *environmental contrast* (wilderness environments provide a sharp contrast to familiar environments); (b) *physical activity* (complex activities over an extended period of time); (c) *intentional use of stress* (intrinsic part of situations; not contrived); (d) *small group context* (cooperation and interdependence skills are emphasised); and (e) *new knowledge and skills* (emphasis on learning novel, unfamiliar skills).

Walsh and Golins (1976) subsequently presented what has become one of the most widely cited outdoor education models developed during this period. Walsh and Golins conceptualised the background to the problem they were tackling as follows:

> Outward Bound … is not something which is necessarily 23 days in length; has training, expedition phases, a solo, final expedition, and a marathon; or is conducted by an Outward Bound school …. Nor is it the values, such as: self-preservation, self actualization, perseverance, initiative, reflection, experimentiveness, etc. …. Instead we are talking about the structures, components, and conditions whose presence and interaction insure that an experience is conducive along the lines of Outward Bound (i.e., aids the persons involved in reaching the objectives intended.). (Walsh & Golins, pp. i-ii)

Seven elements, plus "transfer", were identifiable in Outward Bound programs and considered to be replicable by other programs (Walsh & Golins, 1976). These elements were conceptualised as unfolding sequentially: The *learner* is placed in a *unique physical environment* and into a *unique social environment*, then given a *characteristic set of problem-solving tasks* and *impelled into a state of dissonance* to which s/he *adapts by gaining mastery*, which then *reorganises the meaning* and direction of the learner's life experience (see Figure 2.5).

The Outward Bound Process Model (Walsh & Golins, 1976) has attracted considerable discussion (e.g., Gager, 1979; McKenzie, 2000a, 2000b, 2003; Nold, 1978; Sibthorp, 2003). Gager developed a generalisation for experiential education settings: a *learner* is placed into a *demanding reality context* which necessitates mastery of *new, applied skills* followed immediately by *responsible, challenging action* coupled with an opportunity for *critical analysis and reflection* (see Figure 2.6).

More recently, McKenzie (2000a, 2000b; 2003) reviewed and investigated some aspects of the Outward Bound Process Model. McKenzie conducted a mixed-methods follow-up study exploring the experiences of adolescent and adult participants in Outward Bound programs in Canada, concluding that five groups of factors (activities, physical environment, instructors, group, and students' individual characteristics) contributed to participant outcomes ($N = 92$). These domains inform subsequent development of a systems framework later in this chapter. McKenzie

suggested that the study's results were reasonably consistent with the Outward Bound Process Model (Walsh & Golins, 1976), although several refinements were suggested, including a less linear approach.

Sibthorp (2000, 2003) examined some aspects of the Outward Bound Process Model in studying whether participant antecedent variables (e.g., age, gender) and emergent characteristics of the experience (e.g., social environment, instructor support, and self-empowerment) would predict changes in self-efficacy outcomes for adolescents participating in a commercial adventure education program in the USA ($N = 253$). The main predictor was perceived personal empowerment during the program and, to some extent, students' perceived relevance of the program. These results appeared to confirm the importance of providing learners with opportunities to acquire skills, autonomy, and experience mastery.

Bacon (1987) and James (1980a) described early evolutions of Outward Bound models. James characterised the initial Outward Bound model as "letting the mountains speak for themselves" (a phrase he attributed to Rusty Baillie). In this approach, the Outward Bound experience is understood to emerge from and reside in the direct experience of challenge and adventure in remote wilderness settings, in a small group context. Well-designed "mountain experiences" were thought to be sufficiently compelling that they did not need, or could even be undermined by, cognitive and verbal processing. Bacon and Kimball (1989) suggested that wilderness-based living impels participants into an altered consciousness characterised by a direct dialogue with the wilderness and feedback based on interacting with natural laws.

In the evolution of Outward Bound, the mountains speak for themselves model was replaced by the "Outward Bound plus" model (Bacon, 1987). This approach combined the power of natural experience with additional reflective processes and facilitated dialogue in order to maximise learning. Bacon also proposed a third-generation "metaphorical" model (Bacon, 1983) which emphasised the use of experiential metaphors to help facilitate a deeper and more transferable learning process, extending an earlier suggestion by Kesselheim (1974) that the transfer of newly acquired behaviors to life back home could be facilitated by the conscious use of analogy and metaphor (see also Bacon & Kimball, 1989; Gass, 1995, 1999; Hovelynck, 1998, 1999).

Priest and Gass (1997, 2005) subsequently suggested further evolutions of facilitation techniques including framing, frontloading, and paradoxical intention. Others have also emphasised the metaphoric (Gass & Priest, 2006; Hovelynck, 1998) and symbolic nature of adventurous journeying (e.g., Lord, 1987; Loynes, 1999, 2003; Varley, 2006), in which outdoor education programs can be viewed as modern-day rites of passage (e.g., Bacon & Kimball, 1989; Bell, 2003; Maddern, 1990) and holistic, Indigenous reconnections with mind, body, and soul (Drengson, 2004; Ellis-Smith, 2005a, 2005b).

A final, more recent, Outward Bound model is "dramaturgy". Dramaturgy is originally a theatrical term which is now being used within experiential education to refer to the conscious engineering of narrative themes in order to engender a sense of play and drama. In a dramaturgical approach, participants are viewed as actors, instructors as actor-directors, the environment as a stage, and the curriculum as a co-created experiential drama through which learning goals can be pursued (Martin et al., 2002). A dramaturgy is often seen as a series of "activity waves", that is, a series of peaks and troughs, consisting of periods of turbulence, excitement, activity, and calm (Schoel et al., 1988; Schoel & Maizell, 2002; see Figure 2.4). In dramaturgy, different waveforms may indicate predominantly social, physical, creative, and reflective activity sequences (Martin et al., 2002).

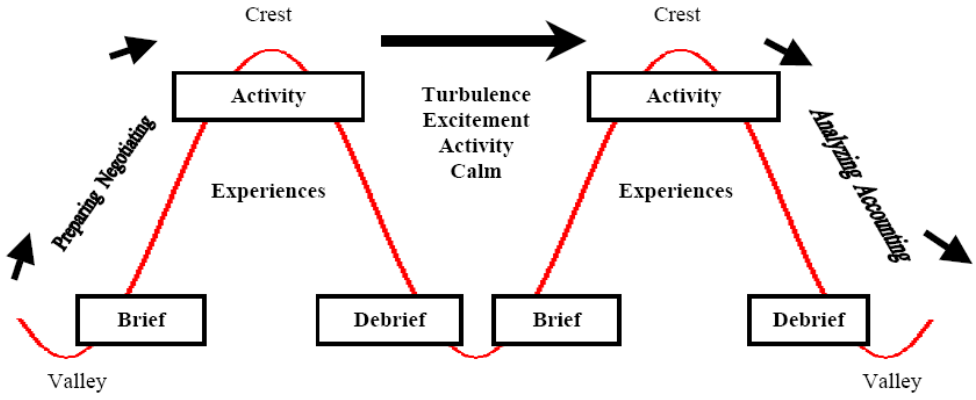


Figure 2.4 The adventure wave (adapted from Schoel et al., 1988, in Rawson, 1991, p.18).

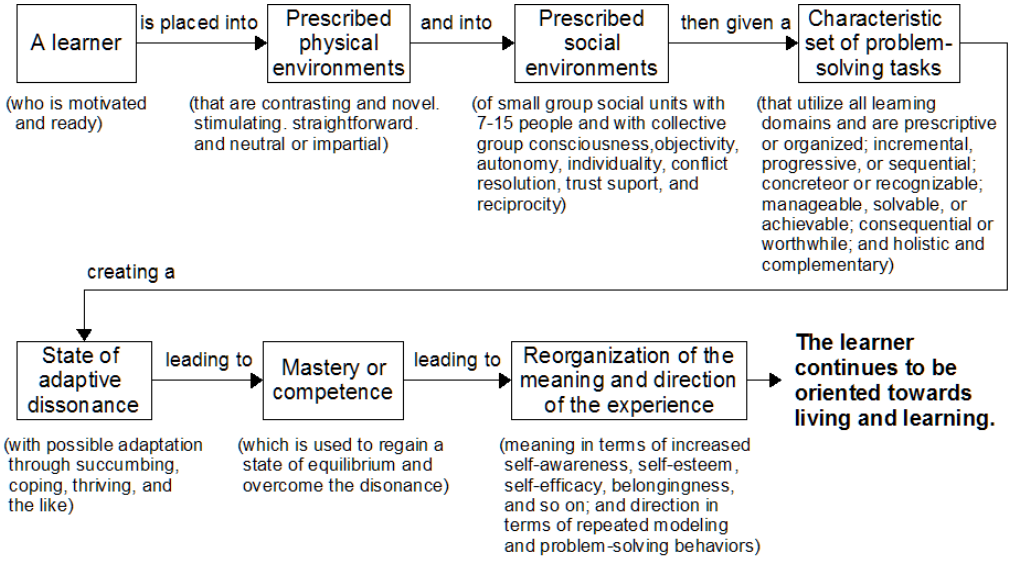


Figure 2.5 The Outward Bound Process Model (adapted from Walsh & Golins, 1976).

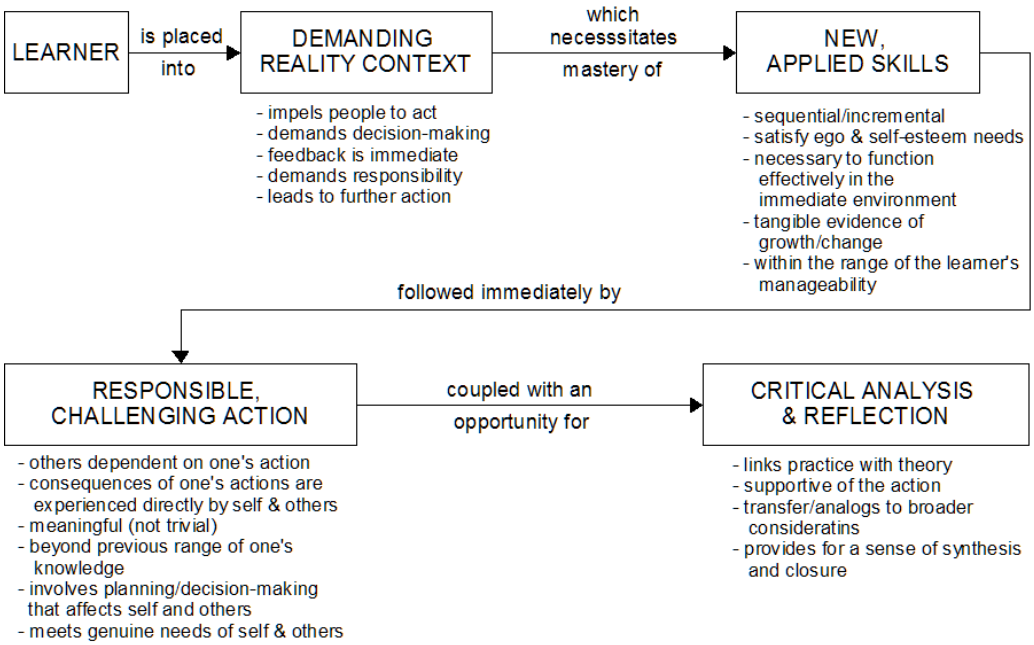


Figure 2.6 Experiential learning process flow (Gager, 1978, p. 5).

Barret and Greenaway (1995). Barret and Greenaway (1995) identified several key "ingredients" of outdoor education programs (see Figure 2.7), including *adventure activities*, the *natural environment*, the *group*, the *staff*, the *learning climate*, and a *philosophy* (a set of values and way of working that binds these ingredients together). Barret and Greenaway's "ingredients" are arguably more broadly applicable than the Outward Bound models, and less linear. Each of the proposed ingredients may be present in varying degrees in different types of outdoor education programs. These ingredients provide a useful collation of major theoretical themes and program components, and a starting point for developing a more generic, process-based, approach to outdoor education.

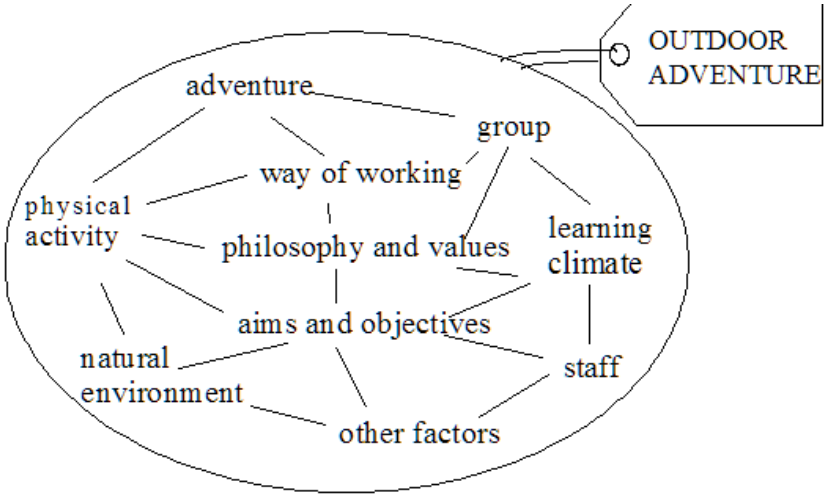


Figure 2.7 The ingredients of outdoor adventure (Barret & Greenaway, 1995).
Note. Reproduced with permission, from Barret and Greenaway (1995a, p. 8).

Russell and Farnum (2004). Russell's therapeutic adventure models (1999; Russell, Hendee, & Phillips-Miller, 1999; Russell & Hendee, 2000; Russell & Farnum, 2004) are informed by case studies of wilderness therapy programs involving youth experiencing emotional and behavioural problems (Russell, 2001; Russell & Phillips-Miller, 2001). Thus, these models exhibit arguably greater ecological validity. The models reinforce previous themes in the literature (wilderness environment, physical activity, and small-group social interaction), but add particular emphasis on psychological processes, the role of restorative nature of the wilderness environment, and on physical exercise than previously discussed models (see Table 2.6). Wilderness is emphasised because of its value in treating clients who tend to be expert resisters of human-based attempts to effect change in

their emotional and behavioural patterns (Handley, 1994). Likewise, the emphasis on the role of physical exercise provides a non-direct form of intervention (Handley), boosting mood and psychological well-being, and providing a practical method of dealing with substance abuse withdrawal.

Table 2.6 *Conceptual Framework of the Wilderness Therapy Treatment Milieu (adapted From Russell and Farnum's, 2004, Figure 1)*

Category	Peak Intensity	Proposition (adapted)
Wilderness	Beginning	A restorative environment is particularly advantageous for clients experiencing anxiety, stress, and mental fatigue.
Physical Self	Middle-late	Consistent physical activity leads to feeling and looking better.
Social Self	Late	Participants get to know each other, breaking down stereotypes and allowing formation of close interpersonal relationships.

Beard and Wilson (2002). One criticism of several previous models (e.g., Russell & Farnum, 2004; Walsh & Golins, 1976) is that they imply a sequential process which, among other problems, seems to limit broader applicability of the components to other contexts. The Learning Combination Lock model (LCL; Beard & Wilson, 2002, 2007; see Figure 2.8) suggests a more flexible and dynamic conceptualisation of outdoor experiential programming. The LCL consists of a large array of elements which are seen to interact within an experiential learning setting. The elements represent the external environment (places and elements), the sensory modality used by participants, and the participants' internal environment (emotions, forms of intelligence, and ways of learning). The combination lock metaphor is that a range of different experiences can be "dialed" by selecting various combinations of elements.

The LCL model lends itself to the design of "artificial" experiential and adventure education programs in which activities can almost literally be "called up" from a "bag of tricks". One of the strengths of the LCL model is that it incorporates individual differences (e.g., learning styles). However, the model does not include elements such as the role of the instructor, group, program philosophy, and the individual's past experience, which are incorporated to varying extents in previously discussed multi-element outdoor education models. The LCL also seems to lack referencing of earlier models, and has not attracted much in the way of critique or application (Rickards, 2007).

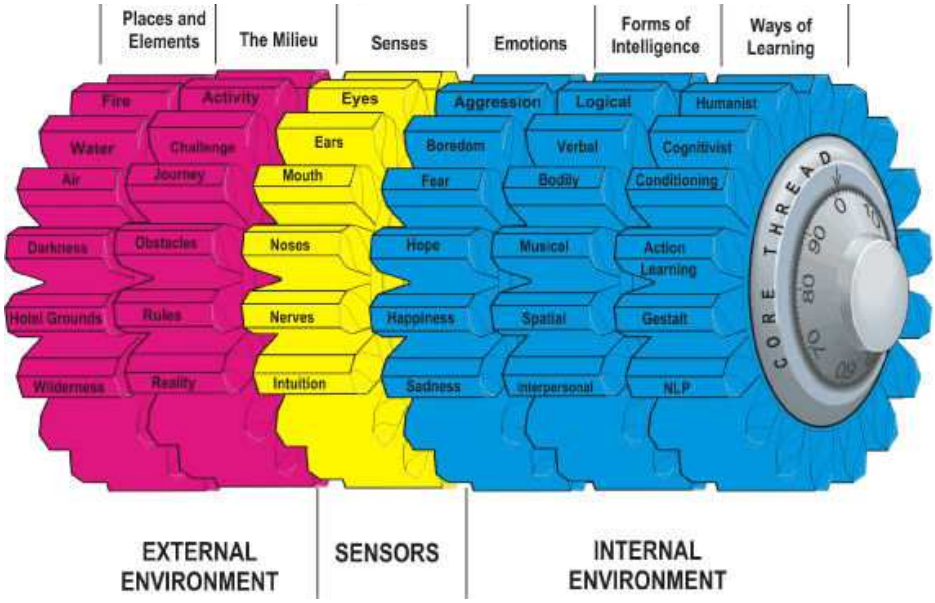


Figure 2.8 The Learning Combination Lock model (Beard & Wilson, 2002).

Note. Reproduced with first author's permission.

Other theories. A variety of other multi-element theories have been proposed as relevant to understanding outdoor education programs. Two of the clearest syntheses of previous themes are provided by Hopkins (1985) and the Outdoor Education Group (2007). Hopkins suggested the following characteristics for effective adventure education programs:

1. Experiential learning with high impact, problem solving experiences;
2. Adaptation to the physical, social, and cultural needs of participants;
3. High expectations and focus on individual achievement;
4. Empathic climate;
5. Emphasis on group process, social skills, co-operation, and effective communication;
6. Incorporation of environmental awareness and creative appreciation; and
7. Regard of adventure as a metaphor for life.

The design principles synthesised by the Outdoor Education Group (2007) and which guide their program design succinctly capture the core outdoor education elements and processes discussed in this chapter:

1. A semi-wilderness environment;
2. Isolation from as many/all forms of technology and human impact/development;
3. The presence of a course facilitator, and a structured curriculum;
4. Small groups of learners (e.g., l6 - 18 or less);
5. Continual contact with the learning medium;
6. Appropriate level and forms of challenge (physical, emotional, spiritual); and
7. Transfer of learning to and from the course.

Summary. This section reviewed multi-elemeent theories of outdoor education. These theories describe generic components and processes which characterise outdoor education programs. Central themes include: the natural environment; participants (individual differences); instructor(s); small groups; challenging, compelling activities; and program philosophy. Although there is some consensus around each of these proposed elements, no model to date has dynamically conceptualised interrelations between each of these theorised components.

A Systems Framework

Introduction. Outdoor education can be viewed as a dynamic interaction between systems (e.g., physiological, cognitive, behavioral, emotional, spiritual, social, cultural, and environmental systems). The holistic, interactionist nature of outdoor education is reflected in the diverse, complex, and dynamic nature of available theories. However, the various theories and models reviewed to date notably lack integration and cross-referencing. Thus, this section proposes a *systems framework* (Checkland & Scholes, 1990; Warfield, 2006) in an attempt to draw together the major theoretical conceptualisations of outdoor education which have been reviewed in this chapter.

Interactivity. When outdoor education "works", it seems to be more than a sum of its parts. Thus, an interactionist perspective offers promise. According to Scherl (1986), "in an interactionist model what is central is not the individual or the physical and social environment along, but the ongoing interaction between both"

and that "this interaction is coloured by the person's continual appraisal of his/her surroundings" (p. 2). Priest (1986), for example, observed that "in outdoor education the emphasis for the subject of learning is placed on relationships, relationships concerning people and natural resources" (p. 13).

Interactionist perspectives have also been applied in related fields, such as experiential education and leisure. Boud and Walker described experience as meaningful, active engagement with the environment in which "each learner forms part of the milieu, enriching it with his or her personal contribution and creating an interaction which becomes the individual as well as the shared learning experience" (1991, p. 18, quoted in Boud, Cohen, & Walker, 1993, pp. 6-7). Similarly, leisure has been described as a transactional process in which the person and the natural environment "jointly define one another and contribute to the meaning and nature of an holistic event" (Knopf, 1987, p. 403, quoted in Altman & Rogoff, 1987, p. 24). Other potentially relevant social science interactionist system model contexts include ekistics (human civilisation; Doxiadis, 1970), environmental psychology (Wapner, 1995), permaculture (Mollison, 1979, 1997; Mollison & Holmgren, 1978), and social psychology (Minami & Tanaka, 1995).

Domains and elements. Seven domains are proposed as underlying the phenomena of outdoor education. These domains derive from the main themes in this chapter's review of outdoor education theories, but do not preclude other possible domains. The first six domains are similar to those proposed by McKenzie (2000a,b; 2003), Barret and Greenaway (1995a, 1995b), Carver (1996, 1997, 1998), Itin (1999), and Ringer (1997), with the addition of a seventh domain (Culture; see Figure 2.9):

1. *Individual*: each individual has a unique history and individual differences; may contain elements such as one's fitness, ethnicity, self-concept, outdoor skill, and so on:

2. *Environment*: the physical setting, usually *relatively* natural; may contain elements such as weather, terrain, flora, and fauna;
3. *Activity*: the set of situationally-contingent tasks, activities, and problems to be solved;
4. *Program*: the program philosophy and values, manifest in choices about every aspect of program design and style;
5. *Group*: the unfolding group psychodynamic;
6. *Facilitator*: the facilitator's in situ presence, acting towards, and reacting to, elements in the system[10];
7. *Culture*: the cultural context which provides a social fabric into which elements from other domains are richly embedded.

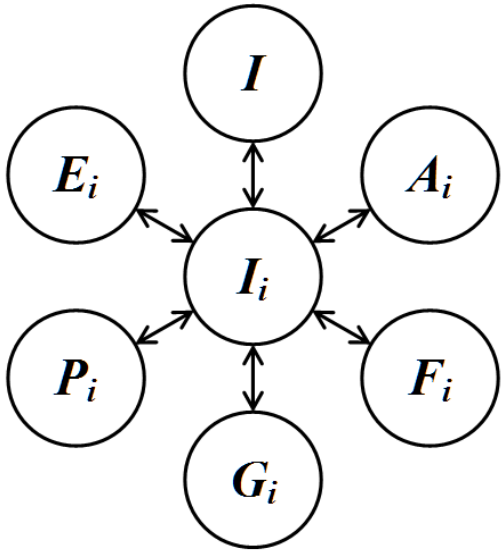


Figure 2.9 Structural model depicting the interactive relationship between an individuals' phenomenological reality (I_i) and domains of influence in outdoor education.

Note. i = a temporal instant; I = Individual (stored past); E = Environment; A = Activity; P = Program; G = Group; F = Facilitation; C = Cultural milieu (surrounding, not shown).

What occurs during an outdoor education program can be understood as a complex interaction between *elements* within each of these *domains*. These elements interact with one another and with elements in other domains. Phenomena which

[10] "the role of leaders can be seen as assisting the *process* rather than assisting the participant" (Handley, 1997, p. 74) [my italics]

arise in relation to a rock climbing experience, for example, might be seen as arising from an interaction between:

1. *Individual*: Physical strength, flexibility, and agility, motivation, personality, self-conceptions, and past experiences;
2. *Environment*: Rock, weather, and location;
3. *Activity*: Grade (difficulty) and type of climb;
4. *Program*: Philosophy used to guide participants through this particular type of activity;
5. *Group*: Group dynamics, behaviour, and atmosphere;
6. *Facilitator*: Facilitation style, technical skills, and rapport with participants; and
7. *Culture*: Cultural norms and beliefs.

A systems framework provides an adaptable way of conceptualising possible interrelations between the major domains and elements which have emerged from outdoor education theoretical and empirical literature. Such a framework can be useful for both "outcome" and "process" research, and is equally applicable to qualitative and quantitative methodologies, as well as to action research and experiential sampling methods (e.g., McIntyre, 1999; McIntyre & Roggenbuck, 1998). The systems framework is also intended to be helpful for program design, facilitation, and knowledge management.

Temporal change. System states shift and evolve over time; elements are in dynamic flux. The future state of the system (or any element in the system) arises as a complex function of the past system states and the present constituent elements. Thus, there is a *force field* arising from the dynamic interaction between the immediate past system state and present system elements. Thus, the proposed system framework has much in common with Lewin's field theory (1951) and Dewey's theory of experience (1938/1963). Ringer (1997) described such a system as follows:

> Movement towards the goal will not always be visible and is unlikely to be "linear". Human change processes of the nature we are advocating resemble random events with an overall pattern of

progress that eventually results in the group moving toward their goal. (p. 267)

Theoretical propositions. From an anthropocentric point of view, a person can be understood as evolving through a series of phenomenological instants over time. As time progresses, the individual stores complex patterns from past experiences. These stored "patterns" constitute a "self" which interacts with the surrounding milieu, giving rise to the individual's next phenomenological instant, and contributing to a new system state. The notion of an interactive dynamic between stored experience and present experience draws from Dewey's principles of continuity and interaction (1938/1963), as a well as Lazarus and Folkman's (1984) transactional model of stress, appraisal, and coping.

Interaction between an individual's past (I) and present (I_i) can be referred to symbolically, where I refers to a person's stored past experience, and I_i refers to an individual's current phenomenological reality. The subscript i is a temporal variable. Dewey (1938/1963) emphasised the importance of the teacher understanding the interaction between I (individuals' past pattern) and I_i (individual's current state). Thus, the teacher should take action to manage learning activities and environments such that a student's experiences unfold in a developmental way, opening up future possibilities rather than limiting them. These systems framework propositions can be expressed in a structural model (see Figure 2.9).

The systems framework has been presented here primarily in terms of the relationship between I_i and the other domains. However, the framework could be just as readily used to focus on other domains, and much more could be said about each of the domains and their interrelationships. The point of this section, however, was to synthesise the main aspects of outdoor education theory into an integrated framework for understanding how outdoor education methods may be able foster the development of participants' life skills.

Summary. This section described a systems framework to help integrate various theoretical outdoor education perspectives. The framework conceptualised seven interactive domains (Individual, Environment, Activity, Program, Group, Facilitator, and Culture). The state of elements within each domain was understood to be a function of their past states and the force field generated by the interactions amongst other elements in the system.

Summary

This section reviewed major theoretical perspectives about how outdoor education programs may facilitate personal and social development. These perspectives focused on the role of natural environments, experiential learning, psychosocial and psychoeducational factors, and multi-element outdoor education theories. Natural environments offer unique, integrating contexts for undertaking challenge-based experiential activities as part of small, supportive groups, under the guidance of experienced instructors, as well as direct, physical and psychological restorative benefits. Experiential theories, largely based on Dewey's theory of experience and learning cycle (or wave) models, are frequently utilised in outdoor education. Psychosocial perspectives emphasise behavioural learning theory, group psychodynamics, stress-inoculation, and social support. Multi-element theories emerged from outdoor education practice-based models, evolving from "letting experiences speak for themselves" to include various facilitation techniques which emphasise instructors' roles in helping participants to move through action-reflection learning cycles. Finally, this chapter conceptualised a systems framework in an effort to holistically integrate major outdoor education theoretical domains and elements.

Summary

This chapter described outdoor education as the use of challenging, group-based experiential activities in relatively natural environments for a variety of purposes (with personal and social development as the most common aim). Theoretical underpinnings of outdoor education programs, including environmental, experiential, psychosocial, psychoeducational, and multi-element theories and models, were critically examined. This led to the development of a systems framework in an effort to integrate the various theoretical perspectives. This systems framework may provide a useful conceptual model for future outdoor education theory and research, and is used to help organise the next chapters' empirical literature review (which considers various types of outcomes and the extent to which these outcomes are influenced by student, group, and program characteristics) and in the design of Study 2 (Chapter 7). The next chapter also develops a theoretical and operationalisationable framework for "life effectiveness skills" as a major target of outdoor education programs, with instrumentation testing subsequently undertaken in Study 1 (Chapter 6).

CHAPTER 3

LIFE EFFECTIVENESS CONSTRUCTS AND REVIEW OF RESEARCH EXAMINING THE IMPACT OF OUTDOOR EDUCATION PROGRAMS

Introduction

This chapter defines, and then presents a theoretical rationale for, multiple dimensions of life effectiveness and life effectiveness as a global construct. A major literature review of research on personal and social development outcomes of outdoor education programs is then presented. Finally, implications for future research investigating the developmental outcomes of outdoor education are discussed.

Life Effectiveness

Introduction

"Life effectiveness" can be conceptualised as a person's demonstrated capacity to adapt, survive, and thrive. Life effectiveness can be further conceived as consisting of multiple, generic, enhanceable life skills which correspond to typical aims of personal and social development intervention programs. Psychosocial and outdoor education theory and research pertaining to each of 11 proposed life effectiveness factors is discussed.

Definition

Life effectiveness is proposed to refer to a person's capacity to adapt, survive, and thrive; that is, it refers to how well one is equipped to handle the demands of life. Hamburg (1990) defined life skills as "requisite skills for surviving, living with others and succeeding in a complex society" (Hamburg, 1990, p. 3). Skinner might

also have been referring to life effectiveness when he wrote, “let men be happy, informed, skillful, well behaved, and productive” (1955/1956, p. 47). Life effectiveness is used here to broadly refer to behaviour, cognitions, and emotions which give cross-situational advantage for “surviving and thriving”. Life effectiveness is further proposed to consist of learnable and enhanceable “life skills”. Such a view of life effectiveness as “learnable” and “enhanceable” is intended, in part, to distinguish the construct from relatively stable psychological constructs (such as personality traits) and, to some extent, also from fuzzier constructs such as “resilience” and “hardiness” which are not necessarily conceptualised as consisting of enhanceable life skills (e.g.,. see Ahern, Kiehl, Sole, & Byers, 2006; Ungar, 2005).

Despite its apparent relevance, importance, and desirability, the term “life effectiveness” is not in common use and it rarely appears in the psychological literature. At least one example, however, is instructive. The *Views of Life Scale* was developed for health and well-being assessment (Williams, Eyring, Gaynor, & Long, 1991). Williams et al. hypothesised three factors, one of which was “effective life management”. They described a person with effective life management in this way:

> One’s life is well-managed - One believes s/he is doing those things that make the best use of his or her resources. Sh/e believes that s/he has opportunities for self-improvement, focuses on the present, makes good decisions, solves problems efficiently, achieves desired goals, maintains a balance among the important areas of life, does mainly what s/he enjoys, and is managing life with increased effectiveness. (p.168)

However, effective life management was not revealed as a distinct construct (Williams et al., 1991). An oblique factor analysis found five factors, two of which had considerable overlap with effective life management: quality of life (e.g., “I have lots of/little energy”) and life management (e.g., “I usually/seldom achieve my most important goals”). These results seem to suggest that further definitional and conceptual work is needed to operationalise a multidimensional life effectiveness measurement model.

Similar Terms

To elaborate further on the intended meaning of life effectiveness as a global construct, several synonymous terms are suggested in Table 3.1, any of which might reasonably be used in place of *life effectiveness*. "Life" may also be referred to as "Personal" or "Individual", whilst "Effectiveness" may also be referred to as "Competence", "Efficiency", "Fitness", "Proficiency", or "Skill". The intended meaning implied by "competence" here is consistent with Mitchell's (1983) description:

> Competence grows from the process of recognizing one's abilities and applying them meaningfully and completely. Competence means assessing oneself as qualified, capable, fit, sufficient, adequate. Competence emerges when a person's talents, skills, and resources find useful application in meeting a commensurate challenge, problem, or difficulty. In sum, the competent individual's perceived abilities are roughly equal to their perceived responsibilities. (p. 180)

Life effectiveness may be considered as behavioural, emotional, and cognitive competence. Viewing competence as consisting of skills helps in approaching life effectiveness as learnable. Thesaurus synonyms for "skill" (see Table 3.2), for example, suggest themes of being *active*, *knowing*, and [practically] *intelligent*. Thus considered, life effectiveness is the extent to which one actively and ably handles one's goals and challenges. Thus, life effectiveness may be self-perceived but is necessarily tempered and contextualised by external contingencies.

Table 3.1 *Synonymous Life Effectiveness Terms*

	1st term		
2nd term	Life	Personal	Individual
Competence	Life Competence	Personal Competence	Individual Competence
Effectiveness	Life Effectiveness	Personal Effectiveness	Individual Effectiveness
Efficiency	Life Efficiency	Personal Efficiency	Individual Efficiency
Fitness	Life Fitness	Personal Fitness	Individual Fitness
Proficiency	Life Proficiency	Personal Proficiency	Individual Proficiency
Skill	Life Skill	Personal Skill	Individual Skill

Table 3.2 *Synonyms of Skill (Roget, 1972)*

Synonyms of Skill
698. Skill - N. skill, skillfulness, address; dexter-ity, -ousness; adroitness, expertness, etc. adj. ; proficiency, competence, craft, callidity, facility, knack, trick, sleight, master-y, -ship; excellence, panurgy; ambidext-erity, -rousness…
knowledge of the world, world wisdom, savoir-faire; tact; mother wit etc. (sagacity); discretion etc. (caution); finesse; craftiness etc. (cunning); management etc. (conduct); ars celare artem; self-help.
cleverness, talent, ability, ingenuity, capacity, parts, talents, faculty, endowment, forte, turn, gift, genius, flair, feeling; intelligence etc.; sharpness, readiness etc. (activity); apt-ness, -itude; turn - , capacity - , genius-for; felicity, capacity, curiosa felicitas, qualification, habilitation.
proficient etc…
V. be - skilful etc. adj. ; excel in, be master of; have -a turn for etc. n.
know - what's what, - a hawk from a handsaw, - what one is about,- on which side one's bread is buttered, - what's o'clock, - a thing or two; have cut one's - eye, -wisdom- teeth.
see -one's way, - where the wind lies, - which way the wind blows; have -all one's wits about one, - one's hand in; savoir vivre; scire quid valeant humeri quid ferre recusent
look after the main chance; cut one's coat according to one's cloth; live by one's wits; exercise one's discretion, feather the oar, sail near the wind; stop to conquer etc. (cunning); play one's - cards well, - best car; hit the right nail on the head, put the saddle on the right horse.
take advantage of, make the most of; profit by etc. (use); make a hit etc (succeed); make a virtue of necessity; make hay while the sun shines etc. (occasion)
Adj. skilful, dexterous, adroit, expert, apt, slick, handy, quick, deft, ready, resourceful, gain; smart etc. (active); proficient, good at, up to, at home in, master of, a good hand at, au fait, thoroughbred, masterly, crack, accomplished, conversant, etc. (knowing).
experienced, practiced, skilled; up -, well up-in; in -practice, - proper cue; competent, efficient, qualified, capable, fitted, fit for, up to the mark, trained, initiated, prepared, primed, finished.
clever, able, ingenious, felicitous, gifted, talented, endowed, cut, inventive etc.; shrewd, sharp etc. (intelligent); cunning etc; alive to, up to snuff, not to be caught with chaff; discreet, neat-handed, fine-fingered, ambidextrous, sure-footed; cut out -, fitted- for.
technical, artistics, scientified, daedalian, ship-shape; workman-, business-, statesman-like.
Adv. Skillfully etc. adj. ; well etc; artistically; with -skill, - consummate skill; secundum artem, suo Marte; to the best of one's abilities etc (exertion); like a machine.

Related Constructs

Life effectiveness is conceptualised as related to, but distinct from, a range of other constructs, including practical intelligence, self-concept, self-efficacy, self-actualisation, psychological resilience, and Covey's (1989) habits of highly effective people. Relationships between these constructs and life effectiveness are described in the following sections.

Practical intelligence. Practical intelligence (also called contextual intelligence) is the ability to adapt to everyday life's personal or practical problems by drawing on existing knowledge and skills. Practical intelligence is particularly involved in dealing with new and unusual situations in everyday life (Sternberg et al., 2000; Sternberg, Wagner, Williams, & Horvath, 1995). Thus, practical intelligence is defined similarly to life effectiveness. Sternberg emphasises that this intelligence (which is part of his tripartite theory of intelligence) is about "street smarts" or common sense. It involves the ability to apply knowledge to real world situations and includes the capacity to choose and shape one's surrounding environment. It is perhaps unfortunate that Sternberg opted for the culturally-laden term "intelligence" as doing so has attracted well-founded criticism. For example, Gottfredson (2002) claimed that what Sternberg calls practical intelligence is simply a specific set of skills people learn in order to cope with specific environments - or task-specific knowledge. The current study's notion of life effectiveness focuses on *generic, practical life skills*, and not on task-specific knowledge.

Self-concept. Self-concept refers to the central core of the phenomenal self and the personal organisation of beliefs about that core self (Combs, 1999). Moderate positive correlations would be expected between overall self-concept and overall life effectiveness and between specifically matched factors, but not between unrelated factors. However, when it comes to measuring change, there are likely to be more notable differences between self-concept and life effectiveness. Self-concept refers to *beliefs* about central aspects of self which may or may not correspond to actual behaviour, whereas life effectiveness is, in theory, about the extent to which one is actually successful in performing life skills.

Personal agency and self-efficacy. Life effectiveness is meaningfully related to personal agency and self-efficacy. Personal agency refers to "one's capability to

originate and direct actions for given purposes. It is influenced by the belief in one's effectiveness in performing specific tasks, which is termed *self-efficacy*, as well as by one's actual skill" (Zimmerman & Cleary, 2006, p. 45). Self-efficacy refers to the degree of confidence a person has in his/her ability to handle specific tasks. Importantly, personal agency and self-efficacy are understood to be inherently trainable and enhanceable.

Although general self-efficacy is often measured, Bandura (1997) recommended use of specific self-efficacy scales because they are more reliable and valid as indicators of actual behavior. Thus, self-efficacy, like life effectiveness, is best conceived of as consisting of self-efficacies relating to specific tasks. Although self-efficacy and life effectiveness appear to have much in common, there is an important conceptual difference. Self-efficacy focuses on (cognitively-held) *beliefs* in one's capacity to perform. Life effectiveness, on the other hand, emphasises the extent to which a life skill is actually performed.

Habits of highly effective people. Covey (1989) provided a value-centered, character-based model for developing personal and interpersonal competence and effectiveness. Covey identified seven behavioural habits as providing efficient, effective, cross-situational advantage. Life effectiveness shares with Covey's approach the notion that both personal self-management and social negotiation skills are important. The proposed life effectiveness approach differs from Covey's approach in avoiding the moral component; thus, life effectiveness skills are theoretically masterable by "thieves and saints" alike.

Proposed Dimensions

Life effectiveness has largely been discussed so far as a global construct. However, if an adequate measure of life effectiveness is to be developed, a richer understanding of the possible componentry of life effectiveness is needed. Thus, this section proposes 11 dimensions of life effectiveness (see Table 3.3)[11]. Each dimension is defined, and an overview of related theoretical and research knowledge is provided. A complete list of life effectiveness dimensions may not be possible

[11] The 11 proposed dimensions of life effectiveness emerged from unpublished work on life effectiveness during the 1980s and 1990s by Garry Richards and colleagues at OBA. See Table 5.7 for an overview of the previous stages of development.

because life effectiveness is, at least in part, situationally- and culturally-determined. The underlying intent, nevertheless, is to specify and operationalise a broad range of generic, independent life skills. Thus, a person who demonstrates competence in these areas is likely to be someone possessing a high level of overall life effectiveness.

Rogers (1951), in many ways, captured the essence of life effectiveness, as it is being proposed here, in discussing the goals of experiential learning processes which he was using with student teachers in a university setting:

> the goal ... is to assist students to become individuals ...
>
> who are able to take self-initiated actions;
>
> who are capable of intelligent choice and self-direction;
>
> who are critical learners, able to evaluate the contributions made by others;
>
> who have acquired knowledge to the solution of problems;
>
> who, even more importantly, are able to adapt flexibly and intelligently to new problem situations;
>
> who have internalized an adaptative mode of approach to problems, utilizing all pertinent experience freely and creatively;
>
> who are able to cooperate effectively with others in these various activities;
>
> who work, not for approval of others, but in terms of their own socialized purposes. (pp. 387-388)

In the context of outdoor education, Sibthorp and colleagues developed a recent, related instrument (the NOI) designed to measure generic outcomes for programs conducted by the National Outdoor Leadership School in the USA. The NOI focused on six constructs: communication, leadership, small group behaviour, judgment in the outdoors, outdoor skills, and environmental awareness (Sibthorp, Paisley, & Gookin, 2007). The NOI's three psychosocial factors (communication, leadership, and small-group behaviour) are discussed in the context of the proposed life effectiveness factor sections which follow. The other three outdoor factors

(judgement in the outdoors, outdoor skills, and environmental awareness) were specific to the outdoor education context and, thus, do not represent generic life effectiveness skills.

Table 3.3 *Proposed Dimensions of Life Effectiveness*

Dimension	Description
Achievement Motivation	Motivated to achieve excellence and put the required effort into action to attain it.
Active Initiative	Initiates action in new situations. Likes to be busy, energetic, and actively involved in solving problems.
Emotional Control	Stays calm in new, changing or stressful situations.
Hardiness Resourcefulness	Succeeds in performing difficult tasks with limited resources.
Intellectual Flexibility	Adapts thinking and accommodates different perspectives when presented with better ideas.
Organisational Self-Discipline	Controls behaviour in a logical, sensible, and organised manner.
Productive Teamwork	Uses interpersonal skills to work productively in group situations.
Self Confidence	Uses personal abilities with high expectation of success in one's actions.
Social Competence	Effective in interactions with others.
Task Leadership	Leads and motivates other people effectively when a task needs to be done.
Time Management	Makes optimal, efficient use of time.

Note. See Table 5.8 for a more detailed version of this table.

Achievement Motivation. An Achievement Motivation construct is proposed to indicate the extent to which a person is motivated to achieve excellence and put the required effort into action to attain it. Psychological theory has proposed a causal link between motivation and achievement (Arkes, 1982; McClelland, 1985, 1987); basically, the more motivated a person is to achieve, the more likely it is that the person will take action to reach a particular achievement (Weiner, 1980). However, it would also seem likely that achievement reciprocally enhances motivation.

According to McClelland (1985, 1987), an achievement orientation involves habitual thinking and behaviour which seeks challenging but obtainable goals which provide internal rewards rather than external recognition. An achievement orientation also involves a desire for task-relevant feedback (e.g., how well am I doing?) rather than for attitudinal feedback (e.g., how well do you like me?). McClelland further theorised that achievement motivation was developed over time and shaped by life experiences.

Intervention efforts have sought to enhance motivation in order to improve achievement (Nicholls, 1984), often in educational and career contexts, with mixed success. Development of achievement motivation is a common goal of adventure-based outdoor education programs. This is illustrated, for example, in the Outward Bound motto, "to serve, to strive, and not to yield". James (1980b) commented that Outward Bound students learned "that *the will to achieve* depends upon being an active participant, showing initiative under circumstances when one's attention would normally be flagging" (pp. 13-14; my italics). In general, outdoor educators hope that by providing guided opportunities for participants to achieve difficult goals that this will enhance participants' overall motivation to excel and achieve with high standards in other aspects of their lives.

Active Initiative. An Active Initiative construct is proposed as the extent to which a person willingly initiates action and contributes energy in new situations. Active Initiative is likely to promote performance in school/work settings (e.g., Thompson, 2005) and to facilitate taking control of and directing one's personal life. Despite prima facie validity suggesting Active Initiative as an important component of life effectiveness, there is little available research literature. Nevertheless, it appears to be a desirable quality. Larson (2000), for example, commented that "the capacity for initiative is essential for adults in our society and will become more important in the twenty-first century, yet adolescents have few opportunities to learn it" (p. 170). Rogers (1962), similarly, discussed the need for real life learning and problem solving experiences, suggesting that

> it is necessary for self-initiated learning that the student, of whatever level, be confronted by issues which have meaning and relevance for him. In our culture we tend to try to insulate the student from too many of the actual problems of life, and this constitutes a difficulty. If we desire to have students learn to be free and responsible individuals, we must be willing for them to confront life, to face problems. (p. 45)[12]

[12] Also see Rozanski and Kubzansky (2005)'s conceptualisation of 'vitality', as "a positive energetic state that is characterized by enthusiasm and a sense of aliveness" (p. S48) and which contributes to coping flexibility and emotional flexibility.

Taking initiative and responsibility is an important, common expectation of experiential outdoor education programs. Participants are generally thrust with considerable responsibility to cope with demanding decision-making and problem-solving. Initiative-taking is encouraged through developmental use of specific "initiative and problem solving tasks" and the various challenges commonly encountered during outdoor expeditions. This outcome is often described in terms of participants becoming more self-reliant, showing more initiative, and developing greater independence (Richards, 1977). Larson (2005) contended that "structured voluntary activities, in which youths experience the rare combination of intrinsic motivation in combination with deep attention" (p. 170) offer the best context for developing initiative.

Emotional Control. An Emotional Control construct is proposed to indicate the extent to which a person stays calm in new, changing, or stressful situations. Having the capacity to control one's emotions appears to be an adaptive response which is associated with desirable life outcomes, and may be part of what Goleman (1995) has termed emotional intelligence (see also Abraham, 2004; Cherniss, 2004).

Bonanno, Papa, O'Neill, Westphal, and Coifman (2004) proposed an emotional flexibility hypothesis, that is, that successful adaptation depends on the ability to flexibly enhance or suppress emotional expression in accord with situational demands. Bonanno et al. conducted a longitudinal study which showed that college age students who were better able to suppress *and* enhance expression of emotion evidenced less psychological distress over time[13]. Similarly, Kanner and Feldman (1991) found that control over *both* emotional hassles and emotional uplifts in early adolescence is associated with resistance to depression and greater behavioural restraint.

The focus for the Emotional Control dimension is on the extent to which a person can control his/her emotions under difficult or demanding situations. This focus is partly based on theoretical grounds (that challenging situations are salient tests of a person's emotional control) and partly for the practical reason that

[13] Also see reviews of emotional regulation research by Barrett and Gross (2001), Ochsner and Gross (2004), and Richards and Gross (2000).

experiential training programs often aim to enhance people's emotional coping through controlled exposure to difficult situations.

Hardiness Resourcefulness. Hardiness Resourcefulness is proposed as a construct to indicate the extent to which a person succeeds in performing difficult tasks with limited resources. Hardiness, resourcefulness, resilience, and mental toughness are interrelated terms used refer to personal attributes which enable a person to function effectively in difficult or demanding situations.

Hardiness refers to the extent to which a person experiences potentially stressful circumstances in developmental rather than debilitative ways (Maddi, 2004). Resourcefulness refers to the extent to which a person has a repertoire of behaviours and skills by which a person self-regulates internal responses such as emotions, pain, and cognitions (Rosenbaum & Jaffe, 1983). Resilience is seen as an internalised set of attributes that enable a person to adapt to difficult circumstances (Karapetian & Johnson, 2005). Mental toughness is being able to cope with many demands, remaining determined, focused, confident, and in control under pressure (Jones, 2002). Given the conceptual overlaps, a unitary Hardiness Resourcefulness life effectiveness factor is proposed to represent a person's overall capacity to cope with, and thrive, in stressful circumstances.

Research evidence suggests that hardiness, resourcefulness, and resilience are indicators of mental health and general well-being (Maddi, 2004; Maddi & Khoshaba, 1994), a buffer between stress and illnesses (Antonovsky, 1987; Kobasa, 1979; Kobasa, Maddi, & Kahn, 1982), and that these constructs are positively associated with adaptive coping behaviours (Rosenbaum, 1990; Williams, Wiebe, & Smith, 1992), optimism (Scheier & Carver, 1985; Sweetman, Munz, & Wheeler, 1993), and more successful training and sporting performance (Maddi & Hess, 1992; Westman, 1990). Research evidence also suggests that hardiness and resourcefulness can be learned (Karapetian & Johnson, 2005; Maddi, Kahn, & Maddi, 1998; Meichenbaum, 1977; Rosenbaum, 1990; Waaktaar, Christie, Borge, & Torgersen, 2004).

Enhancement of hardiness, resourcefulness, and resilience is a key goal for adventure-based outdoor education programs. These programs utilise stress-inoculation methods in the context of wilderness-based living and expeditioning. Outdoor education programs such as Outward Bound are founded on a belief that

people need to experience appropriate challenge and hardship in order to enhance their inner capacity to overcome difficulties (see Chapter 2). Bacon and Kimball, (1989), for example, have described wilderness therapy as "by design, a frontal assault on learned helplessness" (p. 123).

Intellectual Flexibility. An Intellectual Flexibility construct is proposed to indicate the extent to which a person is open to the ideas of others, and appropriately adjusts his/her views to accommodate better ideas. Intellectual Flexibility could also be labeled Open Thinking. Similar scales have appeared in other instruments such as the Personality Research Form (Jackson, 1984; Cognitive Structure) and as one of the "big 5" personality factors (e.g., Openness to Experience in the NEO; McCrae & Costa, 2003). Links have also been established with conceptual complexity (Suedfeld, 1995), and existential openness (Stevens, 1992).

Outdoor education programs and instructors encourage development of openness of thinking and cognitive flexibility by exposing participants to novel ideas, viewpoints, settings, activities, cultures, and diverse group members. Group discussions are used to encourage sharing of viewpoints and feelings. Problems in outdoor education contexts generally have to be solved and thus there is reward for effective sharing and modifying of ideas. Intellectual Flexibility is also promoted in the outdoor education setting via modeling by instructors and peers, particularly when they are seen reacting to and trying to solve difficult problems.

Organisational Self-Discipline. An Organisational Self-Discipline construct is proposed to refer to the effectiveness of a person's planning, organisation, and subsequent actions to ensure that tasks are well organised and completed. Although there is no substantive research evidence available to support the existence of Organisational Self-Discipline as a distinct factor, the notions of self-discipline and self-organisation appear in many self-help books and personal development courses, hence there appears to be prima facie evidence for such a dimension. The proposed Organisational Self-Discipline life effectiveness factor may be related to conscientiousness, a personality factor (McCrae & Costa, 2003). However, conscientiousness refers to a stable preference for order and paying to attention to details, whereas Organisational Self-Discipline is about the *efficiency* of actions taken to complete tasks.

Personal organisation, self-responsibility, and self-discipline are basic necessities for participation in outdoor education programs, particularly those involving expeditions. In essence, autonomy is expected and fostered (Richards, 1977). For example, one has to take responsibility for keeping one's equipment together and being able to pack and unpack quickly. Similarly, cooking a meal for a group requires careful planning, organisation, and task management. Self-discipline is also required in the longer run to pace oneself and endure difficulties.

Productive Teamwork. A Productive Teamwork construct is proposed to indicate the extent to which a person uses his/her interpersonal skills to work productively in group situations. Being able to work effectively in small groups has become a highly valued work and leisure skill. It is important to distinguish between team- and individual-level measures. The proposed Productive Teamwork life effectiveness factor aims to assess individual productivity as a team member, not collective team performance. As one of the top business and training buzzwords, teamwork (and teambuilding) has attracted considerable conceptual and measurement attention, however past measurement attempts have been problematic. Cannon-Bowers, Tannenbaum, Salas, and Volpe (1995) reported that the literature on team skills was confusing, contradictory, and plagued with inconsistencies. Dyer (1984) similarly contended that many measures of teamwork are unreliable, complex, insensitive, and measure irrelevant variables.

In an attempt to resolve conceptual inconsistencies, Cannon-Bowers et al. found that 130 skill labels could be sorted into eight major teamwork skill categories: adaptability, situation awareness, performance monitoring/feedback, leadership, interpersonal relations, coordination, communication, and decision making. In an alternative approach, Stevens and Campion (1994) describe the following KSAs (knowledge, skill, and ability) for teamwork as: conflict resolution, collaborative problem solving, communication, goal-setting and performance management, and planning and task coordination. KSAs are conceptualised as trainable and as distinct from personality traits.

Outdoor education is commonly viewed as a teambuilding medium. Whilst improving the functioning of intact teams is a goal of some programs (e.g., Corporate programs), it is more common that the aim is to develop individuals' teamwork skills, with the hope of transferring these skills to other settings after the program.

Outdoor education programs offer a potentially rich environment for development of teamwork skills due to the feedback-rich group tasks and genuine interpersonal caring which tends to evolve, and which is often engendered by program philosophy and mutual dependence (e.g., see Ewert & McAvoy, 2000; Quay, Dickinson, & Nettleton, 2003; Richards, 1977).

Self-Confidence. A Self Confidence construct is proposed to indicate the extent to which a person has high expectation of success in his/her actions. Self Confidence is similar to general self-efficacy (Bandura, 1997; Scholz, Gutiérrez-Dona, Sud, & Schwarzer, 2002). A person who acts with authentic positive belief in the efficacy of his/her capabilities is more likely to push through difficulties and challenges and succeed in meeting his/her objectives. As James (1897/1956) wrote, "often enough our faith beforehand in an uncertified result is the only thing that makes the result come true" (p. 59). Perhaps, then, it should be not be surprising that the happiest, healthiest people tend to be those with slightly inflated self-confidence rather than realistic or pessimistic self-perceptions (Taylor, 1989; Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000).

Enhanced self confidence is arguably the most commonly touted outcome of outdoor education. Hahn, co-founder of Outward Bound, discussed the need to "defeat defeatism" (Hahn, 1960; James, 1990/2000). Importantly, however, interventions should not seek simply to vacuously inflate self-opinion (e.g., see Baumeister's criticisms of self-esteem boosting; Baumeister, Campbell, Krueger, & Vohs, 2003); rather interventions should help participants to develop and discover their full capabilities, which is more likely to provide authentic boosts to personal confidence. Outdoor education programs are structured so as to provide graduated exposure to tasks of increasing complexity and to thereby engender a sense of mastery (Walsh & Golins, 1976). According to Bacon and Kimball (1989), "confidence is developed through successive achievement and the accumulation of an increasing repertoire of skills" (p. 124). Although self confidence is a common outdoor education program aim, it is much less often measured as an outcome. Researchers have previously tended to measure related concepts, including self-esteem, self-concept, and self-efficacy.

Social Competence. The proposed Social Competence construct encompasses a broad spectrum of social skills to represent overall effectiveness of an individual's social interactions. Social competence has been variously referred to in the psychological literature as social skills (e.g., Gresham, 1998), interpersonal competence (Cairns, Leung, Gest, & Cairns, 1995), and interpersonal intelligence (Gardner, 1983). Social competence includes effectiveness in communication, empathy, active listening, assertiveness, and conflict resolution (e.g., see Bolton, 1987).

Much psychological theory and research has indicated that social skills can be improved through a variety of intervention and training approaches (e.g., see Bandura, 1997; Beelman, Pfingsten, & Lösel, 1994; Weissberg, Caplan, & Sivo, 1989). However, the psychological literature tends to have concentrated on some specific aspects of social competence (e.g., peer relations; Inderbitzen, 1994) and on social competence for specific populations, particularly children (e.g., Saunders & Green, 1993), people with specific conditions and disorders (such as intellectual disabilities), and the elderly (e.g., Pelechano, Miguel, & Penate, 1991). The proposed broad Social Competence construct is intended to be applicable across a wide range of social situations and relevant to a diverse range of people.

Development of social competence is a major and common aim of outdoor education programs (Barret & Greenaway, 1995a). Outdoor education programs are generally conducted in small groups, with members living closely and intensely together for days and weeks at a time. Thus, the small group social environment is particularly salient and, when well managed, provides considerable opportunity for the development of many social skills. Development of social skills and social competence is further promoted in outdoor education settings by: (a) exposing participants to a wide range of cultural and social perspectives and resources through the diverse backgrounds of instructors and participants; (b) broadening the range of each individual's social roles and providing opportunities for participants to experiment with different social roles; (c) impelling participants into social experiences that require active responses, including accommodation and re-evaluations of social attitudes and behaviours, and which prompt more realistic evaluations of social effectiveness; and (d) encouragement of a supportive group atmosphere (e.g., through group and individual social contracting) (Richards, 1977).

Task Leadership. The Task Leadership construct is proposed as an indicator of a person's effectiveness in motivating and leading other people when a task needs to be done. Like teamwork, leadership has become a popular business training and educational buzzword. Psychological literature on leadership has tended to focus on an "industrial" view of leadership (Rost, 1997), emphasising the characteristics and styles of people performing in designated leadership roles (e.g., Mumford, 1986; Zaccaro, 2007), and on situational factors which give rise to the emergence of leaders (e.g., Zaccaro, Foti, & Kenny, 1991; see Hogan & Kaiser (2005) for a review). However, the focus of the proposed Task Leadership is on individuals' effectiveness at stepping into leadership roles *when required*, as opposed to being an out-and-out leader per se. In this sense, the proposed Task Leadership construct is more related to a functional or self-efficacy leadership model (Hoyt, Murphy, Haverson, & Watson, 2003) than to trait- or situation-based models. Task Leadership appears to consist of an array of competencies such as flexibility in leadership style, creativity in problem solving, communication, vision, courage, and wisdom (e.g., see Sternberg, 2007). In particular, a functional approach to leadership depends upon flexible behaviour and ability to diagnose what functions are needed at a particular time in order for a group to function most effectively[14].

Training of leadership skills is commonly perceived to be a goal of outdoor education programs (Moore & Russell, 2002; Richards, 1975). However the extent to which leadership skills are developed is likely to be dependent on program design (including appropriate activities and tasks), group structure (e.g., group gender composition and group size), and facilitation methods (e.g., rotating participants through leadership roles and responsibilities). Outdoor education programs can also provide considerable opportunity for social learning of effective leadership skills by observing instructors and peers. For example, the practical nature of the tasks and open, supportive group atmospheres facilitate receiving clear feedback on leadership performance. However, as Richards (1975) argues, much of what might be considered leadership development in outdoor education may actually arise indirectly, such as from the development of related life effectiveness constructs such as social competence, active initiative, and productive teamwork.

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[14] Also see Richards (1977) and Wielkiewicz and Stelzner's (2005) ecological perspective on leadership.

Time Management. A Time Management construct is proposed to indicate the extent to which a person makes optimal use of time. Effective time management is valued in many cultures. However, it has seemingly become an increasingly desirable quality in industrialised societies, such as is attested to by the multitude of popular articles, books, and training approaches (e.g., Blanchard & Johnson, 1982; Covey & Merrill, 1994; Gleik, 1999; Taylor & Mackenzie, 1986).

Psychological studies tend to have focused on time management within specific locations (such as work or study) or for specific populations (e.g., Adams & Jex, 1999; Barling, Kelloway, & Cheung, 1996; Buehler, Griffin, & Ross, 1994; Hall & Hursch, 1982; King, Winett, & Lovett, 1986; Macan, 1994). Thus, there seems to be a need for a more generic time management construct which refers to skills applied across different settings. Thus conceptualised, time management is likely to be related to constructs such as self-discipline, goal-setting, and self-regulation.

Outdoor education programs in which participants are given (guided) responsibility for individual and group decisions and time management, and which set specific, challenging goals, would seem to hold promise for enhancing participants' time management skills. Consequences of how one spends one's time during outdoor expeditions are reasonably immediate (e.g., arriving into camp after dark). The intensity of outdoor education programs can also help participants to realise how much more productive they can potentially be with their available time. Group problem-solving exercises and debriefings are also used to help generate ideas and develop strategies for more efficient management of time and task-oriented behaviour.

Summary

This section conceptualised life effectiveness as the extent to which a person possesses and uses psychosocial skills which lead to him/her surviving and thriving in a variety of circumstances. Life effectiveness was further conceived of as multiple, generic life skill behaviours which can be learnt, such as through outdoor education programs. Life effectiveness was considered in relation to practical intelligence, self-concept, personal agency and self-efficacy, and habits of highly effective people. Finally, 11 dimensions of life effectiveness were proposed and discussed in relation to related psychosocial and outdoor education theory and research.

Review of Research about the Effects on Outdoor Education Programs on Personal and Social Development

Introduction

This section critically reviews traditional research literature reviews, meta-analytic reviews, and multi-level studies examining personal and social development impacts of outdoor education programs. Reviewing the research literature on outdoor education is a formidable task because: (a) it is a diverse literature lacking in cohesion; (b) much of the research suffers from poor methodology; and (c) most studies are unpublished[15]. However, at least several hundred primary studies have been conducted and there at least a dozen notable traditional and meta-analytic reviews available.

Traditional Reviews

Introduction. This section summarises major traditional reviews of research on the personal and social development outcomes of outdoor education programs. The main advantage of traditional-style reviews is that, when well conducted, insightful and valid syntheses of the research literature can emerge. Disadvantages include that: (a) reviewer bias can lead to overemphasis of some studies and conclusions (see Bushman & Wells, 2001); (b) it is difficult to account for statistical power, thus traditional reviews tend rely, at best, on vote-counting of statistical significance, rather than effect sizes; and (c) traditional reviews are unable to systematically quantify correlates of program outcomes.

The criteria for selecting reviews for inclusion in this section were that they: (a) covered at least a reasonable proportion of available empirical research on effects of outdoor education programs; (b) demonstrated academic rigour (e.g., close reading of primary research studies and accurate referencing); and (c) provided information not largely covered by other reviews. Using these criteria, six reviews were selected

[15] For example, in Cason and Gillis' (1994) meta-analysis of the effects on adventure programming on adolescents, 17% of the 47 studies used were published.

for further discussion (Barret & Greenaway, 1995a, 1995b; Burton, 1981; Crompton & Sellar, 1981; Ewert, 1983, 1987; Rickinson et al., 2004)[16].

Crompton and Sellar (1981). Crompton and Sellar (1981) reviewed 45 empirical research studies on the affective outcomes of residential camping[17] and outdoor education programs for school-aged participants. Crompton and Sellar identified three outcome categories: self-concept, socialisation, and attitudes towards learning. Sixty-nine percent of studies exhibited significant, positive findings, with 31% of the studies' outcomes being inconclusive or not significant[18]. The general pattern of findings reported by Crompton and Sellar was: (a) good, consistent evidence for enhancements of self-concept and peer socialisation outcomes; (b) fairly good evidence for enhancement of teacher-student relations; and (c) mixed evidence for the effects on locus of control, racial integration, disadvantaged groups, and attitudes towards the outdoors and school.

The overall consensus of the review was cautious optimism about the affective benefits of outdoor education and camping programs on school-age students. Crompton and Sellar (1981) emphasised that their general conclusions were tentative because the body of evaluative literature was relatively sparse and consisted mostly of master's theses and doctoral dissertations (only 8 of the 45 studies were published), and because the robustness of the literature was mediocre due to: (a) many studies using simple designs with inadequate control or randomisation procedures; (b) samples being frequently small and unrepresentative; (c) reliability and validity of the measuring instruments being sometimes untested; and (d) biases of the studies' researchers possibly emerging in the interpretation of their findings.

Burton (1981). Burton (1981) systematically reviewed 73 studies of Outward Bound-type wilderness programs (involving expeditions). Thirty-eight percent of

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[16] Several other substantial reviews of OE outcome research were noted, but not included because, most commonly, of having a specific focus (e.g., correctional/therapeutic adventure programs (Bandoroff, 1989; Gillis, 1992, 1996, 2000; Gillis & Thomsen, 1996; Reddrop, 1997; West & Crompton, 2001) or not covering sufficiently unique ground (e.g., Burch, 1977; Devlin, Corbett & Peebles, 1995; Godfrey, 1974; Iida, 1975; Richards, 1977; Shore, 1977). Also see Ewert and McAvoy (2000) and more traditional reviews of OE studies mentioned in Ewert (1987).

[17] In Crompton and Sellar's (1981) review, residential camping referred to 1 to 7 week programs in the USA in which students stayed in dormitory-style accommodation and participated in activities during the day such as adventure, craft, and drama. Camp leaders were usually volunteers and most camp programs followed accreditation guidelines produced by the American Camping Association.

[18] See Table A-4 for the numbers of studies with statistically significant and non-significant results.

studies reported mostly positive outcomes, 26% reported some positive outcomes, 34% reported non-significant outcomes, and 2% had "negative" outcomes. Burton concluded that the results indicated that Outward Bound-type programs have a positive impact upon self-perceptions such as self-concept, locus of control, self-assertion and personality, but that this impact was less significant for studies identified as methodologically adequate. In addition, actual behavior (such as GPA, observed behavior, school functioning, and absenteeism) did not appear to undergo much significant change (recidivism was an exception; it was markedly reduced).

Burton (1981) commented that most studies focused on global outcomes and that there was little further need for such studies. Instead, he recommended that more information was needed about how outdoor education programs can be made more efficient and effective by systematically examining each of the components that make up a program. As such, Burton suggested that future studies should focus on comparing specific program characteristics, such as type of program, type of activities, group size, or instructional methods which may enhance the effectiveness of Outward Bound-type programs.

Ewert (1983, 1987). Ewert (1983) reviewed 54 outdoor education self-concept studies, followed by a wider-ranging critical overview of adventure recreation research (1987). Ewert's first review focused on self-concept outcomes for survival training, wilderness experience, school outdoor education, and Outward Bound program studies. Seventy-two percent of the 54 studies showed statistically significant, positive overall changes, whilst 28% were inconclusive or not statistically significant. Ewert concluded that outdoor adventure activities, when properly structured and programmed, do positively affect participants' self-concept. However, many studies suffered from small sample sizes, inadequate or nonexistent control groups, a lack of follow-up data, a lack of replication, and a lack of generalisability. Consequently, Ewert cautioned that "whether results have been truly favorable is still debatable" and that "while many studies have indicated a positive change, the longevity of this change has not been demonstrated" (p. 21).

Ewert's second review (1987) focused more broadly on providing an overview of adventure recreation research and on recommending future research directions. This review identified three main areas of investigation: benefits to the individual (e.g., self-concept), social benefits (e.g., recidivism), and wilderness

experience (e.g., adventure participation motivations) and concluded that "there can be little doubt that participation in these types of programs and activities can provide a variety of benefits for the individual and group. These potential benefits can be psychological, sociological, educational and physical" (p. 23). Ewert's recommendations for future research included pursuit of methodological pluralism (to move beyond the over-reliance on self-report surveys), more sophisticated data analytic procedures and methods, and greater focus on testing theories and independent variables that could predict outcomes.

Barret and Greenaway (1995a, 1995b). Barret and Greenaway (1995a, 1995b) provided a wide-ranging review of the effects of adventure education on young people's personal and social development. This review reiterated, updated, and extended key themes from earlier reviews in that there appeared to be positive impacts of outdoor education programs on self- and social-related constructs for participants. Barret and Greenaway also concluded that the research literature suffered from methodological problems including a lack of control or comparison groups, a lack of follow-up studies, and a lack of studies which linked processes and outcomes. Barret and Greenaway's review was wider than the earlier reviews by Crompton and Sellar (1981) and Ewert (1983) in that it had a more international focus in the studies reviewed and, whilst self-concept outcome studies were dominant, other outcomes were also considered. However, the review was restricted to a focus on young people (11-19 years), particularly youth at risk.

Rickinson et al. (2004). Rickinson et al. (2004) reviewed 150 research studies on outdoor learning conducted between 1993 and 2003. The studies in this review were selected for their focus on outdoor learning in primary, secondary, and tertiary education sectors, and excluded outdoor learning studies from informal, training, and therapeutic sectors. Studies were categorised as field work, outdoor adventure, and school grounds/community programs. In general, the review found good support for outdoor learning as having positive impacts on students, however it commented on the diversity of the findings which varied widely between different types of programs and for different individuals.

The Rickinson et al. (2004) review updated and extended (but does not replace) Barret and Greenaway's (1995a, 1995b) review in terms of efficiently organising and summarising international outdoor education research literature about

the effects for mainstream education-system students from a British perspective. Rickinson et al. suggested five factors as associated with stronger outcomes: (a) longer, more sustained outdoor experience programs; (b) well designed preparatory and follow-up work; (c) use of a wide range of carefully-structured learning activities and assessments linked to the school; (d) facilitation of the learning process; and (e) close links between programs aims and program practices. However, the review lacked critical appraisal of the research literature design and methodology.

Summary. Vote-counting reviews of approximately 50 to 100 empirical outdoor education studies conducted by the early 1980s indicated that 64% (Burton, 1981), 69% (Crompton & Sellar, 1981), and 72% (Ewert, 1983) of studies reported at least some significant, positive outcomes. Each of the reviews offered cautious, positive views about the effects of outdoor adventure programs on the personal and social development of participants. Weaknesses of the traditional reviews include that only the Crompton and Sellar (1981) review was peer-reviewed and published, and that five of the six reviews are at least a decade old. Key recommendations of the reviews included the need to use more rigorous research methodology, to investigate processes and program components, and to measure multidimensional outcomes.

Meta-Analytic Reviews

Introduction. This section summarises key meta-analyses about outdoor education and related fields. Since the mid-1990s, several meta-analytic reviews have analysed the effects of outdoor education programs (Cason & Gillis, 1994; Hattie et al., 1997; Marsh, P. E., 1999a, 1999b). There have also been several meta-analyses of research on related programs, particularly wilderness therapy (Hans, 1997, 2000; Staunton, 2003; Wilson & Lipsey, 2000) and ropes challenge courses (Bunting & Donley, 2002; Gillis & Speelman, in press). Neill (2002, 2003; Neill & Richards, 1998) has also previously summarised the main findings from most of these meta-analytic studies, however this sections provides a more complete and up-to-date summary.

Understanding meta-analysis. Meta-analysis is a systematic technique for combining the outcome statistics from many different studies. It has become a popular reviewing method in fields such as medicine and psychology for reviewing large bodies of empirical literature on a particular topic. Meta-analysis also allows

for the effect of independent variables (such as program length) to be coded and analysed, providing that such relevant data are provided in the original studies.

Meta-analysis was originally developed by Glass (1976, 1977; Smith & Glass, 1981) in response to a controversial traditional review of the psychotherapy literature by Eysenck (1952) which argued that psychotherapy was ineffective. Subsequently, the Smith and Glass (1977; Smith, Glass, & Miller, 1980) meta-analysis found that psychotherapy research indicated large effects on psychological outcomes.

Meta-analyses report results in terms of effect sizes. An effect size, as typically used in intervention studies, is a measure of "how much" difference there is between an outcome of interest (most typically peoples' rating of themselves) at two different points in time. An effect size calculated this way indicates *amount of change*. Whilst different forms of effect size exist, the commonly reported form for intervention studies is the standardised mean difference, which is calculated as the difference between two means divided by an estimate of the population standard deviation. Thus, a standardised mean effect size provides a measure of change in standard deviation units.

A standardised mean effect size value of 0 represents no change, a negative value indicates a decrease, and a positive value indicates an increase. Effect sizes are proportional, so an effect size of 0.40 represents twice as much change as an effect size of 0.20. Cohen (1977, 1988) provided the most commonly cited benchmarks for standardised mean effect size interpretation, suggesting that 0.20 is small, 0.50 is medium, and 0.80 is large. However, such global guides should be used with caution since it is necessary to know more about the context in order to assess the value of a particular effect size value. For example, a small effect size can be very impressive if the outcome is difficult to change (e.g., a personality construct) or particularly valuable (e.g., an increase in life expectancy). Conversely, a large effect size does not necessarily mean that there is any practical value in the change, such as when an outcome is not related to the aims of an intervention.

Cason (1993; Cason & Gillis, 1994). Cason (1993; Cason & Gillis, 1994) conducted a meta-analysis of the effects of adventure-based programs, based on data representing 43 studies, 147 effects, and 2,291 adolescents. The overall standardised mean effect size was small-moderate (0.31, $SD = 0.62$). Effect sizes varied

significantly across outcome measure, with significantly positive effects for each of the six outcome categories: clinical scales (1.05), academic grades and school attendance (0.54), attitude surveys (0.46), behavioural assessment by others (0.40), and self-concept and locus of control (0.33).

Cason (1993; Cason & Gillis, 1994) found that program length had a significant, weak, positive, linear relation with outcome (r = .17; durations ranged between 36 and 5400 hours; *Mdn* = 54 hours (3 weeks)). Cason also found that age had a significant, weak, negative, linear relation with outcome (r = -.18), with younger adolescents reporting slightly stronger improvements than older adolescents. Finally, effect sizes varied according to the quality of the studies, with lower quality studies reporting higher effect sizes.

Hattie et al. (1997). Hattie et al. (1997) conducted a meta-analysis of the effects of adventure education programs, with data representing 96 studies (1,728 effects and 12,057 participants) conducted between 1968 and 1994. The overall standardised mean effect size was small-moderate (0.34), with outcomes grouped results into six broad categories (see Table 3.4). The short-term (immediate) program effect sizes for each of these outcomes were statistically significant. There was also a small drop in scores between pre-program and the first day (-0.05), and an increase in scores between the end of the program and follow-up up to 18 months after the program (0.17).

Hattie et al. (1997) found that 36% of the variance in the outcomes could be explained by three significant independent variables: (a) the organisation running the program (highest results were for Outward Bound Australia programs[19]); (b) program length (programs greater than 20 days were the most effective); and (c) age of participants (adults had larger effect sizes than adolescents). In summarising their findings Hattie et al. concluded that adventure education programs can obtain notable outcomes and have lasting effects, but that there is a great deal of variability in outcomes between different studies, different programs, and different individuals.

[19] There was a moderate effect for research studies of OBA programs (0.47, 584 effects) and a small effect for non-OBA programs (0.17, 416 effects). Both types of programs, however had small, positive increases in outcomes during the follow-up period (0.17 and 0.18 respectively).

Marsh, P. E. (1999a, 1999b). Marsh, P. E. (1999a, 1999b) conducted a meta-analysis of American camping program studies, with data representing 22 studies and 37 effects. Overall, Marsh found a small effect size of 0.20 for self-construct outcomes (mostly self-esteem and self-concept). This small effect size was not unexpected, given that not all camps aim to enhance campers' personal and/or social development. Camping programs which had a personal development philosophy (0.41) had much stronger effects than camps without such a philosophy which had negligible effects (~ 0). These findings lend credibility to the notion that organisational culture and program philosophy are a critical factor underlying outdoor education program effects. Marsh also found a negative correlation between age and outcome (i.e., stronger effects for younger participants), similar to Cason (1993; Cason & Gillis, 1994). Together, the philosophy of the camp and the age of campers explained 33% of the variance in effect sizes.

Bunting and Donley (2002). Bunting and Donley (2002) conducted a meta-analysis of 15 studies of experiential challenge-based programs which typically used Adventure-Based Counseling models involving trust activities, initiative games, and ropes challenge courses (Schoel & Maizell, 2002; Schoel et al., 1988). Results indicated a wide range of effect sizes, with an overall mean effect size of 0.55. Outcomes were strongest for team development (0.58), followed by self-concept (0.23) and self-esteem (0.16) outcomes. Bunting and Donley also reported: (a) a positive, linear correlation of .28 between the duration of ropes course programs and changes in measured outcomes; (b) that lower quality studies had higher effect sizes; and (c) that there was a positive relation between age (school-age, college-age, and corporate client-age) and effect size. Bunting and Donley did not report the number of effects or number of participants represented by their meta-analysis.

Gillis and Speelman (in press). Gillis and Speelman (in press) conducted a meta-analysis of ropes challenge course-type programs, with data representing 44 studies (390 effects, 2,976 participants) published between 1986 and 2006. Overall, these studies reported a medium effect size (0.43), made up of 0.45 for short-term effects and 0.23 for long-term effects. Gillis and Speelman only included studies with control groups, thus the estimated effects were relative to controls. Higher effects were found for adult groups and for studies measuring family functioning and group dynamics. Studies with a developmental or therapeutic foci had higher effect

sizes than those with an educational focus. Recommendations for future research included the importance of recording detailed program design information, selecting appropriate instrumentation, and including follow-up data.

Hans (1997, 2000). Hans (1997, 2000) conducted a meta-analysis of adventure therapy effects on locus of control, with data representing 24 studies (30 effects, 1,632 participants). Overall, Hans reported a small-moderate effect size of 0.38. There were two significant independent variables. Firstly, programs which had therapeutic goals as their primary purpose had higher effect sizes than programs with goals such as recreation. Secondly, residential and semi-residential programs were more effective than "sessional" programs which utilised adventure activities but did not take participants away from their familiar environments overnight.

Wilson and Lipsey (2000). Wilson and Lipsey's (2000) meta-analysis focused on the impact of wilderness-based expedition programs on the delinquent behaviour of at-risk youth. Data represented 28 studies (which had comparison or control groups and were published post-1950), 60 effects, and over 3,000 participants. Overall, there was a small effect size of 0.18 for recidivism and 0.24 for psychological constructs (e.g., self-esteem, social skills, and school adjustment). Programs involving relatively intense activities and/or with therapeutic enhancements produced the greatest reductions in delinquent behavior. Program duration was not related to outcome among short-term programs (up to 6 weeks) but extended programs (over 10 weeks) showed smaller overall effects. Finally, studies which employed more rigorous methodologies, such as random assignment, did not result in different effects. Wilson and Lipsey concluded that the results provided strong indication that a therapeutic component and physical intensity enhanced delinquency outcomes. They theorised that:

> perhaps its role [the therapeutic component] is to help the participating youth focus their attention on the defining experiences of the challenge program. That is, incorporating therapy into a wilderness challenge program may enable participants to process the challenging experiences and draw implications for their own behavior with more success. The larger effects of programs that involve more intense challenge activities is consistent with this interpretation. If the salience of the challenge and psychological engagement with it are

> critical to the positive changes induced by these programs, more intense challenges may facilitate these responses independent of any therapeutic facilitation. (p. 11)

Staunton (2003). Staunton (2003) conducted a meta-analysis of adventure therapy program studies conducted between 1969 and 2003, with data representing 17 studies, 95 effects, and 879 participants. There was a moderate short-term effect size of 0.53 (91 effects), and a small-moderate long-term overall effect size of 0.35 (4 effects). Remarkably, all 95 estimated effects were positive.

Several independent variables contributed to accounting for 36% of the variance in effect sizes. Effect sizes varied significantly according to: (a) *outcome category* (self-construct outcomes (0.25) were lower than behavioural (0.63) and clinical outcomes (0.61)); (b) *program style* (wilderness expeditions (0.41) and mixed-style (0.34) were less effective than adventure-based counselling- programs (0.72)); (c) *program continuity* (continuously operated programs (without breaks) had higher effect sizes (0.59) than intermittent programs (0.37)); (d) *location* (residential programs (i.e., involving being away at night) had larger effects (0.55) than outpatient (i.e., daytime only) programs (0.19), with mixed programs in between (0.38)); (e) *diagnosis* (participants with psychological diagnoses (0.72) had larger effects than participants with behavioural (0.50) problems); (f) *participant age* (older participants (over 18 years; 1.11) had much larger effects than younger participants (11 to 18 years; 0.49)); and (g) *publication source* (unpublished (0.63) studies had higher effect sizes than journal articles (0.43) which had higher effects sizes than dissertations (0.17)). Outcomes did not vary according to: (a) *program duration* (the majority of programs were between 21 and 32 days; M = 51 days; range = 1 to 84 days); or (b) *gender of group* (Single-sex programs (0.47) had similar outcomes to co-educational programs (0.58)).

Table 3.4 *Summary of Effect Sizes for Six Outcome Categories (Hattie et al., 1997)*

Category	Description	Program Effect		Follow-up	
		ES	*n*	ES	*n*
Leadership	Conscientiousness, Decision making, Leadership, Organisational ability, Time management, Values, Goals	.38*	222	.15	58
Self-concept	Physical ability/appearance, Peer relations, General, Academic, Confidence, Self-efficacy, Family, Self-understanding, Well-being, Independence	.28*	271	.23*	149
Academic	Mathematics, Reading, Grade Point Average (GPA), Problem solving	.46*	30	.21	9
Personality	Femininity/Masculinity, Achievement motivation, Emotional stability, Aggression, Assertiveness, Locus of control, Maturity, Neurosis reduction	.37*	235	.14	76
Interpersonal	Cooperation, Interpersonal communication, Social competence, Behavior, Relating skills, Recidivism	.32*	176	.17	36
Adventuresome	Challengeness, Flexibility, Physical fitness, Environmental awareness	.38*	69	-.06	19

Note. * $p < .05$

Table 3.5 *Summary of Effect Sizes by Time Contrast (adapted from Hattie et al., 1997, Table 3)*

Contrast	No. of effects	$ES_{.025}$	$ES_{.500}$	$ES_{.975}$
T0 to T1	316	-0.29	-0.05	0.16
T1 to T2	1,062	0.09	0.34	0.60
T2 to T3	347	-0.03	0.17	0.37

Note. The reported contrasts were derived pair-wise from available meta-analytic data. Thus, the samples for each contrast are not the same and caution should be applied interpreting the effect sizes additively (e.g., -0.05 + 0.34 + 0.17 = 0.47 ≠ T0 to T3).

Table 3.6 *Summary of Effect Sizes from Meta-analyses of Outdoor Education and Closely Related Programs*

Author	Program	Outcome	Sample	ES	Studies	*N* Effects	*N* Partici-pants
Bunting & Donley (2002)	Ropes challenge	All (e.g., self, social)	General	0.55	15	-	-
Cason (1993; Cason & Gillis, 1994)	Adventure education	All (e.g., self, social)	Adolescents	0.31	43	147	2,291
Gillis & Speelman (in press)	Ropes challenge	All (e.g., self, social)	General	0.43	44	390	2,796
Hans (1997, 2000)	Adventure therapy	Locus of control	Therapeutic	0.38	24	30	1,632
Hattie et al. (1997)	Adventure education	All (e.g., self, social)	General	0.34	96	1,728	12,057
Marsh, P. E. (1999a, 1999b)	Camping	All (e.g., self, social)	Adolescents	0.20	22	37	-
Staunton (2003)	Adventure therapy	All (e.g., self, social)	Therapeutic	0.53	17	90	879
Wilson & Lipsey (2000)	Adventure therapy	Recidivism	Delinquents	0.18	28	60	> 3,000
Overall (Weighted) Average				0.35	289	-	-

Comparative meta-analyses. Several notable meta-analyses of research on psychotherapeutic, educational, and preventative psychological intervention program effects offer useful comparative benchmarks for outdoor education programs. Table 3.7 lists comparative meta-analytic results, with key findings summarised in this section.

The most frequently cited meta-analytic study of the effects of psychotherapy reported an average effect size of 0.68 for adults, based on 475 studies (Smith & Glass, 1977; Smith, Glass & Miller, 1980). Shapiro and Shapiro (1982) reported even stronger adult psychotherapy outcomes (0.93), based on 143 studies published between 1975 and 1979. Meta-analyses of studies of psychotherapy with children have found similar-sized effects. Casey and Berman (1985), for example, reported an effect size of 0.71 for psychotherapy with children up to 12 years old. A second child psychotherapy meta-analysis involving children aged 4 to 18 years reported a mean effect size of 0.79 (Weisz, Weiss, Alicke, & Klotz, 1987). Similar results (0.72) were reported in a third meta-analysis of 226 child psychotherapy studies (Kazdin, Bass, Ayers, & Rodgers, 1990; see also Weisz, Weiss, & Donenberg, 1992).

A caveat to these positive psychotherapy findings is that they tend to be based on experimental studies. More modest effects have been found for research involving clinic-based treatments (Weisz, Donenberg, Han, & Kaunekis, 1995). Weisz et al. theorised that there were three factors which more present in experimental studies which were contributing to the differences:

> (a) the use of behavioral (including cognitive-behavioral) methods; (b) reliance on specific, focused therapy methods rather than mixed and eclectic approaches; and (c) provision of structure (e.g., through treatment manuals) and monitoring (e.g., through review of therapy tapes) to foster adherence to treatment plans. (p. 83)

Each of these factors involve dimensions which clinic procedures, and potentially also other types of psychological and educational intervention programs, including outdoor education, could consider and implement more effectively. Further discussion of the differences between experimental research psychotherapeutic conditions and clinical conditions can be found in Shapiro and Shapiro (1982) and van de Wiel, Matthys, Cohen-Kettenis, and van Engeland (2002).

Overall, there are noticeably larger overall effects of psychotherapy for adults (0.68) and children (~ 0.70 to 0.80) than there are for participants in outdoor education programs (~ 0.35). Direct comparisons, however, are probably unreasonable because: (a) psychotherapy tends to be conducted with diagnosed clientele who tend to experience the greatest change in response to intervention; and (b) psychotherapy is usually one-on-one with trained therapists over a potentially long period of time.

Another important basis of comparison for outdoor education is with educational interventional programs. Hattie et al. (1997) summarised effect sizes from a synthesis of over 300 meta-analyses reported in Hattie (1987, 1992a, 1993). Overall, educational interventions effect moderately-sized achievement outcomes (0.40) and small-moderately sized affective outcomes (0.28). Global self-esteem outcomes for educational interventions, for example, appear to similar to, or slightly smaller than, the effects of outdoor education programs (0.37; see Table 3.7).

A third major source of comparison for outdoor education programs is with psychological training intervention programs, the most commonly researched outcomes of which are self-esteem and self-concept. Hattie, J. M. (1986, 1992) conducted a meta-analysis of self-concept enhancement programs (e.g., psychology courses, behaviour therapy, cognitive therapy, and client-centred counselling). Data were drawn from 89 studies and represented 485 measured effects. Overall, there was a small-moderate overall effect size of 0.37 which varied by type of intervention, with one of the largest effect sizes being for the category of physical programs (which included outdoor education.) Higher effect sizes were found for programs working with participants who had diagnosed problems (0.55) compared to "normal" groups (0.26).

Durlak and Wells (1997) reported a meta-analysis of studies of intervention programs directed at normal children's and adolescents' behavioral and social functioning (mean age = 9.3 years; 177 studies published prior to 1992). Overall, there was a moderate effect size of 0.42, with follow-up data suggesting retention of gains up to approximately one year.

Haney and Durlak (1998) meta-analysed self-concept intervention studies, building on Hattie, J. M.'s (1986, 1992) earlier study. The overall effect size was small (0.27; 116 studies). Treatments that focused directly on self-concept

enhancement were found to be more effective (0.57) than treatments which aimed to impact indirectly on self-concept (0.10). Interventions with groups with pre-existing problems were more impactful (0.47) than were prevention-type programs with normal participants (0.09; Durlak, 1998). Finally, a limited amount of follow-up data suggested retention of short-term gains.

O'Mara (2003; O'Mara, Marsh, Craven, & Debus, 2006) provided an extended and updated meta-analyses of self-concept intervention program outcomes by Hattie, J. M. (1986, 1992) and Haney and Durlak (1998). O'Mara et al. reported on 501 effects from 145 self-concept outcome studies (published 1958 - 2000), representing 16,900 participants (aged 6 - 18 years) in 200 interventions[20] (20 with follow-up data). The overall effect size was small-moderate (0.31). Interventions which targetted and measured a specific self-concept domain were more effective (0.76) than interventions with global self-concept goals and/or non-targetted measurements (0.21). There was also greater change for targetted self-concept outcomes (0.49) than non-targetted self-concept outcomes (0.08). These results highlight the importance of developing theoretically-informed interventions and evaluating them using matching multidimensional outcome measures. In addition, intervention methods that used praise and feedback, and that were teacher-administered (as opposed to mental health professional administered), were found to be more effective. Finally, follow-up testing found that self-concept benefits were retained over time.

[20] The average intervention program was 21 hours spread over 13 weeks (i.e., approximately a 1-2 hour session per week over a semester; O'Mara et al., 2006).

Table 3.7 *Effect Sizes for Comparative Personal and Social Development Interventions*

Variable	Source	No. effects	ES	*SE*
Psychotherapy				
Adults	Smith & Glass (1977); Smith, Glass, & Miller (1980)	1,766	0.68	.02
Adults	Shapiro & Shapiro (1982)	1,828	0.93	.03
Children (< 13 years)	Casey & Berman (1985)	75	0.71	.08
Children (< 18 years)	Weisz, Weiss, Alicke, & Klotz (1987)	163	0.79	-
Children (< 18 years)	Kazdin, Bass, Ayers, & Rodgers (1990)	226	0.74	.06
Self-esteem	Hattie et al. (1997)	387	0.37	.10
Educational interventions				
Achievement	Hattie et al. (1997)	165,258	0.40	.02
Affect-related variables	Hattie et al. (1997)	24,780	0.28	.02
Self-esteem	Hattie et al. (1997)	1,399	0.19	.04
Psychological interventions				
Self-concept	Hattie, J. M. (1986, 1992)	485	0.37	.12
All (psychological, behavioural, etc.)	Lipsey & Wilson (1993)	9,400	0.47	< .01
Mental health (prevention)	Durlak & Wells (1997)	177	0.42	-
Self-concept	Haney & Durlak (1988)	120	0.27	-
Self-concept	O'Mara (2003; O'Mara et al., 2006)	501	0.31	.04

Summary. Collectively, meta-analytic outdoor education studies, representing over 100 empirical studies and 12,000 participants (Cason & Gillis, 1994; Hattie et al., 1997; Marsh, P. E., 1999a, 1999b), have indicated a small-moderate short-term effect size of 0.35, with limited but promising evidence for long-term effects. An effect size of 0.35 can be statistically converted to estimate that 64% of those who participated in adventure programs were better off than those who did not participate. The meta-analytic results supported the conclusions of traditional reviews, that outdoor education programs tend to have small to medium positive impacts on typically measured outcomes (e.g., self-concept, locus of control, social skills), but they also indicate considerable variability in results.

Meta-analytic reviewers of outdoor education research have also reinforced the calls of traditional reviewers of this literature for more robust designs, richer and more precise measurement of dependent measures, and a greater emphasis on reporting and analysing the effects of independent variables because relatively little is known about relations between specific program components, participant and group characteristics, and measured outcomes.

The considerable variation in outdoor education program effects was partly explained by: (a) program type, with Outward Bound programs in Australia emerging as particularly effective; (b) program length, with longer programs being slightly more effective; and (c) participant age, with adults reporting larger effects than adolescents (Hattie et al., 1997). However, many adolescent programs are compulsory whilst adult programs tend to be voluntary which may confound these findings.

Finally, understanding comparisons of outdoor education research outcomes with findings for other forms of psychosocial interventions offers a larger frame of reference for interpreting outdoor education research. Overall, the outdoor education meta-analysis results (~ 0.35) were slightly stronger than for affective outcomes of innovative educational interventions (~ .30; e.g., see Hattie et al., 1997), and slightly weaker than for similar types of outcomes for prevention-based psychological training programs (~ 0.45; e.g., see Lipsey & Wilson, 1993). These comparative meta-analytic studies also provide empirical evidence about predictive independent variables which may also be relevant in the context of outdoor education.

Multi-Level Studies

Introduction. To date, outdoor education researchers have largely ignored the hierarchical nature of their data. To have done so is somewhat at odds with much recent theoretical and methodological literature in education and psychology which emphasises the importance of group-level and organisation-level differences (e.g., Bryk & Raudenbush, 1992; Goldstein, 1995; Rowe & Hill, 1998). To ignore the hierarchical structure is to deal with data using a single-level hierarchical model. This not only prevents analysis of variation which may cluster at higher units of analysis, but also risks violating the assumption of independence for the dependent variables that is fundamental to most common inferential statistical techniques.

In many fields of social research there is variance at higher-order levels, including health and education. For example, for achievement outcomes in schools, approximately 25% to 30% of the variance in student outcomes is attributable to between-school differences (Lee, 2000). According to Lee, if the proportion of variance that exists at a level of aggregation is more than 10% of the total variance, then multi-level analysis (MLA) should be considered, although others argue that even 5% of variation at higher-levels should be considered worthy of analysis.

In the case of outdoor education, organisations or schools generally conduct different types programs (which vary in format and style) which are comprised of one or more small groups (which vary according to size, composition, instructors, etc.). This represents an inherently hierarchical structure (see Figure 3.1). A hierarchical approach represents a relatively new type of investigation for outdoor education and offers the potential for more accurate modeling and new insights with regard to the underlying sources of variation in dependent variables, and possible effects of independent variables (e.g., effects of instructor characteristics are most appropriately modeled at the group-level). To date, there have been three multi-level studies in areas closely related to outdoor education (Russell & Sibthorp, 2004; Sibthorp, Paisley, & Gookin, 2007; Sibthorp, Witter, Wells, & Ellis, 2004). These studies are summarised in this section.

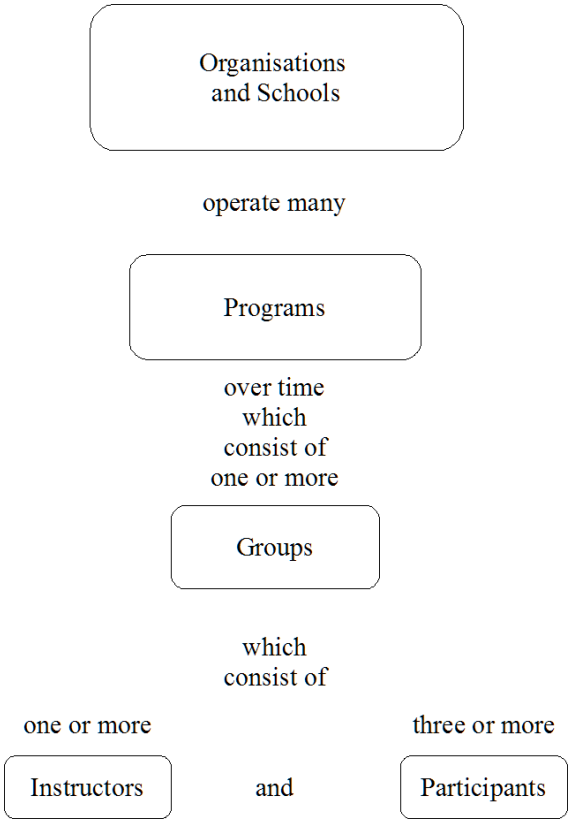


Figure 3.1 Schematic diagram of the hierarchical nature of outdoor education.

Sibthorp, Witter, Wells, and Ellis (2004). Sibthorp et al. (2004) conducted a two-level (participant and group) MLA of data from adolescent participants in a commercial three week sailing and scuba diving adventure education program (N = 168 participants; 20 groups of 5 to 11 participants). Seventy three percent of the variance in change scores for the dependent variable (group functioning) was attributable to the individual-level (27% was attributable to group-level differences). Instructor support was added as a fixed predictor at the group-level, explaining 44% of group-level variance, and 12% of the total variance in group functioning change scores. Thus, positive instructor support predicted greater group functioning. The fact that a significant amount of the variance was attributable to random and fixed effects at the group-level underscores the need for further investigation of multi-level modeling approaches in outdoor education research. The relatively large estimate of variance at the group level could, however, have been due to the dependent measure (group functioning) being a measure of a group-level phenomenon.

Russell and Sibthorp (2004). Russell and Sibthorp (2004) conducted a multi-level study of wilderness therapy programs for youth at risk. Dependent variable data

were based on the pre-post change total scores for adolescent emotional and behavioral symptoms as measured by 523 adolescent self-reports and 372 parent reports using the Youth Outcome Questionnaire. Two two-level multi-level models (MLMs) were analysed, with six programs at level 2, and adolescents or parents at level 1. For self-report response data, the group/program-level explained 14% of the variance (with 86% of the variance at the individual level). Program length explained 67% of the group/program-level variance, and 9% of the total variance, with longer programs being more effective. For parent response data, the group/program-level explained 20% of the variance (with 80% of the variance at the individual level). Program length explained 46% of the variance in the sample data, and 9% of the total variance. There was also a small effect suggesting greater change for females than males. Overall, 14% and 20% of the variance in outcomes was attributable to the group-level for self-report and parent-report changes respectively.

Sibthorp, Paisely, and Gookin (2007). The most substantial multi-level outdoor education study to date was conducted by Sibthorp, Paisely, and Gookin (2007). They analysed participants' perceived changes for three psychosocial outcomes (communication, leadership, and small group behavior) and three outdoor outcomes (judgment in the outdoors, outdoor skills, and environmental awareness). The dependent variables were differences between (retrospective) pre-tests and post-tests for the six outcome variables. Participants were involved in USA-based programs operated by the National Outdoor Leadership Schools in 2004 (*Mo* (duration) = 30 days; *Mdn* (age) = 19 years; 63% male).

Sibthorp, Paisley, and Gookin (2007) analysed two-level MLMs for data from 596 participants (level 1) and 66 group/programs (level 2). In addition, there were eight fixed independent variables. Four independent variables were applied to level 1 (participant's age, sex, previous similar experiences, and perceptions of empowerment) and four were applied to level 2 (challenge level of terrain, group functioning, instructor rapport, and program length).

Table 3.8 summarises Sibthorp, Paisely, and Gookin's (2007) results. Level 2 (group/program) accounted for between 10% and 21% of the variance for the six outcomes. For the group/program-level, the fixed effect results were that: (a) Group-level perception of terrain difficulty was not a significant predictor; (b) Length of program was a positive, significant predictor for five out of six outcomes; (c) Group

functioning positively predicted gains in two outcomes (outdoor judgement and skills); and (d) Group-level rapport with instructors significantly, positively predicted gains in communication skills. For the participant-level, the significant fixed effect results were that: (a) Previous experience was a negative predictor of changes for each of the outcomes; that is, participants who had not had previous similar adventure education experiences reported greater changes for all outcomes compared to those who had had similar previous experiences; (b) Individuals' perceived degree of personal empowerment during the program positively predicted gains for all outcomes; (c) Males reported significantly greater changes for two outcomes (leadership and small group behaviour); and (d) Younger participants reported greater change for the three psychosocial outcomes (communication, leadership, and small group behaviour). Paisley, Sibthorp, Furman, Schumann, and Gookin (2008) recently conducted similar analyses with 2005 and 2006 data (N = 1,228) which largely replicated and confirmed the 2004 findings, with the group/program-level accounting for between 9% (leadership) and 17% (outdoor skills) of the variance for the three measured outcomes.

Table 3.8 *Summary of Two-Level Multi-Level Analyses Involving Eight Predictors and Six Outcomes of Adventure Education Programs (Sibthorp, Paisley, & Gookin, 2007)*

Group/Program (Level 2)					Participant (Level 1)				
ρ	Terrain Diffi-culty	Program Length	Group Function-ing	Instr-uctor Rapport	ρ	Previous Exper-ience	Empow-erment	Gender	Age
.17		+		+	.83	-	+		-
.21		+			.79	-	+	♂	-
.16		+			.84	-	+	♂	-
.10			+		.90	-	+		
.14			+		.86	-	+		
.13		+			.87	-	+		

Note. ρ = Intraclass correlation

Summary. Multi-level studies of outdoor education program data have found significant variance (typically 10% to 20%) attributable to group/program level differences (Paisely et al., 2008; Russell & Sibthorp, 2004; Sibthorp et al., 2004; Sibthorp, Paisely, & Gookin, 2007). These are similar proportions of variance attributable to class and school levels in multi-level educational research examining student outcomes (e.g., Sellström & Bremberg, 2006). Thus, these studies indicate the appropriateness of using data analytic approaches which account for the

hierarchical nature of outdoor education programs. Outdoor education MLAs to date have also exhibited several limitations which could be improved upon, including that: (a) change scores were used as response variables; future studies should consider modeling time as a random level 1 effect, individual as level 2, and group/program as level 3[21]; (b) short-term outcomes were investigated; future studies should also seek to analyse long-term outcomes; and (c) statistical significance was emphasised; future studies should also emphasise the magnitude of effects.

Effects of Independent Variables

Introduction. Traditional and meta-analytic reviews of outdoor education, as well as many others (e.g., McKenzie, 2000a, 2000b, 2003; Sibthorp, 2003; Warner, 1999), have been critical of the lack of investigation of program elements and theoretical processes which may be involved in explaining variance in program, group, and individual outcomes. This section reviews research literature about the role of six naturally-occurring independent variables which may be directly or indirectly associated with variability in outdoor education outcomes. These variables relate to three hierarchical units of analysis (program, group, and participant) and correspond to domains in the systems framework. Data for these six variables are likely to be available in most empirical outdoor education outcome studies. Related reviews and empirical investigations of similar constructs can be found in work by Conrad and Hedin (1981, 1982), McKenzie, Sibthorp, and Witman (1995).

Program. Outdoor education programs typically involve one or more groups of participants in a series of organised activities, with guidance by one or more instructors. Programs vary considerably, however, in format, style, location, activities, and clientele, thus it should not be surprising that meta-analyses have found considerable variability in outcomes across studies and programs (Cason & Gillis, 1994; Hattie et al., 1997). Hattie et al. suggested that "only some adventure programs are effective, and then on only some outcomes, and it is probable that only parts of the programs are influencing these outcomes" (p. 70). Cason and Gillis commented that "when one considers the large range of effect sizes collected, -1.48

[21] Modeling Time as a random effect allows random variance in responses over Time to be modeled. Fixed Time contrasts can be introduced to determine the extent to which they account for random variations in responses over Time.

to 4.26, and the wide variation in the findings, a singular summary effect size ... cannot adequately reflect the effectiveness of adventure programming" (p. 46). Thus, there is clearly a need to better understand whether there are some components or processes in some programs that are particularly conducive (or detrimental in facilitating participant experiences and outcomes. Two naturally-occurring program-level independent variables of interest are Program Type and Program Length.

There are many ways that "program type" could be categorised (e.g., by purpose, style, and type of participant). Hattie et al. (1997) reported no differences in overall short-term outcomes for most program types classified by types of participants (normal, delinquent[22], and management programs), however young adult programs were particularly effective. Organisational philosophy may also be a relevant program-level factor (e.g., pedagogical theories, techniques, and practices; Varley, 2006). For example, Outward Bound, and particularly OBA, programs have been found to have strong effects across measured developmental outcomes (Hattie et al.). An example of organisational philosophy that may have contributed to the OBA outcomes, for example, is that OBA's staffing policy during the mid-1970's to mid-1990's was to employ instructional staff who had tertiary training in education and/or closely related fields. There has been little research, however, investigating how such organisational philosophies and practices might influence outdoor education program processes and outcomes.

Program length has been found by several studies to be weakly, positively associated with larger participant outcomes (e.g., Cason & Gillis, 1994; Hattie et al., 1997; Sibthorp, Paisley, & Gookin, 2007). However, program length is often confounded with program type, making previous research imprecise. Duration effects may not be linear (e.g., outcomes might follow a law of diminishing returns). Program duration may be a proxy for psychological growth processes which are slightly more likely to manifest in a longer program. However, whether the psychological growth processes occur is highly likely to be influenced by other participant, group, activity, and program philosophy characteristics. Thus, a particularly well-conducted program may be able to effect notable change in a

[22] In the Hattie et al. (1997) meta-analysis, delinquent programs had stronger long-term outcomes, but this may have been due to these programs generally involving more follow-up contact with participants.

relatively short duration. Program length, then, is expected to positively predict outcomes, but only to a small extent.

Group. Distinctive kinds of supportive, open, social environments created through group-based outdoor education experiences may influence participant development (e.g., Sibthorp, 2003; Walsh & Golins, 1976). Outdoor education programs generally arrange participants into small groups who live and travel together, sharing many intense experiences, under the guidance of one or more instructors. Groups may vary according to gender composition (single-sex or co-educational), size (almost always between 3 and 30, and commonly between 6 and 18), instructor characteristics and facilitation/leadership style, peer relations, social support, and the extent to which the group moves through various stages of development (e.g., see DeGraaf & Ashby, 1996; Ewert, 1992; Ewert & Heywood, 1991; Fabrizio & Neill, 2005; Kerr & Gass, 1995; McAvoy, Mitten, Stringer, Steckart, & Sproles, 1996; Oakes et al., 1995). There has also been discussion about the role of group heterogeneity and homogeneity in outdoor education (e.g., Bacon, 1988; Oakes et al.; Smith, 1983). Research about the effect of Group Gender and Group Size is explored in more detail below.

Outdoor education programs were initially conducted mainly for males[23]. All-female programs were gradually introduced during the latter half of the twentieth century, and co-educational programs have since become increasingly common (Estes & Ewert, 1988). However, there has recently been strong support for reintroducing more all-female programs (e.g., see Nolan & Priest, 1993; Warren, 1996). Many all-male programs also remain, particularly for adolescents. Most outdoor education programs, however, could be operated as either single-sex or co-educational programs. Thus, whether group gender composition impacts in any particular ways on the processes and outcomes of outdoor education programs is of particular interest and relevance. Research to date, however, is inconclusive. Hattie et al. (1997) found slightly greater effects of outdoor education programs for single-gender groups (ES = 0.40) compared to co-educational (mixed-sex) groups (0.30), but no difference in effects for all-male (0.40) and all-female (0.41) groups. Single-

[23] For example, OB only ran male programs in the 1940s. Programs for females were introduced by OB in the 1950s (Harris, 1961).

gender groups may provide less cross-gender distraction and therefore allow greater concentration of the outdoor education process.

Several theorists (e.g., McKenzie, 2000b; Walsh & Golins, 1976) have speculated that group size may influence outdoor education participant outcomes. Group sizes can vary from a few to as many as 40 or so (e.g., aboard a tall ship). More typically group sizes are around a mythical "ideal" of 10 (Walsh & Golins), and commonly range between about 6 and 18. An ideal group size has been theorised as one which is large enough to provide considerable diversity (e.g., of background, attitudes, and ideas) yet small enough to engage personal involvement and responsibility (Richards, 1977; Walsh & Golins). Group sizes are often influenced by external constraints such as reducing cost (by increasing group sizes) and park regulations (which have required increasingly smaller group sizes). Possible negative participant impacts of large groups can be potentially mitigated by allocating more resources (e.g., instructors, and equipment). Group size may also serve as a proxy for more dynamic group variables (e.g., also see Finn & Pannozzo, 2003; Goldstein & Blatchford, 1988, on class-size).

At least three theories consider possible relations between group size and participant development: (a) *small-group theory*, that small group outcomes should be greater because of greater individualisation in the program focus; (b) *optimal-size theory*, that medium-sized group (~ 12) outcomes should be stronger because they offer an ideal balance between group diversity and individual engagement; and (c) *gestalt theory*, that "a group is a group" no matter the size, and that as long as per capita resources are similar, no differences in outcomes would be expected for groups of different sizes.

Educational research has found mixed, inconclusive evidence about the influence of class size on educational and affective outcomes (e.g., see Bennett, 1998; Scheerens, 2000). Reduction of class sizes seems to be most beneficial for younger students and disadvantaged students (e.g., Wilson, 2002). A review by Hattie (2005) concluded that reduction of class size can lead to worthwhile increases when certain other conditions are also met. However, most mainstream educational research involves relatively large class sizes (e.g., 20 to 40), whereas in outdoor education group sizes are more mostly already 10 to 20.

Participant. Outdoor education theory promotes individualisation of experiences and outcomes; thus individual differences may account for much of the variation in outcomes. A British study (about Outward Bound), for example, pointed out how the course (program) philosophy encourages individual variation:

> Definition of the aims of Outward Bound is particularly difficult because of the individual nature of the experience. Every student is likely to gain something from the course and, indeed, every effort is made to treat each student as an individual. Because of this the aims tend to be non-specific, couched in very broad, generalised terms …. The situation in Outward Bound represents an extreme degree of heterogeneity, where the nature of the service differs, not only from one provider to the next, but also from one recipient to the next. (Williams, 1977, p. 477)

Individual psychological differences (such as in personality, motivation, and learning style) may account for a greater amount of the variance in outdoor education outcomes than group and program differences. Dynamic, interactive individual difference variables could be particularly meaningful. For example, a study of adolescent OBA programs reported that self-reported individual differences in coping styles used during the program accounted for 25% to 30% of the variance in mental health outcomes (Neill & Heubeck, 1997).

Data representing naturally-occurring individual difference variables such as gender, age, and demographic factors are often available, and are sometimes included in analysis and reporting. Both gender and age appear to have somewhat complex and unclear relations with outdoor education program effects. Some reviews and studies have suggested that female outdoor education participants report greater personal and social development (Ewert & McAvoy, 2000; Neill, 1997; Sibthorp, Paisley, & Gookin, 2007), however the only meta-analysis to examine the role of participant gender found no overall differences (Hattie et al., 1997). Gender may also interact with the type of outcome. For example, males may experience greater development of social skills, whilst females may experience greater development of emotional control. This is consistent with an androgynous perspective, whereby females may be more likely to develop desirable androgynous qualities via encountering masculine-type challenges, and vice-versa (Marsh & Richards, 1989;

McDonald, 1996). Thus, gender could play a vital, but not yet well understood, role in outdoor education participant experiences and outcomes.

Outdoor education programs are conducted for participants across the age spectrum, however adolescents and young adults are most commonly targeted. As with gender, the relation between age and outcome is not entirely clear. Hattie et al. (1997) reported larger effects for adults than adolescents, however adult programs tend to be conducted with more motivated volunteers, use more intense methods, and to be of longer durations. Thus, more controlled studies are needed in order to investigate possible interactions between age and outcomes. In Cason and Gillis' (1994) meta-analysis of adventure education program effects for adolescents, age was a weak, significant, negative predictor, indicating that younger adolescents benefited slightly more than older adolescents. Similarly, in investigating young adult adventure education programs, Sibthorp, Paisley, and Gookin (2007) found stronger psychosocial outcomes for younger (~ late teenager years) than older (~ 20s and 30s) and for less experienced participants. These findings seem to suggest that younger and less experienced participants may experience greater benefits. However, adult programs appear to be more impactful because they tend to be more intense and specifically-applied to motivated, self-selected participants. Age could also serve as a proxy for developmental factors (e.g., cognitive complexity), and dynamic variables (such as readiness to change).

Summary. This section reviewed research and theory about the role of six naturally-occurring independent variables (program type and length, group gender and size, and participant gender and age) on outdoor education processes and outcomes. Relatively little is known about how these variables influence outdoor education. Future research could more systematically analyse the effects of such independent variables, controlling for confounds where possible. It is also recommended that future research pay more attention to dynamic independent variables such as organisational philosophy, group dynamics, pedagogical techniques, and individual differences.

Summary and Implications for the Present Investigation

This section reviewed empirical evidence about the personal and social development impacts of outdoor education, how these effects compare with other

types of psychosocial intervention, and the role played by various independent variables. The body of outdoor education empirical research tends to support the view that programs have, on average, small to moderate impacts on participants' personal and social development (ES ~ 0.35). This overall effect is: (a) slightly larger than for innovative, school-based affective intervention and self-concept intervention programs; and (b) slightly smaller than for psychological training programs. However, several caveats should be applied, with implications for future outdoor education research: (a) outdoor education outcomes are highly variable, thus more investigation of independent variables should be undertaken; (b) outdoor education programs are hierarchically structured, and therefore disaggregated and/or hierarchical analyses should be conducted (e.g., Sibthorp and colleagues found 10% to 20% of the variance in outcomes attributable to group/program-level differences); and (c) there is a need for more robust research designs, including more appropriate dependent measures, control and comparison groups, and longitudinal assessments. To help address such issues, the present investigation undertakes two empirical studies. Study 1 operationalises and tests the psychometric validity of an instrument designed to measure multiple dimensions of life effectiveness, and Study 2 conducts a large, longitudinal investigation of changes in life effectiveness dimensions for a variety of outdoor education programs, groups, and participants.

Summary

This chapter conceptualised life effectiveness as generic "life skills" which provide cross-situational advantages for surviving and thriving, and proposed 11 life effectiveness dimensions which may be impacted through outdoor education programs. A review of traditional, meta-analytic, and multi-level outdoor education research literature indicated small to moderate short-term impacts on indicators of personal and social development. Long-term outcomes, however, were less clear. Recommendations for future research included use of multidimensional (rather than unidimensional) dependent measures, analysis of the role of independent variables, consideration of statistical power, reporting of effect sizes, and controlling or testing for possible biases (such as situational threat, social desirability, Hawthorne effect). The present investigation seeks to address several of these issues.

CHAPTER 4

AIMS, HYPOTHESES, RESEARCH QUESTIONS, AND THEIR RATIONALE

Introduction

This chapter describes the problems, aims, hypotheses, research questions, and rationale for the present investigation which has as its central purpose improving the measurement and understanding of the impacts of outdoor education programs on life effectiveness. Study 1 seeks to develop good quality instrumentation for measuring 11 proposed life effectiveness constructs which are relevant to the goals of outdoor education programs. Study 2 conducts a large, longitudinal study of the effects of outdoor education programs on life effectiveness outcomes.

Hypotheses are based on theory and research where available (see Chapters 2 and 3). As outdoor education research is in various stages of development, with several equivocal findings, some hypotheses are extrapolated from psychosocial theory and research. Where past research and theory provides little basis for clear predictions, research questions were formulated.

Hypotheses and research questions are numbered according to study and aim (e.g., Research Question 1.2.4 refers to Study 1, Aim 2, Research Question 4). Rationales for each of the hypotheses and research questions are presented under titles which reflect the corresponding aims, hypotheses and/or research questions.

Study 1. Psychometric Testing and Development of the LEQ

The Problem

The problem for Study 1 was to psychometrically-test and further develop the Life Effectiveness Questionnaire (LEQ) as a robust, easy-to-use, self-report instrument for assessing multiple dimensions of life effectiveness. More specifically,

the problem was to investigate the extent to which the LEQ-G provides psychometrically-sound operationalisation of 11 proposed life effectiveness constructs. Psychometric-soundness was to be demonstrated by: (a) internal consistency of factors; (b) a valid factor structure which conformed to proposed single-factor and/or second-order factor measurement models; and (c) invariance of these measurement models across participant gender and age. Where psychometric properties of the LEQ-G were not acceptable, the task was to revise the model (e.g., by dropping factors and/or items), leading to a refined model (the LEQ-H). The problem was then to test the psychometric validity of the LEQ-H. Finally, testing of invariance of the new measurement model across the first and second data samples was needed. Presentation of normative descriptive statistics for each LEQ factor (with tests of whether scores differed across participant gender and age) was an additional contribution of this psychometric study.

Aims

Study 1's overall aim was to examine the extent to which the LEQ-G and LEQ-H provide psychometrically-robust measures of life effectiveness. Of interest was the reliability of each LEQ factor, the extent to which the a priori hypothesised factor structure fitted data (i.e., configuration of factor loadings, variances, covariances, and unique errors), the extent to which the a priori factor structure was invariant across participant gender and age, and finally whether the central tendencies of self-ratings of life effectiveness factors varied according to gender and age. Study 1's numbered aims were to:

1. Test the psychometric properties of the initial instrument (LEQ-G) as a measure of 11 distinct life effectiveness factors and to revise the instrument based on the findings;
2. Test the psychometric properties of the revised instrument (LEQ-H) as a measure of eight distinct factors of life effectiveness based on a second sample; and
3. Describe self-ratings of life effectiveness factors (based on the revised LEQ-H instrument) and the extent to which they vary according to age and gender.

Statement of the Hypotheses and Research Questions

Research Question 1.1.1: Congeneric factorial structure of the LEQ-G. To what extent will one-factor congeneric factor analyses support the internal consistency and factor structure of each of the 11 proposed LEQ-G factors?

Research Question 1.1.2: Multi-factorial structure of the LEQ-G. To what extent will Confirmatory Factor Analysis (CFA) support the proposed 11-factor structure of the LEQ-G (see Figure 4.1[24]), and would the LEQ-G benefit from refinement?

Research Question 1.1.3: Higher-order factorial structure for the LEQ-G. To what extent will a global second-order life effectiveness factor structure apply to the LEQ-G?

Research Question 1.1.4: Factorial invariance across gender and age for the LEQ-G. To what extent will the factor structure of the LEQ-G be similar for male and females, and across age, as demonstrated by CFA tests of invariance?

Hypothesis 1.1.5: Congeneric factorial structure of the revised LEQ-G model. One-factor congeneric factor analyses will support the internal consistency and factor structure of the revised LEQ-G measurement model.

Hypothesis 1.1.6: Reliability of the revised LEQ-G model. Tests of reliability will demonstrate acceptable (> .7) internal consistency and test-retest reliability for each of the LEQ-G factors in the revised measurement model.

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[24] Figure 4.1 shows a path model for the proposed multidimensional structure of the LEQ-G. There are 64 observed indicators (small rectangles) and 11 latent constructs (ovals) or latent factors. Straight lines indicate the effect of a latent factor on an observed indicator (i.e., a factor loading). Each factor consists of five to eight indicators, leading to 64 loadings. The model is simple, thus each indicator was hypothesised to load only on its respective factor. Covariances among the latent factors are indicated by curved lines. Error terms (or uniquenesses) corresponding to each of the observed indicators are shown as small circles. No correlations between uniquenesses were hypothesised or modeled. The 11 proposed factors were Achievement Motivation (AM), Active Initiative (AI), Emotional Control (EC), Intellectual Flexibility (IF), Hardiness Resourcefulness (HR), Organisational Self-Discipline (OD), Program Type (PT), Self Confidence (SC), Social Competence (SO), Task Leadership (TL), Time Management (TM).

Hypothesis 1.2.1: Congeneric factorial structure of the LEQ-H. One-factor congeneric factor analyses will support the reliability and factor structure of each of the eight LEQ-H factors[25].

Hypothesis 1.2.2: Multi-factorial structure of the LEQ-H. The proposed eight-factor structure for the LEQ-H, with each factor measured by three items (see Figure 4.2), will be demonstrated via CFA.

Hypothesis 1.2.3: Higher-order factorial structure for the LEQ-H. A global second-order life effectiveness factor structure will apply to the LEQ-H.

Hypothesis 1.2.4: Factorial invariance across gender and age for the LEQ-H. The factor structure of the LEQ-H will be similar for male and females and across age as demonstrated by CFA tests of invariance.

Hypothesis 1.2.5: Factorial invariance across samples for the LEQ-H. The factor structure of the LEQ-H will be invariant across Sample 1 and Sample 2 as demonstrated by CFA tests of invariance.

Hypothesis 1.2.6: Reliability of the LEQ-H. Tests of reliability will demonstrate acceptable (> .7) internal consistency and test-retest reliability for each of the LEQ-H factors.

Research Question 1.3.1: Differences in LEQ-H scores as a function of age and gender. What are the normative descriptive properties of the LEQ-H and do LEQ-H factor scores and do overall life effectiveness scores vary as a function of participant age and gender?

[25] The eight proposed factors are Achievement Motivation (AM), Active Initiative (AI), Emotional Control (EC), Intellectual Flexibility (IF), Self Confidence (SC), Social Competence (SO), Task Leadership (TL), and Time Management (TM).

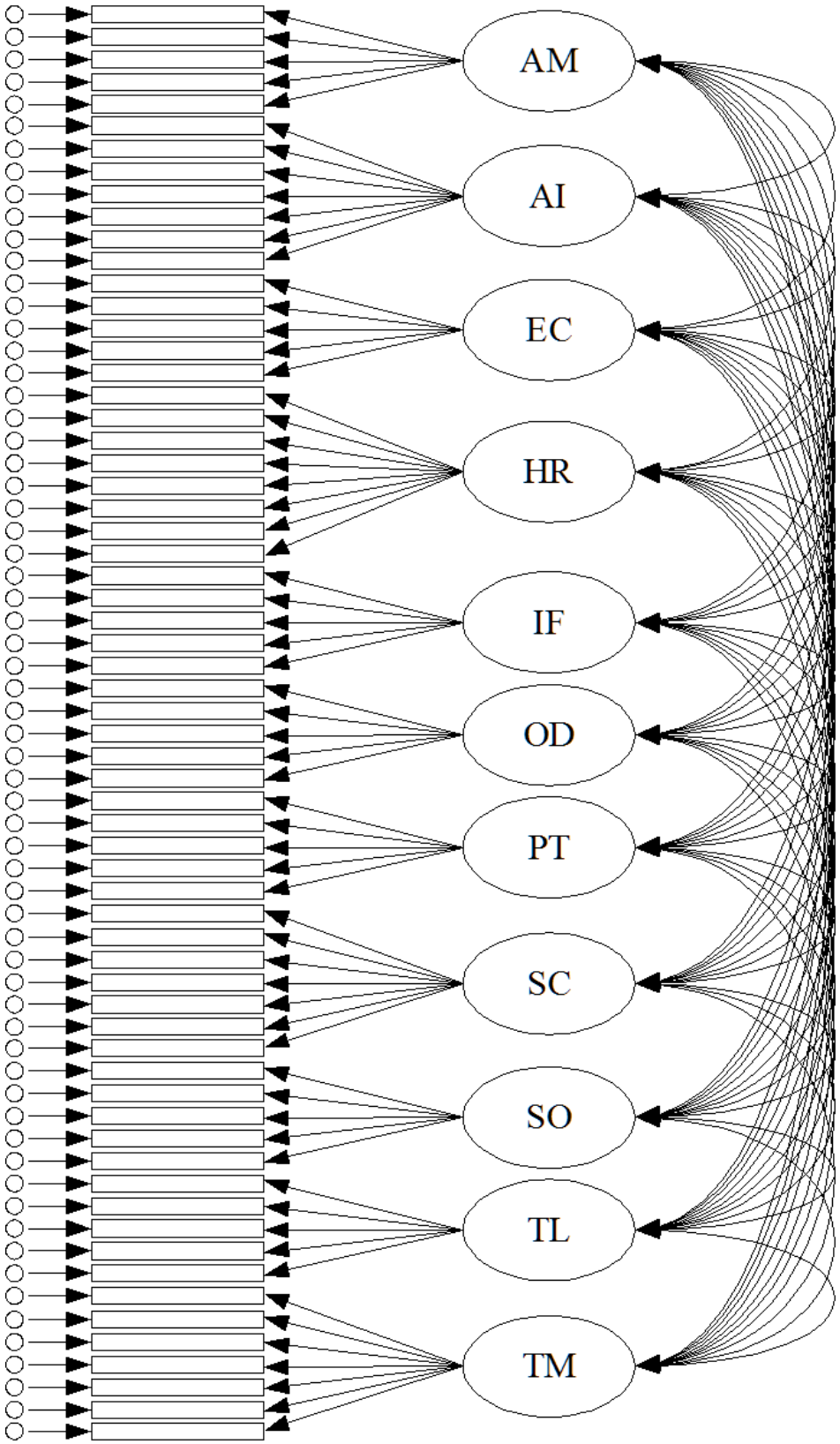


Figure 4.1 The hypothesised 11-factor structure for the 64 LEQ-G items (Study 1).

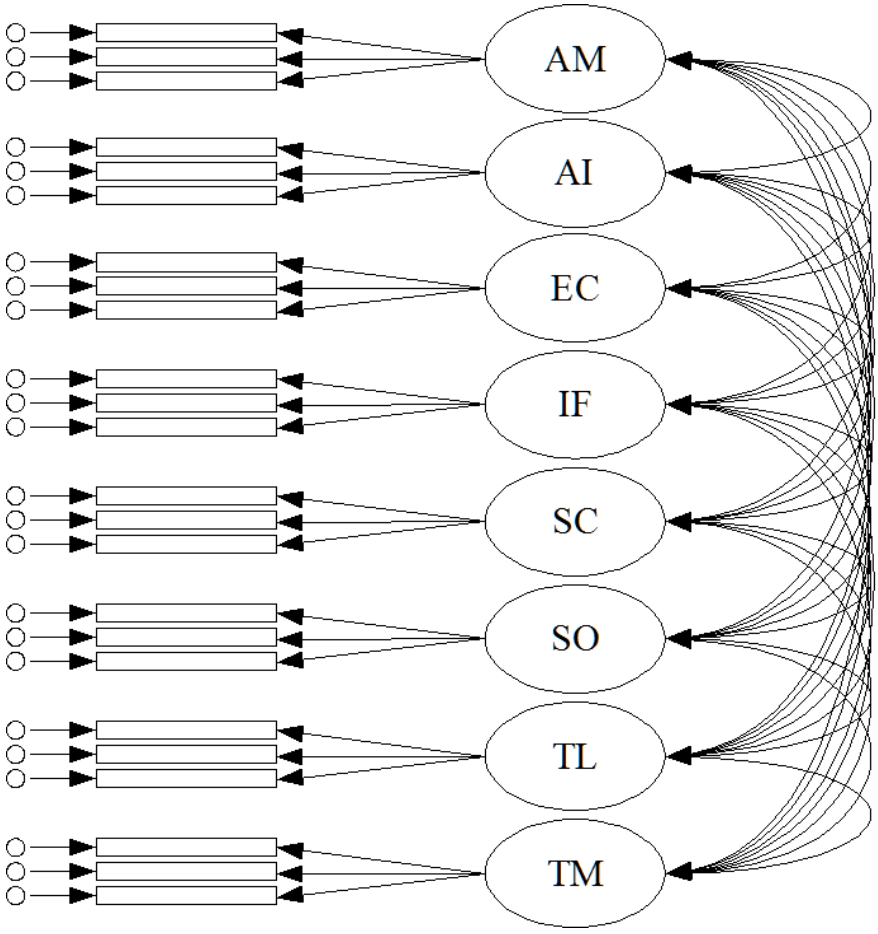


Figure 4.2 The hypothesised 8-factor structure of the 24-item LEQ-H (Study 1).

Rationales for the Hypotheses and Research Questions

Rationale for RQs 1.1.1 to 1.1.4: Psychometrics properties of the LEQ-G. Reviews of outdoor education theory and research in Chapters 2 and 3 identified a need for instrumentation to measure the proposed multiple dimensions of life effectiveness. Several earlier, unpublished stages of instrument development (described in Chapter 5) led to an 11-factor, 64-item version of the LEQ (LEQ-G) which was tested and further developed in Study 1. The proposed factors were derived from theory and research in the fields of psychology, education, and outdoor education (see Chapter 3). On this basis, a multidimensional, first-order factor model and a second-order, global life effectiveness factor model were proposed. Given the lack of previous life effectiveness research, research questions were formed to guide the testing of the LEQ's psychometric properties and subsequent model refinement.

The proposed LEQ factors were expected to be structurally distinct (i.e., multidimensional), but also to be moderately positively intercorrelated and thus able to form a second-order, global life effectiveness factor. Overly correlated factors, however, would not provide unique information and consequently strong consideration was given to dropping redundant items and factors. Particular consideration in developing the LEQ was also given to parsimony, reflecting a practical desire for short, valid instrumentation. In order to be considered as a reasonable measurement model, the LEQ-G congeneric analyses for each factor, and the CFAs, needed to exhibit at least adequate GFIs (i.e., TLI and RNI > .90). Finally, it was important, particularly for use in comparative research, that the derived measurement model(s) be salient across different groups; thus factorial invariance of the proposed measurement models was expected across participant gender and age.

Rationale for Hs 1.1.5 and 1.1.6: Reliability of the revised LEQ-G. Following revision of the LEQ-G measurement model, it is expected that the revised LEQ-H factors would demonstrate at least acceptable (> .7) reliability as indicated by internal consistency and test-retest reliability.

Rationale for Hs 1.2.1 to 1.2.6: Psychometric properties of the LEQ-H. Given that the LEQ-H was based on sound theory (see Chapter 3) and derived from psychometric analysis of the LEQ-G, it is expected that the LEQ-H measurement models will be psychometrically-sound. Hence, a series of hypotheses predicting good fits (i.e., TLI and RNI > .9) for the congeneric, first-order, and second-order models, and factorial invariance across gender and age were formed. Factorial invariance of the LEQ-H measurement models was also expected to be demonstrated across the LEQ-G and LEQ-H samples.

Rationale for RQ 1.3.1: Differences in LEQ-H scores as a function of gender and age. Little is known about the extent to which mean levels of self-perceptions of life effectiveness could vary across participant gender and age. Thus, a Research Question was proposed to investigate further.

Study 2. Longitudinal Impacts of Outdoor Education Programs on the LEQ

The Problem

The purpose of Study 1 was to address some central issues in research about possible causes and outcomes of outdoor education programs. Previous research in this area has been undermined by several notable design issues including low power, lack of baseline and follow-up data, poor selection of dependent measures, and a lack of measurement and analysis of possible predictors of outcomes. The specific problems tackled in this investigation were to find out what impact outdoor education programs have on participants' life effectiveness in the short- and long-term, and to determine the extent to which these impacts vary according to six naturally-occurring independent variables (see Table 4.1).

Table 4.1 Study 2 Independent and Dependent Variables

Independent Variables	Dependent Variables (LEQ-H Factors)
Program Type	Achievement Motivation
Program Length	Active Initiative
Group Gender	Emotional Control
Group Size	Intellectual Flexibility
Participant Gender	Self Confidence
Participant Age	Social Competence
	Task Leadership
	Time Management

Aims

Study 2's overall aim was to conduct a longitudinal investigation of the effects of outdoor education programs on multiple dimensions of life effectiveness and to examine the influence of different types of programs, groups, and participants on life effectiveness outcomes. More specifically, Study 2's numbered aims were to:

1. Test the prior effects of outdoor education programs (between Time 0 (T0; pre-program baseline) and Time 1 (T1; beginning of program)) on overall life effectiveness and multidimensional life effectiveness constructs;
2. Test the short-term effects of outdoor education programs (between T1 and Time 2 (T2; end of program)) on overall life effectiveness and multidimensional life effectiveness constructs;

3. Test the follow-up effects of outdoor education programs (between T2 and Time 3 (T3; follow-up) on overall life effectiveness and multidimensional life effectiveness constructs;
4. Test the long-term effects of outdoor education programs (between T0 and T3) on overall life effectiveness and multidimensional life effectiveness constructs;
5. Test the effect of Program Type on short- and long-term life effectiveness outcomes;
6. Test the effect of Program Length on short- and long-term life effectiveness outcomes;
7. Test the effect of Group Gender composition on short- and long-term life effectiveness outcomes;
8. Test the effect of Group Size on short- and long-term life effectiveness outcomes;
9. Test the effect of Participant Gender on short- and long-term life effectiveness outcomes;
10. Test the effect of Participant Age on short- and long-term life effectiveness outcomes;
11. Identify the multi-level effects, that is, the proportions of variance in the dependent variables (LEQ Overall and factor scores at T1 and T2 and at T0 and T3) which can be accounted for by three random effects (Time (Level 1), Participant (Level 2), and Group (Level 3)) in a series of multi-level model (MLM) analyses.

Statement of the Hypotheses and Research Questions

Hypothesis 2.1.1: Prior effect declines in LEQ Overall scores (T0 to T1). There will be a small decline in outdoor education participants' LEQ Overall scores between T0 and T1.

Research question 2.1.2: Prior effect interaction with LEQ factor scores (T0 to T1). Is there an interaction between Time (T0 and T1) and the LEQ factors?

Hypothesis 2.2.1: Short-term positive effects of the intervention on LEQ Overall scores (T1 to T2). There will be an increase in outdoor education participants' LEQ Overall scores between T1 and T2.

Research question 2.2.2: Short-term effect interaction with LEQ factor scores (T1 to T2). Is there an interaction between Time (T1 and T2) and the LEQ factors?

Hypothesis 2.3.1: Follow-up effect declines in LEQ Overall scores (T2 to T3). There will be a decrease in outdoor education participants' LEQ Overall scores between T2 and T3.

Research Question 2.3.2: Follow-up effect interaction with LEQ factor scores (T2 to T3). Is there an interaction between Time (T2 and T3) and the LEQ factors?

Hypothesis 2.4.1: Long-term positive effects of the intervention on LEQ Overall scores (T0 to T3). There will be an increase in outdoor education participants' LEQ Overall scores between T0 and T3.

Research question 2.4.2: Long-term effect interaction with LEQ factors scores (T0 to T3). Is there an interaction between Time (T0 and T3) and the LEQ factors?

Hypothesis 2.5.1: Short- and long-term positive effects of the intervention for different program types on LEQ Overall scores (T1 to T2 and T0 to T3). Outdoor education program participants in each Program Type will report positive changes in LEQ Overall scores over Time (T1 to T2 and T0 to T3).

Research Question 2.5.2: Short- and long-term effect interactions with LEQ factor scores for different program types (T1 to T2 and T0 to T3). Is there an interaction between Time (T1 to T2 and T0 to T3) and the LEQ factors for each Program Type?

Hypothesis 2.5.3: Larger short- and long-term positive effects for young adult programs compared to other program types on LEQ Overall scores (T1 to T2 and T0 to T3). Young Adult program participants will report greater change in LEQ Overall scores over Time (T1 to T2 and T0 to T3) than participants in other types of outdoor education programs.

Research Question 2.5.4: Short- and long-term effect interactions with LEQ factor scores for young adult programs compared to other programs (T1 to T2 and T0 to T3). Is there an interaction between Time (T1 to T2 and T0 to T3), LEQ factor scores, and Program Type (Young Adult and Others)?

Hypothesis 2.5.5: Larger short- and long-term positive effects for OBA young adult programs compared to other young adult programs on LEQ Overall scores (T1 to T2 and T0 to T3). OBA Young Adult program participants will report greater change in LEQ Overall scores over Time (T1 to T2 and T0 to T3) than participants in other types of Young Adult outdoor education programs.

Research Question 2.5.6: Short- and long-term effect interactions with LEQ factor scores for OBA young adult programs compared to other young adult programs (T1 to T2 and T0 to T3). Is there an interaction between Time (T1 to T2 and T0 to T3), LEQ factor scores, and Program Type (OBA Young Adult and Other Young Adult)?

Hypothesis 2.6.1: Positive relation between program length and short- and long-term changes in LEQ Overall scores (T1 to T2). There will be a positive relation between Program Length and LEQ Overall scores over Time (T1 to T2).

Research Question 2.6.2: Interaction between program length and short-term effects for LEQ factors (T1 to T2). Is there an interaction between Time (T1 to T2), Program Length, and amount of change in LEQ factor scores over Time (T1 to T2)?

Hypothesis 2.7.1: Larger short-term positive effects for single-gender groups on LEQ Overall scores (T1 to T2). Participants in single-gender groups will report greater change in LEQ Overall scores over Time (T1 to T2) than participants in mixed-gender groups.

Research Question 2.7.2: Interaction between group gender composition (single-gender vs. mixed) and short-term effects for LEQ factor scores (T1 to T2). Is there an interaction between LEQ factor scores, Time (T1 to T2), and group gender composition (Single-gender vs. Mixed)?

Hypothesis 2.7.3: No difference in short-term effects for all-male compared to all-female groups on LEQ Overall scores (T1 to T2). Participants in all-male and

all-female single-gender groups will report similar changes in LEQ Overall scores over Time (T1 to T2).

Research Question 2.7.4: Interaction between single-gender group composition (all-male vs. all-female) and LEQ factor scores (T1 to T2). Is there an interaction between LEQ factor scores, Time (T1 to T2), and single-sex Group Gender (all-male and all-female)?

Research Question 2.8.1: Short- and long-term effects of group size on LEQ Overall scores (T1 to T2 and T0 to T3). Is there any relation between Group Size and amount of change in LEQ Overall scores over Time (T1 to T2 and T0 to T3)?

Research Question 2.8.2: Interaction between group size and LEQ factor scores (T1 to T2 and T0 to T3). Is there an interaction between Group Size and amount of change in LEQ factor scores over Time (T1 to T2 and T0 to T3)?

Hypothesis 2.9.1: Short- and long-term effects of participant gender on LEQ Overall scores (T1 to T2 and T0 to T3). There will be no relationship between Participant Gender and change in LEQ Overall scores over Time (T1 to T2 and T0 to T3).

Research Question 2.9.2: Interaction between participant gender and LEQ factor scores (T1 to T2 and T0 to T3). Is there an interaction between Participant Gender and LEQ factor scores over Time (T1 to T2 and T0 to T3)?

Hypothesis 2.10.1: Short- and long-term effects of participant age on LEQ Overall scores (T1 to T2 and T0 to T3). There will be no relationship between Participant Age and change in LEQ Overall scores over Time (T1 to T2 and T0 to T3).

Research Question 2.10.2: Interaction between participant age and LEQ factor scores (T1 to T2 and T0 to T3). Is there an interaction between Participant Age and LEQ factor scores over Time (T1 to T2 and T0 to T3)?

Research Question 2.11.1: Variance components (T1 to T2). What is the statistical significance of, and proportions of variance attributable to, the three random effects (Time (Level 1), Participant (Level 2), and Group (Level 3)), with T1 to T2 LEQ Overall and the LEQ factor scores as response variables?

Research Question 2.11.2: Variance components with the fixed effect of time (T1 to T2). What is the statistical significance of, and magnitude of, the fixed effects of Time (T1 to T2) when these are added to variance components MLMs with three random effects (Time (Level 1), Participant (Level 2), and Group (Level 3)), with T1 to T2 LEQ Overall and LEQ factor scores as response variables.

Research Question 2.11.3: Variance components with the fixed effects of time and interactions with explanatory variables (T1 to T2). What is the statistical significance of, and magnitude of, the 11 fixed interaction terms between Time (T1 to T2) and Participant, Group, and Program independent variables when these are added to variance components MLMs with the fixed effects of Time (T1 to T2), for T1 to T2 LEQ Overall and LEQ factor scores as response variables?

Research Question 2.11.4: Variance components (T0 to T3). What is the statistical significance of, and proportions of variance attributable to, the two random effects (Time (Level 1) and Participant (Level 2), with T0 to T3 LEQ Overall and the LEQ factor scores as response variables?

Research Question 2.11.5: Variance components with the fixed effect of time (T0 to T3). What is the statistical significance of, and proportions of variance attributable to, the fixed effects of Time (T0 to T3) when these are added to variance components MLMs with two random effects (Time (Level 1) and Participant (Level 2), with T0 to T3 LEQ Overall and LEQ factor scores as response variables?

Research Question 2.11.6: Variance components with the fixed effects of time and interactions between explanatory variables (T0 to T3). What is the statistical significance of, and proportions of variance attributable to, the 11 fixed interaction terms between Time (T0 to T3) and Participant, Group, and Program independent variables when these are added to variance components MLMs with the fixed effects of Time (T0 to T3), for T0 to T3 LEQ Overall and LEQ factor scores as response variables?

Rationale for the Hypotheses and Research Questions

Rationale for H 2.1.1 and RQ 2.1.2: Prior effects. Previous research has indicated a likely small decline between T0 (baseline pre-program) and T1 (beginning of outdoor education program) self-assessments (e.g., Hattie et al., 1997). Consequently, it was hypothesised that, consistent with previous research, there

would be a small decrease in LEQ Overall scores between T0 and T1 in the current study. Such declines could be due to either or both of situationally-inflated T0 self-assessments or situationally-depressed T1 self-assessments. There may also be different patterns of change over Time (0 and 1) for different LEQ factor scores, however there is insufficient previous research and theory to warrant specific predictions, and hence Research Question 2.1.2 was posed.

Rationale for H 2.2.1 and RQ 2.2.2: Short-term effects. Previous meta-analytic research (e.g., Cason & Gillis, 1994; Hattie et al., 1997) has found small to moderate positive short-term effects of outdoor education for a variety of personal and social outcomes. Consequently, it was hypothesised that there would be an increase in LEQ Overall scores between T1 (the beginning) and T2 (the end) of outdoor education programs in the current study. Such increases are theorised to be due to engagement by participants with rich psychosocial environments cultivated within outdoor education programs which provide guided experiential learning through expedition- and challenge-based activities. There may be different patterns of change in LEQ factor scores over Time (T1 to T2). Previous research (e.g., Cason & Gillis, 1994; Hattie et al., 1997) has indicated some variation in the strength of effect of outdoor education programs for different outcome measures, however such results are far from definitive or conclusive. Thus, there is a lack of sufficient research or theory to warrant factor-specific predictions, and hence Research Question 2.2.2 was posed.

Rationale for H 2.3.1 and RQ 2.3.2: Follow-up effects. There has been relatively little follow-up research in outdoor education programs (Hattie et al., 1997; Marsh, Richards, & Barnes, 1986a, 1986b are exceptions). Nevertheless, outdoor education theory tends to suggest (somewhat optimistically) that positive developmental changes arising from outdoor education programs can be long-lasting and possibly even catalysts for ongoing growth. On the other hand, traditional learning theory would tend to suggest (somewhat pessimistically) that short-term changes of interventions and training are likely to dissipate over time, particularly after participants return to their normal environments. T2 scores may also be inflated by situational effects such as post-group euphoria, leading to lower T3 scores once temporary T2 effects abate. Although a decrease was hypothesised between T2 and T3, there has been insufficient previous theory or research to indicate whether there

may be different patterns of change over Time (T2 to T3) for the LEQ factors, hence Research Question 2.3.2 is posed.

Rationale for H 2.4.1 and RQ 2.4.2: Long-term effects. Outdoor education philosophy and theory argues for the potential of outdoor education to have positive long-term psychosocial effects (see Chapters 2 and 3). Meta-analytic research has generally been supportive of claims that there are positive short- and long-term effects (e.g., Hattie et al., 1997; Neill & Richards, 1998). Consequently, it is hypothesised that the long-term effect of outdoor education programs in the current study on LEQ Overall scores between T0 and T3 will be positive. Previous research (such as Hattie et al.; Marsh et al., 1986b) has indicated that there is some variation in the strength of effect of outdoor education programs on different outcome measures. However, there is a lack of sufficient research or theory to warrant long-term factor-specific predictions, thus Research Question 2.4.2 is proposed.

Rationale for H / RQs 2.5.T1 to T2.5.6: Program type effects. Previous research has indicated that a variety of different outdoor education programs have positive psychosocial effects on participants (e.g., Hattie et al., 1997; Neill & Richards, 1998). Consequently, it is hypothesised that there will be short- (T1 to T2) and long-term (T0 to T3[26]) increases in LEQ Overall scores for participants in each type of outdoor education program in the current study. There is insufficient previous research, however, to predict whether there would be interactions between Time (T1 to T2 and T0 to T3) and LEQ factor for each Program Type, thus Research Question 2.5.2 was posed.

Past research has also found relatively strong outcomes for Young Adult programs compared to other program types (Hattie et al., 1997). Furthermore, Hattie et al. found that OBA Young Adult programs, in particular, were the most effective program type. This is theorised to be due to Young Adult outdoor education programs, and Young OBA programs in particular, tending to be conducted with more motivated participants, to be longer in duration, and to be more intensely designed and focused around personal and social development objectives compared to other outdoor education programs. Thus, changes in LEQ Overall scores over Time (T1 to T2 and T0 to T3) are expected to be greater for Young Adult programs

[26] Note that T0 to T3 data were only available for Young Adult and Corporate Program Types.

than for other types of programs, and greater for OBA Young Adult programs than other Young Adult programs. There may be different patterns of changes in LEQ factors over Time for Young Adult programs compared to other types of outdoor education programs, and for OBA Young Adult compared to other Young Adult programs. However, there is insufficient research and theory to make specific predictions, thus Research Questions 2.5.4 and 2.5.6 were posed.

Rationale for H 2.6.1 and RQ 2.6.2: Program length effects. Previous research has found a small, positive relation between program length and the psychosocial impacts of outdoor education programs (e.g., Cason & Gillis, 1994; Hattie et al., 1997). Therefore, it is expected that longer programs will have larger effects over time on LEQ Overall and factor scores than shorter programs. These effects will be examined separately for program cohorts with similar types of participants and programs, but which vary in length. Program length may also interact with LEQ factor and Time (T1 to T2), however there is insufficient previous evidence to make specific predictions, thus Research Question 2.6.2 was posed. Only short-term effects were examined, because there was insufficient variations in program length for long-term program data.

Rationale for H / RQs 2.7.T1 to T2.7.4: Group gender effects. Previous research has found slightly greater effects of outdoor education programs for single-gender groups compared to co-educational (mixed-sex) groups, but similar effects for all-male and all-female programs (Hattie et al., 1997). Thus, similar effects are hypothesised in the current study. There may be different effects of group gender composition on LEQ factor scores over time, however there is a lack of sufficient previous research and theory to warrant specific predictions, thus Research Questions 2.7.2 and 2.7.4 were posed.

Rationale for RQs 2.8.1 and 2.8.2: Group size effects. Although there is theoretical speculation about optimal group sizes there is a lack of consensus and research evidence is equivocal (e.g., Hattie, 2005). There is no previous research about the effect of group size on outdoor education program outcomes. Thus, Research Question 2.8.1 was posed to further elucidate the issue. There is also insufficient previous theory or research to make predictions about possible interactions between Group Size, LEQ factors, and Time (T1 to T2 and T0 to T3), thus Research Question 2.8.2 was posed.

Rationale for H 2.9.1 and RQ 2.9.2: Participant gender effects. Previous research (Hattie et al., 1997) has found similar overall effects of outdoor education programs for male and female participants. Therefore, no differences in LEQ Overall scores over Time (T1 to T2 and T0 to T3) for Participant Gender are hypothesised. However, there was insufficient previous theory and research to make specific predictions about a possible interaction between Participant Gender and LEQ factor scores over Time (T1 to T2 and T0 to T3), thus Research Question 2.8.2 was posed.

Rationale for H 2.10.1 and RQ 2.10.2: Participant age effects. The outdoor education programs examined in the current study were designed to facilitate personal development in all age groups, from early adolescence onwards. Although previous research (Hattie et al., 1997) has found larger effects for adults compared to adolescents, this finding could have been confounded by factors such as program type (e.g., adolescent programs tend to be shorter) and participant motivation (e.g., adolescent participation is more likely to be compulsory or coerced). Consequently, no differences in LEQ Overall scores over Time (T1 to T2 and T0 to T3) for Participant Age (controlling for the effect of program type and motivational nature of participation) were hypothesised. There was insufficient previous theory and research to make specific predictions about a possible interaction between Participant Age, LEQ factors, and Time (T1 to T2 and T0 to T3), thus Research Question 2.10.2 was posed.

Rationale for RQs 2.11.T1 to T2.11.6: Multi-level effects. Outdoor education outcome data exhibits a hierarchical structure. Time of measurement is clustered within participant, participants are clustered within groups, groups are clustered within programs, programs within organisations, and so on. Substantial multi-level research has been conducted for academic and non-academic schooling outcomes (e.g., Raudenbush & Willms, 1991; Rowe & Hill, 1998; Sellström & Bremberg, 2006), however there has been little in the way of multi-level modeling of outdoor education programs (Paisely, et al., Russell & Sibthorp, 2004; Sibthorp, Paisley, & Gookin, 2007; Sibthorp, et al., 2004). Thus, Research Questions 2.11.1 and 2.11.4 are posed to explore the proportions of variance attributable to the three random levels (Time, Participant, and Group) using Model 1 (variance components model).

In general, it is expected that each of the three hierarchical levels (Time, Participant, and Group) will account for significant amounts of variance in LEQ

Overall and factor scores. The largest source of random variance is likely to be between participants, since this level has typically accounted for the most variance in previous educational multi-level analyses (e.g., Sellström & Bremberg, 2006). Random variance associated with Time is expected to be notable, particularly given the basic premise of this study that positive changes in life effectiveness would occur over time as a result of outdoor education programs. Random variance at the Group level is expected to be significant (but smaller than the other two random effects) because the study involves a variety of different groups and programs (e.g., high school students, young adults, older adults, and special groups including youth at risk and corporate programs) who are likely to have somewhat similar within-group patterns of change.

The fixed effect of Time (T1 to T2 and T0 to T3) was expected to be significant for models with LEQ Overall and each of the LEQ factors as response variables (Model 2; variance components plus Time as a fixed effect), as per the rationale for Hypotheses 2.2.1 and 2.4.1 and Research Questions 2.2.2 and 2.4.2. Model 2 (variance components model with the fixed effect of time) was used to determine what proportions of variance in the dependent variables (LEQ Overall and factor scores at T1 and T2) are accounted for by the fixed effect of Time (T1 to T2) when this is added to Model 1 (variance components model with three random effects (Time, Participant, and Group)).

Finally, it was unclear how fixed interaction terms involving Time and the Participant-, Group-, and Program-level independent variables would individually and collectively impact on models with LEQ Overall and the LEQ factors as response variables (Model 3; variance components model plus the fixed effect of Time and fixed interactions between Time and each of the Participant, Group, and Program independent variables). Thus, Research Questions 2.11.3 and 2.11.6 were posed. Model 3 added fixed interactions between Time and the six independent variables (Program Type, Program Length, Group Gender, Group Size, Participant Gender, and Participant Age) to Model 2 (variance components model with the fixed effect of Time (T1 to T2)).

As per Hypothesis 2.5.3, Young Adult program participants were expected to exhibit greater changes over time in LEQ Overall scores than participants in other types of outdoor education programs. As per Hypothesis 2.6.1, Program Length was

expected to positively predict changes in LEQ Overall scores over time. As per Hypothesis 2.7.1, single-gender groups were predicted to report greater change over time than mixed-gender groups. As per Hypothesis 2.8.1, no effect of Group Size was expected. As per Hypothesis 2.9.1, no effect of Participant Gender is expected. As per Hypothesis 2.10.1, no effect of Participant Age was expected. Although each of these independent variables were examined in previous hypotheses, these were separate analyses which did not account for the hierarchical nature of the data. An advantage of analysing the independent variables using a multi-level approach was that all the effects could be included in a single, MLA per dependent variable.

Summary

This chapter overviewed the aims, research questions and hypotheses, and rationales for the present investigation. Study 1 aimed to develop good quality instrumentation for measuring changes in life effectiveness. Study 2 aimed to investigate the longitudinal effects of outdoor education programs on multiple dimensions of life effectiveness, and to determine the extent to which six naturally-occurring independent variables explain variance in life effectiveness outcomes. Hypotheses were presented where predictions could be based on theory and research; otherwise research questions were formed. The next chapter describes the methodology for the Study 1 and Study 2, with results presented in Chapter 6 and Chapter 7 respectively.

CHAPTER 5

METHOD

Introduction

Two empirical studies were conducted to address the aims, hypotheses, and research questions described in Chapter 4. Study 1 aimed to further develop the Life Effectiveness Questionnaire (LEQ) using confirmatory factor analysis. Study 2 investigated the impacts of outdoor education programs on LEQ scores and analysed the influence of six independent variables. This chapter describes the methodology (participants, instrumentation, procedures, research design, and data analysis procedures) for these studies.

Participants

After initial data screening, there were 3,961 participants who had completed the LEQ-G or LEQ-H questionnaire on at least *one* occasion out of Time 0 (T0; Pre-program), Time 1 (T1; Beginning of program), Time 2 (T2; end of program), and Time 3 (T3; follow-up; see Table 5.1). Table 5.2 provides a breakdown of sample sizes by Program Type, Time Contrast, and whether or not the program was conducted by OBA. Table 5.3 breaks down sample sizes by gender and age.

Table 5.1 *Administration Times for LEQ Data Collection (T0, T1, T2, and T3)*

Time	Label	Details
T0	Pre-program	Mailed to participants ~ 6 weeks before the program; returned with enrolment forms.
T1	Program start	First day of program; administered by program coordinator or instructor in a group setting.
T2	Program end	(Usually) last day of program; administered by program coordinator or instructor in a group setting.
T3	Follow-up	Mailed to participants ~ 2 to 6 months after the program; returned in a reply-paid envelope.

Study 1

In order to test the psychometric properties of the LEQ-G, Study 1 analysed data from 1,164 participants who completed all[27] LEQ-G items (Sample 1) at the beginning of outdoor education programs (T1) between 1993 and 1995 (673 males, 484 females, and 7 cases who did not indicate gender; *M* age = 22.5 years, *SD* = 6.86, range = 15 to 67). In order to test the psychometrics properties of the LEQ-H, Study 1 analysed data from 1,892 participants (Sample 2) who completed all LEQ-H items (Sample 2) at T1 of outdoor education programs between 1996 and 2000 (1,071 males, 803 females, and 8 cases who did not indicate gender; *M* age = 20.4 years, *SD* = 7.60, range = 11 to 67). For invariance testing, participant age was categorised into groups comprising adolescents (11 - 18 years; *n* = 1,011), young adults (19 - 24 years; *n* = 460), and adults (25 years and over; *n* = 413), with 18 respondents not identifying their age. A combined dataset (Sample 1 and Sample 2) was used for internal reliability and descriptive analyses (*N* = 3,056). Test-retest correlations were based on data from the 1,961 participants who completed a T0 LEQ out of the 3,056 participants from Sample 1 and Sample 2 who had completed a T1 LEQ.

Study 2

Study 2 examined short-term effects of outdoor education programs using data from 3,640 participants who had completed the LEQ (G or H) at least at T1 and T2. To examine long-term effects, data from 663 participants who had completed the LEQ at T0, T1, T2, and T3 were used. Other cohorts or subsets of the data were used for some specific contrasts which are explained in the results. Participants were enrolled in outdoor education programs between 1992 and 2000. Participant profiles, return rates, and analyses of missing data are presented in the following sections.

T1 to T2. Most of the original sample of 3,961 participants completed the LEQ at the beginning (T1; Return rate = 93.0%) and end of outdoor education programs (T2; Return rate = 94.4%). Matched T2 data were available for 3,640 out of the 3,961 participants who had completed T1 (91.9%).

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[27] "Given a sufficiently large sample size, and data that are missing completely at random (Muthén, Kaplan, & Hollis, 1987), listwise deletion is usually recommended when working with SEM [Structural Equation Modeling]." (Byrne, 1994, p. 10)

The sample of 3,640 participants were involved in 281 unique groups which were part of 184 unique programs. Data were sought from all participants in each of the sampled programs. The participants consisted of 2,165 males (59.5%) and 1,454 females (39.9%), with the gender of 21 participants unidentified (0.1%). This gender distribution was roughly typical of participation rates in outdoor education programs in countries such as Australia, North America, and the United Kingdom[28]. The average age of the 3,640 participants with T1 to T2 data was 22.74 years (*SD* = 9.01, range 11 to 67 years), with 83.7% of participants aged 30 or below (*Mo* = 18; see Figure 5.1). This age distribution appears to be typical of the age profile of participants in outdoor education programs[29].

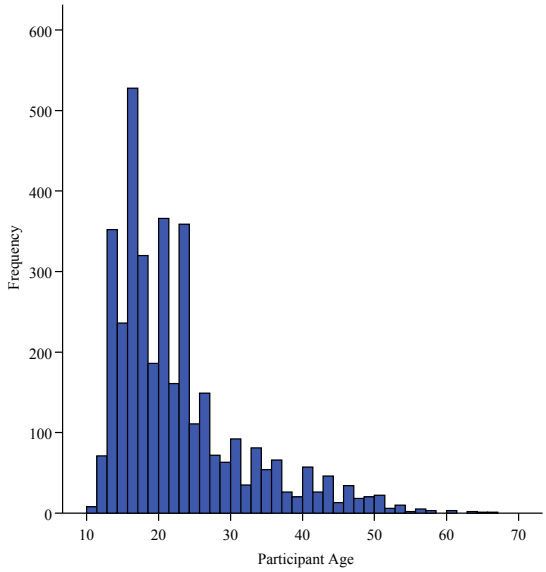


Figure 5.1 Histogram of outdoor education participants' age (years) distribution (*N* = 3,640).

All participants were enrolled in one of six major types of outdoor education program (see Table 5.2 and Figure 5.2): Adolescents (19%, *n* = 698), Young Adults (74%, *n* = 1,932), Adults (9%, *n* = 336), Family (3%, *n* = 108), Corporate (13%, *n* = 471), and Special (3%, *n* = 95). Almost all of these programs were conducted in Australia (99.4%, *n* = 3,617), with the majority of participants involved in programs conducted by OBA (83%; see Table 5.2). For the 17% of participants who were

[28] For example, in the meta-analysis of adventure education programs by Hattie et al. (1997), there were 12,057 participants (72% male; 28% female). In reporting on 8,300 OB USA participants in 1979, Miner and Boldt (1981) indicated that 59% of participants were male and 41% were female.
[29] For example, Miner and Boldt (1981) reported that 83% of OB USA participants in 1979 were 29 years old or less. Male participants in the current study were, on average, about a year older (*M* = 23.04, *SD* = 9.38) than female participants (*M* = 22.23, *SD* = 8.38).

involved in non-OBA programs, a substantial proportion attended sail training voyages for Young Adults (13%, *n* = 378;), with small samples from a scientific exploring society for young people (< 1%, *n* = 22), and an overseas program for gay and lesbian youth (< 1%, *n* = 9).

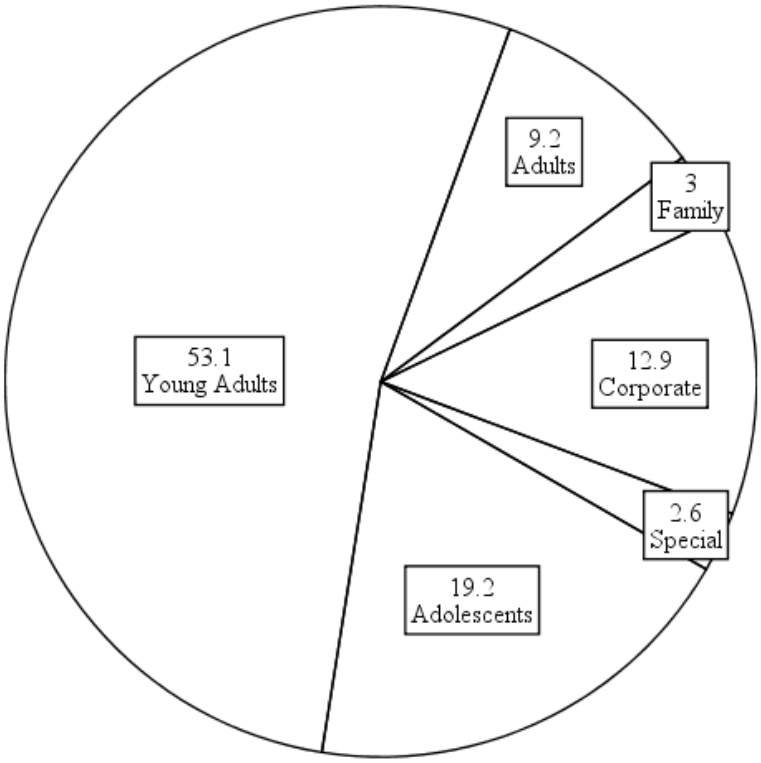


Figure 5.2 Pie chart showing the percentage of participants from each Program Type (T1 to T2, *N* = 3,640).

The OBA sample (83%) is likely to be representative of OBA participants in programs conducted during the 1990s, with the exception of the occasional Special programs because these were quite varied according to the nature of the client group. The non-OBA samples (17%) were conveniently sampled from other outdoor education organisations who were using the LEQ for program evaluation purposes. The results for individual organisations other than OBA are not specifically identified by this study.

T0, T1, T2, and T3. A subset of the 3,640 participants with T1 to T2 data, mostly from Young Adult and Corporate outdoor education programs, were mailed pre-program (T0) and follow-up (T3) LEQs. Of the participants to whom a T0 questionnaire was sent, 90.4% (*n* = 2,118) completed and returned the questionnaire, whilst 9.6% (*n* = 225) did not. Of the participants to whom T3 questionnaires were

mailed, 54.4% (n = 744) returned and 45.6% (n = 624) did not return. Treating the data listwise, all assessments (T0, T1, T2, and T3) were completed by a total of 663 participants.

A breakdown of the 663 respondents by Program Type is shown in Table 5.2 and Figure 5.3. Most of the participants (92%) were in Young Adult programs, higher than for the T1 to T2 contrasts (see Table 5.2 and Figure 5.2). Just over half of the participants were from OBA programs (58%), lower than for the T1 to T2 contrasts (see Table 5.2)[30]. Most of the OBA data T0 to T3 were from 359 participants in OBA Young Adult programs (26-day Standard and 22-day Challenge courses). The rest of the T0 to T3 sample was made up of 45 Corporate program participants with diverse backgrounds (e.g., ranging from apprentices to managers) and eight Special program participants (6.8%) from a non-OBA drug rehabilitation expedition program.

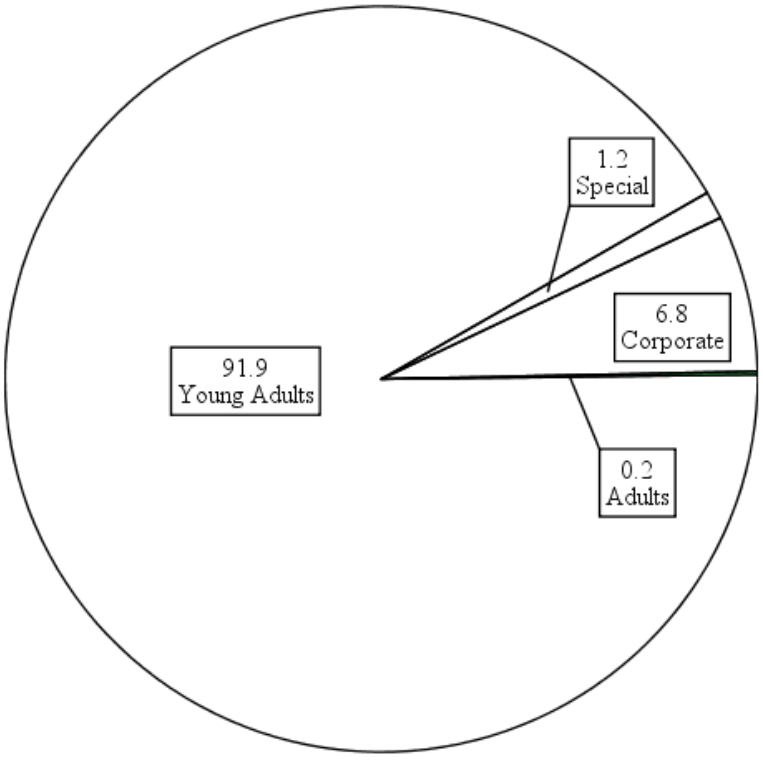


Figure 5.3 Pie chart showing the percentage of participants from each Program Type (T0, T1, T2, and T3; N = 663).

[30] This was largely due to the T0 to T3 sample containing 250 participants from non-OBA sail training voyages and who make up 38% of the sample.

Table 5.2 *Sample Sizes by Program Type, Time Contrast, and OBA/Non-OBA*

Program Type	T1 to T2 (Short-term effects)				T0, T1, T2, and T3 (Longer-term effects)			
	Total		OBA		Total		OBA	
	n	%	*n*	%	*n*	%	*n*	%
Adolescents	698	19.2	673	96.4	-	-	-	-
School	542	14.9	542	100.0	-	-	-	-
Holiday	156	4.3	131	84.0	-	-	-	-
Young Adults	1,932	53.1	1,432	74.1	609	91.9	359	58.9
Standard	170	4.7	170	100.0	81	12.2	81	100.0
Challenge	1,262	34.7	1,262	100.0	278	41.9	278	100.0
Sail Training	478	13.1	0	0.0	250	37.7	0	0.0
Scientific	22	0.6	0	0.0	-	-	-	-
Adults	336	9.2	336	100.0	1	0.2	1	100.0
Family	108	3.0	108	100.0	-	-	-	-
Corporate	471	12.9	451	97.0	45	6.8	31	68.9
Apprentices	139	3.8	139	100.0	-	-	-	-
Mid-high level staff	332	9.1	312	95.8	45	6.8	31	68.9
Special	95	2.6	19	20.0	8	1.2	0	0.0
Drug & Alcohol	67	1.8	0	0.0	8	1.2	0	0.0
Visual Impairment	12	.3	12	100.0	-	-	-	-
Gay & Lesbian	9	.2	0	0.0	-	-	-	-
Unemployed	7	.2	7	100.0	-	-	-	-
Total	3,640	100.0	3,019	82.9	663	100.0	391	57.6

Table 5.3 *Sample Sizes by Study, Time, and Participant Gender and Age*

		Gender						Age										Total
		♂		♀		Missing				Adolescent		Y. Adult		Adult		Missing		
Study	Time	*n*	%	*n*	%	*n*	%	*M*	*S*	*n*	%	*n*	%	*n*	%	*n*	%	*N*
1 (LEQ-G)	1	673	57.8	484	41.6	7	0.6	22.52	6.86	392	33.7	479	41.2	287	24.7	6	0.5	1,164
1 (LEQ-H)	1	1,071	56.6	803	42.4	18	1.0	20.35	7.60	1,011	53.7	460	24.4	413	21.9	8	0.4	1,892
2	1-2	2,165	59.5	1,454	39.9	21	0.6	22.74	9.01	1,515	41.6	1,072	29.5	1,038	28.5	15	0.4	3,640
2	0-3	340	51.3	323	48.7	0	0.0	21.99	6.45	225	33.9	304	45.9	134	20.2	0	0.0	663

Missing questionnaires.

Overview. This section analyses patterns of missing questionnaires for each of the four administration times (T0, T1, T2, and T3). A missing questionnaire occurred when a participant completed *at least one, but not all* of the questionnaires that he/she was scheduled to receive. Incomplete questionnaires (i.e., questionnaires with missing LEQ items) were also treated as missing. Table 5.4 summarises the LEQ completion rates at each time.

Table 5.4 *Return Rates for T0, T1, T2, and T3 LEQs*

	Returned		Not Returned		Total	
Time	*n*	%	*n*	%	*n*	%
T0[a]	2,042	90.5	214	9.5	2,256	100.0
T1	3,685	93.0	276	7.0	3,961	100.0
T2[b]	3,738	94.4	223	5.6	3,961	100.0
T2[c]	3,503	95.1	182	4.9	3,685	100.0
T3[d]	677	48.9	708	51.1	1,385	100.0
T3[e]	669	49.0	697	51.0	1,366	100.0

Note. [a] T0s out of those were sent T0s; [b] T2s out of full sample; [c] T2s out of those who returned T1; [d] T3s out of those who were sent T3s; [e] T3s out of those who were sent T3s and who returned T2.

T1. Most of the original sample of 3,961 participants completed T1 (*n* = 3,685; 93%), with 276 missing (7%; see Table 5.4). T1 questionnaires were administered at the beginning of outdoor education programs. Missing questionnaires were due to scenarios such as participants arriving late, refusals, admin errors (e.g., lost questionnaires), or being incomplete (i.e., missing responses to any of the 24 LEQ items). The high T1 response rate (93%) was probably due to the questionnaire being presented as part of the outdoor education program and in captive environments. It was considered highly likely that the available T1 data were representative of the targeted sample given the low rate of missing T1 questionnaires (7%) and the apparent largely "random" causes for being missing.

T2. LEQs were administered at the end of outdoor education programs (T2). Most of the original sample of 3,961 participants (who had completed at least one of T0, T1, T2, and T3) completed a T2 LEQ (94.4%, *n* = 3738), with 223 missing T2 questionnaires (5.6%; see Table 5.4). Of those who completed T1 (*n* = 3,685), 3503 also completed T2 (95.1%). Missing T2 questionnaires could have been due to drop-outs (i.e., participants not completing the program), not attending the T2 administration session (e.g., refusals), admin errors, or incomplete questionnaires.

The high response rate (94%) was probably due, in part, to the T2 questionnaires being presented as part of the outdoor education program, in a captive environment. Given the low rate of missing T2 questionnaires (6%) and the apparent random causes, it was considered highly likely that the available T2 data were representative of the targeted sample.

T0. LEQs were administered to some participants pre-program (T0). Out of the original sample of 3,961 participants, T0 questionnaires were sent to 2,256 participants (57.0%), with 2,042 returned (90.5%), and 214 not returned (9.5%). To examine whether T0 returnees systematically differed from T0 non-returnees, a MANOVA was conducted with the T1 LEQ factor scores as an eight-level within-subject factor and T0 returned/not returned as a two-level between-subject factor. The between-subject effect of T0 returned/not returned was not significant (F (1, 2254) = 0.46, $p > .05$, $\eta^2 = .00$, $\eta_p^2 = .00$) and neither was the within-subject interaction between T0 returned/not returned and LEQ factor using the Greenhouse-Geisser adjustment (F (6.30, 14191.86) = 2.53, $p > .05$, $\eta^2 = .00$, $\eta_p^2 = .00$).

The data were also examined to determine whether there was a relation between whether T0 was returned, Participant Gender, and Participant Age. A chi-square (χ^2) analysis showed no significant relationship between Participant Gender and T0 returnee/non-returnee (χ^2 (1, 2420) = 1.18, $p > .05$). Similarly, an independent samples t-test, showed that T0 returnees were similar in age to T0 non-returnees (t (2332) = 1.14, $p > .05$). Overall, these analyses indicated that T0 returnees and non-returnees had similar LEQ profiles. Thus, the available T0 questionnaire responses were treated as representative of likely responses from T0 non-returnees.

T3. Out of the original sample of 3,961, follow-up (T3) questionnaires were sent to 1,385 participants (35.0%). Just over half of the T3s were completed and returned (54.4%, $n = 754$); and just under half were not completed and/or not returned (45.6%, $n = 631$). To examine whether T3 non-returnees' LEQ scores differed from T3 returnees, LEQ scores at T0, T1, T2, and T1 to T2 difference score descriptive statistics for T3 returnees versus non-returnees are shown in Table 5.6. MDMANOVAs were conducted with T3 returned/not returned as a two-level between-subject variable and the eight LEQ factor scores as a within-subject factor. Four MDMANOVAs were conducted, for each of the T0, T1, T2, and T1 to T2 LEQ

Overall difference scores. Results are shown in Table 5.5. The between-subject effects of T3 returned/not returned was not significant in any of the analyses, indicating no significant differences in the LEQ Overall scores of T3 returnees compared to T3 non-returnees for T0, T1, T2 or for T1 to T2 difference scores. Interaction effects between T3 returned/not returned and LEQ factor were significant for T0, T1, and T2, but not significant for T1 to T2 difference scores. Hence, there was a different pattern of T0, T1, and T2 LEQ factor scores for those who returned T3 compared to those who did not return T3. To further investigate the significant interaction, follow-up independent sample *t*-tests were conducted. T3 returned/not returned was the independent variable and LEQ factor scores at each of T0, T1, and T2 were the dependent variables. In total there were 24 *t*-tests. Results indicated five small, significant differences ($p < .05$[31]): T3 returnees had significantly higher scores for Achievement Motivation at T0, and Achievement Motivation and Active Initiative at T1 and T2 (Table 5.6).

Table 5.5 *MDMANOVAs Involving T3 Returned/Not Returned and LEQ Factor Scores (T0, T1, T2 and T1 to T2 Difference Score)*

Effect / DV	df_{effect}	df_{error}	F	p	η^2	η_p^2
T3 Returned/Not Returned						
T0	1.00	1206.00	0.36	.850	.00	.00
T1	1.00	1373.00	0.74	.391	.00	.00
T2	1.00	1364.00	0.68	.409	.00	.00
T1 to T2	1.00	1355.00	0.91	.763	.00	.00
T3 Returned/Not returned x LEQ factor						
T0	6.20	7482.55	3.21	.000	.00	.00
T1	6.25	8584.90	4.36	.000	.00	.00
T2	6.22	8484.57	3.99	.000	.00	.00
T1 to T2	6.54	8860.34	0.91	.496	.00	.00

Note. Greenhouse-Geisser adjusted *df*s are reported for interactions between T3 returned/not returned and LEQ factor.

Possible relations between T3 completion, Participant Gender, and Participant Age were also examined. A χ^2 analysis revealed a significant relationship between Participant Gender and T3 returned/not returned (χ^2 (1, 1382) = 24.12, $p <$ .001), with females more likely to return their T3 questionnaire (61.2% of females

[31] Controlling for the family-wise Type I error-rate was considered, however by using a critical α of .05, each of the *t*-tests was able to detect standardised mean effects of approximately .1 or higher which was considered to be an appropriate minimum effect to detect.

returned, compared to 48.8% of males). An independent samples *t*-test found no significant difference in the age of T3 returnees ($M = 21.64$ years, $SD = 6.28$) and T3 non-returnees ($M = 21.32$, $SD = 5.41$, $t\ (1378) = 1.00$, $p > .05$).

Table 5.6 M*s,* SD*s, Independent-Samples* t*-tests for T0, T1, T2, and T1 to T2 Difference Scores by T3 Returned/Not Returned*

	T3 Returned		T3 Not Returned			
	M	*SD*	*M*	*SD*	*t*	*p*
T0						
Achievement Motivation	6.85	0.92	6.69	0.95	2.80	.005**
Active Initiative	6.67	1.11	6.54	1.19	1.86	.064
Emotional Control	6.05	1.16	6.13	1.20	-1.22	.224
Intellectual Flexibility	6.59	0.94	6.53	0.95	1.02	.308
Self Confidence	6.54	1.14	6.56	1.16	-0.25	.800
Social Competence	6.01	1.19	6.10	1.18	-1.41	.159
Task Leadership	5.93	1.24	6.05	1.28	-1.67	.095
Time Management	5.46	1.33	5.40	1.23	0.76	.446
Overall	6.26	0.77	6.25	0.81	-0.19	.850
n and df	679		529		1,208	
T1						
Achievement Motivation	6.64	0.99	6.53	0.97	2.02	.044*
Active Initiative	6.61	1.11	6.41	1.23	3.17	.002**
Emotional Control	5.99	1.20	6.09	1.17	-1.51	.131
Intellectual Flexibility	6.48	0.96	6.41	0.96	1.23	.218
Self Confidence	6.51	1.16	6.54	1.14	-0.49	.621
Social Competence	5.86	1.17	5.89	1.20	-0.46	.647
Task Leadership	5.89	1.18	5.90	1.28	-0.28	.776
Time Management	5.46	1.39	5.35	1.29	1.52	.130
Overall	6.18	0.80	6.14	0.84	0.86	.391
n and *df*	747		628		1,375	
T2						
Achievement Motivation	6.95	0.96	6.83	0.98	-2.16	.031*
Active Initiative	6.96	1.06	6.82	1.16	-2.32	.021*
Emotional Control	6.58	1.13	6.60	1.18	0.30	.768
Intellectual Flexibility	6.89	0.92	6.80	0.97	-1.58	.113
Self Confidence	7.04	1.06	7.05	1.06	0.24	.814
Social Competence	6.48	1.09	6.53	1.12	0.71	.479
Task Leadership	6.45	1.25	6.50	1.21	0.82	.414
Time Management	6.22	1.20	6.11	1.20	-1.62	.105
Overall	6.70	0.85	6.66	0.89	-0.82	.413
n and *df*	742		624		1,366	

Note. * $p < .05$, ** $p < .01$, *** $p < .001$; T3 LEQs were sent to 1,385 participants; T1 to T2 difference scores were not reported because there was no significant differences between T3 returnees and non-returnees, nor were there significant interactions between T3 returnee/non-returnee and T1 to T2 LEQ factor difference scores (see Table 5.5).

T3 returnees and non-returnees had similar LEQ Overall scores at T0, T1, T2, T1 to T2, and ages. T3 returnees were, however, significantly higher than non-

returnees for Achievement Motivation (T0, T1, T2) and Active Initiative (T1, T2), and were more likely to be female. On the basis of these results, T3 responses were treated as being largely representative of likely T3 responses from T3 non-returnees, although some caution in interpretation is warranted because T3 responses attracted the lowest response rate of the four administration times (54.4%) and some small differences for a small number of LEQ factors (5 out of 24).

Conclusion. There were high return rates (> 90%) for the T0, T1, and T2 LEQs, whereas just over 50% of T3s were returned. T1 and T2 LEQs were administered in captive environments, thus attracting approximately 95% response rates. Causes of missing data were likely to be random, therefore these data were treated as representative of the targeted sample. T0 and T3 LEQs were administered in "back-home" environments. Approximately 90% of T0s and approximately 50% of T3s were returned. Analysis of T0 and T3 returnees/no returnees revealed similar LEQ profiles. T3 returnees tended to report slightly higher Achievement Motivation and Active Initiative scores and were more likely to be female. However, T3 returnees had similar overall T0, T1, and T2 LEQ scores, similar overall T1 to T2 LEQ difference scores, and similar patterns of LEQ factor T1 to T2 difference scores. On the basis of these results, LEQ data obtained at each Time was treated as representative of the targeted sample.

Instrumentation

LEQ Overview

The Life Effectiveness Questionnaire (LEQ) is a self-report instrument designed to measure individual effectiveness in a variety of key, generic life skills (see Chapter 3; Neill, 2007c). The LEQ was designed to be sensitive to measuring changes in areas of personal and social development that are typical objectives of experience-based interventions such as outdoor education programs. The proposed notion of a global (single, underlying) life effectiveness construct, and its purported multidimensional structure (see Chapter 3), as operationalised by the LEQ, has yet to be empirically tested and demonstrated. Thus, Study 1 undertook to investigate the psychometric properties of the LEQ-G and the subsequently developed LEQ-H.

Design Principles

The design and development of the LEQ was based on five principles.

Assessment of life skill competencies. The life skills targeted for assessment should be necessary for, and beneficial to, effective and successful human living and working. The greater the specificity of a measure, the more likely it is to predict actual performance (Bandura, 2006; Blau, 1993). Hence, the focus is on assessment of competence in multiple practical life skills that are relevant to a broad range of personal and professional situations.

Relevant to program aims. A major aim of many experience-based intervention programs (such as outdoor education) is to facilitate participants' personal and social development in a broad range of life skills (e.g., self-confidence, initiative taking, and communication skills). Thus, an ideal measurement instrument would encompass a wide range of life proficiency domains which are directly related to typically-stated outdoor education program aims.

Short and simple. For applied use, usability (e.g., instrument length and complexity) matters. Research and evaluation of the effects of outdoor education programs occurs in a variety of field settings (e.g., in outdoor environments with a range of weather conditions), on multiple occasions (e.g., pre-program, first day of program, last day of program, and follow-up), and for a wide range of participants (e.g., those with learning disabilities, low literacy levels, children, and corporate managers). Hence, the shorter and simpler an instrument (reliability and validity aside), the greater the instrument's potential applicability. The overarching aim is to develop instrumentation that provides maximum range and quality of information in as short a time as possible (i.e., a maximum of about 10 minutes). The instrument's instructions and layout also need to be straight-forward so that the instrument can be self-administered or administered by group leaders or teachers in a standardised manner across different situations.

Sensitive to change. The item wordings and response scale are critical aspects of a measurement instrument's sensitivity to change. Item wording needs to elicit meaningful response distributions and be sensitive to change, yet be reliable over time periods during which there is no change. For the response scale, a balance needs to be found between too few and too many response options. For example, a

dichotomous response does not provide much measurement sensitivity, particularly when there are a small number of items per factor, whereas a large number of response scale options (e.g., over 10) risks unnecessary complexity. Despite being an important issue, there is little research on the effects of different measurement scales for measuring change (Cox, 1980). Weng (2004) tested responses to Likert scales of between three and nine options, and found that "scales with few response categories tended to result in lower reliability, especially lower test-retest reliability" (p. 956). A related issue is that response distributions should provide sufficient room for detecting shifts up or down over time (i.e., should not exhibit ceiling or floor effects). Hence, the four moments and frequency distributions of sample data for items and factors should be used to inform instrument development.

Educational exercise. The instrument should ideally serve not only as a research and evaluation tool, but also as a potentially educative and interesting exercise for participants. Whilst providing an educational exercise is not a necessary criterion for a sound psychometric tool, it would add practical value, particularly for use in personal and social development intervention programs. For example, the instrument could enrich self-evaluation, goal-setting, and feedback processes.

Stages of Development of the LEQ

The first version of the LEQ was called "Actuals and Aspirations", reflecting a focus on "actual" and "ideal" aspects of self. Subsequent versions dropped this distinction and focused on measuring multiple dimensions of personal and social competence which were globally termed "life effectiveness". There were five major stages of pilot testing and instrument development (see Table 5.7), with Study 1 representing Stage 6 (LEQ-G) and Study 2 as Stage 7 (LEQ-H). For each stage:

1. Exploratory factor analysis (EFA; Stages 1 to 5) or confirmatory factor analysis (CFA; Stages 6 to 7) was conducted, with separate analyses, where sample sizes were sufficient, for males and females in order to help ensure that a gender-biased structure was not developed. Larger sample sizes were generally used as the stages progressed (N = 105 (Stage 1) through to N = 1,164 (Stage 6) and N = 1,892 (Stage 7)).
2. Increasingly diverse samples tended to be used in successive stages to help ensure wide applicability for the instrument.

Table 5.7 *Stages of Development of the Life Effectiveness Questionnaire*

Stage	Version	Year	Items	Factors	Scale Range	N	Age (years)	Program Types
1	AA	1986	38	7	1-10	105	> 15	OBA (Standard, Adult, Management)
2	LEQ-C	1987	72	8	1-9	314	> 15	OBA (Standard, Adult)
3	LEQ-D	1987 - 1988	53	11	1-8	335	> 15	OBA (Standard, Adult, Management)
4	LEQ-E	1989	63	7	1-8	114	> 15	OBA (Standard, Adult, Management)
5	LEQ-F	1990 - 1993	42	8	1-8	406	> 15	OBA (Standard, Adult, Management), Army, Navy, Sail Training, Scientific expedition
6	LEQ-G	1993 - 1995	64	11	1-8	1,164	> 15	OBA (Standard, Adult, Management), Sail Training, Scientific expedition, Drug & alcohol
7	LEQ-H	1996 - 2000	24	8	1-8	1,892	> 11	OBA (Standard, Management, Adolescent, Special, Family, Staff), Drug & alcohol, Other

Note. AA = Actuals & Aspirations; LEQ = Life Effectiveness Questionnaire; OBA = Outward Bound Australia. The LEQ was originally designed and developed by Garry Richards, with significant contributions from others, including John Barret, Michael Parle, Brenda Morrison, Scott Fry, and Herbert Marsh. Archival research did not reveal or identify an LEQ-B.

LEQ Factors and Instrumentation

The 11 proposed LEQ-G factors (see Chapter 3) are summarised, with operational definitions and sample items, in Table 5.8. All LEQ-G and LEQ-H items are in Appendix B.1.2 and Appendix B.2.2 respectively, with the full instruments in Appendix B.1.1 and Appendix B.2.1 respectively. Item wording focused on self-assessment of competence in relation to each purported life effectiveness factor. All items were positively worded and rated on an eight-point Likert scale which ranged from "1 - False, Not like me" to "8 - True, Like me" (see Figure 5.4).

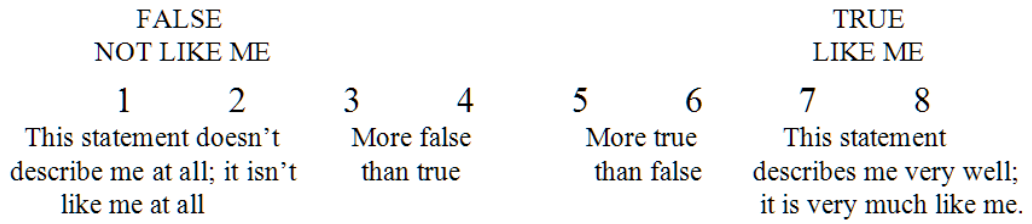


Figure 5.4 Eight-point Likert response scale for the LEQ-G and LEQ-H.

Table 5.8 *Overview of the 11 LEQ-G Factors, with Descriptions and Sample Items*

Factor	Ab.	LEQ	Description → Sample item
Achievement Motivation	AM	G,H	Motivated to achieve excellence and put the required effort into action to attain it. → I try to do the best that I possibly can.
Active Initiative	AI	G,H	Initiates action in new situations. Likes to be busy, energetic, and actively involved in things. → I like to be an active, 'get into it' person.
Emotional Control	EC	G,H	Capacity to stay calm in new, changing or stressful situations. → I stay calm when things go wrong.
Hardiness Resourcefulness	HR	G	Succeeds in performing difficult tasks with limited resources. → I can perform with limited resources.
Intellectual Flexibility	IF	G,H	Adapts thinking and accommodates different perspectives when presented with better ideas. → I am open to new ideas.
Organisational Self-Discipline	OD	G	Controls behaviour in a logical, sensible, and organised manner. → I make logical decisions and am self-disciplined in acting on these decisions.
Productive Teamwork	PT	G	Uses interpersonal skills to work productively in team situations. → I am productive and cooperative when working with a team.
Self Confidence	SC	H	Confidence in personal abilities and success of one's actions. → I believe I can do it.
Social Competence	SO	H	Effectiveness, confidence, and competence in social interactions. → I am successful in social situations.
Task Leadership	TL	H	Leads and motivates other people effectively when a task needs to be done. → I am a good leader when a task needs to be done.
Time Management	TM	H	Makes optimal use of time. Efficient time management, with minimal time wastage. → I manage the way I use my time well.

The LEQ was presented as a double-sided A4 sheet of paper (usually yellow or green). Page one contained instructions, and page two was for participants' details (name, age, gender, etc.) and responses to the LEQ items.

Word Count Clouds

Word count clouds help to visualise word frequencies. More frequently occurring words are displayed in relatively larger font and the words are ordered from most to least frequent. Words such as "I" and "the" are not shown. The word count clouds for the LEQ-G (Figure 5.5) and the LEQ-H (Figure 5.6) items reflect an operationalisation of life effectiveness as about being active, calm, efficient, adaptable, and capable of handling of a variety of changing and potentially stressful situations.

things ... situations ... confident ... calm ... active ... something ... ideas ... social ... others ... thinking ... into ... myself ... easily ... leader ... positive ... efficiently ... decisions ... actively ... involved ... ability ... flexible ... needs ... speaking ... actions ... opinions ... task ... facts ... productive ... motivate ... attitude ... maintain ... information ... sorted ... feelings ... resources ... trust ... started ... action ... resourceful ... initiative ... tasks ... destiny ... persevere ... become ... effectively ... apply ... cope ... getting ... anything ... succeed ... focus ... aspects ... energetic ... limited ... perform ... making ... results ... personal ... competent ... stressful ... organisation ... effective ... overcome ... anxiety ... member ... assertive ... details ... project ... working ... successful ... adapt ... plans ... helpful ... firm ... generous ... using ... organised ... changing ... waste ... generally ... relaxed ... opportunity ... adaptable ... punctual ... manage ... argue ... possibly ... communicate ... instructions ... upset ... cooperate ...

Figure 5.5 LEQ-G word frequency cloud[32].

situations ... things ... calm ... active ... leader ... social ... thinking ... ideas ... overcome ... succeed ... anxiety ... apply ... energetic ... myself ... something ... changing ... confident ... manage ... adaptable ... tasks ... into ... motivate ... communicate ... possibly ... needs ... flexible ... easily ... opinions ... successful ... efficiently ... working ... details ... project ... waste ... competent ... results ... anything ... ability ... stressful ... actively ... involved ... task ...

Figure 5.6 LEQ-H word frequency cloud.

Procedure

Data Collection

Overview. A convenience sample of LEQ-G and LEQ-H data was collected from outdoor education program participants over a 12 year period (1992 to 2000; see Figure 5.7). LEQ administration occurred on up to four occasions for each

[32] Word count clouds were generated with the Text Content Analysis Tool (UsingEnglish.com, 2007).

participant (see Table 5.1). At least one assessment was available for each of 3,961 participants. Reports of misunderstandings about how to complete the instrument were rare. The vast majority of participants found the task straightforward and able to be completed in approximately 15 to 20 minutes for the LEQ-G and 10 minutes for the LEQ-H.

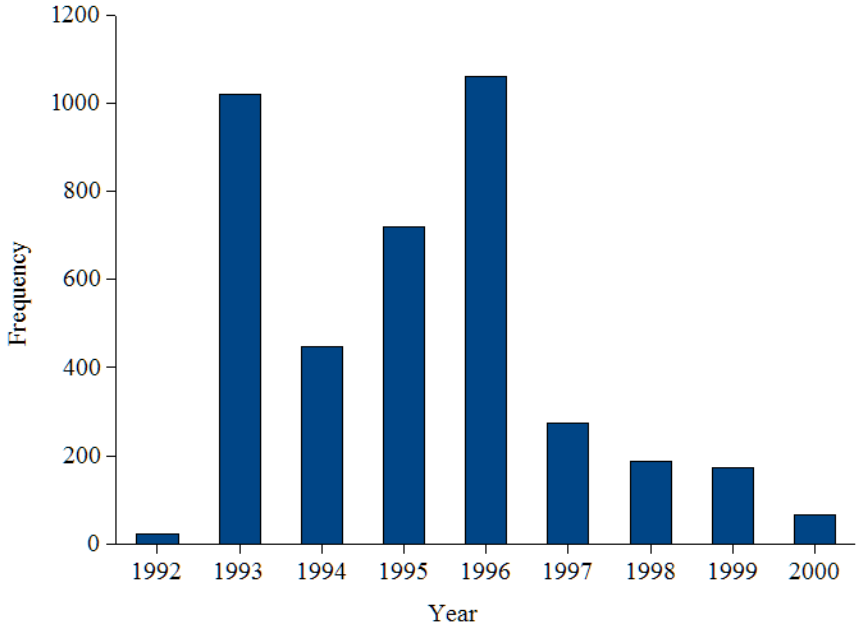


Figure 5.7 Bar graph showing the number of respondents to the LEQ-G and LEQ-H by year ($N = 3,961$).

Participation was voluntary. There were some refusals, but these were rare (< 1%). Consent was by participation. The LEQ was generally presented as part of the program, as a chance to self-evaluate, reflect, and possibly set goals. Briefings to participants included explanation that participants' data would be used to analyse and better understand the programs (see Administration Guidelines in Appendix B.3.1).

LEQ data were collected as part of an ongoing research program at OBA. The researcher played a significant role as an OBA employee in coordinating the organisation's research program between 1992 and 1997, when much of the data for the current study was collected. Additional efforts were made by the researcher during this period, under the auspice of OBA, to broaden the representativeness of the sample by including data from a broader range of OBA programs (especially adolescent programs and shorter programs (< 8 days)) and also from participants in programs conducted by other outdoor education organisations.

When administered at T1 and T2, the LEQ was handed out by the administrator (often the group leader or program coordinator) with the instructions face up. This instructions page included a statement in bold: "Please do not turn over until told to do so". Verbal instructions were then presented by the administrator. For mail distributions at T0 and T3, the LEQ was folded horizontally into thirds, with the top third of the instructions sheet facing outwards.

T0. Pre-program (T0) questionnaires were mailed to participants in Young Adult outdoor education programs and most Corporate outdoor education programs approximately six weeks prior to the commencement of the program as part of a pre-program information package (which included a medical history form, gear list, logistical/travel details, and other program-specific information). This package was sent by postal mail or distributed via the workplace in the case of Corporate programs. Participants returned their pre-program information, including the T0 LEQ, in reply-paid envelopes.

T1 and T2. The beginning of program (T1) and end of program (T2) administrations took place in a wide range of field settings due to the varied and often remote locations of expedition-based outdoor education programs. The T1 and T2 instruments were administered by program coordinators or instructors (group leaders) using standard administration guidelines (a written protocol) to help ensure standard procedures across settings (see Appendix B.3.1).

T3. Follow-up (T3) questionnaires were mailed to participants between 1 and 12 months (typically between 4 and 6 months) after the end of their outdoor education program (see covering letter in Appendix B.3.2)[33]. Participants returned their questionnaires in reply-paid envelopes. There was less incentive to complete the follow-up questionnaire because the program had been completed and there was no other paperwork to be returned, thus return rates were lower than for T0. For an unknown[34] but sizeable proportion of the OBA program participants, up to two

[33] The length of time between the end of programs and sending of the follow-up varied according to the length of the program. Thus, for programs which were up to approximately one week long, follow-up was approximately one month later. For three week programs, follow-up assessments were sent approximately four to six months later.

[34] Sending T3 reminder letters was standard practice, however it was done intermittently. Archival records about the number of T3 reminder letters sent to each participant were not readily available, thus proportions of T3 returnees and non-returnees who received T3 reminder letters are unknown.

reminder letters were sent to participants who had not returned a T3 questionnaire after a period of time (see Appendix B.3.3).

Data Screening

Each response to the LEQ was carefully screened at the time of administration and during data entry. Occasionally there were cases with unusual patterns of response (e.g., zigzags, half-finished questionnaires, and multiple answers per item). If such responses were noted at the time of data collection (as per the Administration Guidelines, see Appendix B.3.1), participants were requested to look more closely at their answers and make appropriate adjustments. Response sets which were not picked up at the time of administration were generally identified at the data-entry stage. Only responses which were judged by the data-enterer to represent coherent, logical, honest responses were entered. Such problems were rare (i.e., ~ 1 in 50 questionnaires), with the vast majority of responses to the LEQ appearing prima facie to represent genuine self-perceptions about life effectiveness. It was important to screen the responses at the time of data entry because outcome results for individual programs were routinely produced, compared with benchmarks, and used in internal and sometimes external reporting, particularly by OBA.

Over half of the data were entered by the primary researcher. Most of the other data were entered by OBA staff under the direct supervision of an experienced research coordinator. A small proportion of the data was collected and entered by other outdoor education organisations. In these instances, instructions on data entry were sent to each organisation and their data were carefully examined before being included in the main database.

Data screening for duplicate cases and out-of-range values was conducted. Out-of-range values were corrected by checking the electronic data against the hard-copy questionnaires. Approximately 10% of the entered data was systematically checked against hard copy data. Accuracy was very high, with minor errors (e.g., a 3 instead of a 4) occurring once in approximately every 10 cases, representing an accuracy rate of over 99% per keystroke[35]. There was no evidence that such keystroke errors were systematic. Overall, the database was considered to be

[35] Data entry for each case required one keystroke per LEQ item per Time, e.g., for a case with T1 and T2 LEQ-H responses, 48 key strokes were required.

predominantly error-free, with potential minor errors likely to be within-range and non-systematic.

Programs

A common criticism of empirical studies of outdoor education program outcomes has been that they lack sufficiently detailed descriptions of program methodology (e.g., Hattie et al., 1997; McKenzie, 2000a, 2000b, 2003; Sibthorp, 2003). This study involved 184 distinct programs conducted by at least 10 different organisations. Programs were categorised into six main types, each of which is overviewed in this section. Most programs were conducted by OBA, thus the description emphasises Outward Bound philosophy and methodology.

Outdoor Education

Study 2 conducted a study of the effects of outdoor education programs on participants' life effectiveness. Most participants were involved in OBA programs (83% ; n = 3,019), with 17% (n = 621) involved in non-OBA programs such as sail training voyages (see Table 5.2). The programs involved in the current study almost entirely had *developmental* purposes, focusing on personal and social development. A relatively small (and unknown) proportion of the programs had educational and therapeutic goals, whilst recreational and environmental goals were rare or absent. The programs were further characterised by being expedition-based, and led by specialist staff trained in hard- (outdoor, technical) and soft- (facilitation) skills, and for being physically and psychologically demanding.

Outward Bound

Outward Bound internationally. An overview of Outward Bound and OBA program philosophy and methods is provided because the bulk of the data was from OBA program participants (83%). Descriptions of non-OBA program methodologies are provided within the subsequent sections about the six main program types.

There are more than 40 Outward Bound schools around the world (Wikipedia, 2007b) which collectively provide programs to over 200,000 students per year (Outward Bound International, 2006). The international Outward Bound mission is "to help people discover and develop their potential to care for themselves, others and the world around them through challenging experiences in

unfamiliar settings" (Outward Bound International, p. 2). Outward Bound schools use a challenge-based approach to personal and social development, predominantly via organised adventurous and wilderness expedition-based experiences.

Outward Bound programs are perhaps most uniquely characterised by their adherence to the educational philosophy of founder, Kurt Hahn, a German Jewish educator (Miner, 1999; Richards, A., n. d.). The Outward Bound methodology was first branded as such in 1941, under the influence and inspiration of Hahn. Exiled from Germany in 1933, Hahn became the founding headmaster of Gordonstoun, a private boys' high school in Scotland in 1934. At Gordonstoun, Hahn put into practice a rigorous, holistic, educational model that emphasised physical fitness, community service, expeditions, and craftsmanship (Richards, A., 1999; Wikipedia, 2007a). Hahn considered these methods as antidotes to modern ills associated with living in industralised society. The success of Gordonstoun led to Hahn spreading the application of these training methods more widely. Thus, Hahn used fitness, service, expeditions, and craftsmanship as the main components of what is now known as the Duke of Edinburgh's Award, a program which encourages students around the world to engage in active learning for self- and social-improvement. In an effort to further promote the award scheme, Hahn, together with Jim Hogan (who become the first Outward Bound school warden), and Lawrence Holt (who provided resources via the Blue Funnel Line; Heathcote, 1971), devised Outward Bound programs as short, compact life skill development programs (Hogan, 1968; Outward Bound International, 2004a). Hahn promoted Outward Bound as "a new kind of school where the world of thought and action will no longer be divided" (quoted by Neill, 2004d). Hahn subsequently emphasised the centrality of four pillars in the philosophy and design of Outward Bound:

> Imagine a Roman Temple; the roof is the training program. It does not matter whether the mountains, the sea or any other topographical medium is used for the activities which help to develop the boy's character. The roof must be held aloft by four pillars: Rescue [service], Physical Fitness, Self-Reliance [via expeditions] and Project Work [craftsmanship]. (Outward Bound International, c. 2006)

Although Outward Bound programs do not derive from any specific psychological theory, the basic underlying tenet is that "all forms of growth in the

human being, whether they be physical, psychological, social or cognitive can be significantly enhanced by the individual engaging himself in active experiences in these various fields" (Richards, 1977, p. 37). The impact is thought to be further enhanced by the "great interdependence of these variables evidenced in Outward Bound" (Richards, p. 37).

The first Outward Bound programs (in 1941) were sailing-based, in large part because the programs were designed in response to the Blue Funnel Line's request for help in the training of young merchant navy seamen (Miner, 1999). The apparent success of the early Outward Bound programs led to the opening of more schools for a wider variety of students in the UK during the late 1940s and 1950s, with international expansion to US and Australia (1956), New Zealand, Europe, Asia, and Africa in subsequent decades (Outward Bound International, 2004b).

All Outward Bound schools are non-profit, independent, educational organisations. Each school adapts and modifies its programs to fit with its particular cultural, geographical, educational, and social resources and constraints. However, each school shares a central adherence to Outward Bound philosophy and methods, as certified through Outward Bound International, the official Outward Bound licensing body. Thus, Outward Bound school philosophies are all similar, but specific practices and activities vary. Outward Bound's educational philosophy is synthesised by its motto, "to serve, to strive, and not to yield". During Outward Bound programs, this motto serves as a practical reminder to participants about the Outward Bound process (Neill, 1996a).

Outward Bound Australia. OBA programs, conducted since 1956, exhibit a strong adherence to Hahnian philosophy (Hahn, 1936, 1940, 1947, 1958, 1960, 1965), but have also been characterised by several unique aspects. For example, Australia has a relatively large geographical area with low population density, thus mobile programs operate in most states, with a single, permanent base near Canberra, the national "bush" capital since 1974[36]. During the years of data collection (1992 to 2000) for the current study, OBA had an annual average of approximately 7,000 students involved in approximately 50,000 student program days. Thus, the current sample of 3,000 OBA participants represents approximately 5% of all OBA

[36] For a more indepth profile of OE in Australia during this period, see Neill (2001a, 2001b).

participants during this period. Altogether, OBA claims to have had over 250,000 participants since 1956 (OBA, 2007) which represents approximately 1 per 80 people of the current Australian population.

All OBA programs had a multi-activity focus, typically combining expedition-based activities such as hiking (carrying full backpacks), camping, water-based expeditions (e.g., rafting, canoeing, or air mattresses), abseiling and rock-climbing, sailing, and caving. Additional challenge-based developmental activities included ropes challenge courses, group initiative tasks, community service activities, solo (time alone in nature), and "final" expeditions in which participants were responsible for making their own decisions. These various skills and activities were conducted as a means of impelling participants in semi-autonomous groups of 8 to 16 into challenging and demanding situations requiring effort, determination, cooperation, and self-reliance. Participants were made responsible for most logistics including meal planning, expedition preparation, equipment maintenance, re-supplies, and problem-solving as the program progressed.

Trained instructors provided technical, logistical, and risk management leadership and expertise, but were also trained to act as facilitators of a guided discovery learning approach. This involved direct and non-direct facilitation of participant experiences via interviews, briefings, debriefings, and feedback. The instructors' role was to provide sufficient direction and structure so as to guide participants' development and to ensure a high chance of "learning success", but not so much as to undermine valuable opportunities for students to discover and learn for themselves.

Notably, instructors were with participants 24/7, with most OBA programs lasting at least nine days. Thus, there was substantial opportunity for instructors to develop an influential relationship with groups and individuals. Whilst the role of the instructor was understandably crucial (and relied on careful selection, training, and management), considerable organisational effort by OBA also went into developing systems and practices which were "instructor-proof". As such, the goal was for program design to be sufficiently robust that a competent instructor should be able to reliably facilitate programs with good participant outcomes.

The natural environment and the group were also seen to serve an important role, along with the program philosophy and activities, the individual, and the

instructor. The dynamic, interactive role of these theoretical elements in outdoor education was described in Chapter 2. These interactive elements are eloquently summarised by an Outward Bound school director's eloquent recipe (see Figure 5.8).

Whilst there is a distinctive physical nature to outdoor education and Outward Bound programs, physical fitness and acquisition of outdoor skills were not the primary goals. Instead, the claim is that a carefully sequenced arrangement of physical activities pursued over a sufficient period of time can serve as an effective medium for participants to recognise and understand their weaknesses, strengths, and resources, and to develop greater confidence in achieving personal goals.

More detailed descriptions of the OBA philosophy and methodology can be found in Chapter 2, Richards (1977), an historical account of the first 50 years of OBA (1956 - 2005; Klaebe, 2004, 2006), an earlier book about OBA programs (Jeneid, 1967), a video documentary which follows two participants through a 26-day Standard Course (OBA, 1986), and the photographic essays in Zelinski (1991, 2002). Summary OBA program descriptions can also be found in several research articles, including Marsh et al. (1986a), Hattie et al. (1997), and Neill (1994).

Outward Bound Recipe

Select: 10 strangers

Remove: Social dependencies - tobacco, spouses, friends, wristwatches, alcohol

Place on the edge of a pan: filled with unusual and stressful circumstances

Give a slight push: and watch to see that all are fully immersed

Add: the opportunity to learn and master skills

Shake: a sprinkling of natural grandeur

Stir in: a soupcon of skilled instructors

Simmer: carefully for 26 days. Skim off the fat and deep-freeze until needed.

Figure 5.8 Outward Bound recipe (Pritchard, n. d.).

Program Types

Six main types of outdoor education program (Adolescent, Young Adult, Adult, Family, Corporate, Special) were distinguished (see Table 5.2). Almost all

programs were conducted in Australia (99.4%), mostly in the Eastern states. The breakdown by location was Australian Capital Territory (34%), New South Wales (19%), Victoria (15%), Queensland (8%), and Western Australia (8%), with 17% from other or unknown program locations, including a small number of overseas programs[37].

Adolescent. Adolescent program participants represented 19.2% (n = 698) of the T1 to T2 sample. LEQ data were collected on the first day (T1) and the last day (T2) of the programs. No data were collected at T0 or T3, thus only short-term effects could be analysed. There were two types of programs: School programs and Holiday programs. School programs were conducted by OBA, as were most of the Holiday programs (84.0%, n = 131). Additionally, there were 25 participants from a holiday program designed for adolescent girls in the USA.

Most Adolescent programs were co-educational (62.3%, n = 435), with the rest being single-sex programs (all male (n = 138) and all female (n = 125)). The average age of participants was 14.25 years (SD = 1.27, range = 11 to 18 years). There were similar numbers and ages of males (n = 379, M = 14.03 years, SD = 1.32) and females (n = 318, M = 14.52 years, SD = 1.15). School program participants (M = 14.31, SD = 1.24) were similar in age to Holiday program participants (M = 14.05, SD = 1.36). Overall, Adolescent programs had relatively larger group sizes (M = 18.12, SD = 4.83, range 3 to 26) than did other programs which operated with discrete groups (M = 12.92, SD = 3.52, range 4 to 25, n = 2,391).

All Adolescent School programs in this study were conducted by OBA between 1995 and 1996. School programs are the main program type conducted by OBA in terms of number of participants, revenue, and operational effort. School programs were typically nine-day programs arranged as contracts between mostly private high schools and OBA (n = 542; 77.7% of Adolescent programs; 14.9% of total). School programs usually involved all students from a particular year level at a high school attending programs of between 3 and 11 days in length (M = 8.77 days, SD = 2.39). Approximately 90% of the School program participants were from private (non-government) schools which meant that these participants were, in general, from higher than average socioeconomic backgrounds. Attendance for

[37] These figures are based on the n = 3,640 sample of participants with Time 1 to 2 LEQ data.

School programs was generally compulsory, unless there were special circumstances such as a medical condition preventing participation. As a result, participation rates were very high (~ 95%).

Typical activities for Adolescent programs included bush cooking, setting and striking camp, navigation, bushwalking, environmental activities, initiative tasks, canoeing and/or rafting, abseiling (and rockclimbing for older groups), ropes challenge courses, group debriefings, and additional activities at the request of the school such as visits to nature sanctuaries, academic work such as geography, religious activities, and so on. According to Richards (1977), OBA school programs involved "total and integrated programming incorporating physical and adventure based activities, personal development techniques and academic studies in the field" (p.123). However, there has been limited research conducted on the processes and effects of OBA programs (Neill, 1994). The general stated objectives for the OBA School programs in this study were to provide a learning environment which:

1. improves confidence, increases self-esteem and develops maturity;
2. develops teamwork, co-operation, effective communication, and understanding;
3. stimulates interpersonal skills and leadership development;
4. focuses resourcefulness, initiative, self-reliance and capacity to adapt to change;
5. encourages continuing personal development and goal-setting;
6. challenges the individual to cope with change, overcome difficulties, and build on their strengths;
7. creates real life experiences which complement and reinforce the learning from within the classroom; and
8. develops a rapport between staff and students not readily attainable in a school environment. (OBA, 1994)

Adolescent Holiday programs consisted of 10-day public enrolment OBA programs (n = 131; 22.3% of adolescent programs; 4.3% of total) and a 10-day holiday outdoor education program in the USA for adolescent females (n = 25) conducted during school vacation periods. Participants were members of the public

who enrolled mostly out of personal interest, typically via parents/guardians. Whilst participants in School programs generally knew one another, participants in Holiday programs usually found themselves amongst a group of strangers. Adolescents' participation was often somewhat coerced by parent/guardian(s) and occasionally had been made compulsory. Holiday programs followed a similar format to School programs, with somewhat greater emphasis on recreational objectives. The focus of the USA non-Outward Bound program was on developing self-confidence, initiative taking, relationships, body image, and developing a deeper sense of purpose and connection with the natural world (Neill & Flory, 1999).

Young Adult. Young Adult program participants represented just over half of the data in the T1 to T2 sample (53.1%, n = 1932) and 91.9% of the data in the T0, T1, T2 and T3 sample. These data were collected between 1992 and 1999. Descriptives are provided here mainly for the T1 to T2 sample. Young Adult program participants were generally between 17 and 30 years, with the emphasis on the 17 to 25 year age group. The average age was 21.44 years (SD = 4.49, Mo = 18, range 15 to 67[38]).

Young Adult programs consisted of 26-day Standard and 22-day Challenge courses[39] conducted by OBA (n = 1432; 74.1% of Young Adult programs and 39.3% of the total sample), 10-day sail training programs conducted by a non-OB, non-profit sail training organisation in Australia (n = 281; 14.5% of Young Adult programs) and a second non-OB, non-profit sail training organisation in Australia (9.9%; n = 197), and a five-week scientific expedition conducted by a non-OB, non-profit organisation in Australia (1.1%; n = 22). The average age for the OBA program participants (M = 22.12, SD = 4.17) was similar to participants in the scientific program (M = 21.81, SD = 2.94), whilst the sail training program participants were slightly younger (M = 19.43, SD = 4.84). Male participation in the OBA programs was higher (60.4%) than for the scientific (42.9%) and the sail training (47.7%) programs.

[38] Data were collected for half a dozen 'Young Adult' participants aged over 40 years who completed non-OBA sail training programs.
[39] 26-day Standard Courses (26-day) were conducted by OBA until 1995, then redesigned as 22-day Challenge Courses from 1996 onwards.

All the Young Adult programs were open-enrolment, allowing any member of the public (of appropriate age and basic fitness) to participate. The participation fees ranged from approximately $60 to $120 per day per participant (1992 - 1999). Generally the participation fee was paid by individual participants themselves, although sponsorship by significant others (often parents), the workplace, or through scholarships was also common. Participation on all Young Adult programs was voluntary and consquently motivation to participate was generally high.

The focus of the OBA Standard and Challenge Courses was on the personal development via an intensive expedition-based program in which participants were encouraged to take responsibility for the conduct of most aspects of the program. These program types best match the original design and conception of Outward Bound by Kurt Hahn. An initial training period of approximately three days was conducted at a basecamp prior to embarking on a three-week expedition. Initial training was given in areas such as physical fitness, first aid, bush rescue, expedition planning, food planning, communication skills, navigation, goal-setting, and bushcraft. Expeditions involved land- and water-based travel, including activities such as bush-walking, caving, rock-climbing, abseiling, orienteering, canoeing, rafting, cascading, ropes confidence courses, sailing, solo (3 days alone), a final expedition without an instructor, and a cross-country run.

Student groups of 8 to 16 were trained to become autonomous in handling challenging and demanding situations requiring effort, determination, cooperation, and self-reliance. This included handling most logistics, meal planning, expedition preparation, equipment maintenance, re-supplies, and problem-solving as the program progressed. Early in the program of increasingly difficult experiences, group instructors played a relatively didactic role, however a guided discovery learning approach was soon implemented. By the last week of the program, participants operated in smaller groups of four to eight, largely independent of their instructor, and taking responsibility for all aspects of their expedition. More detailed explanations of standard Outward Bound programs are provided by Richards (1977) and OBA (1986), with overviews in Hattie et al. (1997) and Marsh et al. (1986a).

The focus for the sail training programs was similar to the OBA Standard/Challenge programs in terms of expected outcomes, however the format was a 10-day ocean sailing voyage aboard square-rigged tall ships. Typical activities

included learning sailing theory, setting sails, tacking the ship, navigation, watch keeping, food preparation, ship duties, and sports and games (Berman, Finkelstein, & Powell, 2005; Finkelstein, 2005; Neill & Richards, 1994a, 1994b; Richards, Barrett, Neill, & Seidel, 1992).

The scientific expedition program had a dual focus. One objective was to collect useful scientific data in remote locations. The second objective was for the experience to be conducted in such a way as to give young people a high level of responsibility for the organisation of the expedition in order to facilitate their personal and social development. These programs were of approximately four weeks in duration and varied according to location (in Australia) and scientific objectives. The program and logistics were largely organised by volunteers.

All of the Young Adult Programs were co-educational. Group sizes for the OBA programs were small (M = 12.25, SD = 1.86). For the sail training programs, group size could not be clearly quantified because participants sailed on a tall ship with approximately 30 to 40 other participants, yet also worked closely in "watches" of around 5 to 10 people. Thus, "group size" for sail training programs was unclear. Similarly, participants in the scientific exploring program operated for considerable time as a part of small, intensive groups (around 5 to 8), but also spent significant amounts time within a larger group of 30 to 40 participants.

LEQ data were collected from Young Adult Program participants on the first day (T1) and the last day of the program (T2), allowing for analysis of short-term effects. For approximately 16% of participants, pre-program (T0) and follow-up (T3) data were also collected via mailouts to individual participants, allowing for analysis of longer-term effects.

Adult. Adult programs were nine-day Adult programs and 12-day Extension programs conducted by OBA between 1993 and 1997. Extension programs were for people who had previously completed an OBA Standard/Challenge or Adult program. In total there were 336 Adult program participants (9.2% of total sample), with 171 males (51.0%) and 164 females (49.0%) females, with one participant's gender missing. Adult programs were primarily for people 30 years or over (M = 38.44, SD = 7.63, Mo = 33, Range = 19 to 67).

Adult programs were open-enrolment, allowing any suitable member of the public to participate. The participation fee was approximately $60 to $100 per day. Generally participants paid the fee themselves, although occasionally sponsorship was obtained, such as from a workplace. Participation was voluntary and people rarely knew any other group members before the program started. Almost all Adult programs were co-educational (92.6%; n = 311,), with some all-female programs (7.4%; n = 25,). Group sizes were generally between 8 and 16 (M = 12.13, SD = 4.07, range 5 to 21).

The focus of Adult programs was on the personal development of participants via wilderness-based expedition programs. Scherl (1982) reported that OBA Adult program participants came from a variety of backgrounds, predominantly urban, and were seeking somewhat more than a holiday in that they were looking for an opportunity to reassess themselves. Compared to the physically and psychologically intense, long OBA Standard and Challenge Courses for young adults, Adult programs offered a shorter, more comfortably-paced program, with less emphasis on physical challenges. Adult and Extension programs were carefully designed to take place in remote, spectacular locations (such as river gorge systems) with access to a variety of adventure activities such as expedition planning, food planning, ropes challenge courses, caving, bushwalking, rafting, canoeing, rockclimbing and abseiling, and solo (1 day alone). Overall, the Adult programs provided an adventurous nine days in which participants could become more effective in their lives through being part of a group in an outdoor expedition.

LEQ data were collected from Adult program participants on the first and last day of the programs (T1 and T2), allowing for analysis of short-term effects. T0 and T3 data were only sought from one Extension program, with a single returning case.

Family. Family programs were unique because they involved groups of family units (each consisting of two or more family members) in 10-day OBA programs. Data were collected between 1993 and 1997. Typically these programs involved father-son dyads, but sometimes involved father-daughter, mother-son, and mother-daughter dyads. Occasionally there were more than two family members in a family unit. Groups consisted of about five to seven family units. There were 108 participants, made up of 56 adolescents and 52 adults. Adults were usually a parent of the accompanying adolescent but sometimes they were other relations, such as

aunties, uncles, older adult siblings, and step-parents. Thirty-nine (69.6%) of the adolescents and 52 (90.4%) of the adults were male. The average age of the adolescents was 14.54 years (*SD* = 1.51, *Mo* = 15, Range = 12 to 18) and the average age of the adults was 43.62 years (*SD* = 6.53, *Mo* = 49, Range = 19 to 56).

Family Programs were open-enrolment and families usually did not know one another before attending the program. Participation fees were approximately $30 to $40 per day for adolescents and $60 to $100 per day for adults. Participation was voluntary, however it was often the decision of the adults in the family to attend. All Family programs were co-educational, with typical group sizes between 10 and 14. Families often paid for the program themselves, although many families also received sponsorship to attend from their workplace.

Family program activities were similar to Adult programs. The focus was on personal and family development through an adventurous expedition. Programs were designed to provide family members with an experience of participating in an expedition together and, in so doing, to improve and strengthen their understanding of one another. Program activities were adapted accordingly but, as with other programs, typically included expedition planning, food planning, ropes challenge courses, caving, bushwalking, rafting, rockclimbing and abseiling, as well as "familyo" (a version of "solo" involving 24 hours camped with only the other family member/s). LEQ data were collected on the first (T1) and last day (T2) of the programs, allowing for analysis of the short-term effects.

Corporate. Corporate Programs in this study were conducted by OBA between 1993 and 1997. Each Corporate program was designed to match training needs expressed by client organisations within the philosophy and practices of OBA. There were 471 participants, with 332 participants who were managers (77.1% male) and 139 participants who were apprentices (82.6% male). The managers' average age was 32.57 years (*SD* = 9.18, *Mdn* = 31, Range = 18 to 63) and the apprentices' average age was 19.79 years (*SD* = 4.41, *Mdn* = 18, Range = 16 to 35).

Corporate program participants were nominated and sponsored by their employers. Some employers made participation voluntary, others encouraged their staff, whilst other employers made the program compulsory. The fees, paid by the employer, ranged from around $80 to $150 per day. This fee was higher than for the other program types because of the tailor-made approach to Corporate programs. The

average group size was 15.34 (*SD* = 5.50, range = 4 to 25). Corporate programs were either all male (23.0%) or co-educational (77.0%).

Corporate program aims varied depending on the needs of the client organisation. Typical aims were teamwork, leadership, problem-solving, and communication skills. Program activities were varied, with some programs being longer and more physical, whilst other programs were shorter and less physically intense. The average program length was 7.16 days (*SD* = 2.38, *Mdn* = 7, *Mo* = 10, Range = 2 to 10). All programs utilised an outdoor expedition format, including typical planning and outdoor activities (i.e., expedition planning, food planning, ropes challenge courses, caving, bushwalking, rafting, rockclimbing and abseiling). Many Corporate programs also incorporated special learning activities such as goal-setting, feedback, and activities relating to development of flexible thinking, teamwork, communication skills, and/or other client-specific goals.

LEQ data were collected from Corporate program participants on the first day (T1) and the last day (T2) of the programs, allowing for analysis of the short-term effects. In addition, T0 and T3 data were collected for 45 participants (9.6% of all Corporate program participants), allowing for analysis of longer-term effects.

Special. Special programs consisted of four different types of outdoor education programs designed to meet developmental or therapeutic needs of particular client groups. In total there were 95 participants made up of groups of people who were unemployed (*n* = 7, *M* = 17.71 years), visually impaired (*n* = 12, *M* = 16.17 years), recovering from drug and alcohol problems (*n* = 67, *M* = 18.22 years), and gay and lesbian youth (*n* = 9, *M* = 21.67 years). The specific purposes of these programs varied widely, but included the common aim of enhancing the life skills of participants. All programs were co-educational, with similar numbers of males and females, except for the drug and alcohol programs in which 78.7% of the participants were male.

The program for people who were unemployed was conducted by OBA and lasted for three days. The program for people with visually impairments was also conducted by OBA and lasted nine days (Neill, 1996b). The programs for people recovering from drug and alcohol problems were conducted by a non-OBA organisation specialising in rehabilitation of such clients through outdoor expeditions (Holmes, 1996a, 1996b). For half of these participants, the expeditions were nine

days and for the other half the expeditions were for 15 days. Finally, the program for gays and lesbian youth was conducted by an overseas Outward Bound school and lasted nine days (Neill & Flory, 2000).

In general, participation in these Special Programs was made possible through fundraising and sponsorship, with voluntary participation. Administration of the LEQ often took place in order to evaluate the program effects and provide feedback to sponsors. Group Sizes for Special programs were small, with an average of eight group members (range 4 to 13), and a higher staff-to-student ratio than for other programs. Program activities were often similar to other outdoor education programs, with appropriate adaptations for the client group. In addition, special sessions were conducted to address particular needs of the groups, such as dealing with drug and alcohol issues. Special program participants received the LEQ on the first day (T1) and last day of the program (T2), with a small number of participants in the drug and alcohol program also completing T0 and T3 assessments (n = 8).

Study 1: Research Design and Analysis

Overview

Study 1 investigated the psychometrics of the LEQ-G and developed a refined model, the LEQ-H. Data collected at the beginning of outdoor education programs (T1) were used because this provided the largest and most representative sample size. The factor structure and reliability of the 11-factor, 64-item LEQ-G was tested using confirmatory factor analysis (CFA) and invariance testing across age and gender (N = 1,164, Sample 1). The revised 8-factor, 24-item LEQ-H instrument was then administered to a new sample (N = 1,892, Sample 2) and the psychometric properties of the instrumentation based on Sample 2 were tested and compared to the results for Sample 1. Invariance of the factor structure across Sample 1 and Sample 2 was also tested. Finally, data from the two samples were pooled, and overall reliability and normative descriptive statistics by gender and age for overall life effectiveness and for each of the LEQ-H factors were reported (N = 3,064). For analyses of test-retest reliability, correlations between T0 and T1 data were used.

Confirmatory Factor Analysis

In the CFA approach to factor analysis, a researcher draws upon a priori knowledge to propose a theoretical structure for observed data. CFA is used to evaluate the degree of fit between the researcher-defined structural model parameters and an observed variance-covariance matrix (based on actual data).

In Study 1, three types of CFA were used: one-factor congeneric analyses, multi-factorial CFAs, and multi-sample CFAs to test for structural invariance between groups. In implementing these CFAs, it was hypothesised that: (a) each measured variable would have a non-zero loading on the factor it was designed to measure and a zero loading on all other factors; (b) the factors would be correlated but not overly so; and (c) the error terms (referred to as uniquenesses (Us)) would be uncorrelated.

Correlation and covariance matrices were prepared using PRELIS versions 1 (Jöreskog & Sörbom, 1988) and 2 (Du Toit, Du Toit, Mels, & Cheng, 2006). CFAs were conducted with LISREL for PC versions 7 (Jöreskog & Sörbom, 1989) and 8 (Jöreskog & Sörbom, 1993). Detailed explanations of the full CFA procedure are available elsewhere (e.g., Bollen 1989; Jöreskog & Sörbom, 1988, 1993; Pedhazur & Schmelkin, 1991), however a discussion of the key elements of CFA as applied to instrument development in this study are provided here.

Congeneric Analyses

One-factor congeneric analyses (Jöreskog & Sörbom, 1989) were conducted separately for each of the proposed LEQ factors. Items hypothesised to form a factor which measures a latent construct (such as Time Management) were tested for fit to a single-factor model. An important assumption underlying the construction of each of the LEQ factors is that the set of items designed to measure a factor forms a unidimensional construct. The one-factor congeneric model provides a direct test of such unidimensionality. Congeneric measurement models also allow the degree to which each individual item contributes to an overall composite scale to be assessed, which is useful for refining the selection of items in a scale. Reliability of one-factor models can be calculated as coefficient omega (ω), which is equal to the sum of the factor loadings (FLs) squared divided by the variance of the scale (Zinbarg, 2005). ω is generally recommended for use in CFA (e.g., see Bacon, Sauer, & Young, 1995;

Heise & Bohrnstedt, 1970; Smith, 1974), although Cronbach's α[40] is also reported for the total sample (Sample 1 and Sample 2) for Study 1. Typical rules of thumb were applied to interpreting measures of reliability for assessing unidimensionality - that is, .9 is desirable, .8 reasonable, .7 acceptable, and below .6 is unacceptable.

The outcomes of congeneric analyses were considered alongside outcomes for the multi-factorial CFAs, providing unidimensional and multidimensional psychometric information which, when used in conjunction with substantive considerations, provided a sound basis for making decisions about which items and factors to keep, modify, or drop. For further information about the congeneric analysis approach to development of multi-item measurement instruments see Gefen (2003), Gerbing and Anderson (1988), Lucke (2005) and Segars (1997).

Factor Structure

Following the congeneric CFAs and reliability analysis for each proposed LEQ factor, a series of the multi-factorial CFAs were conducted, with researcher-driven iterative adjustments to the number of factors and items. In addition, a global, second-order factor model was tested, along with invariance across gender and age.

The multi-factorial CFAs tested the adequacy of a simple, multidimensional structure for describing the observed variance in the data. The degree of misfit was indicated by a chi-square (χ^2) value for each estimated parameter for the model, which was summed to provide a total χ^2. Larger χ^2 values indicated poorer fit of the model to the observed variance-covariance or correlation matrix.

Modification indices (MIs) provided by LISREL (Jöreskog & Sörbom, 1989) were used as indicators of how much improvement in model fit could be obtained by not constraining a parameter of the model (i.e., allowing it to be freely estimated). Freeing parameters creates a better fitting model. However, it also makes more complex models and risks overfitting a model to a particular dataset. Thus, substantive theoretical knowledge was also used to guide decision-making during

[40] Marsh, Tracey, and Craven (2006) explained that: "α is based on the assumption of tau-equivalence in which all items load equally onto the latent factor, whereas α only assumes a congeneric model in which FLs are allowed to differ. Thus, α is a logical lower-bound estimate of α, and a negatively biased estimate of reliability unless the assumption of tau-equivalent measures is met." (p. 802) Thus, for scales in which all items have substantial and similar relations to the underlying latent construct, α tends to be only slightly larger than the slightly negatively biased α.

model development. The MIs of most interest were those for item factor loadings (FLs). In addition, MIs which indicated that the unique error (U) for two items were correlated may indicate a method effect in item responses.

Also of interest for instrument development were the factor correlations (FCrs). Moderate correlations between factors were expected, however these correlations should be low enough that each factor measures a substantially different construct to other factors. As a rule of thumb, FCrs up to approximately .7 were considered acceptable, whereas above approximately .7 would seem to indicate a notable degree of redundancy between factors (> 49% shared variance).

Decisions to drop items and factors were informed by careful examination of the CFA outcome statistics and substantive considerations, particularly with regard to whether the instrument could reasonably fulfill its purpose without a particular item or factor. Refined models were then re-tested. This process continued until a satisfactory model was established. It was also important to test the final model with new data. Hence, Study 1 replicated the CFA analyses with a new dataset (Sample 2) based on the refined instrument (LEQ-H).

Described in this way, instrument development using multi-factorial CFA is not dramatically different to instrument development using exploratory factor analysis (EFA). However, an important distinction is that CFA tends to be theory-driven (it involves testing a given model), whereas EFA can be conducted with no particular model(s) in mind. Thus, when a CFA model is specified, parameters such as FLs can be fixed or allowed to be free, providing that there is substantive justification for doing so. In contrast, in EFA all FLs are freely estimated.

Another distinction between EFA and CFA is that CFA provides valuable psychometric diagnostics. In particular, MIs and goodness-of-fit indices (GFIs) measure the degree of improvement in model fit for each successive adjustment. CFA also allows testing of models involving higher-order factors. The reliability of a higher-order factor can be calculated, based on the item Us and total score variance[41].

[41] McDonald (1985) presents a formula for coefficient omega (ω) which makes it possible to compute the reliability of a total score where items fit a multiple-factor model: $\omega = (1 - (\text{mean}(U)/\text{var}(s))$, where U is the n uniquenesses and s is the sum of the n item scores.

Thus, CFA offers greater power for fine-tuning an instrument's development than is afforded by EFA.

Structural Invariance

A major intended use of the LEQ is for program evaluation (e.g., comparing scores over time for different types of programs, groups, and individuals). However, before such comparisons can be meaningfully made, structural invariance of the instrument should be established. Thus, an important goal of this research was to develop instrumentation which had an equivalent factorial structure across males and females and across a range of age groups.

An instrument is structurally invariant if subpopulations respond to the instrument using a similar perception of the measurement scale (Drasgow & Kanfer, 1985). Structural invariance also means that different subpopulations respond to an instrument using a similar implicit perception of the instrument. One methodological strategy for testing structural equivalence between groups involves multi-sample CFA (Jöreskog & Sörbom, 1989). This involves testing the fit of a measurement model to the data from sub-samples of interest. Total invariance as well as partial invariance (some but not all model parameters) can be tested across samples. Knowing that an instrument is structurally invariant gives a researcher more confidence in drawing meaningful conclusions about differences between groups.

Before testing for structural invariance, it is important to consider a priori knowledge of group differences in the structure of the psychological constructs (Byrne, 1989). If there is reason to believe that invariance between groups may not exist, then different structural models should be considered. In the case of the LEQ, there were no expectations for structural variance across gender or age for the sample, hence the structural model was expected to be invariant across groups.

The first step in invariance testing is to establish a well-fitting and theoretically viable model (Byrne, Shavelson, & Muthén, 1989; Reise, Widaman, & Pugh, 1993). This model is then used to examine similarities and differences in the covariance patterns across the subpopulations of interest (Windle, Iwawaki, & Lerner, 1988).

Global tests of structural invariance evaluate whether or not all the structural model parameters are equivalent across groups. While seemingly straightforward,

this global test can often led to findings which are contradictory, leading to subsequent tests for partial structural invariance (Byrne, Shavelson, & Muthén, 1989). This suggests that conducting tests of partial structural invariance in addition to the test of full structural invariance is prudent. Hence, the current study tests whether there is invariance for the parameters as indicated in Table 5.9. This involves testing models across multiple samples and variously constraining parameters relating to the number of factors (NFs), the loadings of items on those factors (FLs), similar variances (FVs) and covariances (FCvs) or correlations (FCrs) amongst the factors, and finally the uniquenesses (Us) of the items.

Table 5.9 *Invariance Testing Parameters*

Invariant Parameters	Abbreviation	H_0
1. Number of factors	NFs	
2. Factor-loading pattern	FLs	$\Lambda_1 = \Lambda_2 = ... \Lambda_G$
3. Factor variances, covariances, or correlations	FVs, FCvs or FCrs	$\Phi_1 = \Phi_2 = ... \Phi_G$
4. Error	Us	$\theta_1 = \theta_2 = ... \theta_G$

The tenability of 1 and 2 are logical prerequisites to 3 and 4. Support for 1 and 2 is termed *factorial invariance* and may be all that is substantively necessary. The additional invariance of FVs, FCvs, or FCrs (3) and the Us (4) is termed *total invariance* and is of interest, but of less central concern since these parameters and their relations across groups will typically be idiosyncratic to a particular sample (MacCallum & Tucker, 1991; Reise et al., 1993) unless the samples are taken randomly from the same population (Marsh, 1993a).

For invariance testing, the dataset is split into the requisite groups and the structural model is re-tested with the constraint that the specified parameters are held invariant across the groups. Because all multi-group models imposing invariance constraints over groups are nested under models with no such invariance constraints, the differences between the χ^2s for the two models can be evaluated using an inferential statistical approach, based on the difference in *df*s and a selected critical χ^2 value. However, such χ^2 difference tests are subject to the same limitations as other tests of statistical significance that have been largely abandoned in favour of GFIs in CFA research (Marsh, 1993a). Cheung and Rensvold (2002), for example, point out that "many ΔGFIs are superior to $\Delta\chi 2$ as tests of invariance because they are not affected by sample size" (p. 250). Thus, model comparisons in invariance testing should rely more on comparison of fit indices than the statistical significance

of χ^2 differences. If the fit indices for the invariance model are close to the fit indices without invariance constraints then the researcher can be confident that the model being tested is invariant. Conversely, if there is a substantial worsening of the fit indices then this indicates that the parameters being tested are not invariant across the groups. There is no clear consensus on critical values for ΔGFIs. Little (1997) suggested using a critical ΔTLI value of -.05 for testing invariance. Cheung and Rensvold (2002), however, present a stronger rationale for judging invariance between models using a critical difference of -.01 based on ΔRNI (or equivalent).

A further application of invariance testing is for comparing responses to different instruments that contain common items. It is possible, for example, that the contextual effects of the surrounding items affect the way in which participants respond to individual items (Marsh & Yeung, 1999). If those same individual items are placed in the context of different surrounding items, different patterns of relations amongst the items may result. A typical situation where this might occur is when a subset of items is taken from a larger instrument, such as the case in the current study in which a subset of the 64-item LEQ-G were used for the 24-items for the LEQ-H. Whether or not participants' responses to the relations between the items are affected by the change in context can be examined by using invariance testing. An advantage of this approach, providing that invariance can be shown, is that data for common items from different instruments can then be validly pooled for subsequent analyses.

Global, Second-Order Models

In addition to testing simple, first-order multi-factorial measurement models, this study predicted the possibility of a global, second-order factor (see Figure 4.1 and Figure 4.2). In this model, the LEQ items load on first-order factors which, in turn, load on a global life effectiveness factor[42]. This is a more constrained, nested model than a first-order only model, thus will not fit better than a first-order only model. But, as with multi-sample testing, the GFIs can be examined and if there are only slightly poorer GFIs for a global, second-order factor compared to a first-order model this suggests support for the more constrained model. In addition, factorial

[42] One item loading for each first-order factor is arbitrarily fixed to unity in order to identify the higher-order model and to set a metric for the factors (Jöreskog & Sörbom, 1989; Marsh & Hocevar, 1985).

and structural invariance of a second-order model can be tested (e.g., see Byrne (1994), Chen, Sousa, & West, (2005) and Marsh & Hocevar (1985) for instructive examples).

This study applied the higher-order CFA model approach using LISREL, as described in Jöreskog and Sörbom (1989), and followed the higher-order invariance testing approaches described in Byrne (1994), Chen et al. (2005), and Marsh and Hocevar (1985). This included use of a Target coefficient (*T*; suggested by Marsh and Hocevar) to compare the fit of first-order and the more restrictive higher-order models. *T* is calculated as the ratio of the χ^2 of the first-order model to the χ^2 of the second-order model. Consequently, *T* can range between zero and one, with values closer to one indicating that the second-order model fits relatively well[43]. More recently, the Satorra-Bentler χ^2 (S-Bχ^2) has been recommended over χ^2 for difference tests of model fit between nested models (Byrne; Satorra & Bentler, 2001). Calculating the S-Bχ^2 involves inputting the variance-covariance matrix and the asymptotic covariance matrix into the LISREL model specifications.

Outcome Statistics

A number of outcome statistics produced in CFA are useful tools for instrument development. Most have already been mentioned, but are briefly summarised here: factor loadings (FLs), coefficient omega (ω), uniquenesses (Us), chi-square (χ^2), goodness-of-fit indices (GFIs), and modification indices (MIs).

Factor loadings (λ_x). The square of an item's FL (λ_x) in standardised form equals the percentage of its variance that is accounted for by the latent factor. As a general rule of thumb, it was considered desirable for items to have at least half of their variance explained by the latent factor. Hence, a FL of .7 (49% of variance explained) was used as a criterion for acceptable items.

Coefficient omega (ω). Coefficient omega (ω) is a measure of how well item variables serve jointly as a measure of a latent construct. As such, ω measures factor reliability. ω is a lower-bound estimate of the true reliability to the extent that any of the constituent items have unique error. As a general guide, an ω over .7 is minimally

[43] Marsh and Hocevar (1985) note that the distributional properties of *T* are unknown and that *T* is probably most appropriately used for comparing the relative fit of different higher-order models.

acceptable and over .8 is desirable. Cronbach's α results were also reported and were consistent with the ωs obtained via the congeneric analyses.

Uniquenesses (Us). All data are assumed to be sampled with error, thus this is modeled in CFA. Unique variance associated with each item cannot be explained by underlying latent factor(s). The measurement error for each item is assumed to be uncorrelated with measurement error for other items. Used diagnostically, large estimated measurement errors for an item indicate low reliability.

Chi-square (χ^2). A number of outcome statistics have been proposed as measures of the degree to which CFA models fit data. The traditional outcome statistic is the χ^2 which is smaller for better-fitting models. However, the χ^2 statistic is problematic in that it increases with the degrees of freedom (*df*) and the sample size (*n*) when the model fit is imperfect[44]. Also problematic for χ^2 is that if the observed variables in a sample do not have a multivariate normal distribution or are not continuous variables, then the χ^2 may also be inflated (Drasgow & Kanfer, 1985). As a result of inflated χ^2 values, significant probabilities (*p*) are commonly reported, and possibly good models can be rejected if χ^2 is used as the sole fit index.

Goodness-of-fit indices (GFIs). Due to the obvious problems with χ^2 and *p* for model evaluation, many other indices of model fit have been developed, with much discussion of their relative merits (e.g., Bollen, 1990; Bentler, 1989, 1990; Cudeck & Browne, 1983; Jöreskog & Sörbom, 1989; Marsh, Balla, & McDonald, 1988; McDonald & Marsh, 1990), with no clear consensus on which GFIs should be reported. This study adopts the approach argued for and demonstrated by Marsh (1993a; Marsh & Balla, 1994). This involves the Tucker-Lewis Index (TLI; Tucker & Lewis, 1973; also termed the non-normed fit index (NNFI) by Bentler & Bonnet, 1980[45]) because it is relatively independent of sample size and was found by Marsh et al. be among the best of available practical indices of fit. The Relative

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[44]In practice, a model fit to a dataset is always imperfect (unless every parameter is freely estimated so that the model is 'perfectly overfitted' to the data).

[45]The TLI measures model fit relative to the fit of a null model, hence it will be unstable if applied to a data set well-described by a null model (McDonald & Marsh, 1990). A null model does not specify a theoretical structure, does not account for the variances and covariances of the items, and thus does not achieve any data reduction. The null model specifies that each item loads perfectly on a separate factor, so there are the same number of factors as there are items. The null model serves as a baseline for assessing the relative improvement when other models are applied to the data.

Noncentrality Index (RNI) is also reported. The RNI also indicates roughly the proportion of covariation amongst indicators explained by the CFA model relative to a null model. Other popular GFIs, such as the root mean square error of approximation (RMSEA), the comparative fix index (CFI), and the parsimony index based on the RNI (PRNI) can be calculated from the results provided.

For both the TLI and RNI, values near 0 indicate poor fit and values near 1 indicate good fit. Values greater than .90 are usually considered adequate (Bentler & Bonnett, 1980), although values closer to, or above, .95 are desirable (Browne & Cudeck, 1993; Marsh, Balla, & Hau, 1996). The TLI and RNI differ in that the TLI has a correction for a lack of model parsimony whereas the RNI does not. As a result, it is possible for the imposition of invariance constraints to result in no decrement, or even an increase, in the TLI and this is taken as support for the invariance constraints (Marsh, 1993a, 1993b).

Composite Scores

Once the factor structure was established, composite scores were calculated for each of the LEQ factors for each participant at each time and for LEQ Overall. Individuals' LEQ factor scores were computed as unit-weighted averages of the target items. Regression-weighted computation was considered and trialled, but made little difference because the FLs of items were similar. In addition, a total LEQ score for each was computed, based on the average of an individual's LEQ factor scores. In Study 1, LEQ factor scores were compared across age and gender cohorts using descriptive statistics and MANOVAs to determine whether there were any notable baseline differences.

Test-retest Correlations

Test-retest correlations give an indication of the stability of measurement items and factors. If these correlations are low (e.g., < .7) then participants' responses to the item or factors may be changeable for reasons other than those that can be attributed to an intervention experience.

Study 2: Research Design & Analysis

Overview

Study 2 analysed the longitudinal effects of outdoor education programs on life effectiveness. Study 2 used a truncated time series, longitudinal, or repeated measures, quasi-experimental design (Shadish, Cook, & Campbell, 2002). The data consisted of participant responses on up to four occasions (T0, T1, T2, and T3; see Table 5.1) to the common 24 items from the LEQ-G or LEQ-H. Thus, the design consisted of two within-subject variables (Time (up to 4 levels) and LEQ factor (8 levels)). The short- and long-term effects of outdoor education programs on LEQ Overall and on each of the eight factors, and the effect of six naturally-occurring independent variables (Program Type, Program Length, Group Size, Group Gender, Participant Age, and Participant Gender), were analysed using descriptive statistics, multivariate inferential statistics, effect sizes (ESs) with 99.9% confidence intervals (CIs), and multi-level modeling (MLM). Effects were analysed across the entire sample, where appropriate, and otherwise for specific cohorts.

Composite Scores

Three steps were taken to compute LEQ factor and overall scores and to select cases. Firstly, LEQ factor scores were computed "itemwise" at each Time as the mean of *a minimum of one item per factor*. LEQ factor scores were calculated using an itemwise method in order to maximise the sample size. Factor scores at each time were computed as the mean of a participant's responses to the three target items. When a case had a missing item within a factor, the factor score was computed as the mean of the other two available item responses. When two response items within a factor were missing, the factor score was computed as equal to the available item response. When three responses items within a factor were missing, the factor score was also computed as missing. This procedure had the effect of maximising available sample size. It was unlikely to have biased results because fewer than 1% of questionnaires had missing data. Following these computations, cases were selected "factorwise", that is, if they had all eight factor scores at a particular Time. LEQ Overall scores were then computed as the mean of the eight LEQ factor scores. These steps maximised the available sample size but ensured that all eight factor

scores were present at each Time. This procedure was important for subsequent analyses involving total scores or comparisons between factors.

Table 5.10 *LEQ Sample Sizes by Method of Computing LEQ Factor Scores*

	Method		≥ 1 missing item	
Time	Itemwise	Listwise	*n*	%
T0	2,196	2,110	86	3.9
T1	3,835	3,661	174	4.5
T2	3,738	3,610	128	3.4
T3	752	724	28	3.7
T1 and T2	3,640	3,367	273	7.5
T0 and T3	677	627	50	7.4
T0, T1, T2, and T3	663	583	80	12.1

Note. For a case to be included via the itemwise method it required: (a) at least a response to at least one (out of three) items per factor to compute a factor score; and (b) all eight factor scores; For a case to be included via the listwise method it required: (a) responses to all 24 items.

Table 5.10 compares the sample sizes at each Time obtained using the steps described and a more conservative, listwise method[46]. The itemwise method provided ~ 4% larger sample sizes than the listwise method at T0, T1, T2, and T3. In other words, ~ 96% of respondents to the LEQ at any particular Time completed all 24 items. When various time combinations (T1 to T2 and T0 to T3) were considered, the itemwise method provided ~ 7% larger samples than a listwise method. When the full T0, T1, T2 and T3 time combination was considered, the itemwise method provided a 12% larger sample size. Thus, itemwise method clearly helped to maximise the sample size.

Descriptive Statistics

Descriptive statistics for the four moments of the distribution (*M*s, *SD*s, *skew*, and *kurtosis*) for each of the eight LEQ factors and overall life effectiveness at each of T0, T1, T2, and T3 are presented in Table 7.1 (T1 to T2; $N = 3,640$) and Table 7.2 (T0, T1, T2, and T3; $N = 663$). Histograms and descriptive statistics for all available data for each of the eight LEQ factors at each of T0, T1, T2, and T3 are provided in Figure D-1 (T0; $N = 2,196$), Figure D-2 (T1, $N = 3,685$), Figure D-3 (T2, $N = 3,738$), Figure D-4 (T3; $N = 577$), and for LEQ Overall at each time in Figure D-5. For specific analyses, descriptive statistics (Ms, *SD*s, and *n*s) were also reported by

[46] The listwise method required all three items within a factor in order to compute a factor score. If a case had a missing item, then all factor scores were treated as missing for that Time.

categories of Program Type, Program Length, Group Size, Group Gender, Participant Age, and Participant Gender (see Chapter 7).

Recall that the response scale for the LEQ ranged from 1 ("Not at all like me") to 8 ("Very much like me"; see Figure 5.4), thus higher scores indicated more positive self-assessments. Overall, the central tendencies were towards the positive end of the response scale. LEQ Overall means for T0 and T1 were similar (~ 6.1), whilst the means for T2 and T3 were approximately half a point higher (~ 6.6).

LEQ factor scores were moderately negatively skewed[47] and moderately leptokurtic[48]. Histograms for LEQ Overall and each factor at each Time confirmed the negative skew and positive kurtosis. However, the degree of negative skew and kurtosis was not extreme or atypical of positive bias in self-perceptions rated using Likert scales (e.g., see Baumeister, Tice, & Hutton, 1989).

Treating the eight point response scale as a continuum, T1 LEQ factor scores were between 63% and 79% along the scale. This suggests reasonable statistical "room for growth". However, the negative skewness and positive kurtosis also indicated the potential for "ceiling" effects (and thus possible underestimates of "actual change"). Ceiling effects may also have occurred differentially across the LEQ factors. The main factors where this could have been an issue were Active Initiative and Self Confidence.

In general, use of parametric inferential analyses was considered to be warranted, despite the moderate departures from normality, largely because of the robustness of such procedures when using large sample sizes with moderate departures from normality. However, the exact effects of the moderate normality violations on inferential tests are difficult to determine. Thus, inferential results should be interpreted with caution and in conjunction with ES_ns (effect sizes based on normality scores) and CIs, and the multi-level analyses which were conducted with normalised scores.

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[47] For example, skewness for the T1 factors ranged between -0.58 (TM) and -0.96 (AI). Skewness for the T2 factors ranged between -0.94 (TM) and -1.62 (AI). See Chapter 7 for more details.

[48] For example, kurtosis for the T2 factors ranged between 0.11 (TM) and 1.28 (AM). Skewness for the T2 factors ranged between 1.24 (TM) and 3.81 (SC) at T2. See Chapter 7 for more details.

Comparisons by Time

There were four Time comparisons of interest: T1 to T2 (short-term effects), T0 to T3 (long-term effects), T0 and T1 (baseline period), and T2 and T3 (follow-up period). The baseline period assessed the stability of LEQ responses over appropriately six weeks. The follow-up period assessed the long-term transference of outdoor education program effects over approximately 2 to 12 months.

MANOVAs and Paired Sample t-*Tests*

Study 2 used repeated measures multivariate analysis of variance designs (RMMANOVAs) with Time and LEQ factors as within-subject variables. According to O'Brien and Kaiser (1985), "the MANOVA approach for repeated measures affords a robust, flexible alternative to the traditional mixed-model analysis" (p. 331). Whilst other ANOVA designs were possible, the multivariate approach avoids the sphericity assumption which is often violated when measurements are repeated over time (Barcikowski & Robey, 1984). When between-groups variables were considered (for testing the six independent variables), these were added to create mixed-design MANOVAs (MDMANOVAs).

The SPSS GLM Repeated Measures procedure was used. Two within-subject factors were specified: Time (2 or 4) and LEQ factor (8). Of interest were the two multivariate effects involving Time, that is, for Time and Time by LEQ factor. The Time effect tested whether mean LEQ Overall scores had changed over Time (between T1 to T2 or over T0, T1, T2, and T3). The Time by LEQ factor effect examined whether mean changes over Time were similar for the eight LEQ factors. The Factor effect (differences between LEQ factor means) was not of interest[49].

When results indicated a Time by LEQ factor interaction, follow-up paired-sample *t*-tests were conducted for each time comparison for each LEQ factor. Where Time had two levels (i.e., T1 and T2), one paired-sample *t*-test per LEQ factor was conducted. Where Time had four levels (i.e., T0, T1, T2, and T3), paired-sample *t*-tests were used to test LEQ factor means by each of four Time contrasts (T0 to T1, T1 to T2, T2 to T3, and T0 to T3). For completeness, paired-sample *t*-tests were also

[49] Ignoring one effect in a MANOVA like this is also often described as a partial model. However, full models were conducted so that all SS terms could be obtained for the purpose of calculating η^2.

conducted for the LEQ Overall scores, although these tests were somewhat redundant with the multivariate Time effect. In total, 45 follow-up paired-sample *t*-tests were conducted. Using a critical α of .001 for each *t*-test resulted in a family-wise Type I error-rate of .045 which is slightly more conservative than a simple Bonferroni adjustment (α/n_{tests}; Shaffer, 1995) with a family-wise error rate of .05.

The key assumptions for these multivariate analyses were univariate and multivariate normality and independence of observations (Keselman, Algina, & Kowalchuk, 2001). Sphericity for multivariate effects is not an assumption (Barcikowski & Robey, 1984; Keselman et al., 1998). Univariate normality was somewhat violated, however the MANOVAs were considered to be likely to be sufficiently robust to the minor-moderate departures from normality.

Independence of observations[50] was doubtful because: (a) the quasi-experimental design studied naturally-occurring groups in outdoor education programs (and these groups were likely to have contained participants with somewhat similar self-perceptions of life effectiveness); and (b) over time spent together in groups in outdoor education programs, participants' self-perceptions were likely to have become more similar. The consequences of non-independence are to either inflate or deflate test statistics for independent variables depending on whether groups are nested or crossed within the independent variables (Judd, McClelland, & Culhane, 1997). Judd et al.'s discussion of situations in which the independence assumption is likely to be violated, and the consequences, is instructive:

> The most frequent violation in psychological data arises from nestings or groupings of observations that are ignored in the analysis. Although psychologists generally recognize dependence resulting from the grouping of observations within subjects (and handle this dependence appropriately by using within-subject analysis of variance), they often ignore other groupings in their data (e.g., students grouped in classrooms, siblings grouped in families, subjects who interact with each other in laboratory studies, matched or yoked subjects). In

[50] Independence of observations refers to the assumption that the units of analysis are independent of one another. In other words, a participants' score on each variable should be independent of scores for each corresponding variable for all other participants.

> general, to avoid nonindependence problems, any grouping factor in the data must be incorporated into the analysis, either as a fixed or random effect. If groups are ignored and if observations within groups are more similar (positive dependence) or less similar (negative dependence) than observations between groups, then substantial bias in testing the effects of the independent variables of interest is likely to occur. The direction of the bias depends jointly on the sign of the dependence and on whether groups are crossed with or nested under level of the independent variable of interest. With a nested design, dependence leads to inflated *F* values, and negative dependence leads to *F* values that are too small. For a crossed design, the direction of bias is reversed. (p. 459)

In the current study, participants within groups are likely to have been *positively dependent* (i.e., more similar). The effect of this depends on whether the groups are nested within program-level independent variables (such as Program Type), thereby inflating *F* values, or crossed with participant-level independent variables (such as Participant Gender), thereby reducing *F* values. In such situations, Judd et al.'s (1995) advice is to use statistical techniques which model non-independence:

> The appropriate analysis strategy that avoids these biases depends on whether group is considered to be a fixed or random effect. Typically it ought to be considered random, thus permitting generalization of the effect of the independent variable across groups. The appropriate analysis in this case treats group, rather than the individual observation as the unit of analysis. With a nested design, the independent variable is thus a between-group factor. With a cross design, the independent variable is a within-group factor and appropriate analyses involve tests of within-group contrasts or slopes. If group is considered fixed, then one simply partials the group differences out of the individual observations and proceeds to treat those observations as the unit of analysis. (p. 459)

Judd et al.'s (1995) advice leads directly to the application of MLM in Study 2. Caution should be applied nevertheless to interpreting the multivariate analysis

results involving independent variables because of likely violation of the independence of observations assumption. Thus, Study 2's multivariate results should be interpreted in conjunction with the descriptives, *t*-tests, ES_ns and CIs, and the MLAs. Whilst independence of observations is an important assumption, in practice, the non-independence may not have overly influenced Study 2 results because of the large sample size, which led to tests with high power.

The second assumption for the Study 2 multivariate analyses was univariate and multivariate normality. Assessment of univariate normality was discussed in Chapter 5 . It was observed that the LEQ factor scores had minor-moderate negative skewness and moderately positive kurtosis. However, the Study 2 multivariate tests were expected to be quite robust to such departures from univariate normality, particularly given the large sample size (Judd et al., 1997).

Multivariate normality was assessed by calculating Mahalanobis' Distance (MD)[51]. The resulting MD scores were compared with a critical χ^2 of 37.7 (15 *df*, α = .001). Out of 3,640 cases, there were 249 cases with MD scores greater than the critical χ^2 value. Examination of LEQ factor scores revealed that these cases tended to have somewhat unusual patterns (e.g., very low scores on some factors at some times). To test what impact these multivariate outliers were having on the multivariate analyses, the RMMANOVAs were re-run without these cases. The new results had slightly stronger effects. Nevertheless, power remained at 1. Thus, it was considered tolerable to retain the cases which were multivariate outliers for the sake of simplicity and completeness and because they were not impacting on inferential decisions. However, it is acknowledged that inclusion of these multivariate outlier cases inflated variance in the dependent variables and error-terms. Similar analyses involving the effect of removing multivariate outcomes with similar results were found for the T0, T1, T2, and T3 data ($N = 663$)[52].

In order to examine the effects of between-subjects independent variables, these were added to the single-group repeated measures designs, leading to mixed

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[51] To calculate MD, the LEQ factor scores for each Time were regressed on a dummy variable using SPSS Regression, with the option to save MD scores. For T1 to T2, there were 16 independent variables regressed on the constant dummy variable.

[52] Analysis of multivariate outliers for the T0, T1, T2, and T3, found 61 cases with MD values greater than the critical χ^2 value of 61.1 for 31 *df*.

multivariate designs. For these analyses, there were two additional effects of interest - the two interaction terms (IV x Time and IV x Time x LEQ factor).

Reporting of the multivariate analyses included eta-squared (η^2) and partial eta-squared (η_p^2) as effect size measures. There is considerable discussion in the methodological literature debating the relative merits of each effect size measure, with no clear consensus. Thus, it seemed prudent to report both η^2 [53] and η_p^2 [54]. Cohen's (1988) rule of thumb for interpreting the size of η^2 (based on converting his guidelines for interpreting *r* and *d*) is: small (.02), medium (.13), and large (.26). As with other rules of thumb, Cohen emphasises the importance of contextualising effect size interpretation with local, subject-specific comparisons. For example, with regard to interpreting .26 as large, Cohen suggested that these guidelines will

> be often found to be [too] small in sociology, economics, and psychophysics on one hand, and too large in personality, clinical, and social psychology on the other. As always, this criterion is a compromise that should be rejected when it seems unsuited to the substantive content of any given investigation. (p. 414)

In addition to tests of mean differences, correlational techniques such as partial correlations were used to analyse the role of continuous independent variables (e.g., Program Length) in changes over time.

In general, since many of the analyses involved large sample sizes, a critical α level of .001 was adopted to reduce the likelihood of Type I errors (false positives). Despite this stringent α level, power was very high. For example, with a confidence level of .001 and a sample size of 3,640, the power to detect a standardised mean effect size of 0.106 was .999[55]. With a sample size of 663, the power to detect a standardised mean effect size of 0.248 was .999 and the power to

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[53] η^2 is the proportion of total variance explained by an effect (SS_{effect} / SS_{total}). η^2 is not provided via the SPSS GLM procedure, but it can be calculated manually from the SS terms. η^2 is analogous to R^2 in multiple linear regression.

[54] η_p^2 is the amount of variance explained by an effect relative to its specific error-term (SS_{effect} / SS_{effect} + $SS_{error(effect)}$). η_p^2s is the proportion of variance in the dependent variable explained by the independent variable when controlling for all other independent variables in the model. η_p^2 is reported via the SPSS GLM procedure. The η_p^2s in a full model can sum to greater than 1.

[55] Power was calculated using a spreadsheet by Neill (2005a).

detect a standardised mean effect size of 0.178 was .900. Hence, significance test results should be interpreted with caution and in conjunction with effect sizes.

Effect Sizes and Confidence Intervals

Use of effect sizes is now widely recognised as good practice (e.g., American Psychological Association, 2001; Wilkinson & Task Force on Statistical Inference, 1999). In addition to reporting η^2 and η_p^2 for the multivariate tests, standardised mean effect sizes were used to indicate the size of mean differences between LEQ scores at two points in time in *SD* units. In order to minimise possible biases in the magnitude of change estimates due to non-normality and ceiling effects, standardised mean effect sizes were calculated from normalised scores (ES_ns)[56]. LEQ Overall ES_ns were, on average, .02 higher than effect sizes calculated more conventionally as the difference between the two *M*s divided by the pooled *SD*.

ES_ns and 99.9% CIs for the LEQ factor scores and LEQ Overall scores were presented via descriptive statistics and error-bar graphs. Effect sizes indicate the "amount of change" in *SD* units. An effect size near 0 indicates no change, a negative effect size indicates a reduction in scores over time, and a positive effect size indicates that scores increased. Cohen's (1988) widely used rule of thumb is that a standardised mean effect size of 0.2 is small, 0.5 is moderate, and 0.8 is large. However, it is also necessary to contextualise the amount of change by making comparisons with other relevant outcomes within the study and in other empirical studies. Cohen also suggested using practical examples to help guide interpretation of the meaning of his rule of thumb guidelines for interpreting *d* (see Table 5.12). For this study, meta-analyses of outdoor education outcomes and other intervention outcome studies reviewed in Chapter 2 provided appropriate benchmarks.

ES CIs indicate the probable range of the population effect size. Error-bar graphs were used to display both effect sizes and CIs. When a CI range does not include 0 an observed difference in scores is unlikely to be due to chance.

---

[56] The steps to create effect sizes based on normalised scores (ES_ns) were: (a) pool T1 and T2 LEQ Overall scores (for short-term changes), or pool T0, T1, T2, and T3 LEQ Overall scores (for long-term changes); (b) normalise the pooled scores; (c) "unpool" the normalised scores back into separate (time) variables; (d) compute difference scores between normalised LEQ Overall scores at different times; and (e) compute standardised mean ESs based on normalised scores as the difference score (based on normalised scores) divided by T1 normalised LEQ factor score *SD*s.

Other forms of ES expression can be useful. For example, a standardised mean effect size can be interpreted on a ratio scale (e.g., an effect size of .6 represents twice as much change as an effect size of .3). Cohen (1988) suggested converting *d* to (biserial) *r* and r^2, and using (variations of) U to estimate the percentage of overlapping and nonoverlapping distributions for two measures based on the properties of a normal distribution. An extract from Cohen's Table 2.2.1 is presented in Table 5.11 (equivalents of *d*). In this table, U refers to the percentage of participants who were higher on the subsequent assessment. Cohen refers to this as U3. McGraw and Wong (1992) refer to it as the common language effect size indicator. U can be calculated from a standardised mean effect size using a spreadsheet (e.g., DeCoster & Leistico, n.d.).

Table 5.11 *Equivalent Expressions of Standardised Mean Effect Sizes*

ES	*r*	r^2	U (%)
0.0	.000	.000	50.0
0.1	.050	.002	54.0
0.2	.100	.010	57.9
0.3	.148	.022	61.8
0.4	.196	.038	65.5
0.5	.243	.059	69.1
0.6	.287	.083	72.6
0.7	.330	.109	75.8
0.8	.371	.138	78.8
0.9	.410	.168	81.6
1.0	.447	.200	84.1
1.1	.482	.232	86.4
1.2	.514	.265	88.5
1.3	.545	.297	90.3
1.4	.573	.329	91.9
1.5	.600	.360	93.3

Note. Extracted from Cohen, 1988, Table 2.2.1; $r = \text{sqrt}\ (d^2 / (d^2 + 4))$, where *d* = standardised mean ES (ES_n); U represents the percentage of participants with positive overall change over Time; U can be derived from a normal table (as the area below *z*), where *z* = ES. *z* table calculators, such as Lane (1993 - 2007) or the spreadsheet that DeCoster and Leistico (n.d.) are useful for calculating U.

According to U3, a standardised mean effect size of .5 is equivalent to 69.1% of participants reporting higher scores on the subsequent occasion or that a person has a probability of .69 of benefiting from a program which has an effect size of .5. Where primary data are available (as in the current study), U can be compared with the actual percentage of participants who reported higher scores on the subsequent occasion. A standardised mean effect size of .5 is also equivalent to an *r* of .24 or r^2

of 0.058, indicating that 5.8% of the variance in a dependent variable can be accounted for by the independent variable (e.g., Time).

Table 5.12 *Practical Examples of Small, Medium, and Large Standardised Mean Effect Sizes*

ES	Size	Example 1	Example 2	Example 3
0.2	Small	Height difference between 15 & 16 year old ♀s.	Difference between IQ difference of twin siblings and non-twin siblings	Difference between adult ♂ and ♀ performance on the Information and Completion subtest of the WAIS.
0.5	Medium	Height difference between 14 & 16 year old ♀s.	Difference in World War II General Classification Test scores for teachers and general clerks.	Difference in IQ of clerical/semi-skilled workers and professionals / managers.
0.8	Large	Height difference between 13 & 18 year old ♀s.	Difference between IQ of college graduates vs. those who had a 50-50 chance of passing in an academic high-school curriculum.	Difference in IQ between PhD holders and college freshmen.

*Not*e. Extracted from Cohen, 1988, pp. 26-27; WAIS = Weschler Adult Intelligence Scale.

Multi-level Modeling

Overview. Multi-level modelling procedures were used to investigate the effects of outdoor education programs and the six independent variables on participants' life effectiveness. Multi-level modelling is a relatively new data-analytic approach, with limited application in the field of outdoor education. An overview of its history, advantages, and application in the present thesis follows.

Multi-level modelling emerged during the 1980s as a flexible approach to analysing statistical variance within hierarchically structured (or nested) data (Hox, 2002; Raudenbush & Willms, 1991). Multi-level modelling arose through diverse literatures and is variously referred to as hierarchical linear modelling, random-effects and variance component models, multi-stage models, random coefficient models, mixed models, and random regression models (Bryk & Raudenbush, 1992; Hedeker, 2004; Hox).

Multi-level modelling has broad applicability in fields such as epidemiology, medicine, psychology, and education (Browne & Rasbash, 2004). In such fields, it is often conceptually and statistically appropriate to treat response variables as

occurring within higher order units of analysis (Rasbash, Steele, Browne, & Prosser, 2004). Multi-level modelling is an extension of the general linear model which underlies more commonly-used procedures such as multiple linear regression (MLR) and ANOVA; in fact, MLR and ANOVA can be understood as single-level models within a multi-level approach (Bryk & Raudenbush; Hedeker, 2004; Snijders, 2003).

The central argument for use of MLM is that many datasets exhibit natural, hierarchical structures (Browne & Rasbash, 2002; Snijders, 2003), a fact which is neither "accidental nor ignorable" (Goldstein, 1995, p. 1). For example, in educational research, students' academic achievement can be seen as nested within classrooms which, in turn, are nested within schools, and so on. Thus, an outcome such as academic performance may vary between individuals, but it may also vary between classrooms, schools, districts, and countries. In single-level approaches, variance in a response variable is treated as a single unit of analysis, whereas in multi-level approaches, response variable variance is partitioned amongst defined hierarchical levels. MLM partitions variance in dependent variables across the defined units of analysis (levels). The variance associated with each unit of analysis can then be further partitioned into explained (fixed) and unexplained (random) variance. Predictor variables (independent variables) can be used to explain variance in the dependent variable at the different levels. For example, participant gender is an individual-level predictor, teaching style is a classroom-level predictor, and school climate is a school-level predictor. Unexplained variance remaining at each level can provide the researcher with valuable information about where to further investigate causes of variance in the response variable.

MLM is particularly useful for analysing longitudinal data (Snijders, 2003). This can be achieved by treating Time as the first-level, nested within Individuals (2nd level), who may be nested within Groups (3rd level), and Schools (4th level). Compared to alternatives such as MLR and ANOVA, multi-level approaches have several advantages that can make them more accurate and thus able to contribute new substantive findings. Multi-level models explain a greater proportion of the variance, give a stronger test of the relative influence of each of the independent variables, can incorporate cases with missing data, and can treat time as a continuous variable (Hedeker, 2004; Osborne, 2000). The importance of a multi-level approach is underlined by Browne and Rasbash (2002):

> A common criticism of using [single-level] statistical models to analyse quantitative data in the social sciences is that these methods place too much attention on the individual, and too little on the social and institutional contexts in which the individuals are located. Multi-level modelling redresses this imbalance by simultaneously modelling processes at all levels of the population hierarchy. By focusing attention on the levels of the hierarchy in the population, multi-level modelling enables the researcher to understand where and how effects are occurring. (p. 459)

Until the mid-1980s, however, appropriate techniques and software for analysing these types of data had been lacking. With the advent of faster computers and the development of several alternative multi-level statistical software packages during the 1990s, MLM has become more readily accessible (Bryk & Raudenbush, 1992; Goldstein, 1995; Hedeker, 2004; Osborne, 2000).

MLM of LEQ data. The LEQ data were treated as hierarchically structured (see Figure 5.9 and Figure 5.10). Time (Level 1) was measured within Participants (Level 2) who were within Groups (Level 3). MLM was used to determine: (a) the relative influence of these levels on the variance in LEQ responses; and (b) the role played by several fixed effects (independent variables). The analyses were conducted using the commercially-available statistical software MLn (Rasbash & Woodhouse, 1996; Rowe, 1997; Woodhouse, 1996) and MLwiN 2.02 (Goldstein et al., 1998; Rasbash, Browne, Healy, Cameron, & Charlton, 2005; Rasbash et al., 2004).

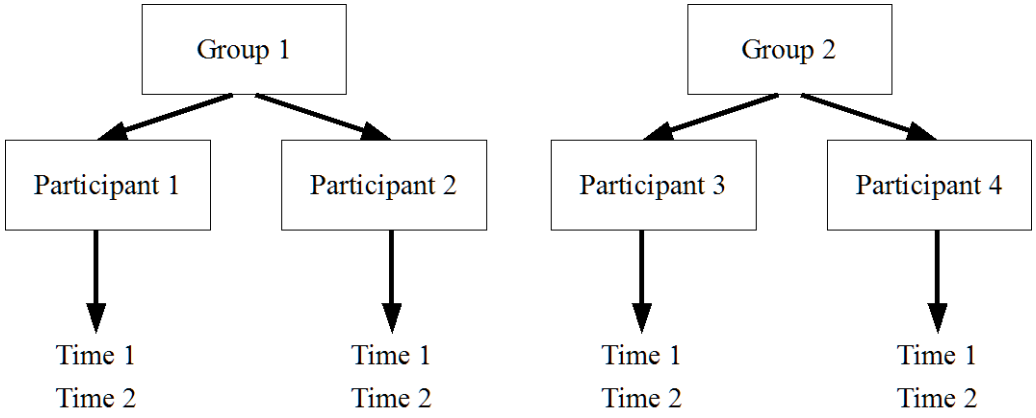


Figure 5.9 Hierarchical data structure of the present investigation (T1 to T2).

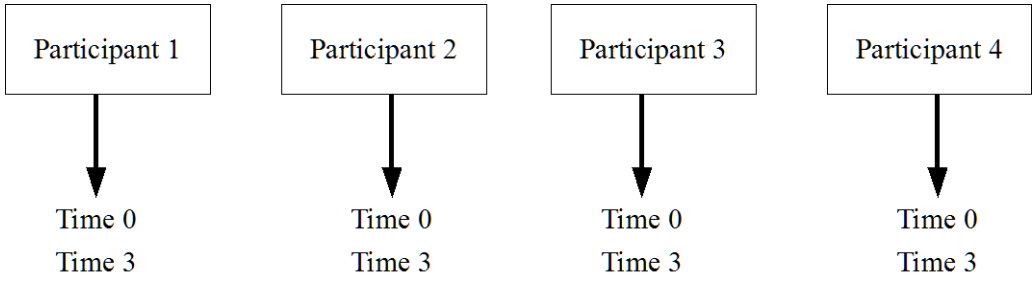


Figure 5.10 Hierarchical data structure of the present investigation (T0 to T3).

Note. Solutions involving a three-level model did not converge. Consequently, the models were simplified to two levels (Participant and Time).

Separate sets of analyses were conducted to examine short-term effects (T1 to T2) and longer-term effects (T0 and T3). Multi-level analyses involving LEQ total scores and each of the LEQ factors as response variables were conducted. Thus, there were 18 sets of multi-level analyses (2 different time contrasts x 9 different response variables). Each set examined a series of three models (explained further on). Results for the first set of multi-level analyses were presented in detail and the rest were summarised (see Chapter 7).

Missing data. Analysis of patterns of missing data in the dependent variables were discussed earlier in this chapter. There was also some missing data amongst the explanatory variables which further reduced the listwise sample size for the MLAs of T1 to T2 data by 15.8% (576 out of 3,640 cases) to 3,064 cases. This was mostly due to a lack of group identification data for 546 cases (527 cases from non-OBA programs (the sail training programs, the scientific exploration program, and the youth at risk program) and 19 cases from family OBA programs). The other 30 cases of missing independent variable data were missing Participant Gender, Participant Age, or both. This missing data were from a non-OB program (Army expedition, n = 12) and 18 other cases which appeared to be randomly missing Participant Gender, Participant Age, or both. Baseline variance-components solutions were examined for both the original data set (N = 3,640) and the reduced data set (N = 3,064) and the parameters were very similar.

For the T0 to T3 data, there were 663 cases with listwise LEQ data, which was reduced to 425 (64.1%) after 239 cases with missing group identification information from the sail training programs were removed. One further case was removed because it was the only participant from the Adult program type (from an OBA Extension Course), leaving 424 cases (64.0%) for multi-level modelling.

Standardisation. Once the T1 to T2 and T0 to T3 data sets were selected for multi-level modelling, the response variables and predictor variables (except for the cross-products of predictor variables used to assess interaction effects) were standardised to have *M*s of 0 and *SD*s of 1. Response variables were pooled across the Time contrast of interest prior to being standardised so that changes over Time were not lost. Standardisation was undertaken in order to make results more readily interpretable. For example, by using standardised response variables, random effect parameter estimates summed to 1 and were thus equal to intraclass correlations (ρ). Standardisation also allowed for parameters from multi-level analyses involving different response variables to be directly compared.

Models. For each dependent variable of interest, a series of three MLMs were analysed. Model 1, the baseline model, is also referred to as a variance-components or intercept-only model. This model partitions the total variance of the response variable according to the hierarchical structure of the data, in this case, across the three levels Time (Level 1), Individual (Level 2) and Group (Level 3). This repeated measures variance-components model provides a baseline for comparing with more complex models that include explanatory variables.

1: Baseline variance components. In MLwiN notation, the variance-components model is expressed as follows:

$$y_{ijk} \sim \mathrm{N}(XB,\ \Omega)$$
$$y_{ijk} = \beta_{0ijk} x_0$$
$$\beta_{0ijk} = \beta_0 + v_{0k} + u_{0jk} + e_{0ijk}$$
$$\begin{bmatrix} v_{0k} \end{bmatrix} \sim \mathrm{N}(0,\ \Omega_v) \ :\ \Omega_v = \begin{bmatrix} \sigma^2_{v0} \end{bmatrix}$$
$$\begin{bmatrix} u_{0jk} \end{bmatrix} \sim \mathrm{N}(0,\ \Omega_u) \ :\ \Omega_u = \begin{bmatrix} \sigma^2_{u0} \end{bmatrix}$$
$$\begin{bmatrix} e_{0ijk} \end{bmatrix} \sim \mathrm{N}(0,\ \Omega_e) \ :\ \Omega_e = \begin{bmatrix} \sigma^2_{e0} \end{bmatrix}$$

In this model, y_{ijk} represents a score at Time *i*, for Individual *j*, of Group *k*. $y_{ijk} \sim \mathrm{N}(XB,\Omega)$ is the standard notation for a normally distributed response (dependent) variable. y_{ijk} consists of a fixed part (XB) and a random part (Ω). The random part represents the variances and covariances associated with each level.

β_{0ijk} represents the intercept, which consists of the fixed term, β_0 (the grand *M*), plus the random terms $v_{0k,}$ $u_{0jk,}$ and e_{0ijk}, which represent the random effects for Group, Individual and Time respectively. β_0 is assumed to be constant and without measurement error. On the other hand, the random terms are assumed to be measured with sampling error, with a normal distribution, *M* of zero, and variances of σ^2_{v0}, σ^2_{u0} and σ^2_{e0}, respectively. Note that if *y* is standardised, β_{0ijk} will be zero. x_0 is an explanatory variable which is given a constant value of 1. x_0 is stored as a constant column (or vector) of ones which is named "cons" by MLwiN convention.

Intraclass correlations (ρ) can also be calculated to indicate the proportion of variance associated with each level compared to the estimated total variance. In the current study, for example, the ρ would be calculated using the formula:

$$\rho = \frac{\sigma^2_{v_0}}{\sigma^2_{v_0} + \sigma^2_{u_0} + \sigma^2_{e0}}$$

If, relative to the total variation, σ^2_{v0} is small, then it can be deduced that group membership has little affect on the response variable.

2: Variance components with the fixed effect of time. For Model 2 (variance-components with the fixed effect of time) the explanatory variable of Time was added to Model 1. Time was dummy coded to indicate either short-term (T1 to T2) or long-term (T0 to T3) contrasts, and then added as a fixed explanatory variable to the baseline model. The generic form for this model is:

$$y_{ijk} \sim \mathrm{N}(XB, \Omega)$$
$$y_{ijk} = \beta_{0ijk}x_0 + \beta_1 x_{1ijk}$$
$$\beta_{0ijk} = \beta_0 + v_{0k} + u_{0jk} + e_{0ijk}$$

$$\begin{bmatrix} v_{0k} \end{bmatrix} \sim \mathrm{N}(0,\ \Omega_v) : \Omega_v = \begin{bmatrix} \sigma^2_{v0} \end{bmatrix}$$

$$\begin{bmatrix} u_{0jk} \end{bmatrix} \sim \mathrm{N}(0,\ \Omega_u) : \Omega_u = \begin{bmatrix} \sigma^2_{u0} \end{bmatrix}$$

$$\begin{bmatrix} e_{0ijk} \end{bmatrix} \sim \mathrm{N}(0,\ \Omega_e) : \Omega_e = \begin{bmatrix} \sigma^2_{e0} \end{bmatrix}$$

In this model, x_{1ijk} is an explanatory variable, with β_1 being a fixed regression slope (for the Time contrast) on x_{1ijk}. Fixed means that the corresponding variance-

components of the slope are zero. Thus, this predictor is treated as having a constant effect on the response variable across all levels (units of analysis).

3: Variance components with the fixed effects of time and interactions between time and explanatory variables. For Model 3 (variance-components with the fixed effects of time and interactions between time and explanatory variables), cross-products between the Time dummy variables (indicating T1 to T2 and T0 to T3 contrasts) and the other explanatory variables (Participant Age, Participant Gender, Group Size, Group Gender, Program Length, and Program Type) were added to Model 2. The simple independent effects of these other explanatory variables were not included because they risked overcomplicating the model (and making it non-positive definite). Of more interest was determining the extent to which any of the explanatory variables interacted with (or moderated) the overall effect of Time on life effectiveness outcomes.

Prior to creating the interaction terms, categorical variables were converted to dummy codes. For Group Gender (All Male, All Female, Mixed), a dummy variable was created to indicate a Single Sex or Co-ed group (gpmixd; 0 = single-sex; 1 = mixed-sex). For Program Type, six dummy variables were created to indicate each of Adolescent (progadol), Young Adult (progyadl), Adult (progadul), Family (progfaml), Corporate (progcorp), and Special (progspec) program types (0 = no; 1 = yes).

All predictors were then standardised. Interaction terms with Time were created by multiplying each of the standardised predictor variables by the standardised time variable. These cross-products were not restandardised. In all, there were 12 fixed predictors in this model: Time (β_1), Participant Gender x Time (β_2), Participant Age x Time (β_3), Group Gender x Time (β_4), Group Size x Time (β_5), Program Length x Time (β_6), Adolescent Program x Time (β_7), Young Adult Program x Time (β_8), Adult Program x Time (β_9), Family Program x Time (β_{10}), Corporate Program x Time (β_{11}), and Special Programs x Time (β_{12}), the generic form for which is:

$$y_{ijk} \sim N(XB, \Omega)$$

$$y_{ijk} = \beta_{0ijk}x_0 + \beta_1 x_{1ijk} + \beta_2 x_{2ijk} + \beta_3 x_{3ijk} + \beta_4 x_{4ijk} + \beta_5 x_{5ijk} + \beta_6 x_{6ijk} + \beta_7 x_{7ijk} + \beta_8 x_{8ijk} + \beta_9 x_{9ijk} + \beta_{10} x_{10ijk} + \beta_{11} x_{11ijk} + \beta_{12} x_{12ijk}$$

$$\beta_{0ijk} = \beta_0 + v_{0k} + u_{0jk} + e_{0ijk}$$

$$\begin{bmatrix} v_{0k} \end{bmatrix} \sim N(0, \Omega_v) : \Omega_v = \begin{bmatrix} \sigma^2_{v0} \end{bmatrix}$$

$$\begin{bmatrix} u_{0jk} \end{bmatrix} \sim N(0, \Omega_u) : \Omega_u = \begin{bmatrix} \sigma^2_{u0} \end{bmatrix}$$

$$\begin{bmatrix} e_{0ijk} \end{bmatrix} \sim N(0, \Omega_e) : \Omega_e = \begin{bmatrix} \sigma^2_{e0} \end{bmatrix}$$

Estimation procedure. The estimation procedure used to calculate the fixed and random parameters of the multi-level models was Iterative Generalised Least Squares (IGLS), the default method in MLwiN. This method finds point estimates for the unknown parameters of interest in the model. The process iterates until the estimates for all parameters do not change from one cycle to the next and hence convergence is achieved (see Goldstein, 1995, for detailed review of the IGLS procedure).

Significance of parameters. To determine the significance of each specific model parameter, the parameter estimate is divided by its standard error (*SE*). This provides a test of the null hypothesis that a given parameter equals zero. The test statistic can be compared with a standard normal (*z*) frequency table (Hedeker & Gibbons, 1997). If the ratio of a parameter to its *SE* is greater than 1.96 (the critical value under normal distribution using a 95% CI) then the parameter estimate can be considered to be significantly different from zero. For a large random sample, this test statistic is approximately normally distributed with a *M* of 0 and variance of 1.

Fixed effect parameter effect sizes. As with much other inferential statistical research, most users of multi-level analyses overly emphasise statistical significance to the exclusion of estimates of the magnitude of effects. In keeping with the theme of earlier analyses, results for MLAs reported: (a) intra-class correlations for estimating the relative size of random effects (already described above); and (b) standard deviation unit effect sizes for MLM fixed effects. Effect sizes were calculated by dividing the fixed effect β coefficients by the *SD* of the variance for the corresponding random level in the variance components model. The *SD* was

calculated as the *SE* (supplied in MLwIN output and reported in results tables in Chapter 7 and Appendix F.1.1 to Appendix F.2.11) multiplied by square root of the *N*. Thus, $ES_m = \beta / SD$ for corresponding level in the variance components model[57]. An important aspect of interpretation is that this effect size represents the standardised effect of fixed independent variable on the dependent variable, *controlling for the influence of other independent variables*. This approach to calculating and reporting effect sizes was derived from that described and modeled in Rethinam, Pyke, and Lynch (2008).

Comparing models. Overall model fit is indicated by the loglikelihood statistic. The loglikelihoods of two models can be compared to help select the model that best fits the data, if one model is a special case of the other model (Hox, 2002). To compare the fit of two models, a χ^2 statistic is computed as the positive difference between the 2 × loglikelihoods for each model. This value has a χ^2 distribution with the *df* being the difference between the number of parameters estimated in each of the two models. If the statistic is not statistically significant, this suggests that the more complicated model may not be necessary (Hox, 2002), particularly given the goal of parsimony.

Preparation of data.

Converting data from SPSS to MLwiN. Data were converted from SPSS 14.0 format (.sav) to MLwiN 2.02 format (.ws) using a modified version of the SPSS macro PreML.inc (Iedema, 2006). The main advantage of this macro over other methods (such as copy and paste or importing as a tab delimited file) is that the macro automatically brings SPSS column names and system missing values into MLwiN.

Coding of independent variables. The six naturally-occurring independent variables were coded as follows and then standardised: Participant Gender (0 for

[57] For example, the ES for the fixed effect of the interaction between Time (T1 to T2) and Participant Gender with T1 to T2 Social Competence scores is -0.026, calculated by dividing its β coefficient (in Model 3; -.033) by the *SD* for the Participant-level random variance in the variance components model (in Model 1; 1.11). The *SD* was calculated as the square root of the Participant-level variance components *SE* (.020) multiplied by the square root of the *N* (3,064). The ES of -0.026 indicates a very small effect (towards males overall reporting 0.03 of a SD, which was nevertheless statistically significant ($p < .05$, $t = 4.13$), suggesting that males tend have slightly greater changes (.03 of a *SD* unit greater) in SO than females.

males, 1 for females), Participant Age (continuous, years), Group Gender (0 for single-sex, 1 for co-educational), Group Size (continuous, *n*), Program Length (continuous, days), and Program Type (dummy coded for the six types (0 for no, 1 for yes)). Fixed effects for Time were dummy coded to reflect T1 to T2 and T0 to T3 contrasts. Fixed effect interaction terms were created by multiplying each of the standardised independent variables by the standardised Time contrast variable.

Sample description.

T1 to T2. There was some missing independent variable data. This reduced the T1 to T2 listwise sample by 15.8% (by 576 out of 3,640 cases) to 3,064 cases. The 3,064 participants with T1 to T2 LEQ and independent variable data each belonged to one of 262 unique groups which consisted of an average of 11.69 participants per group (*SD* = 4.26), ranging from 1 to 26. This is a slight underestimate of actual Group Size as a result of elimination of missing data. The average size of the actual groups to which participants actually belonged was 12.60 participants (*SD* = 4.23; range 3 to 26).

There were 1,833 males and 1,181 females (61.5% and 38.5% respectively). The average age was 23.26 years (*SD* = 9.36, range 11 to 65 years). For Group Gender, 2,652 participants (86.6%) were in co-educational groups and 412 participants (13.4%) were in single-sex groups. The average Program Length was 15.02 days (*SD* = 7.35, range 2 to 28). For Program Type, the breakdown was 698 Adolescent (19.2%), 1,932 Young Adult (53.1%), 336 Adult (9.2%), 108 Family (3.0%), 471 Corporate (12.9%), and 95 Special (2.6%) participants.

T0 to T3. There was some missing independent variable data. This reduced the T0 to T3 listwise sample by 36.0% (by 239 out of 663 cases) to 424 cases. This sizable reduction was mainly because Group Size was not relevant for Young Adult sail training voyages, which tended to operate with a crew of up to 40 who intermingle and work together in smaller watches of 6 to 8. The 424 participants with T0 to T3 LEQ and independent variable data each belonged to one of 72 unique groups. In this sample, the groups had an average of size of 5.89 (*SD* = 3.64), ranging from 1 to 27. This is considerably less, due to listwise elimination of missing data, than the average size of group to which participants originally belonged, which was approximately 12 (range 3 to 27).

There were 249 males and 175 females (58.7% and 41.3% respectively). The average age was 23.58 years (*SD* = 6.73; range 16 to 58 years). For Group Gender, 398 participants were in co-education groups and 26 participants were in single-sex groups (93.9% and 6.1% respectively). The average Program Length was 20.63 days (*SD* = 5.54, range 5 to 26). For Program Type, the breakdown was 0 Adolescent (0%), 609 Young Adult (93.1%), 0 Adult (0%), 0 Family (0%), 45 Corporate (6.9%), and 0 Special (0%) participants.

Summary

This chapter presented the methodology for two studies designed to address this thesis' research aims, and its hypotheses and research questions. Study 1 examined the psychometrics of the LEQ-G and LEQ-H, and Study 2 analysed short- and long-term changes in LEQ scores over time for participants in outdoor education programs. Descriptions of the participant samples (including return rates and missing data), instrumentation, intervention programs, and explanation of the research design and statistical analyses were presented. The OE programs in the current study took place between 1992 and 2000. Participants were involved in 281 unique groups and 184 unique programs, conducted by seven different OE organisations. Most of the data (84%) was from OBA programs, with the other 16% consisting of sail training programs, drug and alcohol rehabilitation expedition programs, scientific exploring expeditions and some other miscellaneous OE programs. The next two chapters presents the results of Study 1 and Study 2.

CHAPTER 6

STUDY 1 RESULTS: PSYCHOMETRIC TESTING AND DEVELOPMENT OF THE LIFE EFFECTIVENESS QUESTIONNAIRE

Introduction

This chapter reports the results of Study 1, which aimed to rigorously assess the psychometrics properties of the Life Effectiveness Questionnaire (LEQ) versions G (LEQ-G) and H (LEQ-H) and thereby examine the instruments' of measurement validity. Theoretical background to the LEQ was presented in Chapter 3, and details about the operationalisation of the proposed life effectiveness constructs were provided in Chapter 5.

Analyses of the 11-factor, 64-item LEQ-G were based on 1,164 cases (673 males, 484 females, and 7 who did not indicate gender), with an average age of 22.5 years (*SD* = 6.86), ranging from 15 to 67 years. Analyses for the 8-factor, 24-item LEQ-H are based on a sample of 1,892 cases (1,071 males, 803 females, and 8 who did not indicate gender), with an average age of 20.4 years (*SD* = 7.60), ranging from 11 to 67 years (see Chapter 5 for a more detailed sample description).

The results are presented according to the order of the study's hypotheses and research questions (see Chapter 4). These results include examination of internal consistency, and congeneric and multi-factorial confirmatory factor analyses (CFAs) of first-order and global second-order measurement models. In addition, invariance of the measurement models across gender and age are presented. Finally, tests of mean differences across gender and age groups are conducted. Chapter 5 provided explanations of the outcome statistics used in this study.

Psychometric Investigation of the LEQ-G

Overview

The psychometric structure and reliability of the LEQ-G was investigated. Analyses were guided by the hypotheses (Hs) and research questions (research questions) described in Chapter 4 and summarised in Table 6.1. LEQ-G item and factor *M*s and *SD*s are shown in Table 6.2. The LEQ-G covariance matrix used for the confirmatory factor analyses is provided in Appendix C.1.

Table 6.1 *Summary of LEQ-G Hypotheses and Research Questions*

Number	Hypotheses and Research Questions
RQ 1.1.1	Congeneric factorial structure of the LEQ-G.
RQ 1.1.2	Multi-factorial structure of the LEQ-G.
RQ 1.1.3	Higher-order factorial structure of the LEQ-G.
RQ 1.1.4	Factorial invariance across gender and age for the LEQ-G.
H 1.1.5	Congeneric factorial structure of the revised LEQ-G.
H 1.1.6	Reliability of the revised LEQ-G.

RQ 1.1.1: Congeneric Factorial Structure of the LEQ-G

Overview. RQ 1.1.1 inquired about the extent to which one-factor congeneric factor analyses support the reliability and factor structure of each of the 11 LEQ-G scales. A series of one-factor congeneric models were analysed to evaluate the reliability and factor structure of each of the 11 proposed LEQ-G scales

Results. As an initial step in examining the factorial structure of the LEQ-G, one-factor congeneric analyses of each of the 11 LEQ-G factors were conducted, with outcome statistics reported in Table 6.2 (N = 1,164, Sample 1). Overall, reliability of the factors was high, with an average coefficient omega (ω) of .893. All factors exhibited ωs above .8. There were seven strongly reliable factors with ωs above .9, and four less reliable factors with ωs between .8 and .9.

Overall, 7 of the 11 factors had strong internal consistency, as indicated by Tucker-Lewis Indices (TLIs) and Relative Noncentrality Indices (RNIs) over .950 and ωs above .9 (except for Intellectual Flexibility, ω = .892). These strong factors were four five-item scales (Achievement Motivation, Intellectual Flexibility, Task Leadership, and Emotional Control), two seven-item scales (Active Initiative and Time Management), and the eight-item Hardiness Resourcefulness scale (see Table 6.2). The other four factors were less reliable, with ωs between .8 and .9:

Organisational-Self Discipline (.843), Productive Teamwork (.873), Self Confidence (.894), and Social Competence (.845). Organisational Self-Discipline items generally had moderately low factor loadings (FLs; M = .720) and high uniquenesses (Us; M = .514), indicating that the construct and/or its operationalisation may be problematic. Social Competence and Self Confidence scales were characterised by three items with high FLs and two items with low FLs, suggesting that these scales could be improved by reducing the number of items. Productive Teamwork contained items with a mixture of high, moderate, and moderately low FLs, suggesting that it could possibly be improved by dropping the weakest items. However, no decisions to drop factors or items were made solely on the basis on the congeneric analyses. Rather, these congeneric results informed subsequent model development, along with the multi-factorial CFA results, to help identify which factors and items were problematic.

Conclusion. Seven of the 11 factors (Achievement Motivation, Active Initiative, Emotional Control, Intellectual Flexibility, Hardiness Resourcefulness, Task Leadership, and Time Management) displayed very strong goodness-of-fit indices (GFIs; TLIs and RNIs > .95) and ωs (> .9). Hence, the internal consistency and congeneric factorial structure of these scales was psychometrically-sound. The other four scales (Organisational Self-Discipline, Self Confidence, Social Competence, and Productive Teamwork) did not display acceptable GFIs (.60 < TLIs and RNIs < .90), and had lower, but acceptable ωs between .8 and .9. Hence internal consistency was somewhat supported, but a congeneric factorial structure was not supported, indicating that these scales may be problematic and that they should be examined more closely in the context of subsequent analyses.

Table 6.2 *Fitted One-Factor Congeneric Models for the 11-Factor 64-Item LEQ-G Factors: FLs, Us, ωs, χ2 , GFIs (*N = *1,164)*

Item	Factor Names & Item Descriptions	FL	U	ω	χ^2	*df*	TLI	RNI	*M*	*SD*
AM	Achievement Motivation	.805	.347	.903	60.17	5	.978	.989	6.56	0.90
03	- get details right	.726	.472						6.49	1.13
11	- get the best results	.891	.207						6.71	1.05
19	- do the best I can	.875	.235						6.73	1.10
27	- do it well	.806	.351						6.48	1.07
35	- best of every opportunity	.729	.468						6.42	1.17
AI	Active Initiative	.810	.339	.931	333.09	14	.955	.970	6.48	1.00
44	- busy & active	.850	.278						6.59	1.21
46	- getting into things	.845	.286						6.65	1.13
50	- active & energetic	.819	.329						6.60	1.26
53	- active in new situations	.813	.340						6.41	1.20
56	- get action started	.687	.528						6.19	1.23
59	- active, ‘get into it’ person	.912	.168						6.48	1.30
62	- make things happen	.745	.445						6.41	1.22
EC	Emotional Control	.817	.352	.911	58.04	5	.980	.990	6.05	1.11
08	- calm in stressful situations	.872	.239						6.13	1.35
16	- calm in new situations	.855	.268						6.06	1.25
24	- calm if people difficult	.674	.546						5.65	1.44
32	- generally calm & relaxed	.787	.381						6.33	1.31
40	- calm when things go wrong	.898	.193						6.08	1.31
HR	Hardiness Resourcefulness	.791	.371	.920	456.47	20	.953	.966	6.18	0.96
43	- positive when things go wrong	.790	.376						6.08	1.25
47	- cope with difficult situations	.854	.270						6.21	1.18
49	- perform with limited resources	.796	.367						6.13	1.12
51	- positive aspects of new situations	.752	.434						6.17	1.30
55	- resourceful in new situations	.848	.282						6.15	1.15
58	- efficient in difficult situations	.873	.239						6.09	1.17

Item	Factor Names & Item Descriptions	FL	U	ω	χ^2	*df*	TLI	RNI	*M*	*SD*
61	- work through long, difficult tasks	.698	.513						6.29	1.24
63	- persevere when things difficult	.719	.483						6.30	1.22
IF	Intellectual Flexibility	.787	.376	.892	103.58	5	.956	.978	6.46	0.87
04	- adapt thinking when plans change	.694	.518						6.25	1.17
12	- open to ideas & opinions of others	.777	.396						6.59	1.05
20	- change thinking if a better idea	.730	.467						6.46	1.10
28	- open to new ideas	.884	.219						6.66	1.03
36	- adaptable/flexible in thinking/ideas	.850	.278						6.36	1.07
OD	Organisational Self-Discipline	.720	.514	.843	282.24	5	.826	.913	5.83	1.02
05	- well organised using reason/facts	.727	.526						5.94	1.21
13	- personal organisation good	.688	.542						5.75	1.43
21	- good sense/reason in decisions	.712	.552						6.34	1.08
29	- plan well & not leave to change	.780	.410						5.78	1.37
37	- do not put things off	.691	.542						5.36	1.56
PT	Productive Teamwork	.756	.416	.873	167.70	5	.918	.959	6.46	0.83
06	- generous and helpful to others	.659	.565						6.46	1.05
14	- effective team member	.775	.400						6.33	1.13
22	- co-operate well with people	.869	.245						6.52	0.98
30	- work well with people	.881	.224						6.46	1.06
38	- consider the feelings of others	.597	.644						6.54	1.09
SC	Self Confidence	.733	.446	.894	575.69	14	.889	.926	6.45	1.05
45	- ability to do anything I want	.550	.698						6.72	1.29
48	- if apply self, confident of success	.591	.651						6.39	1.25
52	- confident of success in action	.803	.355						6.20	1.25
54	- believe I can do it	.852	.275						6.61	1.25
57	- confident in decisions I make	.840	.294						6.15	1.30
60	- trust in myself	.879	.228						6.56	1.35
64	- in control of my destiny	.618	.618						6.52	1.59

Item	Factor Names & Item Descriptions	FL	U	ω	χ^2	*df*	TLI	RNI	*M*	*SD*
SO	Social Competence	.708	.459	.845	586.31	5	.685	.842	5.87	1.15
02	- successful in social situations	.911	.170						5.72	1.27
10	- competent in social situations	.927	.141						5.92	1.26
18	- communicate well with people	.749	.439						6.07	1.24
26	- confident speaking up	.485	.765						5.66	1.57
34	- confident speaking to others	.470	.779						5.96	1.34
TL	Task Leadership	.803	.352	.902	43.12	5	.984	.992	5.99	1.09
07	- firm/assertive to get job done	.759	.425						6.18	1.27
15	- get people to work for me	.842	.295						5.87	1.30
23	- give clear instructions	.710	.496						6.00	1.23
31	- good leader	.890	.209						6.03	1.39
39	- motivate other people	.815	.335						5.91	1.31
TM	Time Management	.757	.414	.906	124.35	14	.980	.987	5.83	1.07
01	- plan and use my time efficiently	.806	.350						5.65	1.37
09	- make the most of my time	.765	.414						6.19	1.33
17	- do not waste time	.829	.313						5.33	1.52
25	- manage the way I use my time	.885	.216						5.60	1.38
33	- punctual and do things on time	.595	.647						5.99	1.46
41	- get information and facts	.575	.669						6.06	1.21
42	- active person and use time well	.842	.291						5.98	1.31

Note. FL = Factor Loading, U = Uniqueness, ω = Coefficient omega; TLI = Tucker-Lewis Index, RNI = Relative Noncentrality Index; Numbers in the first row for each factor indicate mean FLs and Us.

RQ 1.1.2: Multi-Factorial Structure of the LEQ-G

Overview. RQ 1.1.2 inquired about the extent to which CFAs would demonstrate the 11 a-priori factor structure of the LEQ-G (see Figure 4.1), and whether the LEQ-G would benefit from refinement. A series of multi-factorial CFAs involving different numbers of factors and items were conducted using Sample 1 (*N* = 1,164). The multi-factorial CFA results were considered alongside the one-factor congeneric results in order to evaluate and refine the proposed measurement model.

Results. Parameter estimates for the initial baseline 11-factor, 64-item item multi-factorial CFA are presented in Table 6.3, with factor correlations (FCrs) in Table 6.4. The final model parameter estimates for the 8-factor, 24-item item CFA are presented in Table 6.6, with FCrs in Table 6.4, and a path diagram in Figure 6.1. GFIs for all CFA models are summarised in Table 6.7 which also indicates which items were dropped at each interim stage of refinement.

11-factor, 64-item model. A multi-factorial CFA of the initial baseline 11-factor, 64-item LEQ-G model was conducted, with parameter estimates presented in Table 6.3 and the FCrs in Table 6.4. The GFIs for the initial baseline 11-factor model indicated an excellent fit (TLI = .970; RNI = .972) which was much better than the null model (see summary of model testing in Table 6.7). Although this appeared to validate the proposed structure, several factors were still considered developmental. Congeneric analyses indicated that some factors and items needed refinement, particularly given the goal of using a minimal number of items. Thus, further testing was undertaken to develop a shorter measurement model with a similarly well-fitting, or perhaps even stronger-fitting, measurement model.

Table 6.3 *CFA FLs and Us for the Initial Baseline 11-Factor, 64-Item LEQ-G Model (*N = *1,164)*

Item		Factor Loadings											
G	Descriptions	AM	AI	EC	HR	IF	OD	PT	SC	SO	TL	TM	U
03	- get details right	.72	0	0	0	0	0	0	0	0	0	0	.49
11	- get the best results	.86	0	0	0	0	0	0	0	0	0	0	.26
19	- do the best I can	.86	0	0	0	0	0	0	0	0	0	0	.25
27	- do it well	.83	0	0	0	0	0	0	0	0	0	0	.31
35	- best of every opportunity	.77	0	0	0	0	0	0	0	0	0	0	.41
44	- busy & active	0	.84	0	0	0	0	0	0	0	0	0	.29
46	- getting into things	0	.85	0	0	0	0	0	0	0	0	0	.28
50	- active & energetic	0	.80	0	0	0	0	0	0	0	0	0	.36
53	- active in new situations	0	.82	0	0	0	0	0	0	0	0	0	.32
56	- get action started	0	.72	0	0	0	0	0	0	0	0	0	.47
59	- active, ‘get into it’ person	0	.89	0	0	0	0	0	0	0	0	0	.21
62	- make things happen	0	.77	0	0	0	0	0	0	0	0	0	.40
08	- calm in stressful situations	0	0	.86	0	0	0	0	0	0	0	0	.26
16	- calm in new situations	0	0	.86	0	0	0	0	0	0	0	0	.26
24	- calm if people difficult	0	0	.68	0	0	0	0	0	0	0	0	.53
32	- generally calm & relaxed	0	0	.79	0	0	0	0	0	0	0	0	.38
40	- calm when things go wrong	0	0	.90	0	0	0	0	0	0	0	0	.20
43	- positive when things go wrong	0	0	0	.81	0	0	0	0	0	0	0	.34
47	- cope with difficult situations	0	0	0	.86	0	0	0	0	0	0	0	.26
49	- perform with limited resources	0	0	0	.79	0	0	0	0	0	0	0	.38
51	- positive aspects of new situations	0	0	0	.76	0	0	0	0	0	0	0	.42
55	- resourceful in new situations	0	0	0	.83	0	0	0	0	0	0	0	.31
58	- efficient in difficult situations	0	0	0	.86	0	0	0	0	0	0	0	.26
61	- work through long, difficult tasks	0	0	0	.70	0	0	0	0	0	0	0	.51
63	- persevere when things difficult	0	0	0	.72	0	0	0	0	0	0	0	.48

Item		Factor Loadings											
G	Descriptions	AM	AI	EC	HR	IF	OD	PT	SC	SO	TL	TM	U
04	- adapt thinking when plans change	0	0	0	0	.71	0	0	0	0	0	0	.50
12	- open to ideas & opinions of others	0	0	0	0	.77	0	0	0	0	0	0	.40
20	- change thinking if a better idea	0	0	0	0	.73	0	0	0	0	0	0	.47
28	- open to new ideas	0	0	0	0	.88	0	0	0	0	0	0	.23
36	- adaptable/flexible in thinking/ideas	0	0	0	0	.85	0	0	0	0	0	0	.27
05	- well organised using reason/facts	0	0	0	0	0	.68	0	0	0	0	0	.54
13	- personal organisation good	0	0	0	0	0	.73	0	0	0	0	0	.47
21	- good sense/reason in decisions	0	0	0	0	0	.68	0	0	0	0	0	.54
29	- plan well & not leave to change	0	0	0	0	0	.75	0	0	0	0	0	.44
37	- do not put things off	0	0	0	0	0	.76	0	0	0	0	0	.42
06	- generous and helpful to others	0	0	0	0	0	0	.65	0	0	0	0	.58
14	- effective team member	0	0	0	0	0	0	.79	0	0	0	0	.37
22	- co-operate well with people	0	0	0	0	0	0	.86	0	0	0	0	.26
30	- work well with people	0	0	0	0	0	0	.88	0	0	0	0	.23
38	- consider the feelings of others	0	0	0	0	0	0	.60	0	0	0	0	.64
45	- ability to do anything I want	0	0	0	0	0	0	0	.62	0	0	0	.62
48	- if apply self, confident of success	0	0	0	0	0	0	0	.67	0	0	0	.56
52	- confident of success in action	0	0	0	0	0	0	0	.76	0	0	0	.42
54	- believe I can do it	0	0	0	0	0	0	0	.83	0	0	0	.30
57	- confident in decisions I make	0	0	0	0	0	0	0	.86	0	0	0	.26
60	- trust in myself	0	0	0	0	0	0	0	.84	0	0	0	.29
64	- in control of my destiny	0	0	0	0	0	0	0	.60	0	0	0	.64
02	- successful in social situations	0	0	0	0	0	0	0	0	.72	0	0	.48
10	- competent in social situations	0	0	0	0	0	0	0	0	.73	0	0	.46
18	- communicate well with people	0	0	0	0	0	0	0	0	.75	0	0	.43
26	- confident speaking up	0	0	0	0	0	0	0	0	.76	0	0	.42
34	- confident speaking to others	0	0	0	0	0	0	0	0	.71	0	0	.50

Item		Factor Loadings											
G	Descriptions	AM	AI	EC	HR	IF	OD	PT	SC	SO	TL	TM	U
07	- firm/assertive to get job done	0	0	0	0	0	0	0	0	0	.75	0	.43
15	- get people to work for me	0	0	0	0	0	0	0	0	0	.82	0	.32
23	- give clear instructions	0	0	0	0	0	0	0	0	0	.73	0	.47
31	- good leader	0	0	0	0	0	0	0	0	0	.88	0	.22
39	- motivate other people	0	0	0	0	0	0	0	0	0	.83	0	.30
01	- plan and use my time efficiently	0	0	0	0	0	0	0	0	0	0	.79	.37
09	- make the most of my time	0	0	0	0	0	0	0	0	0	0	.77	.41
17	- do not waste time	0	0	0	0	0	0	0	0	0	0	.82	.32
25	- manage the way I use my time	0	0	0	0	0	0	0	0	0	0	.87	.23
33	- punctual and do things on time	0	0	0	0	0	0	0	0	0	0	.61	.62
41	- get information and facts	0	0	0	0	0	0	0	0	0	0	.62	.62
42	- active person and use time well	0	0	0	0	0	0	0	0	0	0	.84	.29

Note. AM = Achievement Motivation; AI = Active Initiative; EC = Emotional Control; HR = Hardiness Resourcefulness; IF=Intellectual Flexibility; OD = Organisational Self-Discipline; PT = Productive Teamwork; SC = Self Confidence; SO = Social Competence; TL = Task Leadership; TM = Time Management; U = uniqueness.

Table 6.4 *FCrs for the Initial Baseline 11-Factor, 64-Item LEQ-G Model (*N = *1,164)*

Factor	AM	AI	EC	HR	IF	OD	PT	SC	SO	TL	TM
Achievement Motivation	1										
Active Initiative	.70	1									
Emotional Control	.50	.53	1								
Hardiness Resourcefulness	.70	.77	.84	1							
Intellectual Flexibility	.61	.61	.66	.71	1						
Organisational Self-Discipline	.78	.60	.55	.72	.59	1					
Productive Teamwork	.65	.66	.58	.67	.75	.61	1				
Self Confidence	.68	.77	.65	.86	.60	.66	.66	1			
Social Competence	.71	.72	.65	.79	.57	.64	.76	.89	1		
Task Leadership	.62	.70	.62	.76	.53	.66	.72	.78	.86	1	
Time Management	.72	.64	.48	.64	.48	.95	.55	.61	.60	.58	1

11-factor, 55-item model. The next step was to refine the initial baseline model. Four out of the 11 proposed factors were developmental and were measured by more than five items. The other seven factors had been refined through earlier stages of development and were each measured by five items. Hence, the first step in refining the LEQ-G model was to drop some developmental items, leading to an 11-factor, 55-item measurement model with each factor measured by five items.

Items were selected for removal based on congeneric and multi-factorial CFA factor loadings (FLs) and FL modification indices (MIs) for the 11-factor, 64-item measurement model. These indicators helped to identify items which lacked "purity" in measuring single constructs (e.g., indicated by large FL MIs). The 11-factor, 55-item model fitted the data slightly less well (TLI = .956; RNI = .959; see Table 6.7). The worsening of model fit was probably due to: (a) dropping items which had contributed to defining their respective factor but, in the interests of parsimony, were considered redundant; and (b) retaining 11-factors, some of which were problematic.

10-factor, 50-item model. The next refinement involved examining problematic factors and consequently removing all Organisational Self-Discipline items. The Organisational Self-Discipline factor performed reasonably well in the one-factor congeneric analyses, but in the multi-factorial CFAs Organisational Self-Discipline items produced high MIs, particularly for cross-loadings on the Time Management factor. This made substantive sense (that one's management of time is closely related to one's organisation and self-discipline). The closeness of the relationship between these constructs was borne out by a very high correlation (in the initial baseline model) between the two factors of .95 (see Table 6.4). With this degree of covariation there was clearly little to distinguish the two sets of items from each other. Organisational Self-Discipline had a lower ω and lower average FLs than Time Management, so it represented a less viable construct, and thus this factor and its items were dropped. The resultant 50-item 10-factor model was tested and found to have higher GFIs (TLI = .978; RNI = .972; see Table 6.7) than previous models.

10-factor, 40-item model. Further examination of the one-factor congeneric analyses and multi-factorial MIs indicated that most factors still contained at least one relatively weak item. Consquently, the worst fitting item, in terms of congeneric and multi-factorial CFA FLs and MIs, was eliminated from each of the 10 remaining factors. The face validity of the remaining items in each factor was also examined to

help ensure that the intended latent construct was still being reasonably measured. This 40-item, 10-factor model showed further improvements in GFIs (TLI = .980 and RNI = .982; see Table 6.7).

9-factor, 36-item model. Further examination of the factor structure for the 10-factor, 40-item model showed that the Hardiness Resourcefulness factor was problematic. Although the congeneric analysis of this scale was promising, the multi-factorial CFA showed that the items tended to have high FL MIs for on the Emotional Control and Self Confidence items, and tended to have moderate FL MIs for Intellectual Flexibility and Productive Teamwork items. This problem was also indicated in the FCrs (in the initial baseline model; see Table 6.2) between Hardiness Resourcefulness and Self Confidence (r = .86) and Hardiness Resourcefulness and Emotional Control (r = .84), both well above the desired criterion of below .7. Hardiness Resourcefulness, as measured by these items, was not clearly distinguishable from related area of life effectiveness. Consequently, the Hardiness Resourcefulness items were eliminated and a 36-item, 9-factor model was tested. This produced little change in the GFIs (TLI = .979; RNI = .981; see Table 6.7).

8-factor, 32-item model. One other factor, Productive Teamwork, appeared to be problematic. Both the congeneric and multi-factorial CFAs showed two items which loaded below .7 on the latent construct. The FL MIs were high for Productive Teamwork items on the Social Competence, Task Leadership and Intellectual Flexibility items. The initial baseline CFA FCrs for the Productive Teamwork factor were moderately high: Intellectual Flexibility (r = .75), Task Leadership (r = .72), and Social Competence (r = .76; see Table 6.4), hence the Productive Teamwork scale and items were dropped, producing a 32-item, 8-factor model. This resulted in the GFIs exhibiting little change (TLI = .979; RNI = .982; see Table 6.7).

8-factor, 24-item model. Although the 8-factor, 32-item factor model had excellent fit indices and was acceptable, it was decided to test whether similar results could be achieved for an even shorter instrument. The weakest item from the eight remaining scales was removed, whilst checking that the remaining three items in each scale still appeared to represent the original theoretical construct. The resulting 8-factor, 24-item model had the strongest fit of the tested models (TLI = .984, RNI = .987; see FLs and Us in Table 6.6, FCrs in Table 6.5, GFIs in Table 6.7, and path diagram in Figure 6.1).

Conclusion. The a priori 11-factor, 64-item LEQ-G measurement model was supported by very strong GFIs (TLIs and RNIs > .95). However, there were also indicators that the model could be improved. After a number of steps, the two factors with the lowest αs in the initial model (Organisational Self-Discipline and Productive Teamwork) were dropped, and a third factor (Hardiness Resourcefulness) was dropped because of its cross-loadings in the multi-factorial CFAs. In addition, a number of weaker items were dropped, leading to an 8-factor, 24-item measurement model which exhibited stronger GFIs than all previous models.

RQ 1.1.3: Higher-Order Factorial Structure of the LEQ-G

Overview. RQ 1.1.3 inquired about the extent to which a global second-order life effectiveness factorial structure applied to the LEQ-G. A second-order model was tested, with the 8-factor, 24-item first-order model nested within a global life effectiveness second-order factor model (see FLs and Us in Table 6.6, FCrs and second-order FLs in Table 6.5, and path diagram in Figure 6.2).

Results. A nested second-order model is more constrained than a first-order model, and therefore cannot provide a better fit (see Chapter 5). Chi-square indicated that the second-order model (χ^2 = 1,294.26, *df* = 244) fitted the data significantly less well than the first-order model (χ^2 = 1,012.37, *df* = 224; $\Delta\chi^2$ = 281.89, *df* = 20, $p <$ .001). Similarly, the Satorra-Bentler corrected chi-square difference (S-Bχ^2) indicated that the second-order model (S-Bχ^2 = 660.96, *df* = 244) fitted the data significantly less well than the first-order model (S-B χ^2 = 506.85, *df* = 224; ΔS-Bχ^2 = 154.11, *df* = 20, $p <$ .001). *T* (the ratio of the first-order model χ^2 to the second-order model χ^2; see Chapter 5) was .78.

Although the $\Delta\chi^2$, ΔS-Bχ^2, and *T* coefficient indicate that the second-order model did not fit as well as a first-order model, three other indicators suggested that the second-order model fitted about as well as the first-order model: (a) the GFIs for the second-order model (see Table 6.7) were within .004 (TLI = .980) and .005 (RNI = .982) of the GFIs for the 8-factor, 24-item first-order model; (b) the loadings (γ) for the eight first-order factors on the global second-order factor were solid (*M* = .60, ranging between .52 (Time Management) and .69 (Self Confidence); see Table 6.5);

and (c) the reliability[58] (internal consistency) of a global factor (derived from all 24-items) was very high (ω = .99).

Conclusions. Significant $\Delta\chi^{2,}$ and ΔS-Bχ^2 and the *T* coefficient indicated that the second-order global 8-factor, 24-item LEQ-G model fitted Sample 1 data less well than a first-order model. However, three other indicators (ΔGFIs, second-order FLs, and multi-factorial reliability) supported the viability of a global second-order model.

Table 6.5 *FCrs and Second-Order Factor Loadings (γ) for the 8-Factor, 24-Item LEQ-G Model (*N = *1,164)*

LEQ-G Factor	AM	AI	EC	IF	SC	SO	TL	TM	γ
Achievement Motivation	1								.53
Active Initiative	.57	1							.64
Emotional Control	.44	.44	1						.61
Intellectual Flexibility	.55	.56	.62	1					.53
Self Confidence	.60	.64	.59	.58	1				.68
Social Competence	.42	.46	.44	.41	.49	1			.59
Task Leadership	.52	.61	.59	.52	.68	.65	1		.69
Time Management	.60	.51	.41	.41	.48	.40	.50	1	.52
Total Factor	.72	.75	.70	.72	.82	.64	.82	.64	M_γ = .60

[58] Using McDonald's (1985) formula for multiple-factor coefficient omega (see Chapter 5).

Table 6.6 *CFA FLs and Us for the 8-Factor, 24-Item LEQ-G Model (*N = *1,164)*

Item			Factor Loadings								
G	H	Description	AM	AI	EC	IF	SC	SO	TL	TM	U
03	03	- get details right	.73	0	0	0	0	0	0	0	.46
11	11	- get the best results	.90	0	0	0	0	0	0	0	.20
19	19	- do the best I can	.87	0	0	0	0	0	0	0	.24
44	07	- busy & actively involved	0	.84	0	0	0	0	0	0	.29
50	15	- active & energetic	0	.85	0	0	0	0	0	0	.27
59	23	- active, ‘get into it’ person	0	.92	0	0	0	0	0	0	.15
08	06	- calm in stressful situations	0	0	.88	0	0	0	0	0	.22
16	14	- calm in new situations	0	0	.87	0	0	0	0	0	.24
40	22	- calm when things go wrong	0	0	.87	0	0	0	0	0	.24
20	04	- change thinking if a better idea	0	0	0	.74	0	0	0	0	.45
28	12	- open to new ideas	0	0	0	.86	0	0	0	0	.25
36	20	- adaptable/flexible in thinking/ideas	0	0	0	.86	0	0	0	0	.27
45	08	- ability to do anything I want	0	0	0	0	.83	0	0	0	.31
48	16	- confident of success	0	0	0	0	.84	0	0	0	.30
54	24	- believe I can do it	0	0	0	0	.89	0	0	0	.21
02	02	- successful in social situations	0	0	0	0	0	.92	0	0	.16
10	10	- competent in social situations	0	0	0	0	0	.93	0	0	.14
18	18	- communicate well with people	0	0	0	0	0	.78	0	0	.39
15	05	- get people to work for me	0	0	0	0	0	0	.84	0	.29
31	13	- good leader	0	0	0	0	0	0	.88	0	.22
39	21	- motivate other people	0	0	0	0	0	0	.83	0	.32
01	01	- plan and use my time efficiently	0	0	0	0	0	0	0	.82	.32
17	09	- do not waste time	0	0	0	0	0	0	0	.83	.31
25	17	- manage the way I use my time	0	0	0	0	0	0	0	.89	.22

Table 6.7 *GFIs for LEQ-G Measurement Models With No Invariance Constraints*

LEQ-G Model				Multi-Factorial		Null		GFIs			
Factors	Items	I/F	Model	χ^2	*df*	χ^2	*df*	TLI	RNI	Dropped items	Notes
11	64	5-8	Initial baseline	15,087.27	1897	468,840.21	2016	.970	.972		
11	55	5	11-factor, 55-item	14,748.72	1375	330,188.29	1485	.956	.959	41,42,43,47,56,57, 61,62,64	Δ to 5 items/factor
10	50	5	10-factor, 50-item	6,862.92	1130	281,965.44	1225	.978	.980	21,37,05,13,29	OD dropped (redundant with TM, *r* = .95).
10	40	4	10-factor, 40-item	3,970.81	695	185,172.58	780	.980	.982	04, 06, 07, 24, 26, 33, 35, 51, 53, 60	Δ to 4 items/factor
9	36	4	9-factor, 36-item	3,271.56	558	143,961.71	630	.979	.981	49, 55, 58, 63	HR dropped (correlated with EC, SC, IF.
8	32	4	8-factor, 32-item	2,492.05	436	112,967.45	496	.979	.982	14, 22, 30, 38	PT dropped (correlated with SO, TL, IF).
8	24	3	8-factor, 24-item	1,012.37	224	60,288.98	276	.984	.987	09, 12, 23, 27, 32, 34, 46, 52	Δ to 3 items/factor
8	24	3	2nd-order global	1,294.26	224	60,288.98	276	.980	.982		Added a global 2nd-order factor

Note. I/F = Items/Factor; TLI = Tucker-Lewis Index; RNI = Relative Non-centrality Index.

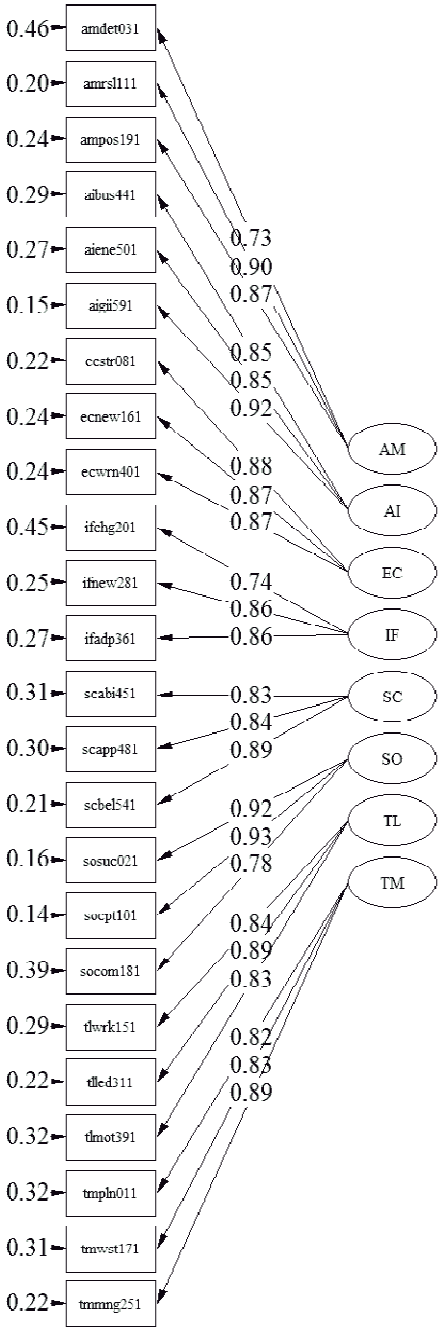


Figure 6.1 Path diagram for the first-order, 8-factor, 24-item LEQ-G model showing standardised FLs and Us (N = 1,164).

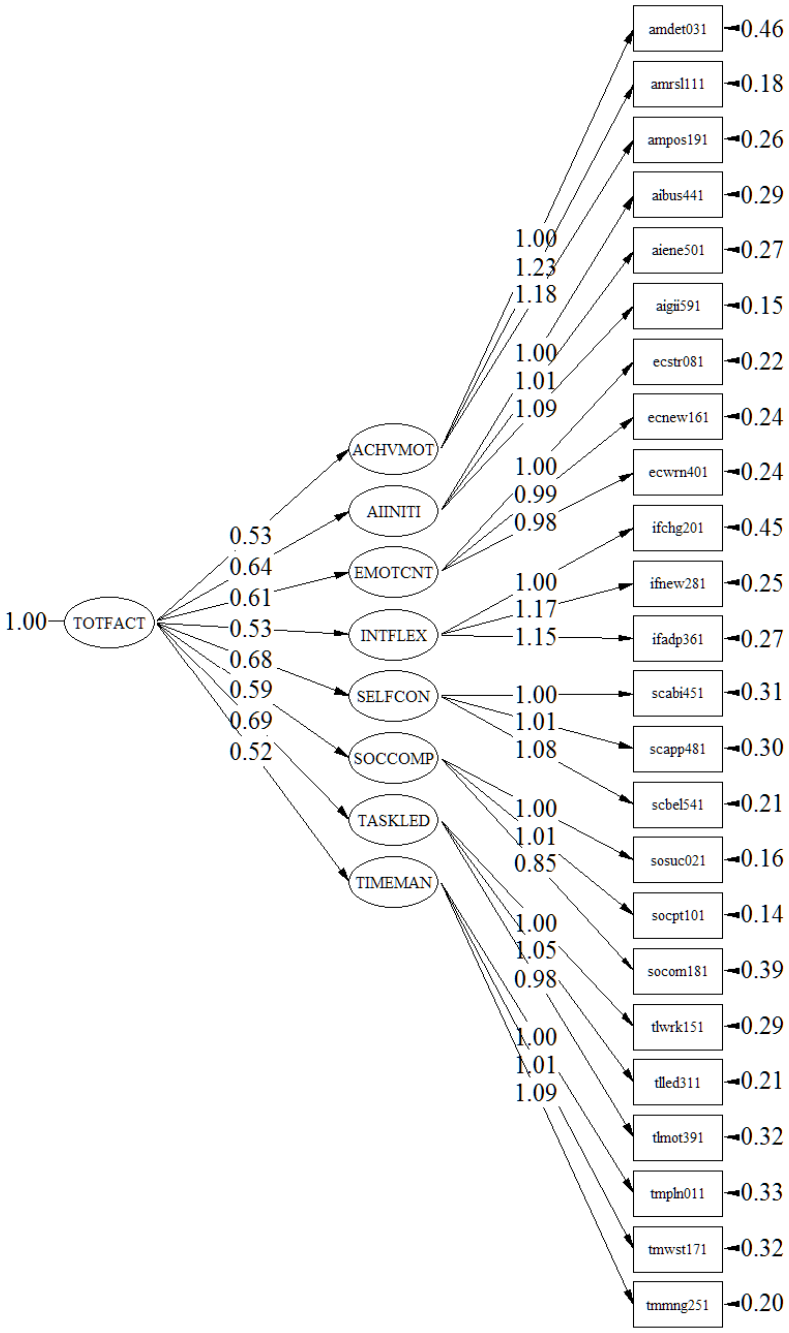


Figure 6.2 Path diagram for the global second-order, 8-factor, 24-item LEQ-G model showing standardised first- and second-order FLs and Us (N = 1,164)[59].

[59] One item loading for each first-order factor was fixed to unity in order to identify the higher-order model and to set a metric for the factor loadings (Jöreskog & Sörbom, 1989; Marsh & Hocevar, 1985).

RQ 1.1.4: Factorial Invariance Across Gender and Age for the LEQ-G

Overview. RQ 1.1.4 inquired about the extent to which the factorial structure of the LEQ-G would be similar for male and females, and across age groups, as demonstrated by structural equation modelling tests of invariance. Tests of invariance were conducted across gender and age groups for the refined 8-factor, 24-item first-order LEQ-G model (Table 6.8) and for the global second-order measurement model (Table 6.9). Interpretation of the TLI is emphasised, since RNI results would have led to the same conclusions.

Results.

Gender. The first-order, 8-factor, 24-item LEQ-G model separately fitted male and female groups similarly well, with TLIs of .979 and .974 respectively (see Table 6.8). When no invariance constraints were imposed the TLI (.977) was excellent. Imposition of invariance of number of factors (NFs) and factor loading (FL) led to a somewhat lower, but still acceptable, TLI (.931; ΔTLI = -.046). Additional imposition of invariance of factor correlations (FCrs) and factor variances (FVs) had little effect (TLI = .932; ΔTLI = -.045). Further constraining uniquenesses (Us) to be invariant led to a substantial decrease in the TLI (.862; ΔTLI = -.115).

The global, second-order, 8-factor, 24-item model separately fitted the Sample 1 data for male and female groups very well, with TLIs of .975 and .972 respectively (see Table 6.9). When no invariance constraints were imposed the TLI (.973) was also excellent. Imposition of second-order FL invariance led to a slightly lower, but still excellent, TLI (.967; ΔTLI = -.006), with the ΔTLI smaller than Cheung and Rensvold's (2002) suggested critical value of -.01. Additionally constraining the first-order NFs and FLs to be invariant produced a somewhat smaller, but still acceptable, TLI (.942; ΔTLI = -.031). Further constraining the first-order FCvs and FVs to be invariant led to a somewhat lower, but still acceptable, TLI (.930; ΔTLI = -.043). Finally, adding invariance of Us reduced the model fit substantially (TLI = .863; ΔTLI = -.090).

Age. Invariance of the first-order, 8-factor, 24-item LEQ-G model was considered across three age groups: adolescents, young adults, and adults. This model separately fitted very well for each of the age groups, with TLIs of .971, .975, and .963 respectively (see Table 6.8). When no invariance constraints were imposed

the TLI (.971) was also excellent. Imposing invariance of NFs and FLs led to a somewhat lower, but still acceptable, TLI (.919; ΔTLI = -.052). Further imposition of invariant FCrs and FVs had little effect (TLI = .922; ΔTLI = -.049). Finally, further imposition of invariant Us substantially reduced the TLI (.800; ΔTLI = -.171).

The global second-order, 8-factor, 24-item model separately fitted the LEQ-G data for adolescent, young adult, and adult age groups very well, with TLIs of .982, .980, .984 respectively (see Table 6.9). When no invariance constraints were imposed the TLI (.968) was also excellent. Imposition of second-order FL invariance led to a higher TLI (.973; ΔTLI = .050), providing clear support for invariance[60]. Additionally constraining the first-order NFs and FLs to be invariant produced a somewhat smaller, but still excellent, TLI (.953; ΔTLI = -.015). Further constraining the first-order FCvs and FVs to be invariant led to a slightly lower, but still acceptable, TLI (.948; ; ΔTLI = -.020). Finally, adding invariance of Us reduced the model fit substantially (TLI = .868; ΔTLI = -.100).

Conclusions.

Gender. There was some limited support for invariance of the NFs, FLs, FCrs, and FVs across males and females, with a ΔTLI of -.046, and little support for total invariance, with a ΔTLI of -.115. These results provide partial support for the conclusion that the first-order, 8-factor, 24-item LEQ-G model measures the same constructs for males and females.

There was support for invariance of the second-order FLs, with a ΔTLI of -.006, and some limited support for invariance of the first-order NFs, FLs, FCvs and FVs, with a ΔTLI of -.043, across males and females. There was little support for total invariance, with a ΔTLI of -.090. These results provide good support for a global second-order, 8-factor, 24-item LEQ-G construct which is invariant across males and females, however there was only partial support for invariance of first-order NFs, FLs, FCrs, and FVs, and no support for total invariance.

[60] As explained in Chapter 5, the TLI includes adjustment for parsimony, thus it is possible for a more constrained model to produce a higher TLI.

Age. There was some limited support for invariance of the NFs, FLs, FCrs, and FVs across the three age groups, with a ΔTLI of -.052, and no support for total invariance, with a ΔTLI = -.171. These results provide limited support for the conclusion that the first-order, 8-factor, 24-item LEQ-G model measures the same constructs for the three age groups.

There was support for invariance of the second-order FLs, with a ΔTLI of .050, some limited support for invariance of the first-order NFs, FLs, FCvs, and FVs, with a ΔTLI of -.020, and little support for total invariance, with a ΔTLI of -.100, across the three age groups. These results provide good support for a global second-order, 8-factor, 24-item LEQ-G construct which is invariant across the three different age groups, however there was only partial support for invariance of first-order NFs, FLs, FCvs, and FVs, and no support for total invariance.

Table 6.8 *GFIs for the First-Order, 8-Factor, 24-Item LEQ-G Model With and Without Invariance Constraints For Gender and Age*

Model	Multi-Factorial		Null		GFIs		
	χ^2	*df*	χ^2	*df*	TLI	RNI	*N*
No invariance							
Males	854.00	224	37,141.04	276	.979	.983	673
Females	715.69	224	23,447.65	276	.974	.979	484
15 to 18 years	686.38	224	19,654.78	276	.971	.976	392
19 to 24 years	726.17	224	25,212.43	276	.975	.980	479
25 years & over	690.48	224	15,838.78	276	.963	.970	287
Gender Invariance							
Null	7,170.51	300	60,588.69	552	.789	.886	1,157
No invariance	1,568.21	448	60,588.69	552	.977	.981	1,157
NF & FL inv.	4,013.33	472	60,588.69	552	.931	.941	1,157
NF, FL, FCr, & FV inv.	4,216.81	500	60,588.69	552	.932	.938	1,157
NF, FL, FCr, FV, & U inv.	8,417.95	524	60,588.69	552	.862	.869	1,157
Age Invariance							
Null	11,365.56	600	60,705.98	828	.752	.820	1,158
No invariance	2,103.03	672	60,705.98	828	.971	.976	1,158
NF & FL inv.	4,920.11	720	60,705.98	828	.919	.930	1,158
NF, FL, FCr, & FV inv.	5,151.11	776	60,705.98	828	.922	.927	1,158
NF, FL, FCr, FV, & U inv.	12,738.89	824	60,705.98	828	.800	.801	1,158

Note. TLI = Tucker-Lewis Index; NF = number of factors; FL = factor loadings; FCr = factor correlations; FV = factor variances; U = uniquenesses; inv. = invariant.

Table 6.9 *GFIs for the Global Second-Order, 8-Factor, 24-Item LEQ-G Model With and Without Invariance Constraints For Gender and Age*

Model	Multi-Factorial		Null		GFIs		
	χ^2	*df*	χ^2	*df*	TLI	RNI	*N*
No invariance							
Males	1,076.53	244	37,141.04	276	.975	.977	673
Females	826.7	244	23,447.65	276	.972	.975	484
15 to 18 years	788.06	244	33,780.07	276	.982	.984	392
19 to 24 years	871.37	244	35,445.09	276	.980	.982	479
25 years & over	780.25	244	37,215.59	276	.984	.986	287
Gender Invariance							
Null	26,634.42	576	60,588.69	552	.584	.566	1,157
No invariance	1,903.23	488	60,588.69	552	.973	.976	1,157
NF & FL (2nd-O) inv.	2,272.29	496	60,588.69	552	.967	.970	1,157
NF & FL (1st-O) inv.	3,502.54	504	60,588.69	552	.945	.950	1,157
NF & FL (1st- & 2nd-O) inv.	3,737.67	512	60,588.69	552	.942	.946	1,157
NF, FL (1st- & 2nd-O), 1st-O FV inv.	4,482.00	520	60,588.69	552	.930	.934	1,157
NF, FL (1st- & 2nd-O), 1st-O FV, & U inv.	8,670.94	544	60,588.69	552	.863	.865	1,157
Age Invariance							
Null	11,365.56	576	60,705.98	552	.828	.821	1,158
No invariance	2,439.68	732	60,705.98	828	.968	.972	1,158
NF & FL (2nd-O) inv.	2,976.57	748	60,705.98	552	.973	.963	1,158
NF & FL (1st-O) inv.	4,370.41	764	60,705.98	552	.957	.940	1,158
NF & FL (1st- & 2nd-O) inv.	4,744.26	780	60,705.98	552	.953	.934	1,158
NF, FL (1st- & 2nd-O), 1st-O FV inv.	5,307.51	796	60,705.98	552	.948	.925	1,158
NF, FL (1st- & 2nd-O), 1st-O FV, & U inv.	13,014.71	844	60,705.98	552	.868	.798	1,158

Note. TLI = Tucker-Lewis Index; NF = number of factors; FL = factor loadings; FV = factor variances; U = uniquenesses; 1st-O = 1st-order; 2nd-O = 2nd-order; inv. = invariant.

H 1.1.5: Congeneric Factorial Structure of the Revised LEQ-G

Overview. H 1.1.5 predicted that one-factor congeneric factor analyses would support the internal consistency and factor structure of each of the revised LEQ-G factors.

Results. Descriptive statistics (*M*s and *SD*s) and outcome statistics (FLs, Us, ωs) for one-factor congeneric analyses of the 8-factor, 24-item LEQ-G measurement model are reported in Table 6.10. Congeneric models with three items are perfectly identified, that is, they have no degrees of freedom, chi-square equal to zero, and consequently have a "perfect fit". Thus, no GFIs can be derived for three-item congeneric models.

All scales exhibited good internal consistency, with ωs between .86 (Intellectual Flexibility) and .91 (Emotional Control), and an average ω of .88 across the eight factors. When approximately twice as many items per factor were used in the 11-factor, 64-item model, the average ω had been .89. All scales exhibited ωs above .85 (previously all ωs had been above .80), so the minimum reliability was higher for the 8-factor, 24-item model. These outcome statistics provide a basis for comparison with the congeneric analyses of LEQ-H (Sample 2) data.

Conclusion. One-factor congeneric tests demonstrated good internal consistency (ωs > .85) for each of the eight factors in the revised LEQ-G measurement model. Hence, H 1.1.5 was accepted.

Table 6.10 *Fitted One-factor Congeneric Models for the 8-Factor 24-Item LEQ-G Factors: FLs, Us, ωs,* M*s, and* SD*s (*N = *1,164*)

Item	Factor Names & Item Descriptions	FL	U	ω	*M*	*SD*
AM	Achievement Motivation	.833	.236	.874	6.64	0.95
03	- get details right	.729	.307		6.49	1.13
11	- get the best results	.838	.256		6.71	1.05
10	- do the best I can	.932	.144		6.73	1.10
AI	Active Initiative	.874	.299	.907	6.56	1.13
07	- busy & active	.833	.468		6.59	1.21
15	- active & energetic	.863	.298		6.60	1.26
23	- active, 'get into it' person	.925	.131		6.48	1.30
EC	Emotional Control	.876	.232	.909	6.09	1.18
06	- calm in stressful situations	.855	.269		6.13	1.35
14	- calm in new situations	.901	.188		6.06	1.25
22	- calm when things go wrong	.873	.238		6.08	1.31
IF	Intellectual Flexibility	.821	.323	.862	6.49	0.92
04	- change thinking if a better idea	.837	.300		6.46	1.10
12	- open to new ideas	.745	.445		6.66	1.03
20	- adaptable/flexible in thinking/ideas	.880	.225		6.36	1.07
SC	Self Confidence	.852	.273	.889	6.57	1.12
08	- ability to do anything I want	.838	.298		6.72	1.29
16	- if apply self, confident of success	.828	.315		6.39	1.25
24	- believe I can do it	.891	.206		6.61	1.25
SO	Social Competence	.872	.234	.872	5.90	1.13
02	- successful in social situations	.767	.412		5.72	1.27
10	- competent in social situations	.931	.134		5.92	1.26
18	- communicate well with people	.919	.155		6.07	1.24
TL	Task Leadership	.234	.275	.887	5.93	1.20
05	- get people to work for me	.892	.204		5.87	1.30
13	- good leader	.797	.365		6.03	1.39
21	- motivate other people	.862	.257		5.91	1.31
TM	Time Management	.846	.283	.883	5.53	1.27
01	- plan and use my time efficiently	.881	.224		5.65	1.37
09	- do not waste time	.829	.312		5.33	1.52
17	- manage the way I use my time	.828	.314		5.60	1.38

Note. FL = Factor Loading, U = Uniqueness, ω = Coefficient omega. Numbers in the first row for each factor indicate mean FLs and Us.

H 1.1.6: Reliability of the Revised LEQ-G

Overview. H 1.1.6 predicted that the revised LEQ-G factors would demonstrate acceptable (> .7) internal consistency and test-retest reliability. Cronbach's α was used to examine internal reliability, and test-retest correlations were used to examine stability over time. Internal consistencies were based on T1 (beginning of program) data. Reporting of Cronbach's α was somewhat redundant given that ω was reported for the initial baseline model and the final model, however Cronbach's α is commonly reported and expected by many test users, and thus is presented here. The test-retest correlations are probably lower-bound estimates because conditions were not identical between T0 (at home, individual setting) and T1 (beginning of program, group setting, which may have been influenced by situational threat).

Results. Internal consistencies and test-retest correlations of the factors in each of the main measurement models are presented in Table 6.11. The average Cronbach's α for the eight factors in the revised model was .87, which was nearly as strong as the average α for the 11 factors in the initial baseline model (.88) despite the revised model factors being each measured by only three items. Cronbach αs for the individual factors in the revised model were all between .8 and .9, ranging between .83 (Achievement Motivation) and .89 (Social Competence). The average α (.87) was slightly lower than the equivalent factor ωs (.89). In all other respects, the Cronbach's α results were consistent with the ωs obtained via the congeneric analyses.

Test-retest correlations between the revised LEQ-G model factors were moderately good (average = .75; ranging from .62 for Intellectual Flexibility to .82 for Task Leadership). The Intellectual Flexibility test-retest correlation was the only one below the criterion of .7, but was above a minimally acceptable criterion of .6. Test-retest correlations were just as strong for factors in the final model (3 items per factor), as they were for factors in the initial model (5 to 8 items per factor).

Conclusion. Overall, Cronbach's α and test-retest reliabilities demonstrated good internal consistency (.87) and reliability (.75) for each of the eight factors in the revised LEQ-G measurement model. Hence, H 1.1.6 was accepted.

Table 6.11 *Cronbach's α and Test-Retest Correlations for the LEQ-G Models*

Factor	Original Model			*k* = 5		*k* = 4		*k* = 3	
	k	α	*r*	α	*r*	α	*r*	α	*r*
Achievement Motivation	5	.88	.74	.88	.74	.86	.74	.83	.72
Active Initiative	7	.92	.74	.91	.76	.90	.76	.88	.76
Emotional Control	5	.89	.78	.89	.79	.90	.79	.89	.77
Hardiness Resourcefulness	8	.92	.76	.88	.75	.86	.75	-	-
Intellectual Flexibility	5	.86	.65	.86	.64	.85	.64	.83	.62
Org. Self-discipline	5	.82	.74	.82	.76	.82	-	-	-
Productive Teamwork	5	.84	.73	.84	.71	.82	.71	-	-
Self Confidence	7	.90	.77	.90	.78	.89	.78	.86	.76
Social Competence	5	.91	.78	.91	.80	.89	.80	.89	.76
Task Leadership	5	.89	.81	.89	.82	.88	.82	.88	.82
Time Management	7	.89	.78	.88	.77	.88	.77	.87	.76
Average		.88	.75	.88	.76	.87	.76	.87	.75
Item Total		.98	.83	.97	.83	.96	.83	.94	.83
N		1,164	1,006	1,164	1,006	1,164	1,006	1,164	1,006

Note. *k* = number of items per factor.

Psychometric Investigation of the LEQ-H

Overview

Analyses of the psychometric structure and reliability of the 8-factor, 24-item LEQ-H were guided by the hypotheses and research questions described in Chapter 4 and summarised in Table 6.12. The LEQ-H was administered to 1,892 Sample 2 participants (after listwise deletion). This data allowed for further testing of the LEQ model which was desirable, particularly given the substantial reduction in the number of factors and items from the 11-factor, 64-item LEQ-G initial baseline model. The eight proposed factors were described in Chapter 3 and were summarised with operational definitions and details in Chapter 5. Item and factor *M*s and *SD*s are shown in Table 6.15. The covariance matrix is available in Appendix C.2.

Table 6.12 *Summary of LEQ-H Hypotheses and Research Questions*

Number	Hypotheses and Research Questions
H 1.2.1	Congeneric factorial structure of the LEQ-H.
H 1.2.2	Multi-factorial structure of the LEQ-G.
H 1.2.3	Higher-order factorial structure of the LEQ-H.
H 1.2.4	Factorial invariance across gender and age for the LEQ-H.
H 1.2.5	Factorial invariance across samples for the LEQ-H.
H 1.2.6	Reliability of the LEQ-H.
RQ 1.2.7	Differences in LEQ-H scores as a function of gender and age.

H 1.2.1 Congeneric Factorial Structure of the LEQ-H

Overview. H 1.2.1 predicted that one-factor congeneric factor analyses would support the internal consistency and factor structure of each of the eight LEQ-H factors.

Results. Descriptive statistics (*M*s and *SD*s) and outcome statistics (FLs, Us, ωs) for one-factor congeneric analyses of the 8-factor, 24-item LEQ-H measurement model are reported in Table 6.13. Congeneric models with three items are perfectly identified, thus no GFIs could be derived. All scales exhibited good internal consistency, with ωs between .80 (Intellectual Flexibility) and .89 (Active Initiative), and an average ω of .85 across the eight factors. This was similar to the average ω of .88 for the LEQ-G 8-factor, 24-item model, and within .05 of the average ω (.89) for the initial baseline LEQ-G 11-factor, 64-item model. Thus, in shifting from the 11-factor, 64-item LEQ-G measurement model with factors specified by five to eight items, the 8-factor, 24-item LEQ-H measurement model, consisting of factors specified by three items, was only slightly less reliable based on a new, larger sample. The eight LEQ-H factors were between .02 (Active Initiative) and .06 (Task Leadership) less reliable than the longer instrument, according to the ωs.

Conclusions. Considering the LEQ-H items used considerably fewer items, and were presented out of the context of the other LEQ-G items to a new sample, the reliability results suggested that each of the eight factors are reliably measured by the LEQ-H. Hence, H 1.2.1 was accepted.

Table 6.13 *Fitted One-Factor Congeneric Models for the 8-Factor 24-Item LEQ-H Factors: FLs, Us, ωs,* M*s and* SD*s (*N *= 1,892)*

Item	Factor Names & Item Descriptions	FL	U	ω	*M*	*SD*
AM	Achievement Motivation	.792	.368	.837	6.47	1.07
03	- get details right	.698	.513		6.26	1.35
11	- get the best results	.874	.237		6.56	1.22
10	- do the best I can	.804	.353		6.58	1.22
AI	Active Initiative	.853	.270	.890	6.38	1.28
07	- busy & active	.780	.392		6.37	1.44
15	- active & energetic	.883	.220		6.46	1.43
23	- active, 'get into it' person	.896	.198		6.30	1.46
EC	Emotional Control	.849	.277	.886	5.81	1.34
06	- calm in stressful situations	.861	.259		5.77	1.58
14	- calm in new situations	.805	.351		5.84	1.43
22	- calm when things go wrong	.882	.222		5.83	1.50
IF	Intellectual Flexibility	.755	.417	.804	6.30	1.04
04	- change thinking if a better idea	.596	.645		6.09	1.40
12	- open to new ideas	.832	.307		6.55	1.20
20	- adaptable/flexible in thinking/ideas	.838	.298		6.26	1.20
SC	Self Confidence	.827	.314	.867	6.29	1.26
08	- ability to do anything I want	.809	.345		6.24	1.53
16	- if apply self, confident of success	.797	.365		6.11	1.37
24	- believe I can do it	.876	.233		6.52	1.42
SO	Social Competence	.832	.303	.873	5.76	1.25
02	- successful in social situations	.898	.194		5.58	1.41
10	- competent in social situations	.859	.263		5.72	1.43
18	- communicate well with people	.739	.453		5.98	1.40
TL	Task Leadership	.776	.389	.823	5.58	1.25
05	- get people to work for me	.639	.592		5.26	1.58
13	- good leader	.828	.315		5.88	1.43
21	- motivate other people	.861	.259		5.60	1.44
TM	Time Management	.808	.345	.850	5.24	1.37
01	- plan and use my time efficiently	.781	.389		5.46	1.50
09	- do not waste time	.771	.406		4.97	1.70
17	- manage the way I use my time	.871	.241		5.31	1.52

Note. FL = Factor Loading, U = Uniqueness, ω = Coefficient omega, TLI = Tucker-Lewis Index, RNI = Relative Noncentrality Index. Numbers in the first row for each factor indicate mean FLs and Us. Coefficient omegas, Chi-squares, and GFIs are not provided because 3-item congeneric models are perfectly specified.

H 1.2.2: Multi-Factorial Structure of the LEQ-H

Overview. H 1.2.2 predicted that CFA would demonstrate that a-priori eight-factor structure with each factor measured by three items (see Figure 4.2).

Results. A multi-factorial CFA of the 8-factor, 24-item LEQ-H model produced the FLs and Us in Table 6.15 and Figure 6.3 and the FCrs in Table 6.16. The GFIs (see Table 6.14) indicated an excellent model fit for Sample 2, with a TLI of .981 (.03 lower than the 8-factor, 24-item LEQ-G model in Sample 1) and an RNI of .984 (.03 higher than in Sample 1).

Conclusions. GFIs indicated an excellent fit for the 8-factor, 24-item LEQ-H measurement model. Hence, H 1.2.2 was accepted.

H 1.2.3: Higher-Order Factorial Structure of the LEQ-H

Overview. H 1.2.3 predicted that a global second-order life effectiveness factorial structure would be applicable to the LEQ-H. A second-order model was tested, with eight first-order factors nested within a global life effectiveness second-order factor (see FLs and Us in Table 6.15, FCrs and second-order FLs in Table 6.16, and path diagram in Figure 6.4). This was a more constrained model and therefore could not fit better than the first-order LEQ-H model.

Results. χ^2 indicated that the second-order model (χ^2 = 1,924.16, *df* = 244) fitted the data significantly less well than the first-order model (χ^2 = 1,473.12, *df* = 224; $\Delta\chi^2$ = 451.04, *df* = 20, $p < .001$). Similarly, the ΔS-Bχ^2 indicated that the second-order model (S-Bχ^2 = 1,034.33, *df* = 244) fitted the data significantly less well than the first model (S-B χ^2 = 788.97, *df* = 224; ΔS-Bχ^2 = 245.36, *df* = 20, $p <$ .001). *T* was .77, similar to *T* for Sample 1 (.78). This suggests that a global second-order model fitted the LEQ-H data similarly well in Sample 1 and Sample 2.

As with Sample 1, although the $\Delta\chi^2$, ΔS-Bχ^2, and *T* coefficient suggested that the second-order model did not fit as well as a first-order model, three other indicators suggested that the second-order model fitted about as well as the first-order model: (a) the GFIs for the second-order model (see Table 6.14) were within .003 (TLI = .976) and .016 (RNI = .979) of the GFIs for the first-order model; (b) the loadings (γ) of the eight first-order factors on the global second-order factor were

mostly solid, with an average of .54, ranging between .36 (Intellectual Flexibility) and .68 (Self Confidence; see Table 6.16); and (c) the reliability (internal consistency) of a global factor (derived from all 24-items) was very high (ω = .99).

Conclusions. Significant $\Delta\chi^2$ results indicated that the second-order global 8-factor, 24-item LEQ-H model fitted Sample 2 data less well than a first-order model. However, three other indicators (ΔGFIs, second-order factor loadings, and multi-factorial reliability) suggested that a global second-order model provides a good fit to the data and is a viable model.

Table 6.14 *GFIs for LEQ-H Measurement Models With No Invariance Constraints*

			Multi-Factorial Model		Null Model		GFIs	
Factors	Items	Model description	χ^2	*df*	χ^2	*df*	TLI	RNI
8	24	Initial baseline	1,473.12	224	80,361.74	276	.981	.984
8	24	Global second-order factor added	1,924.16	224	80,361.74	276	.976	.979

Note. TLI = Tucker-Lewis Index; RNI = Relative Non-centrality Index.

Table 6.15 *CFA FLs and Us for the 8-Factor, 24-Item LEQ-H Model (*N = *1,892)*

Item			Factor Loadings								
G	H	Descriptions	AM	AI	EC	IF	SC	SO	TL	TM	U
03	03	- get details right	.68	0	0	0	0	0	0	0	.54
11	11	- get the best results	.84	0	0	0	0	0	0	0	.29
19	19	- do the best I can	.85	0	0	0	0	0	0	0	.28
44	07	- busy & active	0	.78	0	0	0	0	0	0	.39
50	15	- active & energetic	0	.86	0	0	0	0	0	0	.26
59	23	- active, 'get into it' person	0	.92	0	0	0	0	0	0	.16
08	06	- calm in stressful situations	0	0	.84	0	0	0	0	0	.29
16	14	- calm in new situations	0	0	.83	0	0	0	0	0	.32
40	22	- calm when things go wrong	0	0	.88	0	0	0	0	0	.22
20	04	- change thinking if a better idea	0	0	0	.58	0	0	0	0	.66
28	12	- open to new ideas	0	0	0	.84	0	0	0	0	.30
36	20	- adaptable/flexible in thinking/ideas	0	0	0	.84	0	0	0	0	.29
45	08	- ability to do anything I want	0	0	0	0	.80	0	0	0	.36
48	16	- if apply self, confident of success	0	0	0	0	.81	0	0	0	.35
54	24	- believe I can do it	0	0	0	0	.88	0	0	0	.23
02	02	- successful in social situations	0	0	0	0	0	.87	0	0	.24
10	10	- competent in social situations	0	0	0	0	0	.86	0	0	.25
18	18	- communicate well with people	0	0	0	0	0	.77	0	0	.41
15	05	- get people to work for me	0	0	0	0	0	0	.64	0	.60
31	13	- good leader	0	0	0	0	0	0	.83	0	.31
39	21	- motivate other people	0	0	0	0	0	0	.86	0	.26
01	01	- plan and use my time efficiently	0	0	0	0	0	0	0	.78	.39
17	09	- do not waste time	0	0	0	0	0	0	0	.76	.41
25	17	- manage the way I use my time	0	0	0	0	0	0	0	.88	.23

Table 6.16 *FCrs and Second-Order FLs (γ) for the 8-Factor 24-Item LEQ-H Model (*N = *1,892)*

LEQ-H Factor	AM	AI	EC	IF	SC	SO	TL	TM	γ
Achievement Motivation	1								.52
Active Initiative	.60	1							.61
Emotional Control	.49	.51	1						.55
Intellectual Flexibility	.46	.48	.39	1					.36
Self Confidence	.65	.68	.56	.52	1				.68
Social Competence	.51	.53	.44	.41	.58	1			.59
Task Leadership	.58	.60	.49	.46	.65	.51	1		.48
Time Management	.53	.55	.45	.42	.60	.47	.53	1	.54
Total Factor	.76	.79	.65	.60	.86	.67	.76	.70	M_{γ} = .54

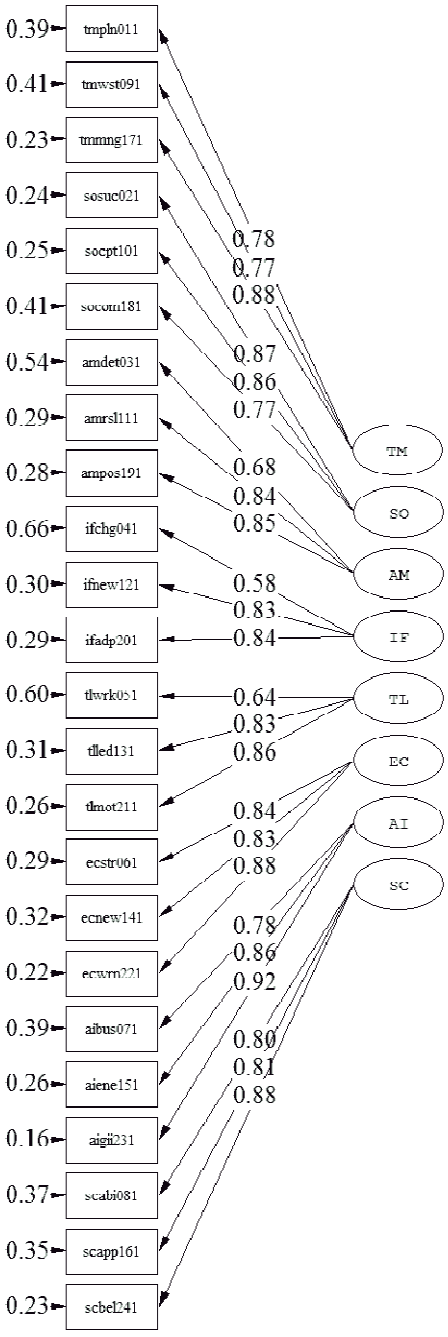


Figure 6.3 Path diagram for the first-order 8-factor, 24-item LEQ-H model showing standardised FLs and Us (N = 1,892).

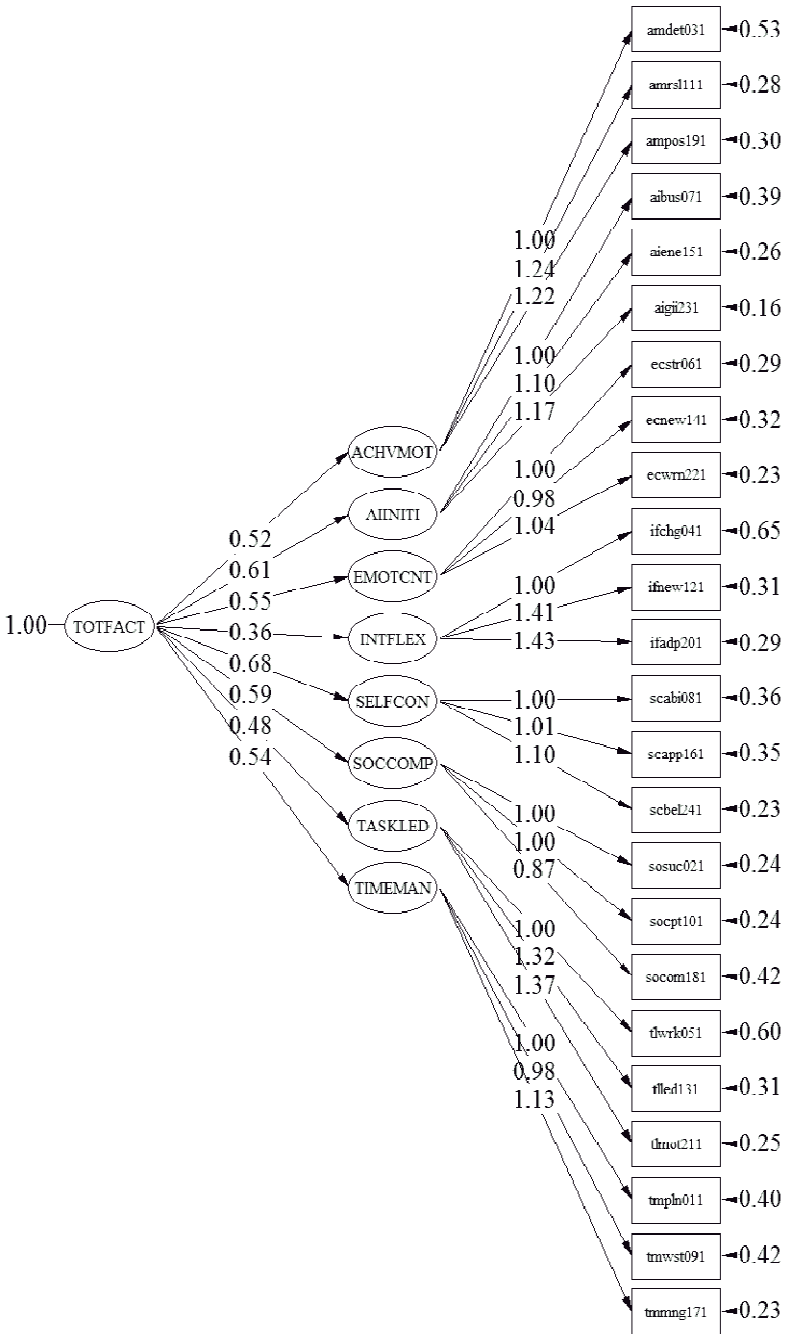


Figure 6.4 Path diagram for the global second-order, 8-factor, 24-item LEQ-H model showing standardised first- and second-order FLs and Us (N = 1,892)[61].

[61] One item loading for each first-order factor was fixed to unity in order to identify the higher-order model and to set a metric for the factor loadings (Jöreskog & Sörbom, 1989; Marsh & Hocevar, 1985).

H 1.2.4: Factorial Invariance Across Gender and Age LEQ-H

Overview. H 1.2.4 predicted that the factorial structure of the LEQ-H would be similar for male and females, and across age groups, as demonstrated by structural equation modelling tests of invariance. Tests of invariance were conducted across gender and age groups for the 8-factor, 24-item, first-order LEQ-H model (Table 6.17) and the global second-order measurement model (Table 6.18). Interpretation of the TLI is reported, since RNI results would have led to the same conclusions.

Results.

Gender. The first-order, 8-factor, 24-item LEQ-H model separately fitted male and female groups similarly well, with TLIs of .980 and .971 respectively (see Table 6.17). When no invariance constraints were imposed the TLI (.976) was excellent. Imposition of invariance of NFs and FLs led to a somewhat lower, but still excellent, TLI (.952; ΔTLI = -.024). Additionally imposing invariance of FCrs and FVs had little effect (TLI = .953; ΔTLI = -.023). Further constraining Us to be invariant led to a substantial decrease in the TLI, although the model was still acceptable (.904; ΔTLI = -.072).

The global second-order, 8-factor, 24-item model separately fitted the Sample 2 data for male and female groups very well, with TLIs of .975 and .967 respectively (see Table 6.18). When no invariance constraints were imposed the TLI (.972) was also excellent. Imposition of second-order FL invariance led to a slightly lower, but still excellent, TLI (.969; ΔTLI = -.003), with the ΔTLI smaller than Cheung and Rensvold's (2002) suggested critical value of -.01. Additionally constraining the first-order NFs and FLs to be invariant produced a somewhat smaller, but still excellent, TLI (.955; ΔTLI = -.017). Further constraining first-order FCvs and FVs to be invariant led to a somewhat smaller, but still acceptable, TLI (.949; ΔTLI = -.023). Further imposing invariance of Us reduced the model fit substantially, but it was still acceptable (TLI = .902; ΔTLI = -.070).

Age. Invariance of the first-order, 8-factor, 24-item LEQ-H model was considered across three age groups: adolescents, young adult, and adults. This model separately fitted very well for each of the age groups, with TLIs of .976, .968, and .968 respectively (see Table 6.17). When no invariance constraints were imposed the

TLI (.972) was also excellent. Imposing invariance of NFs and FLs led to a somewhat lower, but still acceptable, TLI (.931; ΔTLI = -.061). Further imposition of invariance of FCrs and FVs had no effect on the TLI (.931; ΔTLI = -.061). Finally, further imposition of invariant Us substantially reduced the TLI (.834; ΔTLI = -.138).

The global second-order, 8-factor, 24-item model separately fitted the LEQ-H data for adolescent, young adult, and adult age groups very well, with TLIs of .970, 967, and .967 respectively (see Table 6.18). When no invariance constraints were imposed the TLI (.972) was also excellent. Imposition of second-order FL invariance led to a slightly lower, but still excellent, TLI (.965; ΔTLI = -.007), with the ΔTLI smaller than Cheung and Rensvold's (2002) suggested critical value of -.01. Additionally constraining the first-order NFs and FLs to be invariant produced a somewhat smaller, but still acceptable, TLI (.936; ΔTLI = -.036). Further constraining the first-order FCvs and FVs to be invariant led to a slightly lower, but still acceptable, TLI (.927; ΔTLI = -.045). Further constraining the Us to be invariant reduced the model fit substantially (TLI = .833; ΔTLI = -.139).

Conclusions.

Gender. There was some limited support for invariance of NFs, FLs, FCrs, and FVs across males and females (ΔTLI = -.023) and little support for total invariance (ΔTLI = -.072) of the 8-factor, 24-item, first-order LEQ-H model with Sample 2 data. These invariance results were slightly stronger than for the LEQ-G 8-factor, 24-item model with Sample 1 data. These results provide partial support for the conclusion that the first-order, 8-factor, 24-item LEQ-H model measures the same constructs for males and females.

There was good support for invariance of the second-order FLs (ΔTLI = -.003,) and some limited support for invariance of first-order NFs, FLs, FCrs, and FVs (ΔTLI = -.023), across males and females, for the global second-order 8-factor, 24-item LEQ-H model with Sample 2 data. There was little support for total invariance (ΔTLI = -.070). These invariance results were slightly stronger than for same model with Sample 1 LEQ-G data. Overall, these results provide good support for a global second-order, 8-factor, 24-item LEQ-H construct which is invariant across males and

females, however there was only partial support for invariance of first-order NFs, FLs, FCrs, and FVs, and no support for total variance.

Age. There was some limited support for invariance of the NFs, FLs, FCrs, and FVs across the three age groups (ΔTLI = -.061), and no support for total invariance (ΔTLI = -.138). These results provide limited support for the conclusion that the first-order, 8-factor, 24-item LEQ-H model measures the same constructs for the three age groups. These results were slightly weaker than the results for invariance testing of the first-order 8-factor, 24-item LEQ-G model across age groups in Sample 1.

There was support for invariance of the second-order FLs (ΔTLI = -.007), some limited support for invariance of first-order NFs, FLs, FCvs, and FVs (ΔTLI = -.045), and little support for total invariance (ΔTLI = -.139) across the three age groups. These results provide good support for a global second-order, 8-factor, 24-item LEQ-H construct which is invariant across the three different age groups, however there was only partial support for invariance of first-order NFs, FLs, FCrs, and FVs, and no support for total invariance. These results were slightly weaker than the results for invariance testing of the global, second-order 8-factor, 24-item LEQ-G model across age groups in Sample 1.

Table 6.17 *GFIs for the First-Order, 8-Factor, 24-Item LEQ-H Model With and Without Invariance Constraints For Gender and Age*

Model	Multi-Factorial		Null		GFIs		
	χ^2	*df*	χ^2	*df*	TLI	RNI	*N*
No invariance							
Males	1,019.58	224	49,735.45	276	.980	.984	1,071
Females	964.53	224	31,173.09	276	.971	.976	803
11 to 18 years	970.66	224	39,160.82	276	.976	.981	1,011
19 to 24 years	779.35	224	21,944.35	276	.968	.974	460
25 years & over	774.19	224	21,030.26	276	.967	.974	413
Gender Invariance							
Null	6,313.00	300	80,908.53	552	.862	.925	1,874
No invariance	1,984.11	448	80,908.53	552	.976	.981	1,874
NF & FL inv.	3,757.63	472	80,908.53	552	.952	.959	1,874
NF, FL, FCr, & FV inv.	3,935.58	500	80,908.53	552	.953	.957	1,874
NF, FL, FCr, FV, & U inv.	7,878.23	524	80,908.53	552	.904	.909	1,874
Age Invariance							
Null	12,712.61	600	82,135.42	828	.794	.851	1,884
No invariance	2,524.19	672	82,135.42	828	.972	.977	1,884
NF & FL inv.	5,576.46	720	82,135.42	828	.931	.940	1,884
NF, FL, FCr, & FV inv.	6,042.42	776	82,135.42	828	.931	.935	1,884
NF, FL, FCr, FV, & U inv.	14,282.69	824	82,135.42	828	.834	.835	1,884

Note. TLI = Tucker-Lewis Index; NF = number of factors; FL = factor loadings; FCr = factor correlations; FV = factor variances; U = uniquenesses; inv. = invariance.

Table 6.18 *GFIs for the Global Second-Order, 8-Factor, 24-Item LEQ-H Model With and Without Invariance Constraints For Gender and Age*

Model	Multi-Factorial		Null		GFIs		
	χ^2	*df*	χ^2	*df*	TLI	RNI	*N*
No invariance							
Males	1,320.57	244	49,735.45	276	.975	.978	1,071
Females	1,146.73	244	31,173.09	276	.967	.971	803
15 to 18 years	1,275.95	244	39,160.82	276	.970	.974	1,011
19 to 24 years	877.33	244	21,944.35	276	.967	.971	460
25 years & over	854.31	244	21,030.26	276	.967	.971	413
Gender Invariance							
Null	32,908.13	576	80,908.53	552	.614	.598	1,174
No invariance	2,467.30	488	80,908.53	552	.972	.975	1,174
NF & FL (2nd-O) inv.	2,755.42	496	80,908.53	552	.969	.972	1,174
NF & FL (1st-O) inv.	3,677.13	504	80,908.53	552	.957	.961	1,174
NF & FL (1st- & 2nd-O) inv.	3,906.82	512	80,908.53	552	.955	.958	1,174
NF, FL (1st- & 2nd-O), 1st-O FV inv.	4,411.87	520	80,908.53	552	.949	.952	1,174
NF, FL (1st- & 2nd-O), 1st-O FV, & U inv.	8,325.89	544	80,908.53	552	.902	.903	1,174
Age Invariance							
Null	38,118.71	876	82,135.42	828	.567	.542	1,884
No invariance	3,007.58	732	82,135.42	828	.968	.972	1,884
NF & FL (2nd-O) inv.	3,302.53	748	82,135.42	828	.965	.969	1,884
NF & FL (1st-O) inv.	5,216.41	764	82,135.42	828	.941	.945	1,884
NF & FL (1st- & 2nd-O) inv.	5,700.26	780	82,135.42	828	.936	.940	1,884
NF, FL (1st- & 2nd-O), 1st-O FV inv.	6,492.63	796	82,135.42	828	.927	.930	1,884
NF, FL (1st- & 2nd-O), 1st-O FV, & U inv.	14,718.97	844	82,135.42	828	.833	.829	1,884

Note. TLI = Tucker-Lewis Index; NF = number of factors; FL = factor loadings; FV = factor variances; U = uniquenesses; 1st-O = 1st-order; 2nd-O = 2nd-order.

H 1.2.5: Factorial Invariance Across Samples for the LEQ-H

Overview. H 1.2.5 predicted that the factor structure of the LEQ-H would be similar for Sample 1 and Sample 2 as demonstrated by structural equation modelling tests of invariance.

Results. Data from both samples were used to test for invariance of the first-order, 8-factor, 24-item measurement model across Sample 1 (LEQ-G, n = 1,164) and Sample 2 (LEQ-H, n = 1,892; total N = 3,056; see Table 6.19). As already demonstrated, the first-order, 8-factor, 24-item LEQ model fitted very well for Sample 1 (TLI = .984) and Sample 2 (TLI = .981). With no invariance constraints the fit was also excellent (TLI = .982). Imposing invariance of NFs and FLs somewhat reduced the TLI, although the fit was still excellent (.951; ΔTLI = -.030). Additionally constraining FCrs and FVs had little effect (TLI = .950; ΔTLI = -.031). Finally, total invariance reduced the model fit substantially (TLI = .889; ΔTLI = -.092).

Invariance of the global second-order 8-factor, 24-item model was also tested across Sample 1 and Sample 2 (see Table 6.20). As already demonstrated, the global second-order, 8-factor, 24-item LEQ model fitted well for Sample 1 (TLI = .980) and Sample 2 (TLI = .976) separately. With no invariance constraints, the TLI was excellent (.978). Imposition of second-order FL invariance led to a slightly lower, but still excellent, TLI (.971; ΔTLI = -.007), with the ΔTLI smaller than Cheung and Rensvold's (2002) suggested critical value of -.01. Additionally constraining the first-order FLs to be invariant produced a somewhat lower, but still acceptable, TLI (.953; ΔTLI = -.025). Further constraining invariance of first-order FCvs and FVs slightly reduced the TLI (.949; ΔTLI = -.029). Finally, total invariance reduced the model fit substantially (.890; ΔTLI = -.088).

Conclusions. These results provide good support for invariance of second-order FLs, with partial support for invariance of first-order NFs, FLs, FCrs, and FVs, across Sample 1 and Sample 2. There was little support for total invariance.

Table 6.19 *GFIs for the First-Order, 8-Factor, 24-Item LEQ Model With Selected Invariance Constraints For Sample 1 and Sample 2*

Model	Multi-Factorial		Null		GFIs		
	χ^2	*df*	χ^2	*df*	TLI	RNI	*N*
No invariance							
Sample 1	1,012.37	224	60,288.98	276	.984	.987	1,164
Sample 2	1,473.12	224	80,362.31	276	.981	.984	1,892
Sample invariance							
Null	13,042.03	300	140,650.71	552	.833	.909	3,056
No invariance	2,485.49	448	140,650.71	552	.982	.986	3,056
NF and FL inv.	6,404.46	472	140,650.71	552	.951	.958	3,056
NF, FL, FCr and FV inv.	6,836.43	500	140,650.71	552	.950	.955	3,056
NF, FL, FCr, FV and U inv.	15,257.51	524	140,650.71	552	.889	.895	3,056

Note. TLI = Tucker-Lewis Index; NF = number of factors; FL = factor loadings; FCr = factor correlations; FV = factor variances; U = uniquenesses; inv. = invariance.

Table 6.20 *GFIs for the Global Second-Order, 8-Factor, 24-Item LEQ Model With Invariance Constraints For Sample 1 and Sample 2*

Model	Multi-Factorial		Null		GFIs		
	χ^2	*df*	χ^2	*df*	TLI	RNI	*N*
No invariance							
Sample 1	1,294.26	244	60,288.98	276	.980	.983	1,164
Sample 2	1,924.16	244	80,361.74	276	.976	.979	1,892
Sample invariance							
Null	58,627.57	576	140,650.71	552	.603	.586	3,056
No invariance	3,218.42	488	140,650.71	552	.978	.981	3,056
NF & FL (2nd-O) inv.	4,124.68	496	140,650.71	552	.971	.974	3,056
NF & FL (1st-O) inv.	5,961.87	504	140,650.71	552	.957	.961	3,056
NF & FL (1st- & 2nd-O) inv.	6,608.97	512	140,650.71	552	.953	.957	3,056
NF, FL (1st- & 2nd-O), 1st-O FV inv.	7,248.73	520	140,650.71	552	.949	.952	3,056
NF, FL (1st- & 2nd-O), 1st-O FV, & U inv.	15,709.57	544	140,650.71	552	.890	.892	3,056

H 1.2.6: Reliability of the LEQ-H

Overview. H 1.2.6 predicted that the eight LEQ-H factors would demonstrate acceptable (> .7) internal consistency and test-retest reliability. Internal consistencies were based on T1 (beginning of program) data. Test-retest correlations were calculated for scores between T0 (baseline) and T1, a period of approximately one month.

Results. The evidence for factorial invariance across studies justified pooling data from Sample 1 and Sample 2 (N = 3,056). Internal consistencies and test-retest correlations of the factors based on this combined sample are presented in Table 6.21. The average Cronbach's α for the eight factors was .85, which was nearly as strong as the average α for the 11 factors in the initial baseline model (.88) despite the revised model factors being each measured by only three items. Cronbach αs for the individual factors were between .78 (Intellectual Flexibility) and .87 (Active Initiative and Emotional Control).

Test-retest correlations between T0 and T1 for the LEQ-H factors were moderately good (average = .75), ranging between .62 (Intellectual Flexibility) and .81 (Task Leadership; n = 1,961). The Intellectual Flexibility test-retest correlation was the only one below the criterion of .7, but was above a minimally acceptable criterion of .6. Test-retest correlations were just as strong for factors in the LEQ-H model, with three items per factor, as they were for factors in the initial model, with five to eight items per factor.

Table 6.21 *Cronbach's α and Test-Retest Correlations (T0 to T1) for the 8-Factor, 24-Item LEQ Model for Sample 1 and Sample 2 Participants*

Factor	α	*r*
Achievement Motivation	.81	.71
Active Initiative	.87	.76
Emotional Control	.87	.76
Intellectual Flexibility	.78	.65
Self Confidence	.85	.76
Social Competence	.86	.77
Task Leadership	.83	.80
Time Management	.85	.76
Average	.84	.75
Item Total	.93	.81
N	3,056	1,961

Conclusions. Overall, Cronbach's α and test-retest reliabilities demonstrated good internal consistency (.85) and reliability (.75) for each of the eight factors in the LEQ-H measurement model. Hence, H 1.2.6 was accepted. The LEQ-H measurement model exhibits very good internal consistency, with at least moderate stability over a period of approximately one month.

RQ 1.3.1: Differences in LEQ-H scores as a Function of Age and Gender

Overview. RQ 1.3.1 inquired as to whether LEQ-H factor scores would vary as a function of participant age and gender.

Results. Descriptive statistics for the total sample (Sample 1 and Sample 2 pooled data) broken down by gender and the three age groups (adolescent, young adult, and adult) are presented in Table 6.22. Overall, responses to the items exhibited mild-moderate departures from normality. Responses were somewhat negatively skewed (average item skewness ~ -.8) and leptokurtic (average item kurtosis ~ .8). No factor means had a skewness more extreme than -1. Several factors had kurtosis scores between 1 and 1.5. The overall average item mean (6.09 on an 8 point scale) was on the positive side of the mid-point (4.50) but allows sufficient room for more positive self-perceptions to be detected. Repeated measure ANOVAs were conducted to determine whether there were overall mean differences in life effectiveness scores between gender and age groups, and whether there were interactions between these independent variables and LEQ factors.

Gender. Overall, there was no main effect of gender on life effectiveness (F (1, 3029) = 0.02, p = .892); in fact, the overall means for life effectiveness were almost identical for males and females. However, there was an interaction between gender and factor (F (7, 21203) = 21.71, p < .001). This led to conducting independent-sample t-tests for each LEQ factor, with gender as the independent variable (see Table 6.23). These results indicated three significant differences. M males reported significantly higher levels of Emotional Control and Self Confidence. Females reported significantly higher Social Competence. There were no other significant differences at a critical α of .001.

Age. As with gender, there was no main effect of age group on overall life effectiveness (F (2, 3039) = 1.69), p = .185). The trend of the means suggested similar overall scores for under 19 years and over 25 years, with slightly lower scores

for 19 to 24 year olds. There was an interaction between age groups and factor (F (14, 21273) = 6.10, $p < .001$). This led to conducting one-way ANOVAs for each LEQ factor, with age group as the independent variable (see Table 6.23). These results indicated three factors for which there were significant effects of age. Self Confidence was higher amongst under 19 year olds. Social Competence was highest among under 19 year olds, followed by 19 to 24 year olds, followed by 25 and over year olds. Finally, 19 to 24 year olds were significantly lower than the other two age groups for Time Management.

Conclusion. There were no main effects, indicating similar overall life effectiveness scores for males and females, and for the three age groups (adolescents, young adults, and adults). However, there were significant interactions between LEQ factor and each of gender and age, with follow-up tests indicating that: (a) males reported higher levels of Emotional Control and Self Confidence; (b) females reported higher levels of Social Competence; (c) adolescents reported higher values of Self Confidence; (d) Social Competence decreased significantly by age group; and (e) young adults reported the lowest levels for Time Management.

Table 6.22 M*s and* SD*s for the 8-Factor, 24-Item LEQ Model for Study 1 Participants by Gender and Age*

Item	Factor & Item Description	Total				Gender ♂		Gender ♀		Age (years) < 19		Age (years) 19 - 24		Age (years) >= 25	
H		*M*	*SD*	*Skew*	*Kurt*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
AM	Achievement Motivation	6.53	1.03	-0.87	1.15	6.51	1.05	6.57	0.99	6.54	1.08	6.50	0.99	6.57	0.96
03	- get details right	6.35	1.27	-0.95	1.02	6.32	1.29	6.38	1.25	6.32	1.36	6.33	1.19	6.42	1.20
11	- get the best results	6.62	1.16	-0.94	1.37	6.61	1.18	6.63	1.13	6.63	1.25	6.58	1.10	6.63	1.05
19	- do the best I can	6.64	1.18	-1.01	1.35	6.59	1.22	6.70	1.12	6.66	1.24	6.57	1.18	6.66	1.08
AI	Active Initiative	6.45	1.23	-1.00	1.35	6.41	1.27	6.50	1.16	6.49	1.30	6.45	1.18	6.35	1.15
07	- busy & actively involved	6.46	1.36	-1.09	1.50	6.37	1.41	6.57	1.27	6.46	1.48	6.46	1.28	6.44	1.24
15	- active & energetic	6.51	1.37	-1.05	1.23	6.50	1.40	6.52	1.34	6.57	1.45	6.53	1.31	6.37	1.28
23	- active, ‘get into it’ person	6.37	1.41	-0.94	0.93	6.35	1.45	6.40	1.34	6.43	1.50	6.36	1.34	6.25	1.29
EC	Emotional Control	5.92	1.29	-0.74	0.69	6.05	1.27	5.77	1.28	5.93	1.36	5.97	1.21	5.82	1.22
06	- calm in stressful situations	5.91	1.51	-0.76	0.43	6.06	1.48	5.72	1.51	5.89	1.64	5.97	1.39	5.84	1.38
14	- calm in new situations	5.93	1.37	-0.80	0.91	6.04	1.33	5.80	1.37	5.96	1.45	5.98	1.30	5.80	1.29
22	- calm when things go wrong	5.93	1.44	-0.79	0.71	6.04	1.42	5.80	1.43	5.94	1.54	5.97	1.35	5.82	1.34
IF	Intellectual Flexibility	6.37	1.00	-0.82	1.52	6.36	1.02	6.39	0.97	6.38	1.06	6.39	0.96	6.33	0.94
04	- change thinking if a better idea	6.23	1.31	-0.87	1.13	6.25	1.30	6.21	1.31	6.27	1.41	6.21	1.23	6.18	1.19
12	- open to new ideas	6.59	1.14	-0.93	1.26	6.56	1.14	6.64	1.11	6.60	1.23	6.61	1.10	6.55	1.00
20	- adaptable/flexible in thinking/ideas	6.30	1.15	-0.81	1.45	6.28	1.17	6.32	1.10	6.28	1.22	6.34	1.08	6.26	1.10
SC	Self Confidence	6.40	1.21	-0.95	1.01	6.48	1.19	6.30	1.24	6.44	1.25	6.44	1.17	6.27	1.18
08	- ability to do anything I want	6.42	1.46	-1.00	0.92	6.47	1.44	6.37	1.47	6.47	1.52	6.51	1.39	6.24	1.41
16	- confident of success	6.22	1.33	-0.82	0.82	6.34	1.30	6.05	1.36	6.21	1.39	6.26	1.32	6.18	1.23
24	- believe I can do it	6.56	1.36	-1.07	1.29	6.62	1.33	6.48	1.39	6.65	1.43	6.56	1.29	6.39	1.29
SO	Social Competence	5.82	1.21	-0.72	0.75	5.74	1.21	5.94	1.17	5.91	1.20	5.77	1.21	5.68	1.21
02	- successful in social situations	5.63	1.36	-0.59	0.38	5.57	1.36	5.73	1.34	5.76	1.38	5.58	1.33	5.44	1.35
10	- competent in social situations	5.80	1.37	-0.67	0.64	5.74	1.37	5.89	1.34	5.85	1.39	5.80	1.34	5.69	1.37
18	- communicate well with people	6.02	1.34	-0.77	0.76	5.90	1.36	6.19	1.28	6.12	1.39	5.93	1.33	5.92	1.25
TL	Task Leadership	5.71	1.24	-0.65	0.37	5.73	1.26	5.70	1.21	5.68	1.29	5.74	1.20	5.75	1.20

Item	Factor & Item Description	Total				Gender ♂		Gender ♀		Age (years) < 19		Age (years) 19 - 24		Age (years) >= 25	
H		*M*	*SD*	*Skew*	*Kurt*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
05	- get people to work for me	5.49	1.51	-0.74	0.47	5.53	1.54	5.45	1.46	5.29	1.69	5.62	1.32	5.72	1.33
13	- good leader	5.94	1.42	-0.74	0.55	5.94	1.43	5.94	1.40	5.97	1.48	5.92	1.37	5.90	1.33
21	- motivate other people	5.72	1.40	-0.61	0.42	5.72	1.42	5.73	1.35	5.76	1.47	5.69	1.34	5.65	1.32
TM	Time Management	5.35	1.34	-0.56	0.10	5.33	1.35	5.39	1.33	5.40	1.32	5.23	1.39	5.42	1.30
01	- plan and use my time efficiently	5.53	1.46	-0.54	0.12	5.52	1.48	5.55	1.42	5.61	1.47	5.37	1.47	5.57	1.40
09	- do not waste time	5.11	1.64	-0.45	-0.22	5.08	1.65	5.14	1.64	5.13	1.68	4.98	1.65	5.22	1.56
17	- manage the way I use my time	5.42	1.48	-0.62	0.25	5.38	1.49	5.48	1.46	5.46	1.50	5.33	1.51	5.46	1.40
	Average item	6.07	0.85	-0.63	0.61	6.07	0.88	6.07	0.81	6.10	0.87	6.06	0.83	6.02	0.83
	Listwise *N*	3,056				1,744		1,287		1,403		939		700	

Note. The table reported on data collected using the LEQ-G (Sample 1) and LEQ-H (Sample 2) at T1 (beginning of outdoor education programs). Numbers in italics indicate factor *M*s and *SD*s.

Table 6.23 *Inferential Tests of Mean Differences in LEQ Factor Scores for Gender and Age Groups Pooled Across Sample 1 and Sample 2*

Factor	Gender *t*	Gender *p*	Gender M_{diff}	Age *F*	Age *p*	Notes
Achievement Motivation	-1.73	.09	-0.07	1.01	.37	
Active Initiative	-2.03	.04	-0.09	2.80	.06	
Emotional Control	5.89	.00 *	0.27	2.90	.06	
Intellectual Flexibility	-0.80	.43	-0.03	0.79	.46	
Self Confidence	4.03	.00 *	0.18	5.59	.00 *	u/19 ~ 19-24 > o/25 years
Social Competence	-4.55	.00 *	-0.20	9.11	.00 *	u/19 > 19-24 > o/25
Task Leadership	0.58	.56	0.03	1.25	.29	
Time Management	-1.23	.22	-0.06	5.73	.00 *	u/19 ~ o/25 years > 19-24

Note. $M_{diff} = M_{♂} - M_{♀}$; For gender *t*s, *df* = 3029; For age group *F*s, *df* = 2, 3039.

Summary

This chapter presented the results of Study 1, which investigated the psychometric properties of the 11-factor, 64-item LEQ-G, and the refined 8-factor, 24-item LEQ-H measurement model. All tested first-order and global second-order models had excellent fits with the data, and both are viable models.

The refined 8-factor, 24-item model eliminated three problematic scales (Hardiness Resourcefulness, Organisational Self-Discipline, and Productive Teamwork), exhibited the strongest overall fit, and had internally consistent scales with at least moderate test-retest reliability. Invariance of the global second-order model across gender and age groups was supported, with partial support for invariance of the number of first-order factors, factor loadings, factor correlations, and factor variances. Total invariance was not supported.

After testing the measurement models, data from the two samples were pooled. Items and factors exhibited minor-moderate departures from normality, with negative skew and positive kurtosis. There were no significant differences in overall life effectiveness scores across gender and age groups, however there were interactions with LEQ factor, with some small, significant gender and age differences for specific factors. In conclusion, the LEG-G and LEQ-H exhibited robust measurement models, with a global factor structure which is replicable across males and females and across age groups, and with some small, significant variations in first-order factor structure across gender and age groups. Hence, the LEQ can be recommended for use in evaluating the effects of life skill intervention programs.

CHAPTER 7

STUDY 2 RESULTS: LONGITUDINAL IMPACTS OF OUTDOOR EDUCATION PROGRAMS ON LIFE EFFECTIVENESS

Introduction

This chapter reports the results of Study 2 which investigated longitudinal changes in life effectiveness scores for a large sample of outdoor education participants. Data of interest were participant responses to the LEQ-G and the LEQ-H on up to four occasions: pre-program (Time 0; T0), first day (Time 1; T1), last day (Time 2; T2), and follow-up (Time 3; T3). *Prior effect analyses* compared T0 and T1, *short-term effect analyses* compared T1 and T2, *follow-up effect* analyses compared T2 and T3, and *long-term effect analyses* compared T0 and T3 responses. This study also investigated the influence of six naturally-occurring independent variables (Participant Age, Participant Gender, Group Size, Group Gender, Program Length, and Program Type) on short- and long-term changes in LEQ scores.

Longitudinal changes in LEQ Overall and the eight LEQ factor scores were investigated using descriptive statistics, normalised mean effect sizes (ES_ns; see Chapter 5) with 99.9% confidence intervals (CIs), inferential statistics (full-factorial RMMANOVAs with Time (2) by LEQ factor (8) designs, and paired-sample *t*-tests, $\alpha = .001$), and multi-level analyses (MLAs; see Chapter 5). The results are structured according to the aims, hypotheses, and research question posed in Chapter 4. Firstly, the results of longitudinal analyses are presented, secondly, the analyses of independent variables are presented, and finally, the MLA results are presented.

Descriptive Statistics

Sample 1 (LEQ-G) and Sample 2 (LEQ-H) were pooled for Study 2. For analyses of short-term effects (involving T1 and T2), 3,640 cases were available, based on listwise deletion of T1 and T2 LEQ responses. This sample consisted of participants in Adolescent (19%), Young Adult (74%), Adult (9%), Family (3%), Corporate (13%), and Special (3%) programs. For analyses involving T0 and/or T3 data, a subset of 663 cases, based on listwise deletion of T0, T1, T2, and T3 LEQ responses. This sample consisted of participants in Young Adult (92%), Corporate (7%), Special (1%), and Adult (< 1%) programs. See Chapter 5 for more detailed sample descriptions.

Descriptive statistics for the four moments (*Ms*, *SDs*, *skew*, *kurt*) for each of the eight LEQ factors and overall life effectiveness at each of T1 and T2 are provided in Table 7.1 ($N = 3{,}640$). Descriptive statistics for the LEQ factors and LEQ Overall for each of T0, T1, T2, and T3 are provided in Table 7.2 and the mean scores at each Time are shown in line graphs in Figure 7.1 and Figure 7.2 ($N = 663$).

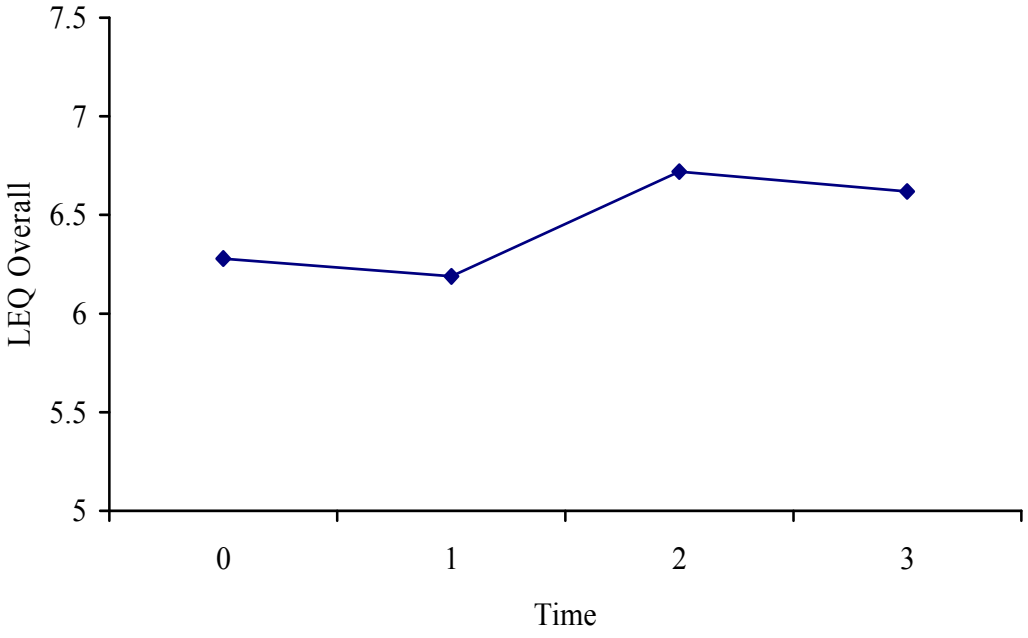


Figure 7.1 Line graph of T0, T1, T2, and T3 LEQ Overall *M*s ($N = 663$).

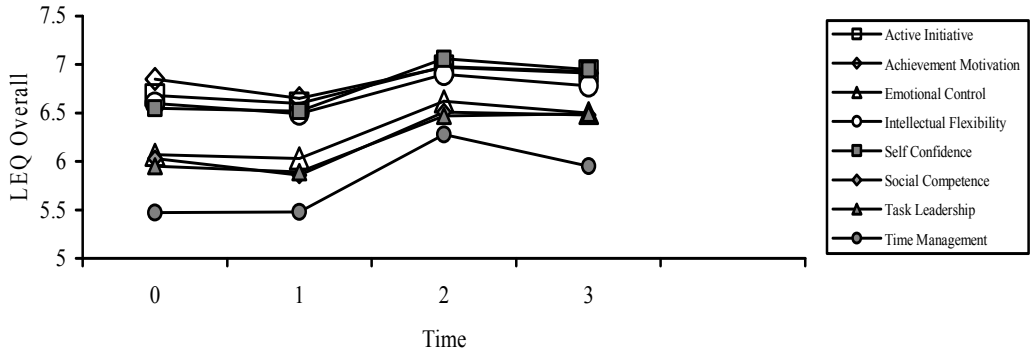


Figure 7.2 Line graphs of T0, T1, T2, and T3 LEQ Factor *M*s (*N* = 663).

T1 factor scores were negatively skewed (-0.58 to -0.96) and platykurtic (0.11 to 1.28, *N* = 3,640). T2 LEQ factor scores were more negatively skewed than at T1 (-0.94 to -1.62) and more platykurtic (1.24 to 3.81). Mean T1 factor scores were 62% to 79% (*M* = 72%) along a continuum equivalent of the eight-point Likert measurement scale. LEQ Overall scores were half a point higher at T2 than at T1 (M_2 - M_1 = 0.52). Thus, mean T2 factor scores were in a higher and slightly narrower range along the measurement scale (73% to 86%; *M* = 80%). This represented an 8% positive shift in LEQ Overall factor scores between T1 and T2.

Although the LEQ score distributions were negatively skewed, there appeared to be reasonable statistical room for growth. It remains possible, however, that: (a) LEQ factor scores may have been subject to ceiling effects; and (b) the extent of ceiling effects may have varied according to the LEQ factor. This issue was partially dealt with by normalising scores before calculating effect sizes.

Table 7.1 M*s,* SD*s, ES$_n$s and CIs, and Pair-Wise Comparisons for T1 and T2 LEQ Factors*

	T1				T2				*t*	T1 to T2		
LEQ Factor	*M*	*SD*	*Sk*	*Kurt*	*M*	*SD*	*Sk*	*Kurt*	T1-T2	$ES_{n.0005}$	$ES_{n.5000}$	$ES_{n.9995}$
Achievement Motivation	6.54	1.01	-0.90	1.28	6.85	0.94	-1.14	1.95	21.29*	0.28	0.33	0.38
Active Initiative	6.43	1.22	-0.96	1.19	6.80	1.13	-1.32	2.35	22.28*	0.28	0.33	0.38
Emotional Control	5.91	1.26	-0.70	0.60	6.48	1.21	-1.16	1.83	30.32*	0.45	0.50	0.55
Intellectual Flexibility	6.38	0.98	-0.76	1.23	6.74	0.98	-1.16	2.41	22.62*	0.34	0.39	0.45
Self Confidence	6.39	1.20	-0.95	1.09	6.99	1.03	-1.62	3.81	34.17*	0.51	0.56	0.61
Social Competence	5.80	1.21	-0.72	0.77	6.39	1.11	-0.98	1.51	33.80*	0.48	0.53	0.58
Task Leadership	5.74	1.24	-0.68	0.49	6.34	1.21	-1.07	1.52	32.99*	0.49	0.54	0.59
Time Management	5.37	1.34	-0.58	0.11	6.12	1.15	-0.94	1.24	38.49*	0.55	0.60	0.65
Overall	6.07	0.84	-0.64	0.68	6.59	0.84	-1.12	2.17	43.23*	0.42	0.47	0.52

Note. N = 3,640, * p < .001, *Sk SE* = .04; *Kurt SE* = .08; ES_n = Effect size based on normalised scores.

Table 7.2 M*s,* SD*s and Pair-Wise Comparisons for T0, T1, T2, and T3 LEQ Factors*

	T0		T1		T2		T3		Pair-wise *t*-tests			
LEQ Factors	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	T0-1	T1-T2	T2-T3	T0-T3
Achievement Motivation	6.85	0.93	6.65	0.97	6.97	0.93	6.91	0.93	-7.00*	9.89*	-1.91	1.75
Active Initiative	6.68	1.10	6.60	1.09	6.98	1.02	6.93	1.11	-2.38	11.89*	-1.46	6.30*
Emotional Control	6.07	1.14	6.03	1.17	6.62	1.10	6.50	1.05	-1.26	14.28*	-3.29	10.18*
Intellectual Flexibility	6.60	0.93	6.49	0.92	6.90	0.90	6.78	0.91	-3.47*	13.34*	-3.69*	4.91*
Self Confidence	6.55	1.13	6.52	1.14	7.06	1.03	6.95	1.08	-0.92	14.81*	-3.06	9.39*
Social Competence	6.03	1.17	5.86	1.17	6.51	1.08	6.48	1.04	-4.91*	16.50*	-0.83	11.04*
Task Leadership	5.95	1.22	5.89	1.17	6.47	1.24	6.49	1.11	-1.90	13.41*	0.44	13.01*
Time Management	5.47	1.33	5.48	1.38	6.28	1.17	5.95	1.25	0.25	18.26*	-7.59*	10.04*
Overall	6.28	0.76	6.19	0.79	6.72	0.82	6.62	0.80	-4.17*	20.72*	-3.97*	12.43*

Note. N = 663, * p < .001

Table 7.3 *ES_ns and CIs for T0, T1, T2, and T3 LEQ Factors*

	T0-T1 ES_n			T1-T2 ES_n			T2-T3 ES_n			T0-T3 ES_n		
LEQ Factors	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.32	-0.22	-0.12	0.25	0.36	0.48	-0.19	-0.07	0.04	-0.05	0.07	0.20
Active Initiative	-0.18	-0.08	0.01	0.27	0.37	0.47	-0.14	-0.04	0.07	0.14	0.25	0.37
Emotional Control	-0.13	-0.03	0.06	0.44	0.56	0.69	-0.23	-0.13	-0.02	0.26	0.38	0.49
Intellectual Flexibility	-0.24	-0.13	-0.02	0.38	0.49	0.61	-0.26	-0.14	-0.02	0.08	0.21	0.34
Self Confidence	-0.12	-0.03	0.06	0.43	0.54	0.65	-0.22	-0.11	0.00	0.26	0.38	0.50
Social Competence	-0.24	-0.15	-0.06	0.50	0.61	0.72	-0.14	-0.04	0.07	0.28	0.40	0.52
Task Leadership	-0.14	-0.06	0.02	0.45	0.57	0.69	-0.12	-0.01	0.10	0.35	0.46	0.57
Time Management	-0.08	0.01	0.10	0.52	0.63	0.74	-0.37	-0.26	-0.15	0.24	0.36	0.48
Overall	-0.18	-0.09	0.01	0.41	0.52	0.63	-0.21	-0.10	0.01	0.20	0.31	0.43

Note. $N = 663$, * $p < .001$

Longitudinal Changes

Introduction

This section reports on analyses of prior, short-term, follow-up, and long-term effects for LEQ-H overall and the eight LEQ-H factors. Results are structured according to the hypotheses and research questions summarised in Table 7.4 and explained in Chapter 4.

Table 7.4 *Summary of Study 2 Longitudinal Change Hypotheses and Research Questions*

Number	Hypotheses and Research Questions
H 2.1.1	Prior effect declines in LEQ Overall scores (T0-T1).
RQ 2.1.2	Prior effect interaction with LEQ factor scores (T0-T1).
H 2.2.1	Short-term positive effects on LEQ Overall scores (T1-T2).
RQ 2.2.2	Short-term effect interaction with LEQ factor scores (T1-T2).
H 2.3.1	Follow-up effect declines in LEQ Overall scores (T2-T3).
RQ 2.3.2	Follow-up effect interaction with LEQ factor scores (T2-T3).
H 2.4.1	Long-term positive effects on LEQ Overall scores (T0-T3).
RQ 2.4.2	Long-term effect interaction with LEQ factor scores (T0-T3).

H 2.1.1 and RQ 2.1.2: Prior Effects

Overview. Hypothesis 2.1.1 was that there would be a small decline in LEQ Overall scores between T0 and T1. Research Question 2.1.2 inquired as to whether there would be an interaction between Time (T0 to T1) and the LEQ factor scores.

Results. Descriptive statistics are shown in Table 7.2 and ES_ns with 99.9% CIs and shown in Table 7.3. There was an ES_n of -0.09 between T0 and T1, indicating a small reduction in participants' LEQ Overall scores (see Table 7.3). There were negative ES_ns for seven out of the eight LEQ factors.

A 2 (Time) by 8 (LEQ factor) full-factorial RMMANOVA indicated a small, statistically significant drop in LEQ Overall scores between T0 and T1 (Wilk's λ = .974, F (1, 662) = 17.69, p < .000, η^2 = .00, η_p^2 = .03). There was also a small, significant interaction between Time and LEQ factor (Wilk's λ = .928, F (7, 656) = 7.22, p < .001, η^2 = .00, η_p^2 = .07), indicating that the drop in life effectiveness ratings was not equivalent for all the LEQ factors. Examination of the ES_ns and 99.9% CIs (see Table 7.3 and Figure 7.3) indicated that there were statistically

significant T0 to T1 reductions for three factors: Achievement Motivation (-0.22), Intellectual Flexibility (-0.13), and Social Competence (-0.15).

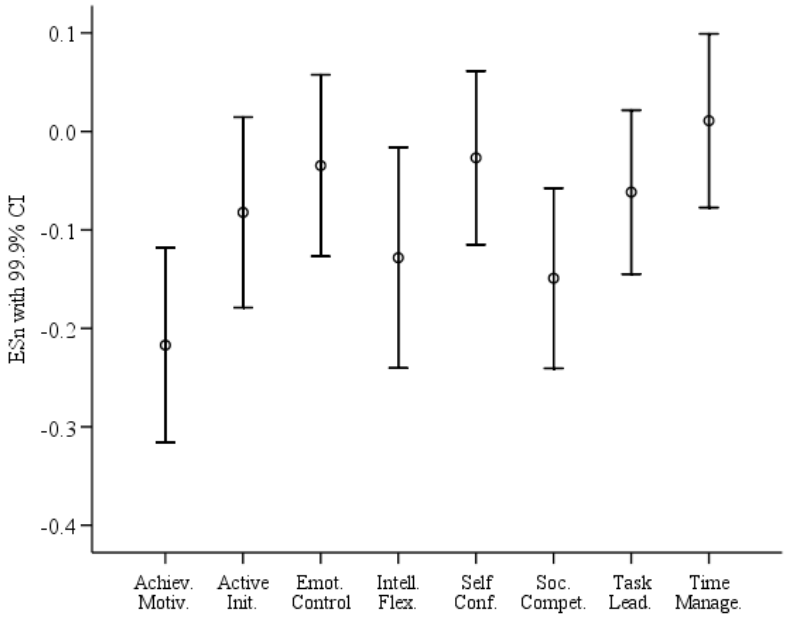


Figure 7.3 Error-bar graph of T0 to T1 LEQ Factor ES_ns and CIs ($N = 663$).

Conclusion. There was a small, statistically significant drop in LEQ Overall scores between Time (T0 to T1; $ES_n = -0.09$, $N = 663$), supporting Hypothesis 2.1.1. There were also small, significant interaction between Time and LEQ factor, with follow-up tests indicating significant drops for Achievement Motivation, Intellectual Flexibility, and Social Competence, addressing Research Question 2.1.2.

H 2.2.1 and RQ 2.2.2: Short-term Effects

Overview. Hypothesis 2.2.1 predicted that there would be positive short-term change in LEQ Overall scores (T1 to T2). Research Question 2.2.2 inquired as to whether there would be an interaction between Time (T1 to T2) and the LEQ factors.

Results. Descriptive statistics and ES_ns with 99.9% CIs for LEQ Overall and for each LEQ factor between T1 and T2 are presented in Table 7.1. A stem-and-leaf plot of ES_ns is shown in Figure 7.4, and an error-bar charter of ES_ns with CIs are shown in Figure 7.5. The ES_ns appear to be normally distributed, with an average LEQ factor $ES_{n\ of}$ 0.47 ($ES_{n.0005} = 0.42$; $ES_{n.9995} = 0.52$).

n	Stem	Leaf
44	=< -1.1	
9	-1.	0

```
 38      -0.  8899
 50      -0.  66677
109      -0.  4444445555
181      -0.  2222222223333333
307      -0.  00000000000000000111111111111
407       0.  000000000000000000001111111111111111111
525       0.  22222222222222222222233333333333333333333333333
502       0.  44444444444444444444444555555555555555555555
447       0.  66666666666666666666677777777777777777777
352       0.  88888888888888888999999999999999
256       1.  000000000000111111111111
163       1.  222222222233333
 96       1.  444445555
 75       1.  6666777
 39       1.  889
 40    >= 2.0
```

Figure 7.4 Stem-and-leaf plot of LEQ Overall T1 to T2 ES_ns.

Note. N = 3,640; each leaf represents 11 cases.

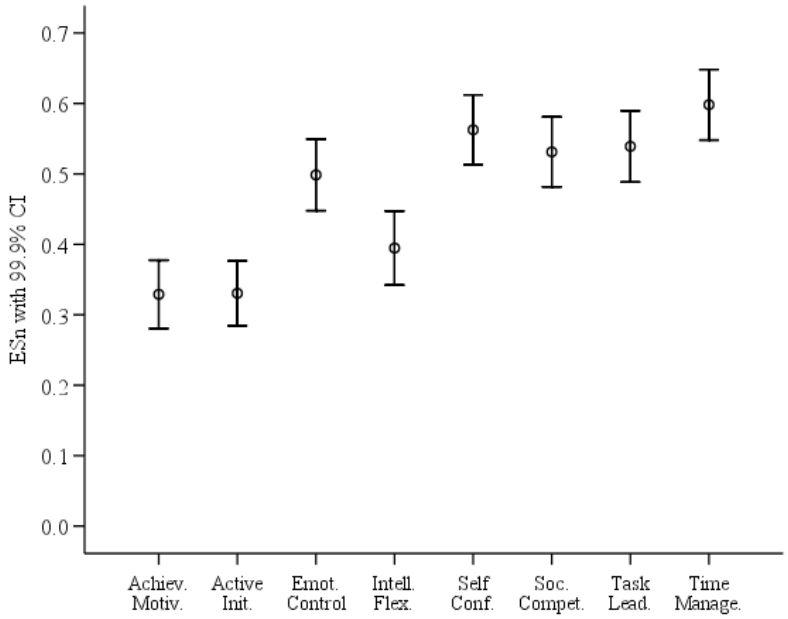


Figure 7.5 Error-bar graphs of T1 to T2 LEQ Factor ES_ns and CIs (N = 3,640).

To help address Hypothesis 2.2.1, a full-factorial 2 (T1 to T2) by 8 (LEQ factor) within-subjects MANOVA was conducted (N = 3,640). The multivariate effect of Time was significant (Wilk's $\lambda = .660$, F (1, 3639) = 1871.42, $p < .001$, $\eta^2 = .07$, $\eta_p^2 = .34$), indicating a small-moderate positive change in participants' overall ratings of their life effectiveness. The Time by LEQ factor effect was small and significant (Wilk's $\lambda = .797$, F (7, 3633) = 132.58, $p < .001$, $\eta^2 = .01$, $\eta_p^2 = .20$),

indicating that the size of changes over Time (T1 to T2) varied between at least some LEQ factors. Follow-up pair-wise *t*-tests indicated significant differences in the amount of change for each LEQ factor (see Table 7.1).

Based on the CIs, there were two distinct ES_n "bands". Band 1 consisted of moderately strong positive ES_ns for five factors with overlapping 99.9% CIs for Emotional Control (0.50), Self Confidence (0.56), Social Competence (0.53), Task Leadership (0.54), and Time Management (0.60). Band 2 consisted of small-moderate positive ES_ns for three factors with overlapping CIs for Achievement Motivation (0.33), Active Initiative (0.33), and Intellectual Flexibility (0.39). The ES_n CIs of factors in Band 1 ($ES_n = 0.55$) did not overlap with the ES_n CIs of the Band 2 factors ($ES_n = 0.35$), indicating that there were significantly different amounts of positive change for these two sets of factors.

T1 to T2 changes were also conducted with the T0, T1, T2, and T3 smaller listwise sample ($N = 663$) to help determine whether this sample was representative of the larger sample. Descriptive statistics are presented in Table 7.2, ES_ns with 99.9% CIs are presented in Table 7.3, a stem-and-leaf plot of ES_ns is shown in Figure 7.8, and an error-bar chart of ES_ns with CIs is shown in Figure 7.9. The average LEQ ES_n was similar to, but slightly larger (0.50) than, the larger sample (0.47). This was not a significant difference (based on overlapping 99.9% CIs). The T1 to T2 ES_ns for the LEQ factors for the smaller sample revealed a similar pattern to the T1 to T2 ES_ns for the larger sample. Overlapping 99.9% CIs for the ES_ns for T1 to T2 changes for most of the factors in the smaller sample did not, however, make clear distinction between the size of change for the factors (see Figure 7.6 and Table 7.3). Nevertheless, a similar trend was evident, with stronger positive effects evident for five Band 1 factors, moderately positive but lower effects for two Band 2 factors, but with the ES_n for Intellectual Flexibility sitting in-between Band 1 and Band 2.

Interpretations of change. This section provides alternative interpretations of statistical change. T1 to T2 ES_ns were converted to *r*, r^2, and U (see Table 7.5 and Table 7.6). The r^2 results indicated that Time (T1 to T2) accounted for 7.3% of the variance in Band 1 LEQ factor score changes and 2.9% of variance in Band 2 factor score changes. According to U (based on the properties of the normal distribution; see Table 7.5 and Table 7.6), it was estimated that 70.9% of participants had higher

Band 1 LEQ factor scores at T2 compared to T1 and that 63.7% of participants had higher Band 2 LEQ factors at T2 compared to T1.

Percentage of change was also calculated based on primary data. This produced higher estimates of the percentage of participants with positive changes than those based on ES_ns and U (81.5% of participants reported mean increases for Band 1 factors and 70.4% reported mean increases for Band 2 factors; see Table 7.6).

Table 7.5 *ES_ns,* r*, and* r^2 *for Band 1 and Band 2 LEQ Factors (T1 to T2)*

LEQ Factor	ES_n	U	*r*	r^2
Band 1: EC, SC, SO, TL, TM	0.55	70.9	.27	.073
Band 2: AM, AI, IF	0.35	63.7	.17	.029
LEQ Overall	0.47	68.1	.23	.053

Table 7.6 *Breakdown of Participants Who Reported Negative Change, No Change, and Positive Change for Band 1 and 2 LEQ Factors Between T1 and T2*

LEQ Factor	*n*	%	U
Band 1			
Negative change	662	18.2	29.1
No change	10	0.3	-
Positive change	2,968	81.5	70.9
Band 2			
Negative change	1,005	27.6	36.3
No change	73	2.0	-
Positive change	2,562	70.4	63.7
Total			
Negative change	738	20.3	31.9
No change	6	0.2	-
Positive change	2,896	79.9	68.1

Note. % is based on primary data (score 2 / score 1); U is based on areas under the normal curve, using ES_n as a *z* score; $N = 3{,}640$.

T1 to T2 primary data in this study indicated that:

1. 77.2% of participants reported positive overall short-term change,
   0.6% reported no short-term change, and
   18.8% reported negative change;
2. ~ 4 times as many participants reported positive overall short-term change for Band 1 outcomes (81.5%) than negative or no overall change for Band 1 outcomes (18.5%), and
3. ~ 2.33 as many participants reported positive overall short-term change for Band 2 outcomes (70.4%), than negative or no overall change for Band 2 outcomes (29.6%).

For a prototypical group of 15 participants:

7. ~ 3 reported negative overall short-term change,
   ~ 1 reported no overall change, and
   ~ 11 reported positive overall change;

8. ~ 1 reported negative overall short-term change of greater than 10%, and
   ~ 6 reported positive change of greater than 10% (see Table 7.7).

In addition, participants were:

9. ~ 11 times more likely to have a positive overall short-term change of greater than 20% than a negative change of greater than 20%, and

10. ~ 15 times more likely to have a positive overall short-term change of greater than 30% than a negative change of greater than 30%.

Other similar kinds of ratio statements can be derived from the stem-and-leaf plot of T1 to T2 ES_ns (see Figure 7.4).

Conclusion. There was moderately positive, statistically significant, short-term change in LEQ Overall scores ($ES_n = 0.47$, $N = 3{,}640$). Overall, participants were more than four times as likely to report positive changes in life effectiveness than they were to report negative changes between the first and last day of outdoor education programs. Thus, Hypothesis 2.2.1 was supported.

There were also statistically significant, small to moderate, positive short-term changes for all eight LEQ factors, with outcomes varying significantly by LEQ factor. There were moderately strong positive ES_ns for Band 1 factors (Emotional Control (0.50), Self Confidence (0.56), Social Competence (0.53), Task Leadership (0.54), and Time Management (0.60)), and small-moderate positive ES_ns for Band 2 factors (Achievement Motivation (0.33), Active Initiative (0.33), and Intellectual Flexibility (0.39),) addressing Research Question 2.2.2. T1 to T2 results for the smaller sample ($N = 663$) were very similar to findings based on the larger sample, indicating that analyses of the small sample (T0 to T1, T2 to T3, and T0 and T3) may be generalisable to the larger sample.

Table 7.7 *Breakdown of Participants With Deciles of Short-term Change (T1 to T2) Based on Primary Data*

Δ%	*F*	%	Cum. %	Rev. Cum. %	f_{15}

< -30	16	0.4	0.4	100.0	0.1
-21 to -30	31	0.9	1.3	99.6	0.1
-11 to -20	113	3.1	3.1	98.7	0.5
-1 to -10	524	14.4	18.8	95.6	2.2
0	147	4.0	22.8	81.2	0.6
1 to 10	1,391	38.2	61.0	77.2	5.7
11 to 20	897	24.6	85.6	39.0	3.7
21 to 30	297	8.2	93.8	14.4	1.2
> 30	224	6.2	100.0	6.2	0.9
Total	3,640	100.0	100.0	100.0	15.0

Note. % is based on primary data (score 2 / score 1); f_{15} = a prototypical group of 15 participants.

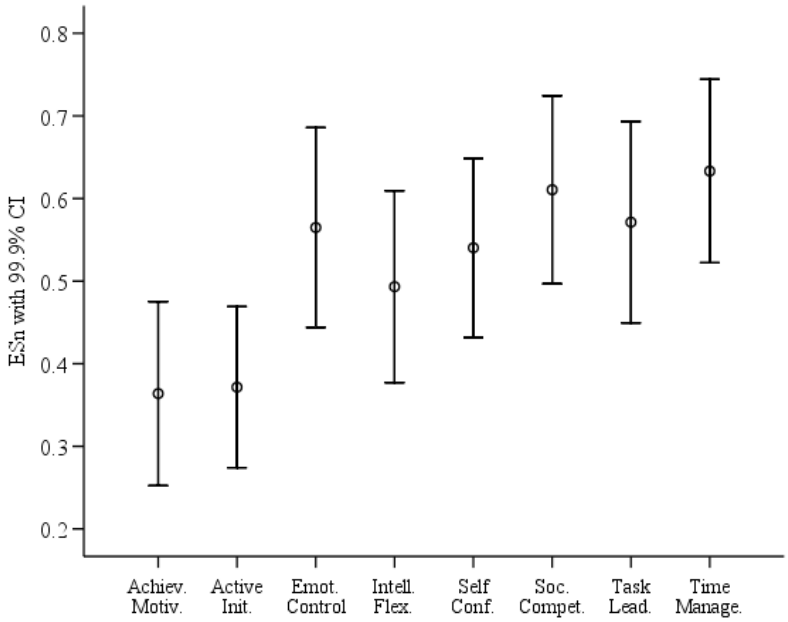


Figure 7.6 Error-bar graph of T1 to T2 LEQ Factor ES_ns with CIs (N = 663).

H 2.3.1 and RQ 2.3.2: Follow-up Effects

Overview. Hypothesis 2.3.1 was that there would be a decrease in LEQ Overall between T2 and T3. Research Question 2.3.2 inquired as to whether there would be an interaction between Time (T2 to T3) and the LEQ factors.

Results. Descriptive statistics are shown in Table 7.2 and ES_ns with 99.9% CIs and shown in Table 7.3. There was an ES_n of -0.10 between T2 and T3, indicating a small reduction in participants' LEQ Overall scores. There were negative ES_ns for all eight LEQ factors.

A 2 (Time) by 8 (LEQ factor) full-factorial RMMANOVA indicated a statistically significant drop in LEQ Overall scores between T2 and T3 (Wilk's λ = .977, F (1, 662) = 15.89, p < .001, η^2 = .00, η_p^2 = .02), a small effect. There was also

a significant interaction between Time and LEQ factor (Wilk's $\lambda = .904$, F (7, 656) = 9.98, $p < .001$, $\eta^2 = .00$, $\eta_p^2 = .10$), a small effect, showing that the drop in life effectiveness ratings was not equivalent for all the LEQ factors.

There were statistically drops between T2 and T3 for three factors (based on ES_n and 99.9% CIs; see Table 7.3 and Figure 7.3): Intellectual Flexibility (-0.14), Self Confidence (-0.11), Time Management (-0.26). Closer examination of the ES_n and 99.9% CIs in Figure 7.7, however, suggests a slightly different interpretation, with similar ES_ns and overlapping CIs for seven factors ($ES_n \sim -0.10$), and a noticeably more negative T1 to T2 effect size for Time Management ($ES_n = -0.26$).

Conclusion. There was a small, statistically significant drop in LEQ Overall between T2 and T3 ($ES_n = -0.10$, $N = 663$), supporting Hypothesis 2.3.1. There was also a significant interaction between Time (T2 to T3) and LEQ factor, with follow-up tests indicating small significant drops for Intellectual Flexibility, Self Confidence, and particularly for Time Management.

H 2.4.1 and RQ 2.4.2: Long-term Effects

Overview. Hypothesis 2.4.1 was that there would be positive long-term change in LEQ Overall scores (T0 to T3). Research Question 2.4.2 inquired as to whether there would be an interaction between Time (T0 to T3) and the LEQ factors.

Results. Descriptive statistics are shown in Table 7.2 and ES_ns with 99.9% CIs in Table 7.3. There was an ES_n of 0.31 between T0 and T3, indicating a small to moderate long-term increase in participants' LEQ Overall scores. This was not significantly lower than the T1 to T2 ES_n of 0.52 (based on the overlapping 99.9% CIs; see Table 7.3; $N = 663$).

A 2 (Time) by 8 (LEQ factor) full-factorial RMMANOVA indicated a small to moderate statistically significant increase in LEQ Overall scores between T0 and T3 (Wilk's $\lambda = .811$, F (1, 662) = 154.33, $p < .001$, $\eta^2 = .03$, $\eta_p^2 = .19$). There was also a significant interaction between Time and LEQ factor (Wilk's $\lambda = .756$, F (7, 656) = 30.20, $p < .001$, $\eta^2 = .01$, $\eta_p^2 = .24$), indicating that increases in LEQ scores between T0 and T3 were not equivalent for all LEQ factors to a small to moderate extent.

There were positive ES_ns for all eight LEQ factors, but only seven were statistically significant increases (based on ES_ns and 99.9% CIs; see Table 7.3 and Figure 7.9). The seven significant increases ranged between ES_ns of 0.21 and 0.46. Long-term change for Achievement Motivation (0.07) was not statistically significant. The ES_ns and CIs suggested a similar pattern of outcomes to the T1 to T2 results in that there were moderately strong Band 1 outcomes for Emotional Control, Self Confidence, Social Competence, Task Leadership, and Time Management, with small to moderate Band 2 outcomes for Achievement Motivation, Active Initiative, and Intellectual Flexibility. However, the CIs were mostly overlapping, so it was less possible to clearly separate distinct outcome bands for the T0 to T3 LEQ outcomes.

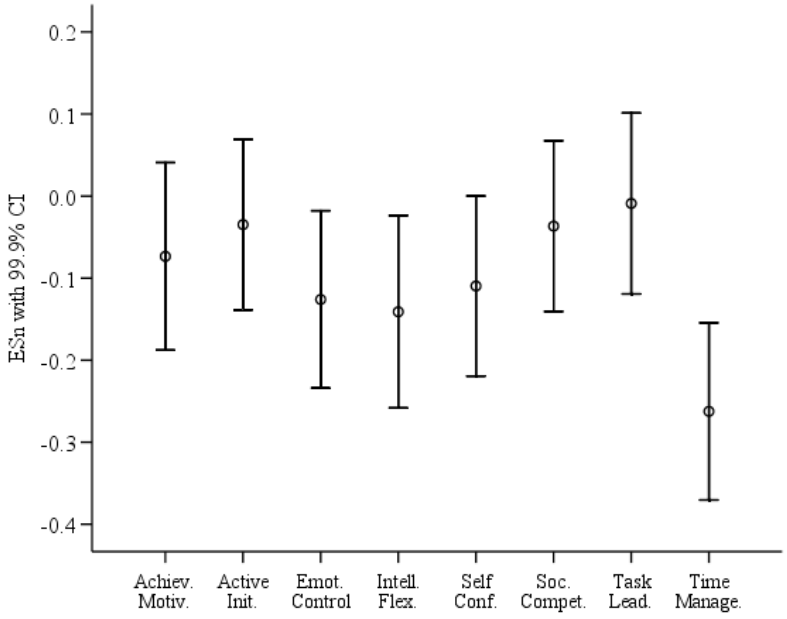


Figure 7.7 Error-bar graph of T2 to T3 LEQ Factor ES_ns with CIs (N = 663).

Interpretations of change. T0 to T3 ES_ns were converted to r, r^2, and U (see Figure 7.8 and Table 7.9). The r^2 results indicated that Time (T0 to T3) accounted for 3.8% of the variance in Band 1 LEQ factor score changes and 0.8% of variance in Band 2 factor score changes, approximately half the size of T1 to T2 effects. According to U (see Table 7.8 and Table 7.9), it was estimated that 65.5% of participants had higher Band 1 LEQ factor scores at T3 compared to T0 and that 57.1% of participants had higher Band 2 LEQ factors at T3 compared to T0. This was slightly lower than for T2 to T1 (70.9% and 63.7% respectively).

Percentage of change was also calculated using primary data. This produced higher estimates of the percentage of participants with positive changes than those based on ES_ns and U (72.9% of participants reported mean increases for Band 1 factors and 59.3% reported mean increases for Band 2 factors; see Table 7.9).

n	Stem	Leaf
4	=< -1.8	
6	-1.	56
18	-1.	0123&
63	-0.	55566667778899
96	-0.	000001111112222223334444
155	0.	00000000011111122222233333333344444444
152	0.	55555556666666667777777778888899999999
92	1.	000001111112222333444
54	1.	5555566778899
16	2.	011&
5	2.	5&
2	>= 2.8	

Figure 7.8 Stem-and-leaf plot of LEQ Overall T0 to T3 ES_ns (*N* = 663; each leaf represents 4 cases; & denotes fractional leaves).

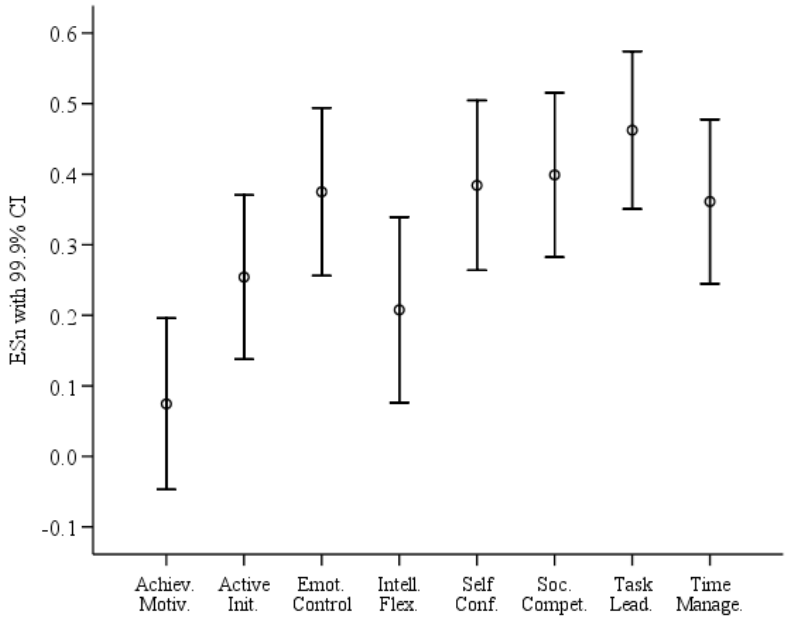


Figure 7.9 Error-bar graph of T0 to T3 LEQ Factor ES_ns with CIs (*N* = 663).

Table 7.8 *ES_ns,* r*, and* r^2 *for Band 1 and 2 LEQ Factors (T0 to T3)*

LEQ Factor	ES_n	U	*r*	r^2
Band 1: EC, SC, SO, TL, TM	0.40	65.5	.20	.038
Band 2: AM, AI, IF	0.18	57.1	.09	.008
LEQ Overall	0.31	62.2	.15	.023

T0 to T3 primary data in this study indicated that:

1. 71.8% of participants reported positive overall long-term change,
   2.7% reported no long-term change, and
   28.2% reported negative change,
   which also indicated that long-term change was ~ half to two-thirds the size of short-term change.

2. ~ 2.5 times as many participants reported positive overall long-term change for Band 1 outcomes (72.9%) than negative or no overall change for Band 1 outcomes (27.1%), and
   ~ 1.33 times as many participants reported positive overall long-term change for Band 2 outcomes (57.1%) than negative or no overall change for Band 2 outcomes (42.9%).

For a prototypical group of 15 participants:

1. ~ 4 reported negative overall long-term change,
   ~ 1 reported no overall change, and
   ~ 10 reported positive overall change.

2. ~ 1 reported negative overall long-term change of greater than 10%, and
   ~ 5 reported positive change of greater than 10% (see Table 7.10).

In addition, participants were:

1. ~ 5 times more likely to have a positive overall long-term change of greater than 20% than a negative change of greater than 20%, and

2. ~ 4 times more likely to have a positive overall long-term change of greater than 30% than a negative change of greater than 30%.

Other ratio statements can be derived from the T0 to T3 ES_n stem-and-leaf plot (see Figure 7.8).

Conclusion. There were small to moderate, statistically significant, positive long-term changes in LEQ Overall scores ($ES_n = 0.31$, $N = 633$). Participants were approximately two and a half times more likely to report positive long-term changes than negative changes. Thus, Hypothesis 2.4.1 was supported. Long-term change was approximately half to two-thirds of the size of short-term change.

There were statistically significant, small to moderate, positive changes for seven out of the eight LEQ factors (not Achievement Motivation), with outcomes varying significantly by LEQ factor. T0 to T3 LEQ factor score ES_ns had overlapping CIs, but generally followed the pattern of moderately-strong long-term Band 1 changes, and small positive Band 2 changes.

Table 7.9 *Breakdown of Participants Who Reported Negative Change, No Change, and Positive Change for Band 1 and 2 LEQ Factors Between T0 and T3 (*N = *663)*

LEQ Factor	*n*	%	U
Band 1			
Negative change	176	26.5	34.5
No change	4	0.6	-
Positive change	483	72.9	65.5
Band 2			
Negative change	259	39.1	42.9
No change	11	1.7	-
Positive change	393	59.3	57.1
Total			
Negative change	187	28.2	37.8
No change	18	2.7	-
Positive change	458	71.8	62.2

Note. % is based on primary data (score 2 / score 1); U reflects estimated areas under the normal curve, using ES_n as a *z* score.

Summary

This section reported on analyses of longitudinal changes in LEQ Overall and the eight LEQ factors ($N = 3{,}640$ for T1 to T2; $N = 663$ for T0, T1, T2, and T3), addressing Hypothesis 2.1.1 through to Research Question 2.4.2. There were statistically significant, positive short-term and long-term changes for LEQ Overall and for each of the eight factors (with the exception of long-term change for Achievement Motivation). Participants were four times as likely to report positive short-term life effectiveness changes, and two and half times as likely to report positive long-term changes, than they were to report negative changes.

LEQ Overall scores dropped slightly between T0 and T1 (ES_n = -0.09), increased moderately between T1 to T2 (ES_n = 0.52), and dropped slightly between T2 to T3 (ES_n = -0.10; see Figure 7.1). Overall, change between T0 and T3 was small-moderate (ES_ns = 0.31) and about half to two-thirds the size of the short-term ES_n for the same sample (0.52; see Table 7.3). Thus, positive short-term changes were *partially sustained* in the longer-term. It should be noted that these positive long-term findings only applied to Young Adult programs.

For all time contrasts (i.e., for T0 to T1, T1 to T2, T2 to T3, and T0 to T3), there were significant interactions between Time and LEQ factor, indicating different patterns of change for at least some of the LEQ factors. These interaction effects tended to be small. Overall, there were moderately strong short- (T1 to T2) and long-term (T0 to T3) changes for Time Management, Social Competence, Task Leadership, Emotional Control, and Self Confidence, and small positive changes for Achievement Motivation, Active Initiative, and Intellectual Flexibility.

Table 7.10 *Breakdown of Participants By Deciles of T0 to T3 Long-Term Change, Based on Primary Data*

Δ%	*F*	%	Cum. %	Rev. Cum. %	f_{15}
< -30	5	0.8	0.8	100.0	0.1
-21 to -30	9	1.4	2.1	97.9	0.2
-11 to -20	31	4.7	6.8	91.1	0.7
-1 to -10	142	21.4	28.2	96.8	3.2
0	28	4.2	32.4	89.1	0.6
1 to 10	241	36.3	68.8	68.8	5.4
11 to 20	135	20.4	89.1	32.4	3.1
21 to 30	51	7.7	96.8	28.2	1.2
> 30	21	3.2	100.0	6.8	0.5
Total	663	100.0	100.0	100.0	15.0

Note. % is based on primary data (score 2 / score 1); f_{15} = prototypical group of 15 participants.

The Influence of Six Independent Variables

Introduction

This section examines the role of six naturally-occurring independent variables (Program Type, Program Length, Group Gender, Group Size, Participant Gender, and Participant Age) in predicting short- and long-term changes in life effectiveness. Results are structured according to the hypotheses and research questions summarised in Table 7.11and explained in Chapter 4. A summary of the significant effects is provided in Table 7.33.

Table 7.11 *Summary of Study 2 Independent Variable Hypotheses and Research Questions*

Number	Hypotheses and Research Questions
H 2.5.1	Short- and long-term positive effects of the intervention for different program types on LEQ Overall scores (T1-T2 and T0-T3).
RQ 2.5.2	Short- and long-term effect interactions with LEQ factor scores for different program types (T1-T2 and T0-T3).
H 2.5.3	Larger short- and long-term positive effects for young adult programs vs. other program types on LEQ Overall scores (T1-T2 and T0- T3).
RQ 2.5.4	Short- and long-term effect interactions with LEQ factor scores for young adult programs vs. other programs (T1-T2 and T0-T3).
H 2.5.5	Larger short- and long-term positive effects for OBA young adult programs vs. other young adult programs on LEQ Overall scores (T1-T2 and T0-T3).
RQ 2.5.6	Short- and long-term effect interactions with LEQ factor scores for OBA young adult programs vs. other young adult programs (T1-T2 and T0-T3).
H 2.6.1	Positive relation between program length and short-term changes in LEQ Overall scores (T1-T2).
RQ 2.6.2	Interaction between program length and short-term effects for LEQ factors (T1-T2).
H 2.7.1	Larger short-term positive effects for single-gender groups on LEQ Overall scores (T1-T2).
RQ 2.7.2	Interaction between group gender composition (single-gender vs. mixed) and short- and long-term effects for LEQ factor scores (T1-T2).
H 2.7.3	No difference in short-term effects for all-male vs. all-female groups on LEQ Overall scores (T1-T2).
RQ 2.7.4	Interaction between single-gender group composition (all-male vs. all-female) and LEQ factor scores (T1-T2).
RQ 2.8.1	Short- and long-term effects of group size on LEQ Overall scores (T1-T2 and T0-T3).
RQ 2.8.2	Interaction between group size and LEQ factor scores (T1-T2 and T0-T3).
H 2.9.1	Short- and long-term effects of participant gender on LEQ Overall scores (T1-T2 and T0-T3).
RQ 2.9.2	Interaction between participant gender and LEQ factor scores (T1-T2 and T0-T3).
RQ 2.10.1	Short- and long-term effects of participant age on LEQ Overall scores (T1-T2 and T0-T3).
RQ 2.10.2	Interaction between participant gender and LEQ factor scores (T1-T2 and T0-T3).

H / RQs 2.5.1 to 2.5.6: Program Type Effects

Overview. Hypotheses and Research Questions 2.1.1 to 2.5.6 investigated the effect of Program Type on short- (T1 to T2) and long-term (T0 to T3) changes in

LEQ Overall (H 2.5.1, H 2.5.3, and H 2.5.5) and in each of the eight LEQ factor scores (RQ 2.5.2, RQ, 2.5.4, and RQ 2.5.6). For the first two analyses (H 2.5.1 and RQ 2.5.2), Program Type was coded categorically (Adolescent, Young Adult, Adult, Family, Corporate, and Special). For the next two analyses (H 2.5.3 and RQ 2.5.4), Program Type was dummy coded as Young Adult compared to other program types. For the last two analyses (H 2.5.5 and RQ 2.5.6), Program Type was dummy coded as Young Adult OBA programs compared to Young Adult non-OBA programs.

Results. To help address Hypothesis 2.5.1 (that each Program Type would have positive T1 to T2 changes in LEQ Overall scores), descriptive statistics are shown in Table 7.12 and Table 7.13, and error-bar graphs of ES_ns with CIs for T1 to T2 LEQ Overall and factor scores by Program Type are shown in Figure 7.10 and Figure 7.11. LEQ ES_ns for the six Program Types were all positive, ranging between 0.32 (Adolescent) and 0.56 (Young Adult; see Table 7.13). 99.9% CIs indicated that LEQ Overall ES_ns for each Program Type were significantly different to 0. Significant, positive short-term changes were also evident for each Program Type for each LEQ factor (48 outcomes), except for Achievement Motivation (Family) and Intellectual Flexibility (Special).

To help address Research Question 2.5.2, (interactions between Time and LEQ factors for each Program Type), six Time (T1 to T2) by LEQ factor (8) RMMANOVAs were conducted (one for each Program Type; see Table 7.11). These analyses indicated significant, small-moderate Time by LEQ factor interactions for each of the six main Program Types (η_p^2 from .132 to .307). T1 to T2 ES_ns and 99.9% CIs indicated that LEQ factor outcomes for Young Adult programs could be separated into two bands (as was the case for the overall results), with moderate changes for Band 1 (Emotional Control, Self Confidence, Social Competence, Task Leadership, and Time Management) and small-moderate changes for Band 2 (Achievement Motivation, Active Initiative, and Intellectual Flexibility). For the other five Program Types, the 99.9% CIs of the LEQ factor ES_ns were mostly overlapping.

To help address Hypothesis 2.5.3 and Research Question 2.5.4 about differences in outcomes for Young Adult programs compared to other program types, descriptive statistics are shown in Table 7.12 and Table 7.13, and error-bar graphs of ES_ns with CIs for T1 to T2 LEQ Overall scores and LEQ factor scores by

Program Type are shown in Figure 7.10 and Figure 7.11. The Young Adult program T1 to T2 change in LEQ Overall ES_n (0.56) was significantly ($p < .001$) larger than for Adolescent ($ES_n = 0.32$), Adult ($ES_n = 0.40$), and Corporate ($ES_n = 0.39$) programs. However, Young Adult program short-term outcomes were not significantly greater than Family ($ES_n = 0.40$) and Special ($ES_n = 0.55$) programs in part due to the relatively small sample sizes for these two program types, and thus wider 99.9% CIs for the ES_n estimates. Thus, Hypothesis 2.5.3, that Young Adult programs would have larger short-term changes than other program types was partially supported.

To help address Research Question 2.5.4 (whether there would be Time (T1 to T2) by LEQ factor interactions for each Program Type), ES_ns, and 99.9% CIs were examined (see Table 7.12, Table 7.13, and Figure 7.11). Significant differences between LEQ factor ES_ns were evident for Young Adult programs, but not for other program types. The relatively large sample size for Young Adult programs (n = 1,932) contributed to its outcomes having narrower CIs and thus greater power to detect differences between the ES_ns for different LEQ factors. Young Adult program LEQ factor T1 to T2 ES_ns fitted the overall trend described earlier, with outcomes falling into two bands except that Emotional Control had overlapping 99.9% CIs with some factors from both bands (see Figure 7.11). The T1 to T2 LEQ factor ES_ns within each of the five other Program Types had overlapping 99.9% CIs with the exception that, for Adult programs, Achievement Motivation had a significantly lower ES_n than Emotional Control and Self Confidence.

To help address Hypothesis 2.5.5 (that the short-term effects of Young Adult OBA would be larger than for Young Adult non-OBA programs), descriptive statistics in Table 7.15 and ES_ns and 99.9% CIs in Table 7.16 were examined. Short-term changes in LEQ Overall were strong for Young Adult OBA programs (ES_n = 0.63, n = 1,432), and small-moderate for Young Adult non-OBA programs (ES_n = 0.38, n = 500). According to the ES_n CIs for LEQ Overall, both Program Types had significantly greater than 0 effects, and these ES_ns were significantly different to one another (i.e., Young OBA programs had significantly larger effects than Young Adult non-OBA programs). These results were supported by a significant MDMANOVA interaction between Time and Program Type (Young Adult OBA

versus non-OBA) (Wilk's $\lambda = .968$, $F\ (1, 1930) = 62.87$, $p = < .001$, $\eta^2 = .01$, $\eta_p^2 = .03$).

To help address Research Question 2.5.6 (whether there would be an interaction between Time (T1 to T2), LEQ factor, and Young Adult OBA vs. Young Adult non-OBA programs), a full-factorial MDMANOVA was conducted. There was a small, significant interaction between Time, Program Type (Young Adult OBA vs. non-OBA), and LEQ factor (Wilk's $\lambda = .976$, $F\ (7, 1924) = 6.87$, $p < .001$, $\eta^2 = .00$, $\eta_p^2 = .02$). The main cause of the small interaction effect was that Young Adult OBA programs had relatively stronger short-term effects on Self Confidence and Time Management (see Table 7.16) compared to Young Adult non-OBA programs.

To help address H 2.5.1, RQ 2.5.2, and H 2.5.3 (long-term effects for all program types and larger long-term effects for Young Adult programs compared to other program types), T0 to T3 descriptive statistics are presented in Table 7.17, and ES_ns and 99.9% CIs are presented in Table 7.18[62]. Long-term changes in LEQ Overall scores for Young Adult programs ($ES_n = 0.48$) and Corporate programs ($ES_n = 0.09$) were significantly greater than 0 according to the 99.9% CIs. These ES_ns did not differ significantly from each other[63]. However, these results only partially supported Hypothesis 2.5.1 (that each program type would have positive long-term effects) because Young Adult program long-term outcomes for LEQ Overall and each of the eight LEQ factors were significant and positive, but Corporate programs did not have significant long-term positive outcomes for LEQ Overall or any of the LEQ factors[64].

Addressing Research Question 2.5.4 (interaction between LEQ factor, Young Adult vs. other program types, and Time (T0 to T3)), there was a small, non-significant interaction between Time (T0 to T3), Program Type (Young Adult and

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[62] T0 to T3 data were available for Young Adult ($n = 609$), Corporate ($n = 45$), Special ($n =- 8$), and Adult ($n = 1$) programs. Due to low *n*s, only Young Adult and Corporate program data were analysed.
[63] There was no significant difference based on 99.9% CIs and a non-significant MDMANOVA interaction between Time (T0 to T3) and Program Type. A 2 (T0 to T3) by 8 (LEQ factor) by 2 (Program Type) full-factorial MDMANOVA indicated a small, non-significant interaction between Time and Program Type (Wilk's $\lambda = .986$, $F\ (1, 652) = 9.25$, $p = .002 > .001$, $\eta = .00$, $\eta_p^2 = .01$).
[64] MDMANOVA results did not indicate that Young Adult program long-term outcomes were significantly greater than for other Program Types (in this case Corporate), although ES_ns indicated a notable difference (0.48 compared to 0.09), as did the fact that Young Adults ES_ns were significantly different to 0 and that Corporate program ES_ns were not significantly different to 0.

Corporate), and LEQ factor (Wilk's $\lambda = .980$, F (7, 646) = 1.84, $p = .020 > .001$, $\eta_p = .00$, $\eta_p^2 = .02$. The main cause of the small interaction effect was that Young Adult and Corporate programs achieved similar long-term ES_ns for Time Management (0.35), but for all other LEQ factors Young Adult long-term ES_ns were larger.

To help address Hypothesis 2.5.5 and Research Question 2.5.6 (comparing the long-term effects of Young Adult OBA and non-OBA programs), descriptive statistics are presented in Table 7.19, and ES_ns and 99.9% CIs are presented in Table 7.20. Long-term changes in LEQ Overall were moderately positive for both OBA Young Adult programs ($ES_n = 0.47$, $n = 359$) and non-OBA Young Adult programs ($ES_n = 0.48$, $n = 250$). According to the ES_n CIs for LEQ Overall, both Program Types had significantly greater than zero long-term effects, with the 99.9% CIs for these two Program Types overlapping. These results were supported by a non-significant interaction between Time and OBA/ non-OBA Young Program MDMANOVA (Wilk's $\lambda = 1.000$, F (1, 607) = 0.25, $p => .001$, $\eta^2 = .00$, $\eta_p^2 = .00$).

Addressing Research Question 2.5.6 (interaction between LEQ factor, OBA Young Adult vs. non-OBA Young Adult program types, and Time (T0 to T3)), there was a small, non-significant interaction between Time, Program Type (Young Adult OBA vs. non-OBA), and LEQ factor (Wilk's $\lambda = .981$, F (7, 601) = 1.69, $p = > .001$, $\eta^2 = .00$, $\eta_p^2 = .02$). The main cause of the small interaction effect was that OBA Young Adult programs had a slightly stronger long-term effect on Achievement Motivation, whereas non-OBA Young Adult programs had a slightly stronger long-term effect on Time Management (see Table 7.20).

Conclusion. Hypothesis 2.5.1 (positive effects for all program types for overall outcomes) was supported for short-term outcomes (T1 to T2) and partially supported for long-term outcomes (T0 to T3). For short-term outcomes, each Program Type exhibited significant, positive, short-term changes in LEQ Overall, with 46 out of 48 possible LEQ factor effects being statistically significant[65]. Short-term ES_ns for the six main program types ranged between 0.32 (Adolescent) and 0.56 (Young Adult). Long-term data were only available for Corporate (0.09) and Young

[65] AM (Family) and IF (Special) were the two factors for which were not significant short-term effects.

Adult (0.48) programs, with statistically significant, positive results for Young Adult program, but not Corporate programs.

Addressing RQ 2.5.2, there were small, significant interactions between Time (T1 to T2) and LEQ factors for each of the six Program Types. However, follow-up testing only identified a significant Time (T1 to T2) by LEQ factor interaction for Young Adult programs. Young Adult program LEQ factor outcomes could be separated into Band 1 (moderate) and Band 2 (small-moderate). For the other five Program Types, the LEQ factor ES_ns had overlapping CIs.

Hypothesis 2.5.3 was partially supported. Young Adult program ES_ns were larger in the short- and long-term than outcomes for other Program Types, but differences were only statistically significant when comparing short-term Young Adult program outcomes with Adolescent, Adult and, Corporate programs, and were not were not significantly more effective than Family and Special programs. Young Adult program long-term outcomes were not significantly greater than long-term Corporate outcomes, although there was a considerable difference in the LEQ Overall ES_ns.

H 2.5.5 and H 2.5.6 were partially supported. Young Adult OBA short-term outcomes were stronger than for Young Adult non-OBA programs, particularly for Self Confidence and Time Management, but there was no difference in long-term outcomes.

Table 7.12 M*s and* SD*s for T1 and T2 LEQ Factor Scores by Program Type*

		Adolescent		Young Adult		Adult		Family		Corporate		Special	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	1	6.54	1.12	6.48	1.02	6.56	0.89	6.86	0.76	6.77	0.81	6.31	1.27
	2	6.76	1.05	6.86	0.95	6.74	0.88	7.00	0.76	7.01	0.77	6.84	1.14
Active Initiative	1	6.40	1.36	6.44	1.20	6.22	1.12	6.40	1.24	6.59	1.02	6.18	1.61
	2	6.61	1.32	6.89	1.07	6.61	1.11	6.82	1.08	6.87	0.93	6.71	1.34
Emotional Control	1	5.81	1.43	5.96	1.23	5.71	1.12	5.79	1.20	6.18	1.09	5.37	1.61
	2	6.16	1.41	6.61	1.13	6.29	1.08	6.40	1.20	6.66	1.01	6.06	1.67
Intellectual Flexibility	1	6.29	1.08	6.40	0.97	6.38	0.88	6.41	0.75	6.51	0.89	6.19	1.31
	2	6.47	1.13	6.82	0.93	6.71	0.84	6.67	0.91	6.86	0.87	6.48	1.22
Self Confidence	1	6.38	1.26	6.39	1.20	6.13	1.21	6.44	1.01	6.61	0.97	6.36	1.63
	2	6.87	1.17	7.07	0.99	6.77	1.03	6.91	0.90	7.04	0.87	6.95	1.34
Social Competence	1	5.94	1.25	5.76	1.21	5.55	1.22	5.92	0.99	5.96	1.09	5.62	1.46
	2	6.30	1.18	6.48	1.08	6.03	1.18	6.37	0.94	6.42	1.02	6.43	1.26
Task Leadership	1	5.53	1.33	5.77	1.22	5.60	1.28	5.83	1.11	6.05	1.06	5.37	1.44
	2	6.04	1.33	6.46	1.18	6.00	1.23	6.43	1.04	6.53	0.97	6.11	1.41
Time Management	1	5.44	1.32	5.26	1.37	5.30	1.37	5.66	1.13	5.74	1.13	5.18	1.39
	2	5.92	1.25	6.18	1.13	5.92	1.17	6.15	0.97	6.33	0.99	5.99	1.43
Overall	1	6.04	0.88	6.06	0.86	5.93	0.75	6.16	0.71	6.30	0.70	5.82	1.04
	2	6.39	0.93	6.67	0.82	6.38	0.80	6.59	0.75	6.71	0.73	6.45	1.09
n			698		1,932		336		108		471		95

Table 7.13 *ES_ns and CIs for T1 to T2 LEQ Factors by Program Type*

	Adolescent			Young Adult			Adult			Family			Corporate			Special		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	0.11	0.23	0.36	0.33	0.40	0.47	0.05	0.19	0.33	-0.09	0.17	0.42	0.15	0.26	0.37	0.22	0.56	0.89
Active Initiative	0.06	0.18	0.30	0.33	0.40	0.46	0.22	0.35	0.48	0.10	0.37	0.63	0.14	0.25	0.36	0.07	0.42	0.77
Emotional Control	0.18	0.30	0.43	0.51	0.58	0.65	0.35	0.49	0.62	0.24	0.53	0.81	0.32	0.44	0.56	0.20	0.59	0.98
Intellectual Flexibility	0.08	0.21	0.35	0.40	0.47	0.55	0.22	0.36	0.50	0.03	0.32	0.61	0.27	0.40	0.53	-0.11	0.30	0.71
Self Confidence	0.33	0.46	0.59	0.57	0.64	0.71	0.42	0.57	0.71	0.24	0.45	0.66	0.30	0.42	0.54	0.14	0.53	0.91
Social Competence	0.20	0.32	0.43	0.58	0.65	0.72	0.28	0.42	0.56	0.19	0.41	0.63	0.31	0.43	0.54	0.32	0.72	1.12
Task Leadership	0.32	0.45	0.57	0.55	0.63	0.70	0.22	0.35	0.48	0.28	0.53	0.78	0.33	0.44	0.55	0.29	0.63	0.97
Time Management	0.28	0.40	0.51	0.65	0.73	0.80	0.32	0.47	0.63	0.12	0.39	0.66	0.38	0.50	0.61	0.31	0.67	1.04
Overall	0.24	0.32	0.40	0.52	0.56	0.61	0.30	0.40	0.49	0.22	0.40	0.57	0.31	0.39	0.47	0.30	0.55	0.81
n			698			1,932			336			108			471			95

Table 7.14 *Results of 2 (T1 to T2) by 8 (LEQ Factor) RMMANOVAs for Each Program Type*

Effect / Program	Wilk's λ	df_{effect}	df_{error}	*F*	*p*	η^2	η_p^2
Time							
Adolescent	.823	1	697	149.55	.000	.03	.18
Young Adult	.598	1	1,931	1299.05	.000	.10	.40
Adult	.650	1	335	180.25	.000	.06	.35
Family	.634	1	366	61.69	.000	.06	.37
Corporate	.624	1	470	282.69	.000	.07	.38
Special	.649	1	94	50.76	.000	.08	.35
Time x LEQ factor							
Adolescent	.868	7	691	14.95	.000	.00	.13
Young Adult	.733	7	1,925	99.95	.000	.01	.27
Adults	.732	7	329	17.17	.000	.01	.28
Family	.693	7	101	6.39	.000	.01	.31
Corporate	.805	7	464	16.08	.000	.00	.20
Special	.791	7	88	3.32	.000	.01	.21

Table 7.15 M*s and* SD*s for T1 and T2 LEQ Factor Scores by OBA Young Adult Versus Non-OBA Young Adult Programs*

		OBA Young Adult		Non-OBA Young Adult		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	1	6.42	1.03	6.48	1.02	6.48	1.02
	2	6.86	0.92	6.86	0.95	6.86	0.95
Active Initiative	1	6.37	1.21	6.44	1.20	6.44	1.20
	2	6.87	1.05	6.89	1.07	6.89	1.07
Emotional Control	1	5.90	1.25	5.96	1.23	5.96	1.23
	2	6.64	1.13	6.61	1.13	6.61	1.13
Intellectual Flexibility	1	6.35	0.98	6.40	0.97	6.40	0.97
	2	6.83	0.92	6.82	0.93	6.82	0.93
Self Confidence	1	6.32	1.20	6.39	1.20	6.39	1.20
	2	7.11	0.92	7.07	0.99	7.07	0.99
Social Competence	1	5.66	1.22	5.76	1.21	5.76	1.21
	2	6.46	1.06	6.48	1.08	6.48	1.08
Task Leadership	1	5.68	1.24	5.77	1.22	5.77	1.22
	2	6.44	1.15	6.46	1.18	6.46	1.18
Time Management	1	5.17	1.39	5.26	1.37	5.26	1.37
	2	6.21	1.09	6.18	1.13	6.18	1.13
Overall	1	5.99	0.86	6.06	0.86	6.06	0.86
	2	6.68	0.79	6.67	0.82	6.67	0.82
n			1,432		500		1,932

Note. OBA = Outward Bound Australia

Table 7.16 *ES_ns and CIs for T1 and T2 LEQ Factors by OBA Young Adult Versus Non-OBA Young Adult Programs*

	OBA Young Adult			Non-OBA Young Adult			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	0.38	0.46	0.54	0.12	0.23	0.35	0.33	0.40	0.47
Active Initiative	0.35	0.43	0.50	0.20	0.30	0.40	0.33	0.40	0.33
Emotional Control	0.56	0.65	0.73	0.27	0.40	0.51	0.51	0.58	0.65
Intellectual Flexibility	0.44	0.52	0.61	0.20	0.33	0.46	0.40	0.47	0.55
Self Confidence	0.65	0.73	0.82	0.25	0.37	0.49	0.57	0.64	0.71
Social Competence	0.63	0.71	0.80	0.35	0.48	0.60	0.58	0.65	0.72
Task Leadership	0.59	0.68	0.76	0.35	0.48	0.62	0.55	0.63	0.70
Time Management	0.73	0.82	0.90	0.34	0.46	0.58	0.65	0.73	0.80
Overall	0.57	0.63	0.68	0.30	0.38	0.46	0.51	0.56	0.61
n			1,432			500			1,932

Note. OBA = Outward Bound Australia

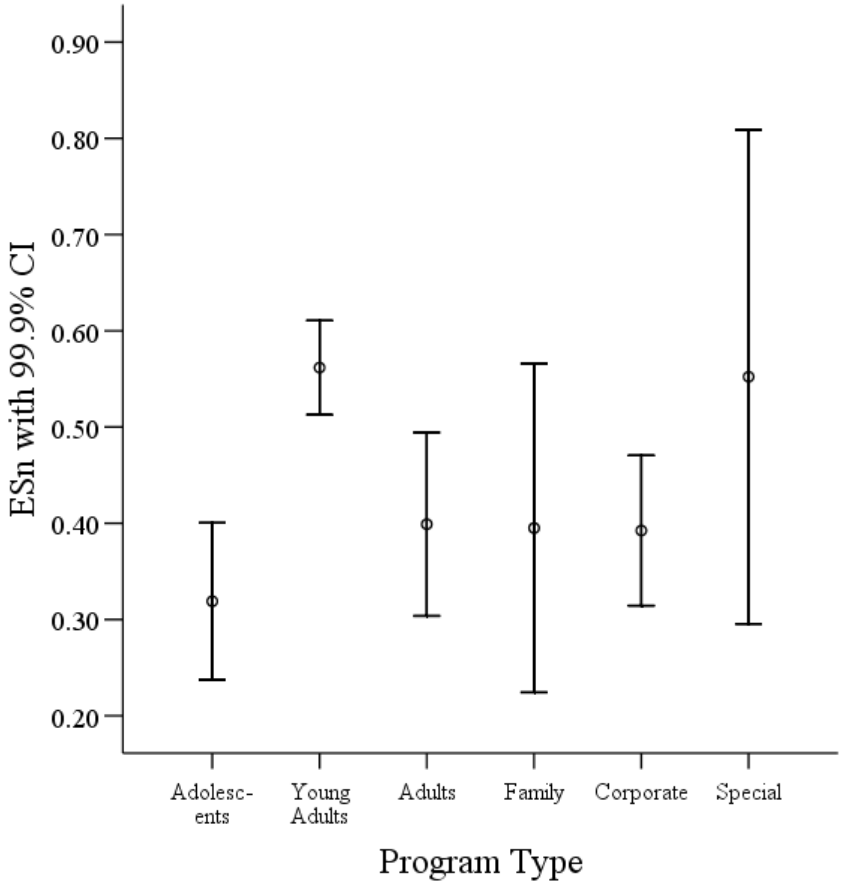


Figure 7.10 Error-bar graph of T1 to T2 ES_ns with CIs for LEQ Overall for each Program Type.

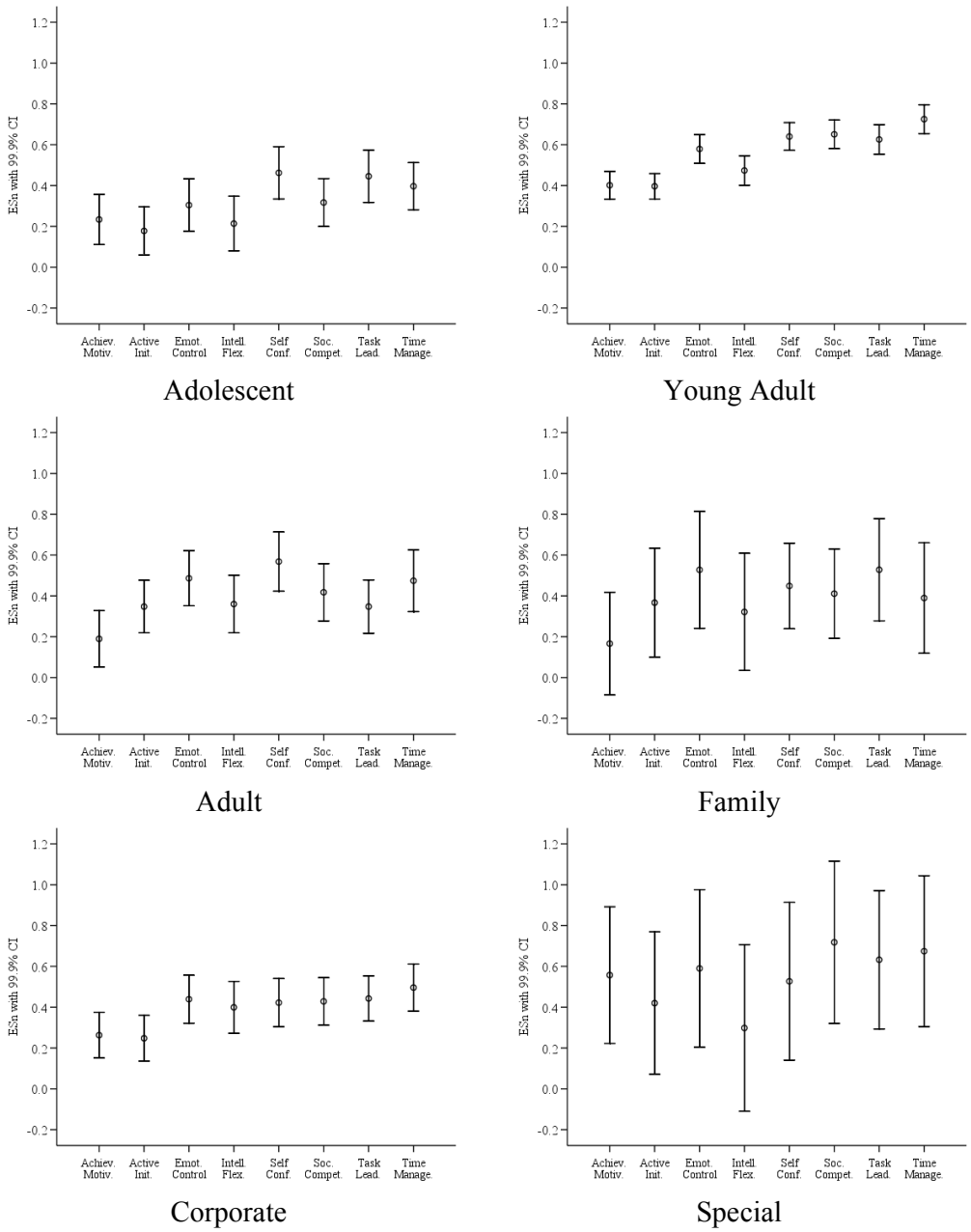


Figure 7.11 Error-bar graphs of T1 to T2 ES_ns with CIs for LEQ Factor for each Program Type.

Table 7.17 M*s and* SD*s for T0 and T3 LEQ Factor Scores by Program Type*

		Young Adult		Corporate		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	0	6.85	0.93	6.90	0.74	6.86	0.92
	3	6.94	0.92	6.53	0.95	6.91	0.93
Active Initiative	0	6.71	1.10	6.50	1.00	6.69	1.10
	3	6.98	1.09	6.45	1.13	6.94	1.10
Emotional Control	0	6.08	1.14	6.01	1.12	6.08	1.14
	3	6.52	1.05	6.22	1.08	6.50	1.05
Intellectual Flexibility	0	6.62	0.92	6.40	0.86	6.61	0.92
	3	6.83	0.88	6.27	1.02	6.79	0.90
Self Confidence	0	6.55	1.15	6.46	0.97	6.55	1.14
	3	6.99	1.06	6.47	1.03	6.95	1.06
Social Competence	0	6.03	1.18	6.06	1.01	6.03	1.17
	3	6.51	1.04	6.16	0.99	6.48	1.04
Task Leadership	0	5.95	1.21	6.27	0.94	5.97	1.20
	3	6.51	1.09	6.27	1.15	6.49	1.10
Time Management	0	5.49	1.32	5.41	1.30	5.49	1.32
	3	5.96	1.27	5.91	1.09	5.96	1.25
Overall	0	6.29	0.77	6.25	0.60	6.28	0.76
	3	6.65	0.79	6.28	0.86	6.63	0.80
n			609		45		654

Table 7.18 *ES_ns and CIs for T0 and T3 LEQ Factors by Program Type*

	Young Adult			Corporate			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.02	0.10	0.23	-0.90	-0.35	0.20	-0.05	0.07	0.19
Active Initiative	0.15	0.27	0.39	-0.44	-0.02	0.39	0.14	0.25	0.37
Emotional Control	0.26	0.38	0.51	-0.37	0.17	0.71	0.25	0.37	0.49
Intellectual Flexibility	0.10	0.23	0.36	-0.66	-0.10	0.46	0.08	0.21	0.34
Self Confidence	0.29	0.42	0.54	-0.47	0.00	0.48	0.27	0.39	0.51
Social Competence	0.30	0.42	0.54	-0.35	0.09	0.53	0.28	0.40	0.51
Task Leadership	0.37	0.49	0.60	-0.46	0.02	0.51	0.34	0.46	0.57
Time Management	0.23	0.35	0.48	-0.05	0.35	0.74	0.24	0.35	0.47
Overall	0.36	0.48	0.59	-0.36	0.09	0.54	0.34	0.45	0.56
n			609			45			654

Table 7.19 M*s and* SD*s for T0 and T3 LEQ Factor Scores by OBA Young Adult versus Non-OBA Young Adult Programs*

		OBA Young Adult		Non-OBA Young Adult		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	0	6.78	0.97	6.96	0.85	6.85	0.93
	3	6.93	0.92	6.96	0.93	6.94	0.92
Active Initiative	0	6.63	1.11	6.82	1.09	6.71	1.10
	3	6.92	1.09	7.06	1.09	6.98	1.09
Emotional Control	0	6.05	1.11	6.13	1.17	6.08	1.14
	3	6.48	1.03	6.57	1.08	6.52	1.05
Intellectual Flexibility	0	6.58	0.89	6.69	0.96	6.62	0.92
	3	6.78	0.88	6.90	0.89	6.83	0.88
Self Confidence	0	6.47	1.18	6.68	1.10	6.55	1.15
	3	6.93	1.05	7.07	1.07	6.99	1.06
Social Competence	0	5.86	1.21	6.28	1.09	6.03	1.18
	3	6.38	1.05	6.68	1.01	6.51	1.04
Task Leadership	0	5.83	1.19	6.11	1.23	5.95	1.21
	3	6.39	1.08	6.68	1.09	6.51	1.09
Time Management	0	5.49	1.35	5.50	1.29	5.49	1.32
	3	5.91	1.24	6.03	1.30	5.96	1.27
Overall	0	6.21	0.76	6.40	0.76	6.29	0.77
	3	6.59	0.77	6.75	0.80	6.65	0.79
n			359		250		609

Table 7.20 *ES_ns and CIs for T0 and T3 LEQ Factors by OBA Young Adult versus Non-OBA Young Adult Programs*

	OBA Young Adult			Non-OBA Young Adult			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.01	0.16	0.34	-0.15	0.02	0.19	-0.02	0.10	0.23
Active Initiative	0.12	0.29	0.45	0.07	0.26	0.44	0.15	0.27	0.39
Emotional Control	0.21	0.38	0.54	0.21	0.40	0.59	0.26	0.38	0.51
Intellectual Flexibility	0.05	0.23	0.40	0.02	0.23	0.44	0.10	0.23	0.36
Self Confidence	0.25	0.43	0.60	0.22	0.40	0.58	0.29	0.42	0.54
Social Competence	0.29	0.44	0.60	0.19	0.38	0.57	0.30	0.42	0.54
Task Leadership	0.32	0.47	0.61	0.33	0.52	0.70	0.37	0.49	0.60
Time Management	0.13	0.30	0.47	0.25	0.43	0.60	0.23	0.35	0.48
Overall	0.32	0.47	0.63	0.30	0.48	0.65	0.36	0.48	0.59
n			359			250			609

H 2.6.1 and RQ 2.6.2: Program Length Effects

Overview. Hypothesis 2.6.1 predicted a positive relation between Program Length and LEQ outcomes over Time (T1 to T2). Research Question 2.6.2 further inquired as to whether the relation between Program Length and life effectiveness outcomes varied according to LEQ factor. Only short-term effects were considered because there were insufficient variations in Program Length for analysis of long-term data.

Program Length was confounded with Program Type (e.g., Young Adult programs tended to be longer than Corporate programs), and Participant Age (e.g., Young Adults tended to participate in the longest programs). Thus, analyses of the effect of Program Length were conducted separately for each of three Program Types (Adolescent, Corporate, and Special) within which there were reasonably comparable variations of program length. Participant Age was used as a covariate to control for its potential influence. Descriptive statistics about the lengths of programs (see Table 7.21) indicated that the central tendency for program length was around 9 to 10 days, and ranged between 3 and 15 days.

Results. Partial correlations (r_ps) between LEQ ES_ns (T1 to T2) and Program Length (days), controlling for Participant Age, were computed separately for Adolescent, Corporate, and Special program types (see Table 7.21). There were mostly weak positive r_ps between Program Length and LEQ factor T1 to T2 ES_ns (ranging from -0.13 to .22), but none were statistically significant ($p > .001$). The average partial correlation across the three program types (weighted by sample size) was .06.

Conclusion. Hypothesis 2.6.1 was not supported. Program Length had small, positive, partial correlations with short-term changes in LEQ Overall scores (with the effect of Participant Age partialled out). Although there was some variation in the size of correlations by LEQ factor, none on these small effects were statistically significant.

Table 7.21 *Partial Correlations Between T1 to T2 LEQ Factor ES_ns and Outdoor Education Program Length (with Participant Age Partialled Out) by Program Type, with Program Type Descriptive Statistics*

LEQ Factor	Adolescent	Corporate	Special
Achievement Motivation	.11	.05	-.13
Active Initiative	.11	.07	.18
Emotional Control	-.01	.05	.08
Intellectual Flexibility	.02	.07	.12
Self Confidence	.10	.03	-.06
Social Competence	-.02	.12	.11
Task Leadership	-.00	.12	-.06
Time Management	.04	.12	.22
Overall	.04	.08	.06
Min. length	3	2	3
Max. length	11	10	15
M length	9	7	11
Mo length	10	10	9
Mdn length	9	7	9
n	693	457	86

Note. None of these correlations are significant using $p < .001$.

H / RQs 2.7.1 to 2.7.4: Group Gender Effects

Overview. Hypothesis 2.7.1 was that participants in single-gender groups would report greater change in LEQ Overall scores over Time (T1 to T2) than participants in mixed-gender groups. Research Question 2.7.2 inquired as to whether there would be an interaction between group gender (single-gender compared to mixed gender), Time (T1 to T2), and LEQ factor. Hypothesis 2.7.3 was that all-male and all-female groups would have similar outcomes. Research Question 2.7.4 inquired as to whether there would be an interaction between group gender (all-male compared to all-female), Time (T1 to T2), and LEQ factor.

Only T1 to T2 Adolescent program data were analysed because this was the only Program Type which included relatively homogenous participant samples which differed by Group Gender. Group Gender was recoded into dummy variables to indicate Single-sex ($n = 263$) versus Co-educational ($n = 435$) groups, and All-male ($n = 138$) versus All-female groups ($n = 125$). T0 to T3 data were not available for Adolescent programs.

Results. Descriptive statistics for the T1 to T2 LEQ Overall and factor scores by Group Gender are shown in Table 7.22. ES_ns with 99.9% CIs are shown in Table 7.23. Hypothesis 2.7.1 was not supported, with the LEQ Overall ES_n for single-sex groups (0.33) being similar to co-educational groups (0.31), with overlapping 99.9%

CIs. This finding was supported by a non-significant interaction between Time (T1 and T2) and Group Gender[66]. In addition, addressing Research Question 2.7.2, there was a non-significant multivariate interaction effect between Time, LEQ factor, and Group Gender (Wilk's $\lambda = .987$, $F\ (7, 690) = 1.28$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .01$).

Hypothesis 2.7.3 (that all-male and all-female groups would have similar outcomes) was supported, although there was a non-significant difference between the LEQ Overall ES_ns for all-male (0.28) and all-female (0.40) groups, with overlapping ES_n CIs (see Table 7.23)[67]. In addition, addressing Research Question 2.7.4, there was no interaction between Time, LEQ factor, and all-male versus all-female groups (Wilk's $\lambda = .973$, $F\ (7, 255) = 1.03$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .03$).

Conclusion. Group Gender (single-sex vs. co-educational, and all-male vs. all-female) did not have any significant effects on LEQ Overall T1 to T2 changes, rejecting Hypothesis 2.7.1 and accepting Hypothesis 2.7.3. Group Gender did not interact with changes in LEQ factors over Time (T1 to T2), addressing Research Question 2.7.2 and 2.7.4. These results only applied to Adolescent programs.

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[66] A 2 (T1 to T2) by 8 (LEQ factor) by 2 (Single-sex vs. Co-educational) full-factorial MDMANOVA was conducted. Of interest was a non-significant multivariate interaction effect between Time and Group Gender (Wilk's $\lambda = .999$, $F\ (1, 696) = 0.50$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$).

[67] The lack of significant difference between short-term outcomes for all-female and all-male groups was supported by a 2 (T1 to T2) by 8 (LEQ factor) by 2 (All-male vs. All-female) full-factorial MDMANOVA which revealed a small, non-significant multivariate interaction effect between Time and All-male vs. All-female group (Wilk's $\lambda = .991$, $F\ (1, 261) = 2.26$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .01$).

Table 7.22 M*s and* SD*s for T1 and T2 LEQ Factor Scores for Adolescent Programs by Group Gender*

		Single-Sex		Co-educational		All-male		All-female		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	1	6.47	1.19	6.58	1.08	6.41	1.31	6.52	1.05	6.54	1.12
	2	6.66	1.11	6.82	1.01	6.53	1.26	6.81	0.91	6.76	1.05
Active Initiative	1	6.41	1.38	6.40	1.35	6.28	1.51	6.55	1.20	6.40	1.36
	2	6.61	1.34	6.61	1.30	6.47	1.49	6.76	1.15	6.61	1.32
Emotional Control	1	5.74	1.45	5.85	1.41	5.65	1.50	5.84	1.40	5.81	1.43
	2	6.15	1.42	6.17	1.41	6.01	1.49	6.31	1.34	6.16	1.41
Intellectual Flexibility	1	6.21	1.15	6.33	1.03	6.11	1.22	6.32	1.06	6.29	1.08
	2	6.43	1.18	6.49	1.10	6.20	1.24	6.69	1.05	6.47	1.13
Self Confidence	1	6.32	1.32	6.42	1.23	6.36	1.33	6.27	1.31	6.38	1.26
	2	6.85	1.20	6.88	1.15	6.77	1.32	6.94	1.04	6.87	1.17
Social Competence	1	5.81	1.29	6.02	1.22	5.63	1.25	6.00	1.32	5.94	1.25
	2	6.22	1.25	6.35	1.13	6.05	1.29	6.40	1.18	6.30	1.18
Task Leadership	1	5.46	1.40	5.57	1.29	5.27	1.43	5.68	1.33	5.53	1.33
	2	5.93	1.41	6.11	1.28	5.73	1.49	6.15	1.29	6.04	1.33
Time Management	1	5.20	1.48	5.58	1.20	5.22	1.40	5.19	1.57	5.44	1.32
	2	5.79	1.30	6.01	1.21	5.70	1.38	5.88	1.21	5.92	1.25
Overall	1	5.95	0.93	6.09	0.85	5.87	0.99	6.05	0.84	6.04	0.88
	2	6.33	0.94	6.43	0.92	6.18	1.04	6.49	0.78	6.39	0.92
n			263		435		138		125		698

Table 7.23 *ES_ns and CIs for T1 to T2 LEQ Factor Scores for Adolescent Programs by Group Gender*

	Single-sex			Co-educational			All-male			All-female			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	0.00	0.20	0.40	0.10	0.25	0.41	-0.16	0.12	0.40	0.01	0.29	0.57	0.11	0.23	0.36
Active Initiative	0.00	0.18	0.35	0.02	0.18	0.33	-0.11	0.16	0.42	-0.03	0.20	0.44	0.06	0.18	0.30
Emotional Control	0.14	0.34	0.55	0.12	0.28	0.45	0.02	0.29	0.56	0.09	0.40	0.72	0.18	0.30	0.43
Intellectual Flexibility	0.03	0.24	0.46	0.02	0.20	0.37	-0.22	0.09	0.40	0.12	0.42	0.71	0.08	0.21	0.35
Self Confidence	0.30	0.50	0.69	0.27	0.44	0.61	0.13	0.41	0.70	0.32	0.59	0.86	0.33	0.46	0.59
Social Competence	0.17	0.36	0.53	0.14	0.29	0.44	0.08	0.37	0.66	0.09	0.35	0.61	0.20	0.32	0.43
Task Leadership	0.19	0.40	0.61	0.31	0.47	0.64	0.09	0.39	0.69	0.12	0.41	0.70	0.32	0.45	0.57
Time Management	0.25	0.44	0.64	0.22	0.37	0.51	0.10	0.39	0.68	0.25	0.50	0.75	0.28	0.40	0.51
Overall	0.22	0.33	0.45	0.20	0.31	0.42	0.10	0.28	0.46	0.24	0.40	0.55	0.24	0.32	0.40
n			263			435			138			125			698

RQs 2.8.1 and 2.8.2: Group Size Effects

Overview. Research Questions 2.8.1 and 2.8.2 inquired as to whether there would be any relation between Group Size and LEQ Overall and factor scores over Time (T1 to T2 and T0 to T3). Data from Adolescent, Young Adult[68] (OBA Standard and Challenge programs), and Corporate programs were used for T1 to T2 analyses because within each of these Program Types there were relatively homogenous participant samples and program styles, with sufficient variations in Group Size so as to allow for meaningful comparisons. For T0 to T3, only data from Young Adult programs were appropriate for Group Size analysis.

Group Size was recoded as an ordinal variable: small (up to 12), medium (13 to 16), large (17 to 20), and very large (21 to 26)[69]. These sizes were based on examination of the Group Size distributions for each Program Type for T1 to T2 and T0 to T3. Whilst the breakdowns are somewhat arbitrary, they represent naturally-occurring variations in group size evident for each of the Program Types (Adolescent, Young Adult, and Corporate). Descriptives statistics about group sizes within each Group Size category are shown in the bottom part of Table 7.25 for T1 to T2 data and Table 7.26 for T0 to T3 data.

Results.

T1 to T2. To help address Research Question 2.8.1 and Research Question 2.8.2 (relations between Group Size and LEQ changes over Time (T1 to T2)), T1 to T2 descriptive statistics are presented in Table 7.24 and T1 to T2 ES_ns and 99.9% CIs are presented in Table 7.25. T1 to T2 ES_ns for LEQ Overall varied somewhat by Group Size, with Small (0.55) and Medium (0.55) groups tending to have larger effects than Large (0.29), and Very Large (0.38) groups (see Table 7.25), however a MDMANOVA indicated no significant interaction between Group Size and Time

[68] Group Size was only available for OBA Young Adult programs. Non-OBA Young Adult program Group Sizes were difficult to determine. For example, tall ship programs involved large crews, broken into smaller watches. Such group structures were not equivalent or comparable to smaller, land-expedition style OE groups, and thus data from these programs was not used for analyses of the effect of Group Size.

[69] Particularly large group sizes (> 26, e.g., from sail training voyages) were not included.

(T1 to T2) for LEQ Overall scores[70]. Closer inspection of the ES_ns and CIs for different Group Sizes by Program Type revealed that the observed differences were probably caused by relatively high ES_ns for Young Adult programs, which only had small and medium Group Sizes. The MDMANOVA also indicated no interactions between Time (T1 to T2), LEQ factor, and Group Size[71], addressing Research Question 2.8.2. Finally, there were no interactions of interest involving Group Size, Time (T1 to T2), and Program Type[72]. Thus, the non-significant interaction between Time (T1 to T2) and Group Size non-effect was consistent across Program Type.

T0 to T3. To help address Research Question 2.8.1 and Research Question 2.8.2 (relations between Group Size and LEQ changes over Time (T0 to T3)), T0 to T3 descriptive statistics are presented in Table 7.26 and T0 to T3 ES_ns and 99.9% CIs are presented in Table 7.27. A MDMANOVA indicated no significant effects of Group Size on T0 to T3 changes in LEQ Overall scores (addressing Research Question 2.8.1)[73]. The MDMANOVA also indicated no interactions between Time (T0 to T3), LEQ factor, and Group Size (Research Question 2.8.2) [74].

Conclusion. Addressing Research Question 2.8.1, there were no significant effects of Group Size on short- or long-term LEQ Overall outcomes. Nor where there interactions between Time, Group Size, and LEQ factor or Program Type, addressing Research Question 2.8.2.

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[70] A 2 (T1 to T2) by 8 (LEQ factor) x 4 (Group Size) x 3 (Program Type) full-factorial MDMANOVA was conducted to analyse the effect of Group Size. There was a significant interaction between Time (T1 to T2) and Group Size (Wilk's $\lambda = .998$, $F\ (3, 2591) = 1.94$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$).

[71] There was no significant interaction between Time (T1 to T2), LEQ factor, and Group Size (Wilk's $\lambda = .989$, $F\ (21, 7423.27) = 1.33$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$).

[72] The interaction between for Time (T1 to 2), Group Size, and Program Type was not significant (Wilk's $\lambda = .996$, $F\ (4, 2591) = 2.90$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$), and neither was the Time, LEQ factor, Group Size and Program Type (Wilk's $\lambda = .981$, $F\ (28, 9321.77) = 1.82$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$) interaction.

[73] A 2 (T0 to T3) by 8 (LEQ factor) by 2 (Group Size) full-factorial MDMANOVA was conducted to analyse the effect of Group Size. There was no significant interaction between Time (T0 to T3) and Group Size (Wilk's $\lambda = .999$, $F\ (1, 357) = 0.32$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$).

[74] There was no significant interaction between Time (T0 to T3), LEQ factor, and Group Size (Wilk's $\lambda = .986$, $F\ (7, 351) = 0.71$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .01$).

Table 7.24 M*s and* SD*s for T1 and T2 LEQ Factor Scores for Adolescent, Young Adult, and Special Programs by Group Size*

		Small (3 to 12)		Medium (13 to 16)		Large (17 to 20)		Very Large (21 to 26)		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	1	6.51	1.02	6.46	1.02	6.64	1.02	6.57	1.06	6.51	1.03
	2	6.89	0.92	6.83	0.94	6.86	0.98	6.88	0.96	6.86	0.94
Active Initiative	1	6.42	1.21	6.40	1.19	6.43	1.34	6.47	1.24	6.42	1.22
	2	6.85	1.08	6.81	1.10	6.63	1.23	6.76	1.14	6.80	1.11
Intellectual Flexibility	1	6.37	0.96	6.32	1.03	6.45	0.98	6.38	1.00	6.36	1.00
	2	6.79	0.96	6.75	0.99	6.63	1.04	6.63	1.01	6.74	0.99
Emotional Control	1	5.98	1.24	5.84	1.29	6.02	1.33	5.92	1.32	5.93	1.28
	2	6.61	1.14	6.55	1.20	6.33	1.31	6.28	1.34	6.52	1.21
Self Confidence	1	6.39	1.17	6.35	1.20	6.46	1.23	6.45	1.12	6.39	1.18
	2	7.07	0.96	7.04	1.00	6.96	1.05	6.96	1.00	7.03	0.99
Social Competence	1	5.77	1.22	5.69	1.22	6.20	1.10	5.76	1.23	5.79	1.22
	2	6.43	1.09	6.43	1.07	6.45	1.08	6.26	1.13	6.41	1.09
Task Leadership	1	5.74	1.21	5.67	1.27	5.78	1.29	5.66	1.24	5.71	1.25
	2	6.41	1.17	6.38	1.18	6.24	1.25	6.16	1.18	6.35	1.19
Time Management	1	5.25	1.38	5.30	1.37	5.74	1.21	5.42	1.20	5.35	1.35
	2	6.18	1.12	6.16	1.12	6.15	1.16	6.03	1.13	6.15	1.13
Overall	1	6.05	0.85	6.00	0.86	6.22	0.87	6.08	0.76	6.06	0.85
	2	6.65	0.81	6.62	0.83	6.53	0.89	6.50	0.80	6.61	0.83
n			1,006		971		310		314		2,601

Table 7.25 *ES_ns and CIs for T1 to T2 LEQ Factor Scores for Adolescent, Young Adult, and Special Programs by Group Size, with Group Size Descriptive Statistics*

	Small (up to 12)			Medium (13 to 16)			Large (17 to 20)			Very Large (21 to 26)			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	0.30	0.40	0.49	0.28	0.38	0.49	0.08	0.24	0.41	0.15	0.32	0.49	0.30	0.36	0.42
Active Initiative	0.29	0.38	0.47	0.26	0.36	0.45	-0.01	0.17	0.34	0.10	0.26	0.42	0.27	0.33	0.39
Emotional Control	0.45	0.55	0.65	0.52	0.62	0.72	0.10	0.28	0.46	0.15	0.33	0.50	0.45	0.52	0.58
Intellectual Flexibility	0.37	0.48	0.58	0.36	0.47	0.58	0.03	0.21	0.40	0.10	0.28	0.46	0.35	0.42	0.48
Self Confidence	0.55	0.65	0.74	0.53	0.64	0.74	0.28	0.47	0.66	0.33	0.50	0.66	0.54	0.60	0.67
Social Competence	0.50	0.60	0.69	0.55	0.65	0.76	0.08	0.23	0.38	0.27	0.44	0.61	0.49	0.55	0.62
Task Leadership	0.52	0.61	0.71	0.53	0.63	0.73	0.22	0.40	0.59	0.25	0.43	0.60	0.51	0.57	0.63
Time Management	0.65	0.74	0.84	0.58	0.68	0.78	0.18	0.35	0.52	0.36	0.51	0.67	0.59	0.65	0.71
Overall	0.48	0.55	0.62	0.48	0.55	0.63	0.18	0.29	0.41	0.28	0.38	0.49	0.46	0.50	0.54
M group size			10.5			14.0			19.0			23.3			14.4
Mo group size			12.0			13.0			20.0			23.0			13.0
Mdn group size			11.0			14.0			19.0			23.0			13.0
n			1,006			971			310			314			2,601

Table 7.26 M*s and* SD*s for T0 and T3 LEQ Factor Scores for Young Adult Programs by Group Size*

		Small (3 to 12)		Medium (13 to 16)		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	0	6.75	1.02	6.83	0.93	6.78	0.97
	3	6.96	0.87	6.91	0.98	6.93	0.92
Active Initiative	0	6.72	1.04	6.52	1.18	6.63	1.11
	3	6.98	1.07	6.85	1.11	6.92	1.09
Intellectual Flexibility	0	5.99	1.18	6.11	1.03	6.05	1.11
	3	6.45	1.03	6.51	1.03	6.48	1.03
Emotional Control	0	6.59	0.92	6.56	0.86	6.58	0.89
	3	6.79	0.88	6.77	0.87	6.78	0.88
Self Confidence	0	6.40	1.28	6.54	1.05	6.47	1.18
	3	6.91	1.07	6.95	1.03	6.93	1.05
Social Competence	0	5.85	1.26	5.86	1.15	5.86	1.21
	3	6.38	1.04	6.39	1.06	6.38	1.05
Task Leadership	0	5.80	1.23	5.87	1.15	5.83	1.19
	3	6.37	1.05	6.42	1.11	6.39	1.08
Time Management	0	5.43	1.31	5.55	1.39	5.49	1.35
	3	5.92	1.23	5.90	1.26	5.91	1.24
Overall	0	6.19	0.81	6.23	0.71	6.21	0.76
	3	6.59	0.76	6.59	0.79	6.59	0.77
n			191		168		359

Table 7.27 *ES_ns and CIs for T0 to T3 LEQ Factor Scores for Young Adult Programs by Group Size*

	Small (up to 12)			Medium (13 to 16)			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.04	0.21	0.46	-0.15	0.11	0.36	-0.02	0.10	0.23
Active Initiative	0.03	0.26	0.48	0.08	0.32	0.55	0.15	0.27	0.39
Emotional Control	0.17	0.39	0.60	0.12	0.36	0.61	0.26	0.38	0.51
Intellectual Flexibility	-0.03	0.22	0.47	-0.01	0.23	0.48	0.10	0.23	0.36
Self Confidence	0.20	0.44	0.68	0.16	0.41	0.66	0.29	0.42	0.54
Social Competence	0.20	0.43	0.67	0.25	0.46	0.66	0.30	0.42	0.54
Task Leadership	0.25	0.45	0.66	0.28	0.48	0.68	0.37	0.49	0.60
Time Management	0.13	0.36	0.58	-0.02	0.24	0.50	0.23	0.35	0.48
Overall	0.27	0.48	0.70	0.25	0.46	0.68	0.36	0.47	0.59
M group size			11.2			13.9			12.4
Mo group size			12.0			13.0			12.0
Mdn group size			11.0			14.0			12.0
n			191			168			359

H 2.9.1 and RQ 2.9.2: Participant Gender Effects

Overview. Hypothesis 2.9.1 was that there would be no differences in short- (T1 to T2) and long-term (T0 to T3) changes in LEQ Overall scores according to Participant Gender. Research Question 2.9.2 inquired as to whether there would be an interaction between Participant Gender, Time (T1 to T2 and T0 to T3) and LEQ factor. For these analyses, T1 to T2 LEQ data was available for four Program Types (Adolescent, Adult, Young Adult and Special; n = 3,050). Within each Program Type there were relatively homogenous participant samples and programs styles, with sufficient variation in Participant Gender as to allow meaningful comparison. T0 to T3 LEQ data for Young Adult programs were analysed (n = 609) because this was the only Program Type with relatively homogenous participant samples and programs styles and with sufficient variation in Participant Gender as to allow for meaningful comparison of outcomes between males and females.

Results.

T1 to T2. To help address Hypothesis 2.9.1 and Research Question 2.9.2 (about short-term Participant Gender effects), T1 to T2 descriptive statistics are presented in Table 7.28 and ES_ns and CIs are presented in Table 7.29. LEQ Overall ES_ns were similar between T1 and T2 for male (0.51) and female (0.46) participants, supported by a non-significant MDMANOVA interaction between Participant Gender and Time (T1 to T2)[75].

Addressing Research Question 2.9.2, there was a significant interaction between Time (T1 to T2), LEQ factor, and Participant Gender[76], indicating that males and females had different patterns of short-term change for the different LEQ factors. Non-significant interactions involving Program Type indicated that the observed patterns involving Time and Participant did not vary across Program

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[75] A 2 (T1 to T2) by 8 (LEQ factor) by 2 (Participant Gender) by 4 (Program Type) full-factorial MDMANOVA was conducted to analyse the effect of Participant Gender. There was a non-significant multivariate interaction between Time and Participant Gender (Wilk's $\lambda = .999$, F (1, 3041) = 1.98, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$).

[76] There was a small, significant multivariate interaction between Time, LEQ factor, and Participant Gender (Wilk's $\lambda = .991$, F (7, 3035) = 4.08, $p < .001$, $\eta^2 = .00$, $\eta_p^2 = .01$).

Types[77]. A series of eight MDANOVAs were conducted to follow-up the interaction between Time (T1 and T2) and Participant Gender for each of the LEQ factors (see Table 7.28). Only one of the eight analyses revealed a significant Time by Participant Gender interaction. For Social Competence, male participants reported a greater positive change ($ES_n = 0.62$) than did female participants ($ES_n = 0.46$). Thus, in addressing Research Question 2.9.2, although a significant interaction between Participant Gender, Time (T1 to T2) and LEQ factor was evident, variations in LEQ factor outcomes between male and female participants were small.

T0 to T3. To help address Hypothesis 2.9.1 and Research Question 2.9.2 (about long-term Participant Gender effects), T0 to T3 descriptive statistics are presented in Table 7.30 and ES_ns with 99.9% CIs are presented in Table 7.31. LEQ Overall ES_ns were similar between T1 and T2 for male (0.34) and female (0.33) participants, supported by a non-significant MDMANOVA interaction between Participant Gender and Time (T0 to T3)[78]. Addressing Research Question 2.9.2, there was a non-significant MDMANOVA interaction between Participant, Gender, Time, (T0 to T3), and LEQ factor[79].

Conclusion. Hypothesis 2.9.1 (that there would be no relation between Participant Gender and T1 to T2 LEQ Overall outcomes) was supported. Results were largely consistent across LEQ factors, addressing Research Question 2.9.2. Although there was a significant interaction effect between Participant Gender, Time (T1 to T2), and LEQ factor, follow-up testing only revealed that male participants reported greater change in Social Competence than female participants, a small effect. There was no interaction between Participant Gender, Time (T0 to T3), and LEQ factor.

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[77] There was a non-significant multivariate interaction between Time (T1 to T2), Participant Gender, and Program Type (Wilk's $\lambda = .997$, $F\ (3, 3041) = 3.45$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$), and a non-significant multivariate interaction between Time (T1 to T2), LEQ factor, Participant Gender and Program Type (Wilk's $\lambda = .993$, $F\ (21, 8715.43) = 0.97$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$).

[78] A 2 (T0 to T3) by 8 (LEQ factor) by 2 (Participant Gender) full-factorial MDMANOVA indicated a non-significant multivariate interaction between Time and Participant Gender (Wilk's $\lambda = 1.00$, $F\ (1, 607) = 0.00$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$).

[79] There was a non-significant multivariate interaction between Time (T0 to T3), LEQ factor, and Participant Gender (Wilk's $\lambda = .991$, $F\ (7, 601) = 0.75$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .01$).

Table 7.28 M*s and* SD*s for T1 and T2 LEQ Factor Scores by Participant Gender, with Time x Gender ANOVAs*

		Male		Female		T x Gender	Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*F*	*M*	*SD*
Achievement Motivation	1	6.47	1.08	6.54	1.00	4.63	6.50	1.04
	2	6.83	0.98	6.83	0.96		6.82	0.97
Active Initiative	1	6.37	1.27	6.44	1.21	3.59	6.40	1.25
	2	6.79	1.17	6.78	1.13		6.79	1.15
Emotional Control	1	6.00	1.29	5.73	1.26	0.03	5.88	1.28
	2	6.58	1.20	6.31	1.24		6.46	1.23
Intellectual Flexibility	1	6.36	1.02	6.38	0.97	0.51	6.36	1.00
	2	6.72	1.01	6.72	0.96		6.72	0.99
Self Confidence	1	6.45	1.19	6.24	1.27	6.54	6.36	1.23
	2	7.04	1.03	6.93	1.08		6.99	1.05
Social Competence	1	5.67	1.24	5.90	1.21	13.54 *	5.77	1.24
	2	6.37	1.14	6.41	1.12		6.39	1.13
Task Leadership	1	5.69	1.29	5.68	1.24	8.25	5.68	1.27
	2	6.36	1.23	6.23	1.26		6.30	1.24
Time Management	1	5.28	1.37	5.34	1.35	5.22	5.31	1.36
	2	6.10	1.18	6.06	1.18		6.08	1.18
Overall	1	6.04	0.88	6.03	0.82	2.46	6.03	0.86
	2	6.60	0.87	6.53	0.85		6.57	0.86
n			1,715		1,334	3,049		3,049

Note. * $p < .001$, F (1, 3048); The sample is from Adolescent, Adult, Young Adult, and Special programs.

Table 7.29 *ES_ns and CIs for T1 to T2 LEQ Factor Scores for Adolescent, Adult, Young Adult, and Special Programs by Participant Gender*

	Male			Female			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	0.30	0.37	0.45	0.23	0.31	0.39	0.29	0.34	0.40
Active Initiative	0.30	0.37	0.44	0.24	0.31	0.39	0.29	0.34	0.39
Emotional Control	0.44	0.51	0.59	0.41	0.50	0.58	0.45	0.51	0.56
Intellectual Flexibility	0.33	0.41	0.49	0.30	0.38	0.47	0.34	0.40	0.46
Self Confidence	0.49	0.56	0.64	0.54	0.62	0.71	0.53	0.59	0.65
Social Competence	0.55	0.62	0.70	0.38	0.46	0.55	0.50	0.55	0.61
Task Leadership	0.52	0.60	0.68	0.41	0.50	0.58	0.50	0.56	0.61
Time Management	0.58	0.66	0.74	0.49	0.57	0.66	0.57	0.62	0.68
Overall	0.46	0.51	0.57	0.40	0.46	0.52	0.45	0.49	0.53
n			1,715			1,334			3,049

Table 7.30 M*s and* SD*s for T0 and T3 LEQ Factor Scores for Young Adult Programs by Participant Gender*

		Male		Female		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	1	6.84	0.94	6.87	0.92	6.85	0.93
	2	6.93	0.93	6.95	0.91	6.94	0.92
Active Initiative	1	6.58	1.13	6.83	1.06	6.71	1.10
	2	6.90	1.15	7.05	1.03	6.98	1.09
Emotional Control	1	6.19	1.08	5.99	1.18	6.08	1.14
	2	6.60	1.02	6.44	1.07	6.52	1.05
Intellectual Flexibility	1	6.63	0.88	6.62	0.96	6.62	0.92
	2	6.81	0.87	6.84	0.90	6.83	0.88
Task Leadership	1	5.91	1.20	5.98	1.23	5.95	1.21
	2	6.48	1.12	6.54	1.07	6.51	1.09
Self Confidence	1	6.57	1.03	6.54	1.25	6.55	1.15
	2	6.96	1.05	7.01	1.07	6.99	1.06
Social Competence	1	5.88	1.18	6.18	1.16	6.03	1.18
	2	6.36	1.14	6.64	0.92	6.51	1.04
Time Management	1	5.50	1.34	5.48	1.31	5.49	1.32
	2	5.95	1.30	5.96	1.23	5.96	1.27
Overall	1	6.26	0.77	6.31	0.77	6.29	0.77
	2	6.63	0.81	6.68	0.76	6.65	0.79
n			295		314		609

Table 7.31 *ES_ns and CIs for T0 and T3 LEQ Factor Scores for Young Adult Programs by Participant Gender*

	Male			Female			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.07	0.11	0.28	-0.08	0.10	0.28	-0.02	0.10	0.23
Active Initiative	0.15	0.32	0.50	0.05	0.23	0.40	0.15	0.27	0.39
Emotional Control	0.21	0.38	0.56	0.21	0.39	0.56	0.26	0.38	0.51
Intellectual Flexibility	0.02	0.21	0.41	0.06	0.24	0.43	0.10	0.23	0.36
Self Confidence	0.22	0.40	0.57	0.25	0.43	0.61	0.29	0.42	0.54
Social Competence	0.27	0.43	0.60	0.23	0.40	0.57	0.30	0.42	0.54
Task Leadership	0.34	0.49	0.65	0.32	0.48	0.65	0.37	0.49	0.60
Time Management	0.17	0.35	0.53	0.19	0.36	0.53	0.23	0.35	0.48
Overall	0.21	0.34	0.46	0.21	0.33	0.45	0.25	0.33	0.42
n			295			314			609

H 2.10.1 and RQ 2.10.2: Participant Age Effects

Overview. Hypothesis 2.10.1 was that there would be no differences in short- (T1 to T2) and long-term (T0 to T3) changes in LEQ Overall scores according to Participant Age. Research Question 2.10.2 inquired as to whether there would be an interaction between Participant Age, Time (T1 to T2 and T0 to T3), and LEQ factor. Separate analyses were conducted for the six different Program Types because Program Type was confounded with Participant Age. Age was recoded into ordinal categories based on the major age group distinctions within each Program Type. Thus, for example, Adolescent participants were categorised into 11 to 13, 14 to 15, and 16 to 18 year old groups, whereas Adult program participants were categorised into 28 to 35, 36 to 45, and 46 to 65 year old age groups. These age groups were somewhat arbitrary, but were based on examination of frequency distributions of age for each Program Type. For Young Adult programs, T0 to T3 data were also analysed. Young Adult program analyses were also broken down by OBA Standard/Challenge and Sail Training sub-Program Types because they each involved different age profiles.

Results. As a result of the breakdown of analyses of the effect of Participant Age by Program Type, the presentation of results for Participant Age was considerably longer than for the other independent variables. Thus, a summary of results is provided here and in Table 7.32, with full results reported in Appendix E.2.

Hypothesis 2.10.1 was supported because there were no significant interactions between Time (T1 to T2 and T0 to T3) and Participant Age. In response

to Research Question 2.10.2, there were no significant interactions between Time, Participant Age, and LEQ factor, although some non-significant interactions were noted between Time (T1 to T2), LEQ factor, and Participant Age for Adolescent, Adult, and Family programs[80].

Conclusion. Hypothesis 2.10.1 (that there would be no relation between Participant Age and T1 to T2 and T0 to T3 LEQ Overall outcomes) was supported. Results were consistent across LEQ factors, addressing Research 2.10.2, and pertained to each of the Program Types.

Table 7.32 *η^2 and η_p^2 for Time by Participant Age MDMANOVAs T1 to T2 and T0 to T3*

	T1 to T2		T0 to T3	
MDMANOVA effect	η^2	η_p^2	η^2	η_p^2
Time x Participant Age				
Adolescent	.00	.01		
Young Adult - Sail Training	.00	.00	.00	.01
Young Adult - OBA	.00	.00	.00	.01
Adult	.00	.01		
Family	.00	.02		
Corporate	.00	.00		
Special	.00	.00		
Time x Participant Age x LEQ Factor				
Adolescent	.00	.02		
Young Adult - Sail Training	.00	.01	.00	.00
Young Adult - OBA	.00	.01	.00	.00
Adult	.00	.03		
Family	.00	.09		
Corporate	.00	.04		
Special	.00	.09		

Note. None of these effects are significant ($p < .001$).

Summary

This section analysed the influence of six naturally-occurring independent variables (Program Type, Program Length, Group Gender, Group Size, Participant Gender, and Participant Age) on short- and long-term LEQ Overall and LEQ factor

[80] For Adolescent programs, older adolescents tended to have higher short-term LEQ Overall outcomes. For Adult programs, younger participants had slightly larger changes, particularly for SO and AI, but older participants reported greater change for IF and AM. For Family programs, there was a trend towards greater change for: (a) children than parents, particularly for AM, SO, TL, and Time Management; and (b) parents than children for short-term change for IF. For Corporate programs there was a trend towards higher changes for younger participants, particularly for SO and TL. For Special programs there was a trend towards greater change for: (a) adults than adolescents, particularly for SO, IF, TL, EC, and SC; and (b) adolescents than for adults for TM and AI.

outcomes. Overall, these independent variables were not particularly predictive of outdoor education program LEQ outcomes. The most influential variable appeared to be Program Type. The results for each independent variable are summarised below, with a summary of all the significant effects presented in Table 7.33.

All six main *Program Types* had significant, positive, short-term LEQ Overall effects, with 46 out of 48 possible significant effects for the *LEQ factors*. *Young Adult* programs were the most effective Program Type in the short- and long-term, although they were not significantly more effective than Family and Special programs in the short-term. Young Adult programs had significant, positive long-term effects, but Corporate programs did not. Young Adult program LEQ factor outcomes could be separated into Band 1 factors (moderate change) and Band 2 factors (small-moderate change), but results for other Program Types were less distinct. *Young Adult programs conducted by OBA* were significantly more effective in the short-term than non-OBA programs, particularly for Self Confidence and Time Management, but not in the long-term. *Program Length* had small, positive, non-significant partial correlations with short-term outcomes.

Group Gender did not have any significant effect on LEQ Overall short-term changes for Adolescent programs, nor did it interact with LEQ factors over Time (T1 to T2). Thus, all-male, all-female, and co-educational Adolescent programs appeared to have similar outcomes. *Group Size* did not have any significant effects on short- or long-term LEQ outcomes.

Participant Gender did not have any significant effects on LEQ short- and long-term outcomes, with a minor interaction noted (male participants reported greater change in Social Competence than female participants). Finally, *Participant Age* had no significant effect on LEQ Overall outcomes and this effect was consistent across the LEQ factors and for each Program Type.

Table 7.33 *Summary of LEQ Overall and LEQ Factor Changes Over Time (T1 to T2 and T0 to T3) and the Effects of Six Independent Variables*

	Interactions with Time					Time	Time Effects for Each Program Type					
	Participant		Group		Program							
LEQ Factor	Gender	Age	Gender	Size	Length	All	Adolesc.	Y. Adult	Adult	Family	Corporate	Special
T1 to T2												
AM						+	+	+	+		+	+
AI						+	+	+	+	+	+	+
EC						+	+	+	+	+	+	+
IF						+	+	+	+	+	+	
SC						+	+	+	+	+	+	+
SO			♂			+	+	+	+	+	+	+
TL						+	+	+	+	+	+	+
TM						+	+	+	+	+	+	+
Overall						+	+	+	+	+	+	+
T0 to T3												
AM								+				
AI						+		+				
EC						+		+				
IF						+		+				
SC						+		+				
SO						+		+				
TL						+		+				
TM						+		+				
Overall						+		+				

Note. + = positive effect ($p < .001$); - = negative effect ($p < .001$); Shaded cells indicate that effects were not estimated; Not shown is that Young Adult OBA programs were significantly more effective in the short-term than non-OBA programs, particularly for SC and TM.

Multi-Level Analyses

Introduction

MLAs of short- (T1 to T2; $N = 3{,}064$) and long-term (T0 to T3 $N = 424$) changes in LEQ Overall and factor scores were conducted to address the six multi-level Research Questions (2.11.1 to 2.11.6) which are summarised in Table 7.34 and described in Chapter 4. In total, 54 MLAs were conducted, consisting of: (a) Nine sets of three MLAs with T1 to T2 LEQ Overall and LEQ factor scores as response variables (27 analyses); and (b) Nine sets of three MLAs with T0 to T3 LEQ Overall and LEQ factor scores as response variables (27 analyses).

Table 7.34 *Summary of Study 2 Multi-Level Hypotheses and Research Questions*

Number	Hypotheses and Research Questions
RQ 2.11.1	Variance components (T1 to T2).
RQ 2.11.2	Variance components with the fixed effect of time (T1 to T2).
RQ 2.11.3	Variance components with the fixed effects of time and interactions with explanatory variables (T1 to T2).
RQ 2.11.4	Variance components (T0 to T3).
RQ 2.11.5	Variance components with the fixed effect of time (T0 to T3).
RQ 2.11.6	Variance components with the fixed effects of time and interactions between explanatory variables (T0 to T3).

For T1 to T2 MLAs, the three models tested were: (a): Variance components; (b) Variance components with Time (T1 to T2) as a fixed effect; and (c) Variance components with Time (T1 to T2) and interactions between Time and Participant, Group, and Program variables as fixed effects. Each model involved three random levels: (a) Group; (b) Participant; and (c) Time. For T0 to T3 MLAs, the three models were, in principle, the same as for the T1 to T2 MLAs, except that: (a) T0 to T3 data were used; (b) Time by Program Type dummy variables were not included as fixed effects because the vast majority of the data (93%) were from one program type (Young Adult); and (c) The T0 to T3 models initially specified three random levels (Group, Participant, and Time), however the solutions did not converge for over half of the response variables. Consequently, the models were simplified, reducing them to two levels (Participant and Time). As a result, only the Emotional Control solution failed to converge.

Results pertaining to Research Questions 2.11.1 to 2.11.6 are summarised in the following sections and in a series of tables (Table 7.40, Table 7.36, Table 7.35,

Table 7.37, and Table 7.38). This is followed by detailed presentation of the first set of three MLAs, involving T1 to T2 LEQ Overall scores as the response variable. This explains interpretation of the parameter estimates and MLwiN output screenshots. Summary details and tables are then provided for the 53 subsequent MLAs involving other response variables and time contrasts, with full details in Appendix F.1.1 to Appendix F.2.11.

RQ 2.11.1: Variance Components (T1 to T2)

Overview. Research Question 2.11.1 inquired about the statistical significance of, and proportions of variance attributable to, the three hierarchical levels (Time, Participant, and Group), with T1 to T2 LEQ Overall and LEQ factor scores as response variables.

Results. MLM results are summarised in Table 7.36. Significant ($p < .05$) random variance for T1 to T2 LEQ Overall scores was attributable to Time (54%), Participant (41%), and Group (5%). These variance components varied somewhat across the eight LEQ factors: Time (43% to 60%), Participant (37% to 54%), and Group (2% to 5%).

Conclusion. In response to Research Question 2.11.1, each of three random levels (Time, Participant, and Group) accounted for a significant proportion of variance for each of the T1 to T2 LEQ response variables. Approximately half of the random variance in T1 to T2 LEQ scores was attributable to the Time-level, roughly another half was attributable to the Participant-level (individual differences), and approximately 5% was attributable to the Group-level.

RQ 2.11.2: Variance Components with the Fixed Effect of time (T1 to T2)

Overview. Research Question 2.11.2 inquired about the statistical significance and magnitude of the fixed effects of Time (T1 to T2) when these were added to variance components MLMs with three hierarchical levels (Time, Participant, and Group) for T1 to T2 LEQ Overall and LEQ factor scores as response variables.

Results. Results for the Model 2 fixed effects of Time (T1 to T2) are summarised in Table 7.35. The fixed effect of Time (T1 to T2) was significant for all MLMs with LEQ Overall and LEQ factor scores as response variables. The magnitude and relative size of the fixed Time effects was indicated by the *t* scores,

ES_ms and rank (Table 7.35). The ES_m for LEQ Overall was 0.46, ranging between 0.24 (Active Initiative) and 0.45 (Time Management). The pattern of results confirmed earlier findings of relatively strong short-term impacts for five Band 1 factors (Emotional Control, Self Confidence, Social Competence, Task Leadership, and Time Management), and significant, positive, but smaller effects for three Band 2 factors (Achievement Motivation, Active Initiative, and Intellectual Flexibility).

Introducing the fixed effects of Time (T1 to T2) in Model 2 significantly reduced the Δ -2 log Λs, with variance components for the Time-level reducing from .54 (Model 1) to .35 (Model 2) for LEQ Overall, with similar types of reductions for each of the LEQ factors (see Table 7.38). Nevertheless, there remained a considerable, and significant, amount of random variance at each of the three levels (Time, Participant, and Group).

Conclusion. In response to Research Question 2.11.2, the fixed effect of Time (T1 to T2) was positive and significant for LEQ Overall (ES_m = 0.46) and each of the LEQ factor scores (0.24 to 0.45). The fixed Time (T1 to T2) effect reduced the LEQ Overall and LEQ factor random Time-level variance, but a significant and substantial amount of Time-level variance for all response variables remained unexplained. The significant, positive fixed effects of Time (T1 to T2) and the moderate ES_ms also support Hypothesis 2.2.1 and previous findings with regard to Research Question 2.2.2.

RQ 2.11.3: Variance Components with the Fixed Effects of Time and Interactions with Explanatory Variables (T1 to T2)

Overview. Research Question 2.11.3 inquired about the statistical significance and magnitude of the 11 fixed interaction terms between Time (T1 to T2) and Participant, Group, and Program independent variables when these were added to variance components MLMs with the fixed effect of Time (T1 to T2), with three hierarchical levels (Time, Participant, and Group), for T1 to T2 LEQ Overall and LEQ factor scores as response variables.

Results. Statistically significant results for the Model 3 fixed interaction effects between Time (T1 and T2) and the 11 explanatory variables are summarised in Table 7.40, with the *t* scores and ES_ms summarised in Table 7.37. *Program Type* was the strongest predictor, particularly Young Adult programs (ES_m = 0.43 for LEQ

Overall, ranging 0.15 (Active Initiative) from 0.72 (Emotional Control)), further supporting Hypothesis 2.5.3 and addressing Research Question 2.5.4, followed by Special, Family, Adult, Corporate, and Adolescent programs. There was some variation in this pattern by LEQ factor.

Other than Program Type, there were no clear or consistent fixed effects. For *Program Length*, parameter estimates were mostly positive, but non-significant. The only ES_ms larger than .10 were for Program Length on Active Initiative (0.16), Self Confidence (0.13) and Time Management (0.12), with only the Active Initiative effect being statistically significant ($t > 1.96$, $p > .05$). Several other smaller, fixed effects for some of the LEQ factors were, nevertheless, statistically significant (see summaries in Table 7.40 and Table 7.37). For *Group Gender*, there were two very small, significant effects, indicating that single-sex programs predicted greater short-term change in Active Initiative ($ES_m = -0.02$, , $t = -2.00$, $p < .05$) and Emotional Control ($ES_m = -0.02$, $t = -2.10$, $p < .05$). *Group Size* was not a significant predictor. For *Participant Gender*, male participants reported greater increases for Active Initiative ($ES_m = -0.01$, $t = -2.00$, $p < .05$) and Social Competence ($ES_m = -0.03$, $t = -2.00$, $p < .05$), whereas female participants report greater increases for Self Confidence ($ES_m = 0.03$, $t = 3.00$, $p < .05$). For *Participant Age*, older participants reported greater increases in Emotional Control ($ES_m = 0.04$, $t = 3.08$, $p < .05$) and Intellectual Flexibility ($ES_m = 0.03$, $t = 2.07$, $p < .05$), whereas younger participants reported greater changes in Social Competence ($ES_m = -0.03$, $t = 2.08$, $p < .05$).

Introducing the fixed effects of interactions between Time (T1 to T2) and the Program, Group, and Participant independent variables in Model 3 significantly reduced the Δ -2 log Λs, but did not appreciably change the variance components parameters ($\Delta < .02$) for LEQ Overall and each of the LEQ factors ($\Delta < .03$; see Table 7.38). Thus, after accounting for the fixed effects of interactions between Time (T1 to T2) and the independent variables in Model 3, there remained a considerable and significant amount of random variance at each of the three levels (Time, Participant, and Group).

Conclusion. In response to Research Question 2.11.3, the fixed effect of interactions between Time (T1 to T2) and the independent variables significantly improved the MLM fits for T1 to T2 LEQ Overall and LEQ factors, but only to a small extent. Program Type was the most notable effect, particularly for Young

Adult programs. Program Length was a small, positive predictor, of marginal significance. Group Size was not a significant predictor, whilst Group Gender, Participant Gender, and Participant Age each had some very small significant effects for some outcomes. There remained a significant amount of unexplained variance at each of three levels, particularly for Participant and Time.

RQ 2.11.4: Variance Components (T0 to T3)

Overview. Research Question 2.11.4 inquired about the proportions of variance attributable to two hierarchical levels (Time and Participant) with T0 to T3 LEQ Overall and LEQ factor scores as response variables.

Results. Results are summarised in Table 7.36. Significant ($p < .05$) random variance for T0 to T3 LEQ Overall scores was attributable to each of the two levels: Time (44%) and Participant (56%). The variance components varied somewhat for the eight LEQ factors: for Time (39% to 56%) and (reciprocally) for Participant (61% to 44%).

Conclusion. In response to Research Question 2.11.4, each of two random levels (Time and Participant) accounted for a significant and substantial proportion of variance for each of the T0 to T3 response variables. In general, slightly less than half of the variance was attributable to the Time-level, and slightly over half was attributable to the Participant-level variance (individual differences). Slightly less variance in the T0 to T3 scores was attributable to the Time-level compared to T1 to T2 scores.

RQ 2.11.5: Variance Components with the Fixed Effect of time (T0 to T3)

Overview. Research Question 2.11.5 inquired about the statistical significance and magnitude of the fixed effects of Time (T0 to T3) when these were added to variance components MLMs with two hierarchical levels (Time and Participant) for T0 to T3 LEQ Overall and LEQ factor scores as response variables. Program Type impacts on T0 to T3 changes were not examined because most (93%) of the available data were from one Program Type (Young Adult).

Results. Results for the Model 2 fixed effects of Time (T0 to T3) are summarised in Table 7.35. The fixed effect of Time (T0 to T3) was significant for all MLMs with LEQ Overall and six out of seven LEQ factor scores as response

variables (Emotional Control was not included because its model did not converge; effect for Achievement Motivation was not significant). The ES_m for LEQ Overall was 0.28, and ranged between 0.06 (Achievement Motivation) and 0.27 (Social Competence). The pattern of results confirmed earlier findings of significant, positive, long-term changes in life effectiveness, but of a smaller magnitude than short-term changes. These findings also supported early findings of relatively stronger impacts for Band 1 compared to Band 2 factors.

Introducing the fixed effects of Time (T0 to T3) in Model 2 significantly reduced the Δ -2 log Λs, with variance components for the Time-level reducing from .56 (Model 1) to .46 (Model 2) for LEQ Overall, with similar types of reductions for each of the LEQ factors (see Table 7.38). Nevertheless, there remained a considerable and significant amount of random variance at each of the two levels (Time and Participant).

Conclusion. In response to Research Question 2.11.5, the fixed effect of Time (T0 to T3) was positive and significant for LEQ Overall (ES_m = 0.28) and each of the LEQ factor scores (.06 to .27), except for Achievement Motivation (not significant) and Emotional Control (solution did not converge). The fixed Time (T0 to T3) effect reduced the LEQ Overall and LEQ factor random Time-level variance, but a significant and substantial amount of Time-level variance for all response variables remained unexplained. The significant, positive fixed effects of Time, and the small to moderate ES_ms, also support Hypothesis 2.4.1, and previous findings with regard to Research Question 2.4.2.

RQ 2.11.6: Variance Components with the Fixed Effects of Time and Interactions with Explanatory Variables (T0 to T3)

Overview. Research Question 2.11.6 inquired about the statistical significance and magnitude of the five fixed interaction terms between Time (T0 to T3) and Participant, Group, and Program independent variables when these were added to variance components MLMs with the fixed effect of Time (T0 to T3), with two hierarchical levels (Time and Participant), for T0 to T3 LEQ Overall and LEQ factor scores as response variables.

Results. Statistically significant results for the Model 3 fixed interaction effects between Time (T0 and T3) and the five explanatory variables are summarised

in Table 7.40, with the *t* scores and ES_ms summarised in Table 7.37. There were no clear or consistent fixed effects. However, there were several small, significant, fixed effects for some of the LEQ factors (see summaries in Table 7.40 and Table 7.37). In summary, *Program Length* parameter estimates were negligible and non-significant. For *Group Gender*, there were several small, significant effects, indicating that co-educational groups had significantly more positive long-term changes for three LEQ factors and LEQ Overall[81]. However, these results should be interpreted with caution because the single-sex program data were based on 15 male apprentices in a Corporate program who had smaller effects than the rest of the sample which was mostly (93%) drawn from co-educational Young Adult programs. For *Group Size*, participants in smaller groups reported significantly greater long-term changes for five LEQ factors and LEQ overall[82]. However, these results should be interpreted with caution because they appeared to be caused by a relatively small sample of participants in small groups of between 6 and 10 ($n = 45$) who had slightly larger changes for T0 to T3 for some factors[83]. *Participant Gender* was a small, significant, negative predictor for long-term outcomes for some LEQ factors, indicating that males reported larger changes in Active Initiative ($ES_m = -0.06$, $t = -2.91$, $p < .05$) and Task Leadership ($ES_m = 0.05$, $t = -2.32$, $p < .05$). *Participant Age* was not significant predictor.

Introducing the fixed effects of interactions between Time (T0 to T3) and the Program, Group, and Participant independent variables in Model 3 significantly reduced the Δ -2 log Λs, but did not appreciably change the variance components parameters ($\Delta < .02$) for LEQ Overall, and for each of the LEQ factors ($\Delta < .04$; see Table 7.38). Thus, after accounting for the fixed effects of interactions between Time (T0 to T3) and the independent variables in Model 3, there remained a considerable and significant amount of random variance at each of the two levels (Time and Participant).

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[81] AM ($ES_m = 0.11$, $t = 3.36$, $p < .05$), AI ($ES_m = 0.06$, $t = 2.09$, $p < .05$), IF ($ES_m = 0.07$, $t = 2.00$, $p < .05$), SC ($ES_m = 0.09$, $t = 2.89$, $p < .05$), and LEQ Overall ($ES_m = 0.07$, $t = 2.39$, $p < .05$)

[82] AM ($ES_m = -0.09$, $t = -3.88$, $p < .05$), IF ($ES_m = -0.05$, $t = -2.15$, $p < .05$), SC ($ES_m = -0.05$, $t = -2.32$, $p < .05$), TL ($ES_m = -0.07$, $t = -3.22$, $p < .05$), TM ($ES_m = -0.06$, $t = -2.56$, $p < .05$), and LEQ Overall ($ES_m = -0.07$, $t = -3.13$, $p < .05$)

[83] Group Size data for T0 to T3 was negatively skewed, with relatively small numbers of participants in group sizes of 6 ($n = 8$), 7 ($n = 4$), 8 ($n = 4$), 9 ($n = 6$), and 10 ($n = 23$) representing 11% of the data, and collectively exhibiting stronger effects than for larger groups sizes up to 16.

Conclusion. In response to Research Question 2.11.6, the fixed effect of interactions between Time (T0 to T3) and the independent variables significantly improved MLM fits for T0 to T3 LEQ Overall and LEQ factors, but only to a small extent. Program Length and Participant Age were not significant predictors. Group Size and Group Gender were small, significant predictors for several outcomes, although sampling issues limited generalisability. Males reported slightly stronger long-term outcomes for Active Initiative and Task Leadership. However, there remained a significant amount of unexplained variance at each of two levels, Participant and Time.

Table 7.35 *Summary of MLM 2 t-values, Ranks, and ρ for the Fixed Effect of Time (T1 to T2 and T0 to T3) for LEQ Overall and LEQ Factors as Response Variables*

	T1 to T2			T0 to T3		
LEQ Factor	*t*	ES_m	Rank	*t*	ES_m	Rank
Achievement Motivation	20.75	.25	7	1.84	.06	7
Active Initiative	20.25	.24	8	5.05	.18	5
Emotional Control	28.88	.35	5	-	-	-
Intellectual Flexibility	20.44	.28	6	3.69	.11	6
Self Confidence	31.11	.42	2	7.38	.22	3
Social Competence	31.63	.38	3	9.04	.27	2
Task Leadership	30.50	.37	4	9.82	.30	1
Time Management	37.25	.45	1	6.96	.21	4
Overall	38.35	.46		9.39	.28	

Table 7.36 *Summary of MLM 1 Variance Components (σ^2) For T1 to T2 and T0 to T3 LEQ Overall and Each LEQ Factor As Response Variables*

	Group-level			Participant-level			Time-level		
LEQ Factor	σ^2_v	σ^2_v *SE*	*t*	σ^2_u	σ^2_u *SE*	*t*	σ^2_e	σ^2_e *SE*	*t*
T1 to T2									
Achievement Motivation	.054	.010	5.40	.481	.020	24.05	.467	.012	38.92
Active Initiative	.037	.009	4.11	.530	.021	25.24	.433	.011	39.36
Emotional Control	.043	.009	4.78	.437	.020	21.85	.518	.013	39.85
Intellectual Flexibility	.047	.009	5.22	.424	.020	21.20	.527	.013	40.54
Self Confidence	.027	.008	3.38	.372	.019	19.58	.601	.015	40.07
Social Competence	.025	.008	3.13	.446	.020	22.30	.529	.014	37.79
Task Leadership	.042	.009	4.67	.450	.020	22.50	.508	.013	39.08
Time Management	.036	.008	4.50	.370	.019	19.47	.593	.015	39.53
Overall	.053	.010	5.30	.405	.019	21.32	.542	.014	38.71
T0 to T3									
Achievement Motivation	-	-	-	.456	.053	8.60	.543	.037	14.68
Active Initiative	-	-	-	.559	.056	9.98	.440	.030	14.67
Emotional Control	-	-	-	-	-	-	-	-	-
Intellectual Flexibility	-	-	-	.391	.053	7.38	.608	.042	14.48
Self Confidence	-	-	-	.428	.053	8.08	.570	.039	14.62
Social Competence	-	-	-	.448	.053	8.45	.551	.038	14.50
Task Leadership	-	-	-	.491	.054	9.09	.508	.035	14.51
Time Management	-	-	-	.444	.053	8.38	.555	.038	14.61
Overall	-	-	-	.441	.053	8.32	.558	.038	14.68

Note. Response variables were standardised, therefore the random variance parameter estimates (σ^2) are equivalent to intraclass correlations (ρ).

Table 7.37 *Summary of MLM 3 t-values and ES_ms for the Fixed Effects of Time (β_1; T1 to T2 and T0 to T3) and Interactions Between Time (T1 to T2 and T0 to T3) and Participant, Group, and Program Independent Variables (β_2 to β_{12}) for LEQ Overall and LEQ Factors as Response Variables*

Model 3	AM		AI		EC		IF		SC		SO		TL		TM		Overall	
Fixed Effects	*t*	ES_m	*t*	ES_n	*t*	ES_m	*t*	ES_m	*t*	ES_m	*t*	ES_m	*t*	ES_m	*t*	ES_m	*t*	ES_m
Time (T1 to T2)	20.75	0.25	20.38	0.27	29.00	0.32	20.56	0.26	35.13	0.34	31.63	0.33	30.63	0.34	37.38	0.36	43.86	0.40
Participant Gender	-1.75	-0.01	-2.00	-0.01	0.25	0.00	-0.44	0.00	3.00	0.03	-4.13	-0.03	-1.88	-0.01	-1.13	-0.01	-1.25	-0.01
Participant Age	-1.15	-0.01	0.75	0.01	3.08	0.04	2.07	0.03	1.54	0.02	-2.38	-0.03	-0.62	-0.01	-0.54	-0.01	0.50	0.01
Group Gender	0.10	0.00	-0.89	-0.02	-2.10	-0.04	-1.00	-0.02	-0.90	-0.02	-0.70	-0.02	0.90	0.02	-1.90	-0.04	-1.33	-0.02
Group Size	0.36	0.01	0.60	0.01	0.64	0.01	-0.73	-0.02	1.18	0.03	0.09	0.00	1.73	-0.04	-0.73	-0.02	-0.10	0.00
Program Length	1.29	0.08	2.41	0.16	-1.34	-0.09	1.00	0.07	1.56	0.13	0.29	0.02	-0.56	-0.04	1.63	0.13	1.06	0.06
Program-Adolescent	0.77	0.10	1.04	0.15	2.83	0.41	1.09	0.17	3.05	0.51	-0.15	-0.02	2.82	0.40	1.32	0.21	2.16	0.26
Program-Young Ad.	1.01	0.17	0.83	0.15	3.84	0.72	1.31	0.26	2.97	0.65	0.90	0.19	3.14	0.58	1.82	0.39	2.72	0.43
Program-Adult	0.98	0.10	1.48	0.15	2.96	0.32	1.13	0.13	3.25	0.40	0.71	0.08	2.56	0.27	1.74	0.21	2.48	0.22
Program-Family	0.83	0.05	1.66	0.10	3.38	0.20	1.16	0.07	3.03	0.21	0.41	0.03	2.79	0.16	1.45	0.09	2.56	0.12
Program-Corporate	1.07	0.12	1.32	0.16	2.85	0.35	1.42	0.18	3.03	0.42	0.32	0.04	2.70	0.33	1.73	0.23	2.40	0.25
Program-Special	1.88	0.09	1.48	0.07	3.04	0.16	1.00	0.05	3.22	0.20	0.84	0.05	2.84	0.14	1.38	0.08	2.67	0.12
Time (T0 to T3)	1.92	0.06	5.05	0.18	-	-	3.69	0.11	7.38	0.22	9.04	0.27	9.82	0.30	6.96	0.21	9.39	0.28
Participant Gender	-0.80	-0.02	-2.91	-0.06	-	-	-1.30	-0.03	0.00	0.00	-0.88	-0.02	-2.32	-0.05	-0.88	-0.02	-1.88	-0.04
Participant Age	-0.71	-0.02	-1.06	-0.03	-	-	-0.16	-0.01	0.00	0.00	0.45	0.01	-0.37	-0.01	0.00	0.00	-0.25	-0.01
Group Gender	3.36	0.11	2.09	0.06	-	-	2.00	0.07	2.89	0.09	0.76	0.02	0.91	0.03	0.29	0.01	2.39	0.07
Group Size	-3.88	-0.09	-0.74	-0.01	-	-	-2.15	-0.05	-2.32	-0.05	-1.84	-0.04	-3.22	-0.07	-2.56	-0.06	-3.13	-0.07
Program Length	-0.51	-0.02	-0.19	-0.01	-	-	-0.27	-0.01	0.10	0.00	0.63	0.02	0.59	0.02	-0.07	-0.03	-0.03	0.00

Table 7.38 *Summary of MLM 1, MLM 2, and MLM3 Random Effect Parameter Estimates for T1 to T2 and T0 to T3 LEQ Overall and LEQ Factors as Response Variables*

	AM			AI			EC			IF			SC			SO			TL			TM			Overall		
Model	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
T1 to T2																											
Between-Group	.05	.05	.05	.04	.04	.04	.04	.04	.04	.05	.05	.05	.03	.03	.03	.03	.02	.02	.04	.04	.04	.04	.04	.04	.05	.05	.05
Between-Participant	.48	.51	.51	.53	.56	.56	.44	.49	.49	.02	.46	.46	.37	.45	.46	.45	.51	.51	.45	.51	.51	.45	.46	.47	.41	.50	.51
Between-Time	.47	.41	.40	.43	.38	.37	.52	.41	.40	.53	.46	.45	.60	.44	.43	.53	.40	.40	.51	.39	.38	.41	.42	.40	.54	.35	.34
T0 to T3																											
Between-Participant	.46	.46	.48	.56	.57	.58	-	-	-	.39	.40	.41	.43	.51	.48	.45	.49	.50	.49	.54	.55	.44	.47	.48	.44	.49	.50
Between-Time	.54	.54	.50	.44	.41	.40	-	-	-	.61	.59	.58	.57	.46	.47	.55	.46	.46	.51	.41	.40	.56	.50	.49	.56	.46	.44

Note. Model 1 parameters = ρ.

Example Detailed MLM Results (T1 to T2 LEQ Overall)

Model 1. In order to examine Research Question 2.11.1, a variance components model (Model 1) with three levels (Time, Participant, and Group) was fitted to short-term (T1 to T2) standardised LEQ Overall scores (Ztotfact) as the response variable. MLA parameter estimates are shown in the MLwiN output screenshot in Figure 7.12 and summarised in Table 7.39, along with parameter estimates for Models 2 and 3 which introduced fixed parameters for Time (T1 to T2) and interactions between Time (T1 to T2) and each of the independent variables.

As described in Chapter 5, subscript *i* refers to Time (measurement occasion; Level 1), *j* refers to the Participant (Level 2) and *k* refers to the Group (Level 3). Subscript *ijk* means that variables vary from time to time, from participant to participant, and from group to group. Thus, Ztotfact_{ijk} is the standardised LEQ Overall score for Participant *j* of the *k*th Group at Time *i*. *XB* indicates the fixed part of the model. Ω represents the covariance matrix, with the parameters of interest being β_{0ijk} (the intercept), and the residuals of the random Group (v_{0k}), Participant (u_{0jk}), and Time (e_{ijk}) effects. These residuals are assumed to be normally distributed with a mean of zero and variances of σ^2_{v0}, σ^2_{u0}, and σ^2_{e0}, respectively.

The mean intercept, β_0, constitutes the fixed part of the variance components model, and its parameter estimate represents the grand mean. In this model, the grand mean (intercept) was -.004 (.021). This is very close to 0 because the response variable was standardised. Thus, as a result of standardisation of the response variables, intercept estimates in this study were of no interest.

The intercepts for the Level 3 Group residuals (v_{0k}) had a variance (σ^2_{v0}) of .053 (*SE* = .010, $t = 5.30$, $p < .05$), indicating a small, significant difference between intercepts for different Groups. There was considerable variation in Level 2 Participant residuals (u_{0jk}), with a variance (σ^2_{u0}) of .405 (*SE* = .019, $t = 21.32$, $p < .05$), indicating significant individual differences. Finally, there was considerable,

significant Level 1 Time residual (e_{ijk}) variation (σ^2_{e0}= .542, *SE* = .014, *t* = 38.71, *p* < .05)[84].

Ratios between the parameter estimates and their *SE*s provide a test statistic which can be assessed using the *t* distribution. Thus, using a 95% CI, there is a critical *t* value of 1.96. On this basis, each of the three random levels was associated with a significant proportion of variance in the response variable (see Table 7.39). Finally, the 2 x loglikelihood value of 16,602.020 provides a basis for χ^2 comparison with subsequent nested models. Variance components parameters can also be interpreted as intraclass correlations (ρ) because the response data were standardised[85]. Thus, 41% of the variance in T1 and T2 LEQ Overall scores was attributable to the Participant-level, 54% to the Time-level, and 5% to Group-level.

$$\text{Ztotfact}_{ijk} \sim N(XB, \Omega)$$
$$\text{Ztotfact}_{ijk} = \beta_{0ijk}\text{cons}$$
$$\beta_{0ijk} = -0.004(0.021) + v_{0k} + u_{0jk} + e_{0ijk}$$
$$\begin{bmatrix} v_{0k} \end{bmatrix} \sim N(0,\ \Omega_v) : \Omega_v = \begin{bmatrix} 0.053(0.010) \end{bmatrix}$$
$$\begin{bmatrix} u_{0jk} \end{bmatrix} \sim N(0,\ \Omega_u) : \Omega_u = \begin{bmatrix} 0.405(0.019) \end{bmatrix}$$
$$\begin{bmatrix} e_{0ijk} \end{bmatrix} \sim N(0,\ \Omega_e) : \Omega_e = \begin{bmatrix} 0.542(0.014) \end{bmatrix}$$

*-2*loglikelihood(IGLS Deviance)* = 16602.020(6128 of 6128 cases in use)

Figure 7.12 Model 1: Variance components model for LEQ Overall (Ztotfact).

Model 2. In order to examine Hypothesis 2.11.2, Time (T1 to T2; ztime12) was added as a fixed predictor to the variance components model (see Figure 7.13 and Table 7.39). Parameter estimates indicated that the fixed effect of Time was significant and positive (β_1 = .308, *SE* = .010, *t* = 39.22, *p* < .05, ES_m = 0.46), as hypothesised.

Residual Group-level variance was similar to that for the variance components model, whilst Participant-level variance increased and Time-level

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[84] It should be noted that random Time-level variation does not necessarily indicate positive mean increases between T1 and T2, but rather it signifies a lack of complete stability in LEQ Overall scores between T1 and T2.

[85] When the response variable is standardised, parameters used as the denominator terms sum to 1. For example, the sum of level 3, 2, and 1 variances for model 1 was .053 + .405 + .542 = 1.000.

variance decreased compared to the variance components model (see Table 7.39). These were logical differences because the fixed effect of Time in Model 2 explained a considerable portion of the variance that was previously being treated in Model as random Time-level variance.

The 2 x loglikelihood for model 2 was 15,290.960, indicating a significant $\Delta \chi^2$ of 1311.06 compared to model 1 ($df = 1$, $p < .05$)[86]. Thus, the addition of Time as a fixed predictor provided a better fit than Model 1 and accounted for a notable portion of the random Time variance.

$$\text{Ztotfact}_{ijk} \sim \text{N}(XB, \Omega)$$
$$\text{Ztotfact}_{ijk} = \beta_{0ijk}\text{cons} + 0.307(0.008)\text{Ztime12}_{ijk}$$
$$\beta_{0ijk} = -0.004(0.021) + v_{0k} + u_{0jk} + e_{0ijk}$$

$$\begin{bmatrix} v_{0k} \end{bmatrix} \sim \text{N}(0, \Omega_v) : \Omega_v = \begin{bmatrix} 0.053(0.010) \end{bmatrix}$$

$$\begin{bmatrix} u_{0jk} \end{bmatrix} \sim \text{N}(0, \Omega_u) : \Omega_u = \begin{bmatrix} 0.500(0.019) \end{bmatrix}$$

$$\begin{bmatrix} e_{0ijk} \end{bmatrix} \sim \text{N}(0, \Omega_e) : \Omega_e = \begin{bmatrix} 0.353(0.009) \end{bmatrix}$$

*-2*loglikelihood(IGLS Deviance)* = 15290.960(6128 of 6128 cases in use)

Figure 7.13 Model 2: Baseline variance components model with T1 to T2 as a fixed predictor for LEQ Overall (Ztotfact).

Model 3. In order to examine Research Question 2.11.3, fixed interaction terms between Time (T1 to T2) and the 11 explanatory variables were added. The interaction terms were cross-products between standardised variables for Time (T1 to T2) and each of Participant Age, Participant Gender, Group Size, and Group Gender, Program Length, and dummy variables indicating six Program Types (Adolescent, Young Adult, Adult, Family, Corporate, and Special). MLM parameter estimates, *SE*s, and *t*-values are shown in Figure 7.14 and Table 7.39.

The fixed effect of Time (T1 to T2) was significant ($\beta_1 = .308$, $SE = .007$, $t = 44.00$, $p < .05$, $ES_m = 0.40$). In addition, all of the six fixed interaction effects between Time (T1 to T2) and each of the six Program Types (Adolescent

[86] χ^2 *df*s for model comparisons equal the difference between the number of estimated parameters in the two models.

(zprogadolt12), Young Adult (zprogyadlt12), Adult (zprogadult12), Family (zprogfamlt12), Corporate (zprogcorpt12), and Special (zprogspect12)) were significant and positive, and thus predicted additional variance in response variable above and beyond the Time fixed effect. *t*-statistics and ES_ms allowed comparison of the relative sizes of the Time by Program Type effects: Young Adult ($t = 2.72$, $ES_m = 0.43$), Special ($t = 2.67$, $ES_m = 0.12$), Family ($t = 2.56$, $ES_m = 0.12$), Adult ($t = 2.48$, $ES_m = 0.22$), Corporate ($t = 2.40$, $ES_m = 0.25$), and Adolescent ($t = 2.16$), $ES_m = 0.26$).

None of the interactions between Time (T1 to T2) and Participant Gender (zstudsext12), Participant Age (zageyearst12)), Group (Size (zgpsizet12), and Group Gender (zggpmixd12)) were significant (see Table 7.39). The 2 x loglikelihood was 15,152.530, with the $\Delta \chi^2$ between Model 2 and 3, was significant (138.43, $df = 11$, $p < .05$), indicating an improved overall model fit[87].

$$\text{Ztotfact}_{ijk} \sim N(XB, \Omega)$$

$$\begin{aligned}\text{Ztotfact}_{ijk} = {} & \beta_{0ijk}\text{cons} + 0.308(0.007)\text{Ztime12}_{ijk} + -0.010(0.008)\text{zstudsext12}_{ijk} + \\ & 0.006(0.012)\text{zageyearst12}_{ijk} + -0.001(0.010)\text{zgpsizet12}_{ijk} + -0.012(0.009)\text{zgpmixdt12}_{ijk} + \\ & 0.034(0.032)\text{zproglent12}_{ijk} + 0.145(0.067)\text{zprogadolt12}_{ijk} + 0.239(0.088)\text{zprogyadlt12}_{ijk} + \\ & 0.124(0.050)\text{zprogadult12}_{ijk} + 0.069(0.027)\text{zprogfamlt12}_{ijk} + \\ & 0.137(0.057)\text{zprogcorpt12}_{ijk} + 0.064(0.024)\text{zprogspect12}_{ijk}\end{aligned}$$

$$\beta_{0ijk} = -0.005(0.021) + v_{0k} + u_{0jk} + e_{0ijk}$$

$$\begin{bmatrix} v_{0k} \end{bmatrix} \sim N(0, \Omega_v) : \Omega_v = \begin{bmatrix} 0.052(0.010) \end{bmatrix}$$

$$\begin{bmatrix} u_{0jk} \end{bmatrix} \sim N(0, \Omega_u) : \Omega_u = \begin{bmatrix} 0.506(0.019) \end{bmatrix}$$

$$\begin{bmatrix} e_{0ijk} \end{bmatrix} \sim N(0, \Omega_e) : \Omega_e = \begin{bmatrix} 0.338(0.009) \end{bmatrix}$$

*-2*loglikelihood(IGLS Deviance)* = 15152.530(6128 of 6128 cases in use)

Figure 7.14 Model 3: Baseline variance components model with T1 to T2 and interactions between Time and Explanatory variables as fixed predictors for LEQ Overall (Ztotfact).

[87] The critical 95% χ^2 value for comparing differences between the 2 x loglikelihood estimates of the MLMs with 1 *df* is 3.84 and with 11 *df* is 19.68.

Table 7.39 *MLA Parameter Estimates and Model Fits for LEQ Overall (T1 to T2)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	-.004	.021	-0.19	-.004	.021	-0.19	-.004	.021	-0.19
β_1 Time (1 to 2)				.307	.008	38.35*	.308	.007	43.86*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.010	.008	-1.25
β_3 Participant Age							.006	.012	0.50
β_4 Group Gender							-.012	.009	-1.33
β_5 Group Size							-.001	.010	-0.10
β_6 Program Length							.034	.032	1.06
β_7 Program Type - Adolescent							.145	.067	2.16*
β_8 Program Type - Young Adult							.239	.088	2.72*
β_9 Program Type - Adult							.124	.050	2.48*
β_{10} Program Type - Family							.069	.027	2.56*
β_{11} Program Type - Corporate							.137	.057	2.40*
β_{12} Program Type - Special							.064	.024	2.67*
Random									
σ^2_v Between-Group	.053	.010	5.30*	.053	.010	5.30*	.052	.010	5.20*
σ^2_u Between-Participant	.405	.019	21.32*	.500	.019	26.32*	.506	.019	26.63*
σ^2_e Between-Time	.542	.014	38.71*	.353	.009	39.22*	.338	.009	37.56*
Model fit									
-2 log Λ			16,602.02			15,290.96			15,152.53
Δ -2 log Λ						1,311.06*			138.43*
Total fixed effects			0			1			12

Note. * $p < .05$

Summary

This section reported on MLAs of LEQ Overall and the eight LEQ factors (*N* = 3,064 for T1 to T2 data; *N* = 424 for T0, T1, T2, and T3 data), responding to Research Question 2.11.1 through to Research Question 2.11.6. For short-term analyses, the three levels (Time, Participant, and Group) accounted for approximately 55%, 40%, and 5% of the random variance respectively. For long-term analysis, two levels (Time and Participant) accounted for approximately 56% and 44% of the random variance respectively. A summary of the statistically significant effects is presented in Table 7.40.

Time was a significant fixed predictor of short- and long-term changes in LEQ Overall and for each of the LEQ factors, except for long-term changes in Achievement Motivation and Emotional Control (the solution for which did not converge). The short-term ES_m of .46 and the long-term ES_m of .28 were very similar to the ES_ns reported earlier, as were the patterns and relative magnitudes of the fixed effect of Time (T1 to T2 and T0 to T3) for each of the LEQ factors.

Of the fixed effect interactions between Time (T1 to T2) and the independent variables, *Program Type* was the strongest predictor, with Young Adult programs generally being the most effective in the short-term, supporting earlier analyses[88]. Other statistically significant fixed effects were very small (see summary in Table 7.40).

Program Length did not significantly predict short- or long-term outcomes, with the exception of positively predicting short-term Active Initiative outcomes, a small effect. Program Length coefficients were very small, positive, and non-significant for short-term outcomes.

Group Gender results indicated very slightly greater short-term changes for single-sex groups for Active Initiative and Emotional Control. For long-term changes, co-educational groups had slightly greater changes for Achievement Motivation, Active Initiative, Intellectual Flexibility, Self Confidence, and LEQ

[88] The effect of Program Type was only analysed for T1 to T2 data because T0 to T3 data consisted mostly of only one Program Type (Young Adults, plus some Corporate).

Overall. These long-term results should be interpreted cautiously due to sampling limitations.

Group Size had no impacts on short-term outcomes, but smaller groups had significantly larger long-term changes for Achievement Motivation, Intellectual Flexibility, Self Confidence, Task Leadership, Time Management, and LEQ Overall. Sampling issues, however, limit the generalisability of these long-term findings.

Participant Gender results indicated that male participants had very slightly larger long-term outcomes for Active Initiative and Task Leadership, and stronger long-term outcomes for Active Initiative and Social Competence, whilst females reported stronger short-term outcomes for Self Confidence.

Participant Age results indicated that older participants had very slightly larger outcomes for Emotional Control and Intellectual Flexibility, whilst younger participants had very slightly larger short-term outcomes for Social Competence. Participant Age did not influence longer-term changes or short-term LEQ Overall outcomes.

These MLM results largely corroborated, replicated, and usefully extended earlier findings about the impacts of short- and long-term impacts of outdoor education programs in this study on life effectiveness.

Table 7.40 *Summary of Significant MLM 3 Fixed Effect Parameters, with LEQ Overall and LEQ Factor Scores as Response Variables*

	Interactions with Time					Time	Time Effects for Each Program Type					
	Participant		Group		Program							
LEQ Factor	Gender	Age	Gender	Size	Length	All	Adolesc.	Y. Adult	Adult	Family	Corporate	Special
T1 to T2												
AM						+						
AI	♂		-		+	+						
EC		+	-			+	+	+	+	+	+	+
IF		+				+						
SC	♀					+	+	+	+	+	+	+
SO	♂	-				+						
TL						+	+	+	+	+	+	+
TM						+						
Overall						+	+	+	+	+	+	+
T0 to T3												
AM			+	-								
AI	♂		+			+						
EC												
IF			+	-		+						
SC			+	-		+						
SO						+						
TL	♂			-		+						
TM				-		+						
Overall			+	-		+						

Note. + = positive parameter ($p < .05$); - = negative parameter ($p < .05$); Shaded cells indicate that parameters were not estimated.

Summary

This chapter reported the results of Study 2, based on use of descriptive statistics, effect sizes and confidence intervals, repeated measures and mixed design MANOVAs, and multi-level analyses to investigate short- (T1 to T2) and long-term changes in LEQ Overall and LEQ factor scores, and to examine the role of six naturally-occurring independent variables. Results revealed moderate overall short-term changes in life effectiveness, with small-moderate long-term changes. These results were stronger for a band of five factors (Emotional Control, Self Confidence, Social Competence, Task Leadership, and Time Management), and smaller for a band of three factors (Achievement Motivation, Active Initiative, and Intellectual Flexibility). There was a small negative change between T0 and T1 (prior effects; possibly due to "situational threat") and between T2 and T3 (follow-up effects; possibly due to dissipation of "post-group euphoria"), helping to explain why the long-term effects were somewhat smaller than short-term effects.

Of the six naturally-occurring independent variables, the most useful predictor was Program Type, with Young Adult program participants tending to report the largest short-term changes. Young Adult programs conducted by OBA had particularly strong short-term outcomes, but similar long-term outcomes to Young Adult programs conducted by other organisations. The effects of the other five independent variables were generally very small and non-significant. There was significant random (unexplained) variance which remained at each of the three hierarchical levels: Time (~ 45%), Participant (~ 50%), and Group (~ 5%).

CHAPTER 8

DISCUSSION AND IMPLICATIONS FOR THEORY, RESEARCH, AND PRACTICE

Introduction

This chapter discusses key findings, strengths, limitations, and implications of the present investigation. This thesis sought to address two main problems in the field of outdoor education research: firstly, the lack of appropriate instrumentation for the measurement of change in typically targetted goals of outdoor education (Study 1); and secondly, the lack of large-scale, longitudinal, comparative outdoor education studies and the need to investigate possible predictors of outdoor education outcomes (Study 2). Thus, Study 1 advanced the psychometric development of the Life Effectiveness Questionnaire (LEQ), and Study 2 investigated longitudinal outdoor education program outcomes using the LEQ as an outcome measure.

Study 1: Psychometric Development of the LEQ

Introduction

Study 1 conceptualised and empirically explored the global construct of life effectiveness and its proposed dimensions. The specific aims of Study 1 were to examine the psychometrics of the LEQ-G and LEQ-H, to consider the relative fits of first-order and global second-order models, and to determine whether the LEQ factor structure was salient (invariant) across participant gender and age.

Life effectiveness was conceptualised as comprising of generic, distinct, enhanceable life skills that help a person to lead a productive and well-managed life or, more simply, as a person's capacity to adapt, survive, and thrive. Synonymous phrases include life fitness, personal effectiveness, and personal competence. Life effectiveness was further theorised to include self confidence, achievement motivation, and social, intellectual, emotional, and behavioural self management

skills. Life effectiveness constructs were further conceptualised as theoretically amenable to change via experience- and challenge-based intervention. Life effectiveness has, however, received limited attention in psychological and outdoor education literature to date.

The LEQ operationalised life effectiveness as a multidimensional construct based on five principles: assessing life skill competencies, relevance to program aims, short and simple, sensitivity to change, and usefulness as an educational exercise. Following five previous unpublished stages of instrument development (see Chapter 5), the 11-factor, 64-item LEQ-G was developed. In Study 1, congeneric and multi-factorial CFAs of LEQ-G data (Sample 1) led to a refined measurement model, the 8-factor, 24-item LEQ-H[89]. The LEQ-H model was re-tested with a new dataset (Sample 2) which fully replicated and strongly supported the LEQ-H model as psychometrically sound (see Chapters 5 and 6).

Structure and Invariance

Study 1 found that a first-order, eight-factor structure provided a very good fit to the LEQ Sample 1 and Sample 2 data (TLI > .95). In addition, a global, second-order life effectiveness model also provided a very good fit. Thus, the LEQ measurement model was supported as consisting of eight distinct life effectiveness factors which are sufficiently inter-related so as to also constitute a higher-order, general life effectiveness factor. Although the first- and second-order models were well supported, other models could also be considered in future. For example, a more differentiated second-order model or a third-order model might be feasible.

Invariance testing indicated that the second-order model was slightly more stable across gender and age. The first-order model appeared to vary slightly across gender and age, however it had an excellent fit for each of the groups tested. In general, these results indicate that the LEQ instrument can be used with confidence in making comparative evaluations of factor means and program outcomes across gender and age subgroups, using a first- or second-order model.

[89] The LEQ-H consists of AM, AI, EC, IF, SC, SO, TL, and TM, with each factor measured by three items. Three factors were dropped from the LEQ-G: OD, PT, and HR.

Factors and Items

Congeneric and multi-factorial CFAs helped to establish the psychometric properties of the LEQ-G factors. Eight LEQ-G factors exhibited acceptable internal consistency and patterns of factor loadings. However, there was a lack of psychometric support for 3 of the 11 proposed LEQ-G factors.

Organisational Self-Discipline was dropped because it shared a high correlation with Time Management (> .9) and was not as internally consistent as Time Management. Time Management also had the advantage of being a more clearly defined life effectiveness skill. The high correlation between Time Management and Organisational Self-Discipline also suggests that Time Management can be understood as closely related to self-organisation.

Hardiness Resourcefulness was also dropped. Congeneric analysis appeared to be promising, but CFAs revealed that Hardiness Resourcefulness was highly correlated with Self Confidence and Emotional Control, and moderately correlated with Intellectual Flexibility and Productive Teamwork. Thus, Hardiness Resourcefulness was not operationalised as a distinct construct. This also indicated that many of the other proposed life effectiveness factors are positively related to constructs such as hardiness, resourcefulness, and resilience.

Productive Teamwork was the third factor dropped, although the evidence for doing so was equivocal. Some Productive Teamwork items did not have strong primary loadings. Furthermore, there were moderately high correlations between Productive Teamwork and each of Intellectual Flexibility, Task Leadership, and Social Competence. These were all logical relations which indicated that perhaps Productive Teamwork could better understood as closely related to other areas of life effectiveness, particularly being open to ideas, able to lead, and socially competent as opposed to being a distinct life effectiveness competency. Thus, the Productive Teamwork items were dropped; in so doing, the TLI remained the same. Thus, Productive Teamwork could have been retained to create a 9-factor model or dropped to create an 8-factor model, but the latter model was preferred in the interests of simplicity and using a minimal number of items to measure a maximal range of factors. Teamwork, nevertheless, is a popular concept and is a commonly-stated program goal for many outdoor education programs. Thus, future users may prefer to use a version of the LEQ-H which includes the Productive Teamwork

items. Future development of the LEQ model could also pursue conceptual and theoretical work about teamwork and consider trialing a new set of measurement items in an effort to create a more unique measure of an individuals' teamwork skills.

A criticism of CFA studies is that researchers rarely acknowledge that the fit of favoured models is often identical to other equivalent models (Breckler, 1990). In selecting the 8-factor, 24-item LEQ, with three items per factor, it is acknowledged that other statistically defendable models could have been chosen. Models involving four or five items per factor were also tested, supported, and could have been further developed. Researchers who do not share the pragmatic criterion for a quick and simple self-report tool may wish to adopt, for example, the 32-item or 40-item LEQ versions, with 4 and 5 items per factor respectively, for which there were acceptable fit indices (well over .90). Particularly for small-sample studies, use of longer versions of the LEQ should be considered to improve reliability. Other researchers may wish to include additional factors from related instruments (Neill, 2007c).

Strengths and Limitations

Study 1 found strong psychometric support for an 8-factor, 24-item LEQ factor measurement model. The eight factors had good internal and acceptable test-retest reliability. Psychometric support for the second-order global factor model provides the flexibility of additionally using LEQ Overall scores as a reliable composite. Invariance of the LEQ factor structure indicated that the operationalisation of multidimensional aspects of life effectiveness was salient for males and females and for different age groups. Thus, the LEQ can provide a sound basis from which to pursue conceptual advances in life effectiveness theory, research, and practical application.

Three important limitations of the LEQ instrument are the lack of construct validity, moderate skewness and kurtosis of factor score distributions, and the restricted sample upon which the psychometrics are based. Firstly, whilst a solid factor structure and good internal reliability for LEQ-H were demonstrated, further

testing of construct validity (Shadish et al., 2002) and test-retest stability[90] is recommended.

Secondly, the moderately negative skewness and moderately positive kurtosis of responses to the LEQ is of some concern. Whilst skewness is fairly typical of psychological self-report scales (e.g., self-concept; Hattie, 1992b; Wylie, 1970, 1974, 1989), it is not ideal for instrumentation which aims to be a sensitive and valid measure of change. For example, skewness can contribute to ceiling effects. Adjustments to item wording could help to improve the normality of responses. Similarly, inclusion of items and/or factors which reflect higher levels of life effectiveness (e.g., self-actualisation; Maslow, 1971) could possibly help to reduce negative skewness. A possible future strategy for LEQ development would be to focus on measuring aspects of personal and social competency for which people do not tend to rate themselves as particularly effective (e.g., Time Management was the lowest self-rated factor). Item response theory and analysis (De Boeck & Wilson, 2004; Hambleton & Swaminathan, & Rogers, 1991; Reise et al., 1993; Reeve & Mâsse, 2004) could also be a useful technique in this respect for further analysing and developing the existing LEQ items. Finally, some consideration could be given to adjusting the response scale in order to optimise response distributions.

The third limitation was the restricted nature of sample upon which the psychometric data were based. Participants were mostly from Australia, English-speaking, and were mostly drawn from programs conducted by one outdoor education organisation. Future studies could apply and test the LEQ measurement model more widely with respect to culture and language.

Implications for Theory, Research, and Practice

The LEQ provides a simple-to-use, psychometrically valid, self-report tool for assessing the extent to which one is effective in key, generic life skills. Although there is a vast range of psychological self-report measurement tools available, the LEQ is unique in its focus on life effectiveness and in being intentionally designed for use in research and evaluation studies of the effects of personal and social development intervention programs. Outside of the current study, the LEQ has

[90] Test-retest correlations reported in Chapter 6 were moderate, although they were likely to have been affected, to an unknown degree, by the intervention period.

attracted use mid-1990s[91]. Future development of the LEQ is recommended to consider at least four directions – construct validity, response distribution, replication with other samples, measurement of other factors, and consideration of other possible hierarchical factor structures.

To date, the LEQ's design has been shaped by a focus on typical objectives of OBA programs. Whilst the eight LEQ-H factors may well match several relevant objectives of personal and social development intervention programs, many other key program objectives are not adequately assessed by the LEQ-H, such as conflict resolution, coping skills, locus of control, and physical competence. Thus, it may be advisable to adapt the LEQ and/or to seek additional or alternative measures. Other possible adaptations could be to develop a short, global measure of life effectiveness and/or to develop specific measurement models for particular program types or purposes[92]. In this way, the theoretical framework for the LEQ could provide a useful framework for conceptualising, operationalising, and researching psychobehavioural constructs which are commonly targetted for development and intervention.

In addition to considering different factors, future work with the LEQ may also consider other possible hierarchical factor structures. The current study supported a first-order multidimensional model and a global, second-order model of life effectiveness, but life effectiveness could also be conceptualised in terms of first-order factors within second-order domains (such as self, social, and environment) which, in turn, constitute a higher-order global life effectiveness factor (e.g., as in the Marsh & Shavelson (1985) hierarchical self-concept model).

Future work with the LEQ should also address the lack of demonstrated construct validity. Construct validity could be assessed, for example, via criterion (convergent and discriminant) validity (i.e., logical relations with other theoretically-related measures, possibly also including objective behavioural indicators), predictive validity (e.g., different patterns of outcomes should be evident for intervention programs with qualitatively different aims and methods), and content

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[91] (e.g., Bialeschki & Lyons, 2006; Eagle, Gordon, & Lewis, 2000; Fabrizio, 2002; Ho, 2003; Holmes, 1996a, 1996b; McLeod & Allen-Craig, 2005; Miller, 2006; Purdie & Neill, 2002; Reefe, 2006; Sibthorp & Arthur-Banning, 2004; Stenger, 2001; Terry, 2002)

[92] For example, LEQ models for youth at risk (Neill, 2007a) and corporate (Neill, 2007b) adventure-based programs are being piloted.

validity (e.g., via qualitative and mixed methods studies). Other ways to examine construct validity could include adding one or more "control" factors could help to measure social desirability and facilitate the interpretability of LEQ, testing cross-cultural validity (Byrne & Campbell, 1999; Heine, Lehman, Peng, & Greenholtz, 2002), and comparing self and observer ratings of life effectiveness.

The LEQ could be used in investigation of different methods for measuring change, such as by examining changes in actual and ideal self-ratings (Marsh, 1993c), change scores and end-of-program participant evaluations of change, and change scores and retrospective ratings of change (e.g., see Sibthorp, Paisley, Gookin, & Ward, 2007). End-of-program or within-program open-ended surveys and interviews could also explore, for example, participants' understandings of how outdoor education experiences helped (or did not help) them to develop each life effectiveness area[93]. Action-research could be undertaken to investigate experiential processes, activities, and facilitation techniques which specifically target development of each of the LEQ factors. Such steps could help to expand the theoretical conceptualisations of each factor and to develop their validity and generalisability.

In conclusion, the development of the LEQ-H offers a significant contribution to outdoor education and psychological intervention program research. The psychometric structure of the instrument is sound, the factors are reliable, items have good face validity, but further work on construct validity is recommended.

Summary

The LEQ was developed to measure multiple life effectiveness constructs which are theoretically amenable to change and which are typically targetted by outdoor education and other personal development programs. Study 1 demonstrated a robust multidimensional factor structure which was largely invariant across gender and age. The factors are internally reliable and structurally distinct. There was also good support for a global second-order factor structure and invariance of this global model across gender and age, facilitating meaningful reporting and comparison of overall life effectiveness scores.

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[93] Mixed-method studies by McLeod and Allen-Craig (2005) and Miller (2006), for example, have begun analysing qualitative data about outdoor education program effects on life effectiveness skills.

Future work on the development of the LEQ should undertake replication with other samples, investigate construct validity, and seek to improve sensitivity to change and normality of factor score distributions. Employing techniques such as item response theory, comparison of actual-ideal and self-observer ratings, qualitative data, and investigating other possible life effectiveness constructs could help to increase the LEQ's applicability to other settings and to build knowledge about how each skill can be developed.

Study 2: Longitudinal LEQ Changes and the Effect of Six Independent Variables

Introduction

Study 2 investigated longitudinal outdoor education program outcomes using the LEQ as an outcome measure. The specific aims of Study 2 were to examine the short- and long-term effects of outdoor education programs on participants' life effectiveness, and to determine whether the effects of outdoor education programs on life effectiveness vary according to participant-, group-, and program-level independent variables (Program Type, Program Length, Group Gender, Group Size, Participant Gender, and Participant Age)?

Previous outdoor education research tended to find that outdoor education programs have positive developmental impacts on participants, but findings varied considerably and have been subject to several notable methodological limitations. Key recommendations emerging from critical reviews of outdoor education research (e.g., Barret & Greenaway, 1995a, 1995b; Hattie et al., 1997) highlighted the need for longitudinal designs, appropriate dependent measures, control and/or comparison groups, investigation of the role of independent variables which may influence outcomes, and reporting of effect sizes. These issues were all directly considered in the design of Study 2.

Study 2 utilised a truncated time series design in which the LEQ (version G or H) was administered to outdoor education program participants on up to four occasions: T0 (pre-program), T1 (beginning of program), T2 (end of program), and

T3 (follow-up)[94]. Response rates were over 90% for T0, T1, and T2, and were approximately 50% for T3. Analyses of missing data indicated that the sample was likely to be representative of all targetted participants although some caution in interpretation of analyses involving T3 results is warranted. Overall, there were 3,640 participants with matched T1 and T2 responses, and a subset of 663 participants with T0, T1, T2, and T3 responses[95], making this the largest primary study of outdoor education program outcomes conducted to date.

Analyses of statistical change used effect sizes and confidence intervals (Cohen, 1977, 1988, 1992), multivariate, and multi-level analyses. For each hypothesis or research question, (a) descriptive statistics (*M*s, *SD*s, *n*); (b) standardised mean effect sizes with confidence intervals, error-bar charts, and alternative expressions of change; (c) repeated measures and mixed design MANOVAs with follow-up multivariate and paired sample *t* tests; and (d) multi-level analyses were presented. Power of the inferential tests to detect small effects was generally very high (> .90). Of interest was the size, pattern, and statistical significance of changes in LEQ Overall and the LEQ factors over Time, particularly T0 to T1 (Prior effects), T1 to T2 (Short-term effects), T2 to T3 (Follow-up effects), and T0 to T3 (Long-term effects).

Longitudinal Effects

Prior. Research by Hattie et al. (1997) indicated a drop in outcome measure scores between T0 and T1 (-0.05, 319 effects). Two possible reasons for such a drop are: (a) positively biased self-assessments at T0[96]; and (b) negatively biased self-assessments at T1[97]. As hypothesised, LEQ Overall scores decreased significantly between T0 and T1 (-0.09), a small effect which varied significantly according to the LEQ factor. There were statistically significant drops for Achievement Motivation (-0.18), Intellectual Flexibility (-0.13), and Social Competence (-0.16). These results were largely consistent with, but slightly larger than Hattie et al.'s (-0.05).

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[94] T0 was sent by mail approximately 5 weeks prior to the program, T1 was collected on the first day of the program, T2 was collected on the last day of the program, and T3 was sent to participants typically 3 to 6 months after the program completion.
[95] T0 and T3 were sought for most Young Adult programs and for a small number of other programs.
[96] e.g., due to the comfort of the home environment and motivation associated with receiving pre-program information
[97] e.g., due to perceived situational threats associated with being in a novel, challenging situation

To the extent that the observed T0 to T1 effects are generalisable, reconsideration of much empirical outdoor education research outcome literature, and perhaps also other intervention program research literature, is indicated because short-term (T1 to T2) analyses appear to be upwardly biased. Where a study reports, for example, a small pre-post effect size of 0.2, approximately half of this effect could be accounted for by a 0.1 drop between T0 and T1. Thus, where possible, pre-program (T0) assessments should be attained so as not to rely solely on T1 and T2 pre-post scores. Researchers should also strive to minimise possible T1 testing bias by conducting T1 assessments when situational threats seem least likely[98].

Short-term. In Study 2, a large sample (N = 3,640) of outdoor education program participants completed the LEQ at T1 (beginning of program) and T2 (end of program). As hypothesised, there was a statistically significant, positive change in LEQ Overall between T1 and T2 (ES_n = 0.47, $p < .001$). These short-term results were slightly larger than the small-moderate estimates of outdoor education program effect sizes from meta-analyses reviewed in Chapter 3 (approximately .3 to .4; Cason & Gillis, 1994; Hans, 2000; Hattie et al., 1997; Marsh, P. E., 1999a, 1999b), possibly because: (a) the programs in this study were more efficacious than average[99]; (b) the LEQ was more sensitive to change; (c) LEQ data were normalised before calculation of effect sizes in order to minimise the effects of non-normality[100]; and (d) the denominators used for calculating ES_ns in the current study were based on over 3,000 participants and thus were likely to have been slightly smaller than the *SD*s of measures reported in other studies which were typically based on smaller sample sizes. There was also significant variation in T1 to T2 ES_ns for the different LEQ factors, with moderately strong positive changes evident for Band 1 factors (Emotional Control, Self Confidence, Social Competence, Task Leadership, and Time Management) and small-moderate positive changes for Band 2 (Achievement Motivation, Active Initiative, and Intellectual Flexibility) factors.

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[98] e.g., early in the program, but after the initial arousal associated with arriving at the program

[99] For example, 86% of participants were involved in OBA programs and 39% were involved in challenging 3 to 4 week Young OBA programs for motivated young adults. which have been previously identified as particularly effective (e.g., Hattie et al., 1997).

[100] Normalisation of the LEQ data prior to calculation of ES_ns produced slightly higher (~ 0.03) than conventionally-calculated standardised mean effect sizes.

The overall short-term ES_n for outdoor education program participants in the current study was approximately half a standard deviation unit (0.47), equivalent to an *r* of .23, indicating that 5% of the variance in LEQ scores could be accounted for by the T1 to T2 contrast. According to U, just over twice as many participants (68%) reported positive overall short-term change compared to negative change (32%). However, Us underestimated the percentages of changes based on primary data which indicated that four times as many participants (80%) reported positive change compared to participants who reported negative overall change (20%) in life effectiveness[101]. Percentage of change estimates (based on the primary data, i.e., score 2 / score 1) were also categorised into deciles and expressed in the context of a prototypical group of 15 outdoor education participants.

In the multi-level analyses (MLAs), Time (T1 to T2) was modeled as a random effect in a variance components model (along with Participant and Group), and accounted for 54% of the variance in overall scores (and between 43% and 60% of the variance of factor scores). When the fixed effect of T1 to T2 was introduced, its effect was positive and significant, accounting for one-third to a half of the variance which was attributed as random variance at the Time level in the variance components model. These MLA results were consistent with, and supported, the effect size and MANOVA findings.

Follow-up. One of the major limitations of previous outdoor education outcome research has been the lack of long-term follow-up assessment. In Study 2, follow-up questionnaires were sent to 34% of participants, mainly to those involved in Young Adult programs, and also to some Corporate and Special outdoor education program participants. The T3 return rate was 54% (whereas for the other times (T0, T1, and T2) return rates were greater than 90%.) Analyses of response patterns indicated that T3 returnees were largely representative (in terms of the T0, T1, T2 and T1 to T2 LEQ factor scores) of T3 non-returnees, with some minor, statistically significant differences[102].

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[101] The discrepancy between percentages based on U (interpreting the ES_n as a *z* score) and the primary data warrants broader consideration, particularly with regard to the use of effect sizes in meta-analysis to estimate percentages of change.

[102] T3 returnees were higher for AM at T0, and AM and AI at T1 and T2, and were more likely to be female. T3 returnees could also have been a self-selected group of participants who had more positive perceptions of their OE programs experience and thus were more likely to maintain engagement and

There was a small, statistically significant drop in LEQ Overall scores during the follow-up period (T2 to T3; ES_n = -0.10). Follow-up period changes varied significantly according to the LEQ factor, with small-moderate, statistically significant losses for Time Management and smaller, statistically significant drops for Intellectual Flexibility, and Self Confidence. There were non-significant drops between T2 and T3 for the other five LEQ factors. Overall, these results suggest loss of approximately 20% of the short-term benefits (i.e., -0.10 out of 0.51) during the follow-up period. Thus, retention of short-term gains was reasonably good, but not complete. These follow-up findings were somewhat different to the Hattie et al. (1997) meta-analysis, which found an *ongoing growth* during the follow-up period (ES = 0.17). However, both studies can be interpreted as indicating at least reasonable retention of short-term gains in the short- to medium-term.

Explanations for the slightly lower T3 scores compared to T2 include: (a) temporarily inflation of T2 scores due to effects such as post-group euphoria, halo effects, post-purchase rationalisation, and Hawthorne effects; and/or (b) incomplete "transfer of learning" (or "natural dissipation" of short-term gains). Future research in this area could focus more closely on psychoeducational processes which can foster transfer or ongoing development of life effectiveness (e.g., see Rhodes, 2000).

Long-term. There was a small-moderate long-term change in overall life effectiveness between pre-program (T0) and follow-up (T3; ES_n = 0.31). It should be noted, however, that 92% of the 633 cases with T0, T1, T2, and T3 data were from Young Adult programs, thus there is limited generalisability to the other Program Types. Long-term changes varied somewhat according to LEQ factor, with seven out of the eight LEQ factors changing significantly (not Achievement Motivation).

The long-term (T0 to T3) LEQ factors ES_ns were smaller than short-term (T1 to T2) ES_ns. This appears to have been due to a combination of slightly depressed T1 scores, slightly exaggerated T2 scores, and partial degradation of short-term benefits following return from the specific conditions of the outdoor education program to familiar environments back at home, school, and work.

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return their T3 questionnaire. This is possible but somewhat unlikely given that there were no differences in the size of short-term (T1 to T2) changes for T3 returnees and non-returnees. Nevertheless, caution in the interpretation of analyses involving T3 is warranted.

The overall long-term effect of outdoor education programs in the current study on life effectiveness was approximately one third of a standard deviation unit (0.31), equivalent to an *r* of .15, indicating that 2% of the variance in LEQ scores could be accounted for by the T0 to T3 contrast. According to U, just over one and a half as many participants (62%) of participants reported positive pre-post changes compared to negative changes (38%). However, as with the T1 to T2 analyses, this underestimated the primary change data which indicated that there were two and a half times as many participants (72%) who reported positive pre-post change compared to participants who reported negative overall change (28%).

Variance components. Multi-level variance components models indicated that roughly half the variance over Time (T1 to T2 and T0 to T3) in observed LEQ scores was attributable to the random Time effect, roughly another half was attributable to the random Participant effect (individual differences), and approximately 5% was random Group-level variance. Multi-level analyses involving the fixed effects of Time and interactions between Time and the independent variables largely confirmed the inferential and effect size analyses[103].

Overall, less variance at the group-level was found in this study than previous outdoor education multi-level studies by Sibthorp and colleagues (Russell & Sibthorp, 2004; Sibthorp et al., 2004; Sibthorp, Paisely, & Gookin, 2007) and previous mainstream schooling research (e.g., Sellström & Bremberg, 2006). Perhaps the lower group-level variance in the current study was due to a substantial amount of the data (84% for short-term outcomes) being from OBA programs which followed a relatively standardised methodology. The small amount of group-level variance in the current study suggests reasonable consistency of outcomes across groups, although group-level variation was statistically significant and thus, should not be ignored. Nevertheless, most of the variance in LEQ scores was attributable to lability over Time (about a third of which was due to a general fixed effect of Time) and lability between Participants (individual differences), indicating that future

[103] Where there were minor differences, these tended to be due to: (a) use of continuous independent variables in the MLAs compared to recoded ordinal independent variables in the multivariate inferential and effect size analyses (e.g., for Program Length and Group Size); and/or (b) MLAs were conducted with all data whereas multivariate inferential and effect size analyses were sometimes conducted separately for different Program Types to reduce potential for confounding.

outdoor education research could benefit from a greater focus on how individual differences operate in the dynamics of outdoor education programs.

Independent Variables

Study 2 also examined the influence of six naturally-occurring independent variables (Program Type and Program Length, Group Gender, Group Size, Participant Gender, and Participant Age) on life effectiveness dimensions for appropriate cohorts from the short- and long-term samples using descriptive statistics, effect sizes and confidence intervals, and MANOVAs

Program Type. The independent variable which had the largest impact on life effectiveness outcomes was Program Type. There were significant, positive short-term (T1 to T2) ES_ns for LEQ Overall for each of the six Program Types, ranging between 0.32 (Adolescent) and 0.56 (Young Adult). All Program Types exhibited significant and positive changes for each of the eight LEQ factors, with two exceptions[104]. Long-term (T0 to T3) changes were only available for Young Adult (0.48) and Corporate program types (0.09).

Young Adult programs were generally more effective than other Program Types, indicated by the largest short- and long-term ES_ns for LEQ Overall. Results for other five Program Types were similar, which was also indicated by the MLAs[105]. Young Adult OBA programs (0.63) were significantly more effective in the short-term than Young Adult non-OBA programs (0.38), particularly for Self Confidence and Time Management. However, there were no such differences in the long-term. This somewhat confirms previous research indicating that these three to four week, challenging, expedition-based programs conducted by OBA are particularly impactful (e.g., Hattie et al., 1997; Marsh et al., 1986a, 1986b; Mayes, 1997), and further warrants closer study of the causal mechanisms involved in this and similar programs, as well as further investigation into how such effects might be better retained and/or integrated post-intervention.

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[104] There were non-significant changes for AM (Family) and IF (Special).
[105] The MLA fixed interaction effects between Time (T1 to T2) and Program Type were largest for Young Adult programs followed (in descending order) by Special, Family, Adult, Corporate, and Adolescent programs, with some variation in this pattern depending on the specific LEQ factor.

Multivariate tests indicated a significant interaction between the LEQ factors and Time (T1 to T2) for each Program Type. However, only Young Adult program outcomes exhibited significant differentiation, with a band of moderately strong effects and a band of moderate effects[106]. Further study might examine the weakest LEQ factor outcomes (Achievement Motivation, Active Initiative, and Intellectual Flexibility), and consider the extent to which these are valued objectives, and/or look into ways for more effectively enhancing and/or measuring these constructs.

Special program short-term outcomes were similar in size ($ES_n = 0.55$, $n = 95$) to Young Adult programs ($ES_n = 0.56$, $n = 1{,}932$), but had wider confidence intervals because of a much smaller sample size. These results for Special programs reinforce previous research evidence about the potential remedial and restorative power of outdoor education programs for a variety of academic, non-academic, and life skills (e.g., Backhouse, Craig, & Packer, 1978; Marsh & Richards, 1988; Neill, 1996b; Richards, 1979; Richards & Richards, 1981).

Program Length. Program Length was hypothesised to be positively associated with changes in life effectiveness. Program Lengths varied between 3 and 28 days, with an average length of 14 days[107]. Overall, Program Length was not significantly correlated with life effectiveness for any of the Program Types. There were weak, positive, but non-significant partial correlations with short- and long-term changes in life effectiveness factors. In the MLAs, the Program Length by Time interaction was only a significant, positive predictor for one outcome (Active Initiative for T1 to T2).

Thus, there was only weak, largely non-significant evidence to support the conjecture that longer programs are more effective; the vast majority of the variance in outcomes appears to be independent of Program Length. These results are smaller than the correlation of .17 between Program Length (Cason and Gillis, 1994) but

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[106] Ceiling effects may have played a role. For example, TM had the lowest mean factor score and one of the highest T1 to T2 ES_ns. On the other hand, AM was initially rated relatively high, yet it had one of the lowest T1 to T2 ES_ns; SC also started high and had a large ES_n)

[107] However, the Program Length data were better conceptualised as bimodal, with about two-thirds of the data centred around a mode of 10 days and the other third centred around a mode of 22 days. Analyses were conducted separately for each Program Type within which there were comparable programs of different lengths. This eliminated the confound between duration and type of program. Partial correlations between Program Length and LEQ outcomes were calculated, with the effect of Participant Age as a covariate.

somewhat similar to findings by Hattie et al. (1997). The lack of notable relationship between Program Length and life effectiveness outcomes in the current study could indicate that program length is a less salient feature of outdoor education programs than is commonly thought. More dynamic process-type variables could be more accurate predictors. For example, individual development may be more dependent on, or related to, group processes (Ewert, 1992; Ewert & Heywood, 1991; McAvoy, Mitten, Stringer, Steckart, & Sproles, 1996) than to the duration of the intervention per se. Whilst a minimal length of time is probably necessary, all outdoor education programs generally seek to provide a "complete" experiential cycle, for example by following "hero's journey"-type stages (Bacon, 1987; Campbell, 1968; Lord, 1987; Loynes, 1999, 2003). Environmental contrast (perceived degree of separation or contrast with home environment; Fabrizio & Neill, 2005), program intensity, and individual coping strategies could also be more salient, alternative constructs.

Group Gender and Participant Gender. Group Gender and Participant Gender had little effect on LEQ outcomes. There were no overall differences in outcomes between males and females, however there were some minor differences for specific LEQ factors (i.e., males had significantly larger short-term outcomes for Social Competence). In addition, multi-level findings indicated stronger short- and long-term outcomes for males for Active Initiative, Social Competence and Task Leadership, whereas females had stronger outcomes for Self Confidence.

Adolescent program single-sex groups, particularly all-female groups, had slightly stronger effects than co-educational groups. However, this trend was reversed for Young Adults, with slightly stronger effects for co-educational groups. Multi-level findings did not indicate any conclusive Group Gender (single-sex vs. co-education) effects, with the exception of more positive changes in Emotional Control for single-sex groups. Overall, these results complement and extend the meta-analytic findings by Hattie et al. (1997) that outdoor education programs seem to have slightly larger effects for single-sex compared to co-educational groups. This suggests that adolescent males may benefit somewhat more from co-educational outdoor education environments than adolescent females. However, too much should not made be made of the largely non-significant trends. Overall results were similarly positive for males and females and for single-sex and co-educational groups.

Group Size. There were no short- or long-term differences in LEQ Overall and factor outcomes for different Group Sizes[108], a result which was consistent for each Program Type. This does not support small class or optimal group size theory. Rather it supports a "group as a whole" theory; that is, that a group, at least in the context of outdoor education programs, functions as a psychosocial "gestalt" which somewhat independent of size. The analysis may be somewhat subject, however, to range restriction (ranging between 3 and 26, with 90% of participants in Group Sizes of between 9 and 26). MLA results also indicated no effects of Group Size on short-term outcomes, although interpretation of the results was somewhat complicated[109].

Participant Age. Overall, there were no significant relations involving age and short- or long-term changes in life effectiveness, an effect which was consistent across the LEQ factors. Some non-significant interaction trends were noted[110]. Analyses of the effect of age on short-term outcomes indicated no effects, but there was some non-significant evidence of interactions between age and outcome for some Program Types[111].

MLA results indicated some significant effects of participant age. Older participants tended to have stronger short-term outcomes for Emotional Control and Intellectual Flexibility. Younger participants tended to report stronger short-term outcomes for Social Competence. Participant Age did not influence longer-term changes. These MLA results appear to indicate that participants of different ages derive similar overall changes but with slightly different patterns of outcomes for the different LEQ factors. Thus, age may play a role in determining different kinds of

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[108] Group Sizes were categorised as small (3 to 12), medium (13 to 16), large (17 to 20), and very large (21 to 26) for Adolescent, Young Adult, and Corporate programs.

[109] For long-term MLAs, smaller groups were significantly associated with larger changes for 5 factors (AM, IF, SC, TL, TM) and LEQ Overall. However, these results should be interpreted with caution because they are not consistent with results based on MANOVAs and effect sizes. The different MLA results were probably caused by treating Group Size as continuous, whereas the multivariate treated Group Size as nominal. The MLA findings were due to a relatively small sample of participants in small groups (6 to 10, $n = 45$) who had slightly larger T0 to T3 changes for some factors.

[110] Greater change was evident for older than younger participants in Adolescent programs. On the other hand, greater change was evident for younger than older Corporate program participants (particularly for SO and TL). Perhaps this suggests a non-significant trend towards older adolescents and young adults reporting larger changes, an age group which has been traditionally targetted in OE.

[111] For Family programs, there were stronger short-term outcomes for children compared to parents for AM, SO, TL, and TM, whereas parents reported stronger change for IF. Adults reported greater changes than adolescents in Special programs for EC, IF, SC, SO, and TL, whereas adolescents reported greater changes than adults for AI and TM in these programs.

developmental benefits, although the exact effects appear to be dependent on Program Type and, probably also the nature of the group involved.

Multi-Level Findings

MLAs largely corroborated findings from effect size and MANOVA inferential analyses. This added confidence in the robustness of Study 2's findings because the MLAs took account of inherent hierarchical groupings in the structure of the data. The MLAs also had the advantage of examining the independent variables simultaneously. However, the MLAs had the disadvantage that only one dependent variable was examined per analysis.

Only 5% of the random variance in Study 2 was attributable to differences between groups. This may have been due to the relative homogeneity of groups (most were conducted by one organisation (OBA) which made particularly effort towards providing standard programming). In previous MLAs in the field of outdoor education, Sibthorp and colleagues (Paisely et al., 2008; Russell & Sibthorp, 2004; Sibthorp et al., 2004; Sibthorp, Paisely, & Gookin, 2007) have found approximately 10% to 20% of variance attributable to the group level.

Given that there remained significant unexplained Time- (~ 45%), Participant-(~ 50%), and Group-level (~ 5%) variance, this suggests that other possibly useful independent variables and MLMs could be explored, possibly including multivariate designs, growth curve modeling, modeling of missing data, and allowing variations in parameter slopes for individual differences.

Strengths and Limitations

Study 2 conducted a major investigation of outdoor education outcomes. Strengths of the study include that it: (a) is the largest primary empirical study outdoor education outcomes to date (in terms of sample size and methodological scope); (b) represented a range of participants, groups, and programs, with good return rates; (c) demonstrated use of the LEQ as an intervention program outcome measure; (d) analysed short- and long-term outcomes; (e) analysed the effects of six common, naturally-occurring independent variables on outcomes; (f) demonstrated use of advanced statistical procedures for the analysis of change, including multivariate inferential statistics, effect sizes with prior normalisation of data to

reduce the influence of negative skewness, and multi-level modeling techniques in order to more accurately analyse variance in participants' responses; and (g) interpreted results in the context of effect size benchmarks derived from meta-analytic literature.

Limitations of Study 2 include: (a) Generalisability. Whilst the sample was large and involved a considerable range of programs and participants, it was restricted in its generalisability[112]; (b) T3 return rate. The T3 return rate was just over 50%. Although available analyses indicated that T3 respondees had similar LEQ profiles, it may be that these respondents were more likely to have had positive long-term effects; (c) Lack of control group. There were no control groups (it was a quasi-experimental design), therefore observed changes in the dependent measures cannot be causally attributed to the intervention program. This limitation was somewhat addressed by using comparison groups and by comparing results to meta-analytic benchmarks. Nonetheless, future studies should strive to include control groups; (d) Lack of measure of causal process variables. Although this study analysed the effects of several naturally-occurring independent variables on outcomes, it did not measure any dynamic, causal process variables; (e) Non-independence of observations was likely[113]. This was handled by modeling group as a random effect via MLA but it could have inflated multivariate *F*s in the MANOVAs; (f) Self-report data. The study relied upon empirical self-report data. Self-reports of self-concept have been found to be usually in broad agreement with ratings made by others (Marsh, 1990). Nevertheless, triangulation of findings in future studies is recommended; and (g) Missing data. Missing data were handled conservatively by listwise deletion for independent variables and by imputing LEQ factor scores based on available target items. More sophisticated handling of missing data such as via imputation methods in structural equation modeling and multi-level modeling could help to further test and extend the findings and thereby also improve the validity and generalisability of

[112] 84% percent of the short-term (T1 to T2) sample came from programs conducted by OBA, with the rest conveniently-collected from other (mostly Australian) organisations who were using the LEQ as a program evaluation tool. Although detailed demographic data were not collected, OBA programs are somewhat homogenous with respect to Australian nationality and Caucasian race, English-speaking, and urban, middle-high socioeconomic status. Long-term (T0 to T3) data were limited by being predominantly from one Program Type (Young Adult).

[113] For example, participants within groups are likely to have influenced each other to have more similar responses.

conclusions (e.g., see Bryk & Raudenbush, 1992; Diggle & Kenward, 1994; Gold & Bentler, 2000; Goldstein, 1995; Schafer & Graham, 2002).

Implications for Theory, Research, and Practice

The main implications of Study 2 are that: (a) the conceptualisation of life effectiveness, and operationalisation in the form of the LEQ-H, offer a valuable theoretical and research platform for further investigation of the processes and outcomes of outdoor education and other types of psychosocial intervention programs; (b) there was clear evidence of moderate short- and small to moderate long-term positive impacts of outdoor education programs in this study on participants' ratings of their life effectiveness; (c) this study found little variance in outcomes attributable to six naturally-occurring independent variables; the most notable variation was that Young Adult programs were the most effective, particularly those conducted by OBA; (d) future studies should focus on exploring the role of more dynamic measures of psychosocial processes as predictors of developmental outcomes; (e) caution should be applied to interpreting pre-post (T1 to T2) estimates in outdoor education research because there is mounting evidence that they are positively biased (e.g., due to situational testing effects); and (f) the rigorous use of multivariate inferential, effect size, and multi-level statistical analysis demonstrated in the current study could be considered for more widespread use in outdoor education and intervention program research. The study demonstrated a quasi-experimental methodology and advanced statistical analysis techniques which could be readily replicated, adapted, and extended in other studies.

Study 2 confirmed and extended previous studies which found small to moderate positive short- (T1 to T2) and long-term (T0 to T3) changes for outdoor education programs for a range of measures of personal and social development (e.g., Cason & Gillis, 1994; Hans, 2000; Hattie et al., 1997; Marsh et al., 1986a, 1986b; Marsh, P. E. (1999a, 1999b). Study 2 found moderate short-term positive effects of outdoor education programs on overall life effectiveness of 0.47 (ES_n) which was slightly higher than the 0.30 to 0.40 effect size estimates from outdoor education meta-analyses, perhaps due to: (a) use of a more sensitive measure of change (the LEQ); and (b) a substantial portion of the data (39%) being from three to four week Young Adult OBA programs which have been previously identified as being particularly effective programs (e.g., Hattie et al., 1997).

Several alternative expressions of change were suggested to aid interpretability of the magnitude of short- and long-term changes. In terms of standard deviations units[114], short-term analyses indicated overall change of approximately half a *SD*, whilst long-term analyses indicated an overall change of approximately one third of a *SD*. In odds-ratio terms[115], approximately four times as many participants reported positive short-term overall life effectiveness changes compared to those who reported negative overall change (4:1); for overall long-term range the ratio of positives to negatives was 5:2.

Study 2 identified a small, significant drop in LEQ scores between T0 and T1 (ES_n = -0.09). This result was similar to, but slightly larger than that of Hattie et al. (1997; -0.05) and Marsh et al. (1986b). It now appears to be a robust finding that the first day self-assessments (T1) in outdoor education program research are lower than participants' pre-program assessments (T0). Study 2 also found a small, significant drop between T2 and T3 (ES_n = -0.10), perhaps, for example, due to halo effects, Hawthorne effects, post-group euphoria, post-purchase rationalisation, and/or lack of transfer of learning.

The drops in LEQ scores between T0 to T1 and T2 to T3 findings have important implications for outdoor education and intervention program research. There is accumulating evidence indicating that estimates of short-term change (T1 to T2) may be inflated by negatively biased T1 scores and positively biased T2 scores (see Figure 8.1). Researchers and practitioners are warned that, for example, a positive short-term effect size of 0.20 could actually indicate no real effects and simply be a function of situationally depressed T1 (~ 0.10) and positively biased T2 (~ 0.10) scores. Thus, caution in interpretation of short-term effects is warranted, and appropriate adjustments to research methodology are recommended. Nevertheless, pre-post (T1 to T2) testing will remain popular, particularly for field-based research and program evaluation, on account of its logistical and conceptual simplicity. Thus, it is also important to consider ways of minimising potential T1 and T2 biasing influences and to reflect this in standardised administration procedures. It

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[114] Change in terms of SD units was calculated as the area under the normal curve below *z* score values which were taken as equal to the standardised mean ESs of interest (see Chapter 5; McGraw & Wong, 1992).

[115] Odds-ratios were based on percentages of participants with positive and negative raw change scores for LEQ Overall in the short- (T1 to T2) and long-term (T0 to T3).

may also be prudent to make downward adjustments to estimates of short-term change to correct for possible positive T1 and T2 situational bias. T1 testing should be conducted at a time when artificial situation threats seem least likely to influence participants. This decision will depend largely on the specifics of the program, but a general guide is that T1 should be administered as early as possible after program commencement, but after initial arousal associated with arriving at the program has largely abated. Another option is to consider administering a baseline T0 or T1 assessment during the week prior to program commencement in a familiar home, school, or work environment. T2 assessments, similarly, should ideally be administered after the arousal associated with completion of the last program activity has abated, but before participants are in "going home" mode. Future designs could also consider shorter, in-situ measures during and following outdoor education programs in an effort to better map patterns of psychological response (e.g., Fry & Heubeck, 1998; McIntyre, 1999).

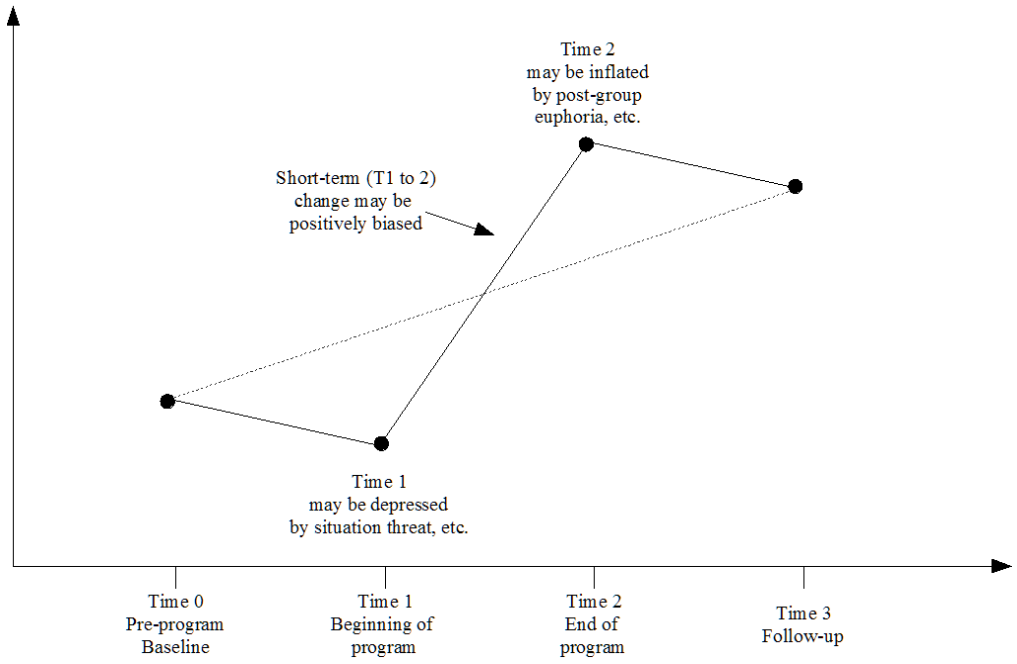


Figure 8.1 Conceptual line graph showing possible biases in self-reporting by outdoor education program participants over time.

Another recommendation for future researchers is with regard to the use of effect sizes and confidence intervals as data analysis techniques for primary research and program evaluation studies. Use of effect sizes and confidence intervals have been called for some time (e.g., Cohen, 1977, 1988, 1992; Kirk, 1996), but only relatively recently have become recognised as best practice (e.g., American

Psychological Association, 2001; Wilkinson & Task Force on Statistical Inference, 1999). To date, relatively few empirical outdoor education studies have made effective use of effect sizes and confidence intervals despite the general social recommendations which were reinforced in the context of outdoor education by Hattie et al. (1997).

In this study, standardised mean effect sizes based on normalised scores (ES_ns) were used in order to minimise possible impacts of skewness. ES_n estimates were slightly higher than standardised mean effect sizes based on original data (0.03). Other researchers may also consider normalising data prior to calculating effect size estimates as a strategy for minimising the effects of skewed data. The current study also demonstrated different ways of expressing the size of change, including U (based on areas under the normal curve), and proportions of students with various deciles of percentage change based on primary data. Such alternative effect size expressions can aid substantive interpretation. Effect size measures might also be calibrated by other variables of value, such as by program cost (to create an index of effect size per dollar (or "return on investment" - "how much bang for your buck?")) and duration (to create an index of effect size per unit of time (or "how much reward for your time?")). Further discussion of meaningful ways to present effect sizes can be found in Yeaton and Sechrest (1981).

In addition to providing an extensive study of life effectiveness outcomes, Study 2 investigated the relative influences of program-, group-, and participant-related variables on outcomes. Much previous empirical outdoor education research has been criticised for not incorporating antecedent and independent variables as possible predictors of outcomes (e.g., see Hattie et al., 1997; McKenzie, 2000; Sibthorp, 2000). Overall, results indicated relatively small effects for the independent variables, with the main independent variable of note being Program Type.

Program Type. Participants in each of the six main types of programs reported significant, positive short-term effects for LEQ Overall and for each of the eight LEQ factors (except for 2 out of 48 possible outcomes). This finding clearly suggests that outdoor education programs can be effectively used for personal and social development. The size of changes varied significantly by Program Type, with

moderate short-term effects for Young Adult programs, and small-moderate effects for each of the other five Program Types[116]. Long-term ES_ns were significantly greater for Young Adult programs than Corporate (which was the only other Program Type for which long-term data were available).

For Young Adult programs, OBA programs were more effective than non-OBA programs, particularly for Self Confidence and Time Management. However, no difference in long-term outcomes was evident for these two Young Adult Program Types. Given the impressive short-term results for Young Adult OBA programs (0.63), more attention could be paid to studying the program design and methods involved[117]. However, Young Adult OBA programs could possibly benefit from implementing more strategies to improve transfer of learning[118].

Impressive short-term effects were also found for Special programs (0.55), which contained a variety of outdoor education programs adapted to meet the development needs of clientele groups with specific needs. This finding further suggests considerable therapeutic and remedial potential for carefully designed and facilitated outdoor education programs (such as been previously indicated in reviews by Cason and Gillis, 1994; Gillis, 1992; Gillis & Thomsen, 1996).

Program Length. In general, there was little in this study to indicate that Program Length (which ranged between 3 and 26 days) was a useful predictor of life effectiveness outcomes. Longer programs were weakly, but non-significantly, associated with more positive short- and long-term outcomes. Importantly, the analyses in the current study accounted for the potentially confounding effects of Program Type and Participant Age which may have affected estimates of the effect of Program Length in other studies (e.g., Cason & Gillis, 1994).

Group Gender and Participant Gender. Outcomes for males and females and for single-sex and co-educational groups were largely similar, suggesting that the

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[116] Young Adult program ES_ns were larger in the short-term than outcomes for other Program Types, but the differences were only statistically significant when compared with Adolescent, Adult and, Corporate programs. Young Adult programs were not significant more effective than Family and Special programs.

[117] e.g., see Fry and Heubeck (1998), Gouvernet (1988), Hattie et al. (1997), Marsh et al. (1986a, 1986b), Mayes (1997), OB Australia (1986), and Richards (1977).

[118] e.g., see Bacon, 1987; Ford, Weissbein, Smith, Gully, & Salas, 1998; Gass, 1985, 1995; McKeough & Marini, 1995; Ramsing & Hurtes, 2002

programs in this study were equally applicable to males and females and to groups with different gender compositions. There was a non-significant trend towards female participants' outcomes being stronger in all-female Adolescent than co-educational Adolescent groups. Thus, for some groups, single-sex versus co-educational group composition may be an important consideration. However in the current study, particularly for adult-aged groups, there was no notable variation in outcomes attributable to participant or group gender composition.

Group Size. There was no evidence that variations in group sizes (between 3 and 26) impacted on life effectiveness outcomes. This should not be taken to necessarily mean that doubling a group size would have no impact, but rather that the outdoor education programs in this study were conducted in such a way that variations in group size were not associated with significant variations in life effectiveness outcomes. Thus, these programs appear to have undertaken successful adaptations with larger groups (such as assigning more staff, using sub-groups for particular activities, etc.) and in so doing maintained consistent quality.

Participant Age. Participant Age had no significant impacts on life effectiveness outcomes. This conclusion was based on inferential and effect size analyses by Participant Age separately for each Program Type. Some non-significant interactions involving Participant Age were noted for some Program Types. However, by and large, outdoor education program outcomes did not vary by participant age (with an age range of 12 to 67 years). The lack of relationship between Participant Age and life effectiveness outcomes would seem to indicate that outdoor education can be applicable to the development of life effectiveness for a wide variety of age groups.

In interpreting the statistical change results of this study, there are some methodological issues which should be borne in mind. Firstly, it is likely that ceiling effects reduced estimates of change because there was more room for statistical "loss" than "growth". This was reflected, for example, in the negatively skewed LEQ data, particularly at T2 and T3. Secondly, the meaning of positive and negative statistical changes in LEQ scores should be interpreted with caution. Whilst it might seem natural to equate statistical change corresponds with phenomenological change,

this should not necessarily be assumed. Consider, for example, that a negative statistical change could emanate from a valuable personal growth experience[119].

Finally, the implications of the variance components multi-level results are briefly considered. The variance in LEQ scores was roughly equally attributable to variations over Time and between Participants, with a small amount accounted for variations between Groups (approximately 10 times more variance in LEQ scores was attributable to Participant-level variations than to Group-level variations). Approximately one-third of the random Time variance was accounted for the fixed effects of Time. However, little of the random Participant-level and remaining Time-level variance was accounted for. The unexplained variance seems to warrant further investigation of individual difference variables which might help to explain the sizable variations in participant's life effectiveness and its development over time.

Summary

Study 2 provided a landmark study of the effects of outdoor education programs. Short-term change was positive and of the magnitude of approximately half a standard deviation unit. Long-term change was also positive and significant, although slightly lower at approximately one third of a standard deviation unit. These findings indicate that the impact of outdoor education programs in the current study was slightly higher than typical findings in previous outdoor education meta-analytic studies (e.g., Cason & Gillis, 1994; Hattie et al., 1997; Marsh P. E., 1999a, 1999b) and similar to that reported by meta-analyses of self-concept interventions (e.g., Hattie, J. M., 1992; O'Mara, 2003; O'Mara et al., 2006) and other psychological intervention programs (e.g., Lipsey & Wilson, 2000).

Study 2 found moderately positive short-term (T1 to T2) changes for overall life effectiveness ($ES_n = 0.47$, $N = 3{,}460$). This result further strengthens evidence from meta-analyses (e.g., Cason & Gillis, 1994; Hattie et al., 1997; Marsh P. E., 1999a, 1999b) that challenging, multi-day, expedition-based outdoor education programs, such as those in the current study, tend to be moderately effective in

[119] This could arise, for example, when a person begins with unrealistically high self-assessments which are then appropriately adjusted downwards as a result of achieving greater self-insight and self-awareness during an OE program. In such a case, there is likely to be a negative statistical change yet positive personal development.

enhancing participants' perceptions of their personal and interpersonal skills. Significant short-term changes were evident for each of the LEQ factors (ranging between 0.33 and 0.60). Moderate change was evident for Band 1 and small-moderate change was evident for Band 2 factors.

Study 2 also found small-moderate long-term (T0 to T3) changes for overall life effectiveness ($ES_n = 0.31$, $N = 633$). Significant long-term changes were evident for all of the LEQ factors except Achievement Motivation. These long-term results were based on a sample mostly consisting of Young Adult participants plus some Corporate program participants, and thus should be generalised with caution. Longer-term changes were positive and significant, but significantly lower than short-term changes[120]. There were statistically significant decreases during the follow-up period (three to six months) for LEQ Overall and for three out of the eight LEQ factors, with the most substantial loss being for Time Management ($ES_n = -0.26$). These results indicate reasonably good (~ 80%) retention of the short-term (T1 to T2) gains during the follow-up period (T2 to T3).

There were positive short-term impacts on life effectiveness for each of six main outdoor education Program Types (ranging between 0.32 and 0.56). Young Adult programs were the most effective (particularly those conducted by OBA). The pattern of outcomes for the eight LEQ factors were similar for all Program Types, except for Young Adult programs in which there were moderately strong change for Band 1 factors and moderate change for Band 2 factors. Young Adult OBA programs were significantly more effective in the short-term than non-OBA programs, particularly for Self Confidence and Time Management, but these effects were not evident in the longer-term.

The five other naturally-occurring independent variables (Program Length, Group Gender, Group Size, Participant Gender, and Participant Age) had relatively little impact on LEQ outcomes. Only 5% of the variability in the dependent measures was attributable to the group-level, suggesting reasonable consistency in outcomes across different groups. The rest of the outcome variance was attributable approximately equally to time- and participant-level effects.

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[120] This discrepancy appeared to be due to a combination of slightly depressed T1 scores (perhaps due to situational threat) and slightly inflated T2 scores (perhaps to due to Hawthorne effects, post-group euphoria, halo effects, post-purchase rationalisation, etc.).

Summary and Conclusion

This chapter discussed key findings from the two studies that made up the present investigation. The review of outdoor education research in Chapter 3 identified some importing future needs, including the need for instrumentation specifically designed for measuring typically aimed-for effects of outdoor education and similar intervention programs. Thus, Study 1 conceptualised life effectiveness as a multidimensional construct, operationalised it as the LEQ, and tested the LEQ-G and the LEQ-H measurement models using congeneric and CFA. As a result, the 8-factor, 24-item LEQ-H can be recommended as a psychometrically-sound self-report measure of eight life effectiveness factors and a global factor, making it well-suited for intervention research and program evaluation.

In Study 2, the LEQ was used in a large, longitudinal, quasi-experimental study of the impacts of outdoor education. This study also investigated the role of six naturally-occurring independent variables. Moderate short-term changes were found, with significant effects for each program type and for each of the eight LEQ factors. Long-term results indicated significant, positive changes for seven out of the eight LEQ factors, with positive long-term effects for Young Adult programs but not for Corporate programs. Follow-up (T2 to T3) effects suggested retention of approximately 80% of the short-term (T1 to T2) benefits, with statistically significant drops in the follow-up period for LEQ Overall and three of the LEQ factors.

The Study 2 findings supported two key conclusions from previous meta-analytic studies of outdoor education outcomes (e.g., Hattie et al., 1997), that: (a) the typical short-term effects of outdoor education programs appear to be in the order of 0.3 to 0.4 standard deviation units, a small to moderate effect size by broader educational and psychological change standards; and (b) that the OBA Standard and Challenge programs had larger than average short-term effect sizes. Overall, Study 2's short-term estimates of change were slightly higher than suggested by previous meta-analyses, although the long-term estimates were slightly lower than found in the Hattie et al. (1997) meta-analysis.

Outdoor education programs in this study were about as effective as other group-based psychosocial intervention programs standards (e.g., Cohen, 1988; Hattie, J. M., 1992; Lipsey & Wilson, 2000; O'Mara, 2003; O'Mara et al., 2006; Smith, Glass, & Miller, 1980), suggesting that outdoor education program research

could conceivably work towards demonstration of some outdoor education programs as empirically supported interventions (Chambless & Ollendick, 2001; Jackson, 2005; Kendall, 1998; Lonigan, 1998; Stoiber & Kratochwill, 2000).

Study 2 also examined the effects of the six naturally-occurring independent variables on life effectiveness outcomes. The most notable variations in outcomes were due to Program Type, with Young Adult OBA program participants reporting the most notable short-term gains. A lack of variance attributable to the naturally-occurring independent variables could be interpreted as evidence of reasonable consistency and equity in programming. However, it also further highlights the need for future outdoor education research to focus on investigating more dynamic psychosocial variables (e.g., motivation, empowerment, coping) which may play roles in explaining individual variability in outdoor education processes and outcomes.

CHAPTER 9

SUMMARY AND CONCLUSION

Outdoor education became a popular, but somewhat controversial, intervention medium during the twentieth century. The most commonly claimed and sought outcomes relate to enhancement of personal and social life skills. A synthesis of theoretical outdoor education literature, in the form of a systems framework, identified seven interactive domains (Participant, Environment, Program, Activities, Group, Instructor, and Culture). This framework was proposed to help conceptualise theoretical and empirical knowledge about outdoor education.

A synthesis of traditional and meta-analytic reviews of outdoor education empirical research was also presented. This body of research reveals promising support for outdoor education programs as enhancing participant outcomes (e.g., self-concept, locus of control, and social skills). However, there has also been consistent criticism about several notable methodological flaws, several of which Study 1 and Study 2 sought to address. One of the key issues is the need for psychometrically-sound dependent measures. Thus, life effectiveness was proposed as a global construct which represents a person's capacity to survive and thrive in a variety of situations. Life effectiveness was further theorised to be enhanceable through psychosocial training interventions, such as outdoor education.

Life effectiveness had previously been operationalised as 11 factors (LEQ-G). Study 1 applied congeneric and CFA, leading to an 8-factor, 24-item model (LEQ-H). There was strong psychometric support for a first-order and a global second-order model, with the factor structure for these models largely invariant across participant gender and age. Key strengths of the LEQ-H include its psychometric robustness, brevity and ease-of-use with a variety of populations, and that the measured constructs match typical goals of personal and social development intervention programs. Recommended areas for ongoing development include concurrent and cross-cultural validity, exploration of other possible life effectiveness

factors, and improvements in item wording and item selection in order to reduce skewness and to maximise discriminability of items.

Study 2 used the LEQ-H as a dependent measure in the largest primary study of the longitudinal effects of outdoor education programs conducted to date. This study pursued two central questions: (a) What are the short- and long-term impacts on outdoor education programs on life effectiveness?; and (b) To what extent can variance in life effectiveness outcomes for outdoor education program participants be explained by six naturally-occurring independent variables?

Study 2 used a quasi-experimental design and found moderately positive short-term effects of outdoor education programs ($ES_n = 0.47$; $N = 3{,}640$), with about 20% loss of short-term benefits in the longer-term ($ES_n = 0.31$; $N = 663$[121]). The ratio of participants with positive to negative gains was 4:1 in the short-term and 5:2 in the longer-term. Overall, the magnitude of results for outdoor education programs in this study appears to be comparable to the broad spectrum of other group-based psychoeducational intervention mediums (e.g., Lipsey & Wilson, 1993).

Significant, positive changes were evident for each life effectiveness factor, with moderately strong effects for dimensions relating to self-belief, capacity to handle stress, social skills, situational leadership, and self-discipline / time management. A small drop in self-perceptions was found prior to the program. When this prior drop is considered together with the small loss during the follow-up period, an important consideration emerges: short-term estimates of change may be upwardly biased. Thus, researchers are cautioned to take steps to minimise this threat to validity.

In addition to determining overall outcomes, Study 2 examined the influence of six naturally-occurring independent variables on outdoor education program life effectiveness outcomes using inferential, multivariate analyses, effect sizes and confidence intervals, and multi-level modeling.

Program Type. All six program types exhibited significant, positive, short-term overall effect sizes (0.32 to 0.56). Young Adult programs had the strongest overall short-term outcomes (0.56). Furthermore, Young Adult programs conducted

[121] Long-term results should be generalised with caution because they were mainly only available for participants in Young Adult programs.

by OBA (0.63) had stronger short-term outcomes than Young Adult programs conducted by other organisations (0.38). These "flagship" Outward Bound programs exhibit many "ideal" or prototypical Outward Bound-type design elements including: (a) small groups of motivated learners; (b) difficult, challenging goals; (c) considerable training and support with expert facilitation (e.g., the most experienced instructors are generally allocated to these programs); (d) a variety of feedback-rich, experiential activities which are physically, psychologically, and socially demanding; (e) relatively remote wilderness locations; (f) three day solo (alone in nature for reflection); (g) final, multi-day expedition in which participants are handed full responsibility; and (h) final "marathon"-type run. No other program type in this study featured so many of the elements which have been suggested as important by various outdoor education theories.

Program Length. Previous meta-analytic research had suggested a weak, positive relationship between outdoor education program length and participant outcomes. The current study found weak, non-significant trends in this direction for each program type (with the effect of participant age partialled out). The lack of significant relation between length and outcome could be due to this study exercising more control over potentially confounding variables (program type and participant age). The findings could also be influenced by range restriction (3 to 26 days).

Group Gender. Life effectiveness outcomes were largely similar for single-sex and co-educational groups. There was a non-significant interaction between group gender and program type[122], suggesting that programs in this study were mostly managed so as to have equivalent effects regardless of group gender composition.

Group Size. Group size was not related to life effectiveness outcomes. Caution should be applied in generalising this finding, however, since it is not based on experimental data. It does suggest, nevertheless, that with appropriate accommodations, participants in differently sized groups can achieve similar life effectiveness outcomes. This may also suggest a gestalt view; that is "a group is a group, regardless of size".

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[122] A non-significant trend suggested that Adolescent single-sex groups (particularly all-female groups) had slightly stronger effects than Adolescent co-educational groups, whereas co-educational Young Adult groups had slightly stronger overall outcomes than single-sex groups.

Participant Gender. Participant Gender had little effect on outcomes. This indicates that outdoor education programs in this study were conducted in such a way as to provide equitable outcomes. There were some minor gender differences by factor[123]. These findings suggest that there may be a gender-specific pattern of outcomes, with similar overall outcomes.

Participant Age. There was no significant effects of age on short- or long-term life effectiveness, an effect which was consistent across the LEQ factors and for each of the Program Types. This seems to indicate "age appropriateness" in the way these programs were adapted and conducted.

In summary, Study 2 found robust evidence that the outdoor education programs in this study had at least small-moderate impacts on life effectiveness, with approximately 80% of short-term benefits retained after six months by Young Adult program participants. Study 2's rigorous methodology provides a robust platform for future research in this area. Key methodological strengths of Study 2 were: (a) a longitudinal, comparative, quasi-experimental research design; (b) utilisation of psychometrically-sound dependent measures which were relevant to program goals; (c) high return rates; and (d) application of advanced statistical analysis and reporting methods for the analysis of change[124]. Future enhancements to the demonstrated methodology could include use of: (a) control groups; (b) other related dependent measures (e.g., other factors) and/or other sources (e.g., observer ratings) of life effectiveness; and (c) more dynamic measures of the theoretical processes involved in outdoor education (such as of engagement, openness, and coping).

In conclusion, this investigation provided a robust theoretical, empirical, and methodological contribution to theory and research knowledge about the personal and social development impacts of outdoor education programs. The thesis contributed a clear conceptualisation and psychometrically sound operationalisation of life effectiveness, and demonstrated its use a major longitudinal, empirical study, thus providing a platform for a new generation of more sophisticated empirical enquiry into the processes and outcomes involved in outdoor education.

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[123] Males had significantly larger short-term outcomes for SO, AI, and TL, whereas females had stronger outcomes for SC.

[124] i.e., ESs with CIs, error-bar charts, and comparisons with related meta-analytic literature, multivariate, and MLAs.

Enhancing Life Effectiveness: The Impacts of Outdoor Education Programs

Volume 2

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Doctor of Philosophy

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APPENDICES

APPENDIX A

Outdoor Education Theory and Research

A.1 Program Purpose Classification Schemes

Table A-1 *Expected Outcomes of Outdoor Education*

Recreational / Physical	Developmental	Therapeutic	Environmental
Learning leisure time activities ↑ fitness and physical skills	Exposure to a wider range of experiences ↑ self-concept ↑ confidence & maturity ↑ relationships with peers Ability to work as a team member ↑ relationships with authority figures	↓ bad behaviour	Learning to enjoy wilderness ↑ knowledge of ecology, nature, etc. Demonstrate conservation behavr

Note. Adapted from Abbott (1987, 1999). Abbott did not include Educational purposes.

Table A-2 *Potential Benefits of Outdoor Adventure Pursuits*

Recreational / Physical	Developmental	Educational	Environmental
Fitness	Self-concept	Problem solving	Outdoor education
Skills	Self-confidence	Academics	Nature awareness
Strength	Self-efficacy		Conservation ed.
Coordination	Sensation seeking		Outdoor techniques
Catharsis	Actualization		
Exercise	Well-being		
Balance	Compassion		
	Group cooperation		
	Respect for others		
	Communication		
	Friendship		
	Belonging		
	Value clarification		

Note. Adapted from Ewert (1989). Ewert's original categories were Physical, Psychological, Sociological, and Educational; and not Therapeutic / Redirectional.

Table A-3 *Purposes of Adventure Programming*

Recreational / Physical	Educational	Developmental	Therapeutic / Redirectional
Δ feelings	Δ feeling & thinking	Δ feeling, thinking, & behaving	Δ feeling, thinking, behaving, & resisting
Leisure, fun, relaxation, reenergise	Learn skills	↑ functional behaviours	↓ dysfunctional personal & group behaviour patterns
Enjoy outdoor & adventurous activities	Learn information	Personal & social growth	

Note. Adapted from Priest (Priest & Gass, 1997, 2005; Priest, 2004). Priest did not include Environmental purposes.

A.2 Traditional Reviews

Table A-4 *Summary of Crompton and Sellar's (1981) Review of Outdoor Education Affective Outcome Studies*

Outcome	Sig.	Not sig.	Total
Self-concept	9	2	11
Pre-post	2	1	3
Actual-ideal	3	0	3
Locus of control	4	1	5
Socialisation	19	7	26
Peer socialisation & perception	7	2	9
Racial integration	2	3	5
Disadvantaged groups	3	1	4
Teacher-student relations	7	1	8
Attitudes towards learning / outdoors	3	5	8
Attitudes towards outdoors	2	3	5
Attitude toward school	1	2	3
Total	31	14	45

Table A-5 *Summary of Ewert's (1982b) Review of Self-Concept Outdoor Education Outcome Studies*

Program	Sig.	Not sig.	Total
Survival training	8	3	11
Wilderness experience	6	3	9
Outdoor education for schools	15	2	17
Outward Bound	10	7	17
Total	39	15	54

A.3 Effect Sizes

Table A-6 *Effect Sizes and Summary Information For Short-Term (Program) and Long-term (Follow-up) Adventure Education Program Outcomes (Table 13, Hattie et al., 1997)*

Variable	No.	Mean	−1.96 *SE*	+1.96 *SE*	H_T	Ratio
		Program				
Leadership	**222**	**.38**	**.05**	**.71**	**889.14**	**4.0**
Conscientiousness	**7**	**.46**	**.24**	**.68**	**51.11**	**8.5**
Decision making	**8**	**.47**	**.06**	**.88**	**23.22**	**3.3**
Leadership-general	68	.33	.01	.66	271.42	4.1
Leadership-teamwork	49	.42	.11	.74	205.47	4.3
Organizational ability	39	.44	.13	.76	148.45	3.9
Time management	36	.46	.10	.81	122.90	3.5
Values	8	.20	−.05	.45	52.80	7.5
Goals	15	.05	−.64	.75	14.71	1.1
Self-concept	271	.28	.07	.47	2,986.88	11.1
Independence	20	.47	.17	.76	32.70	1.7
Physical ability	18	.08	−.10	.26	100.55	5.9
Peer relations	9	.28	.17	.41	75.70	9.5
General self	43	.28	.11	.46	816.97	19.5
Physical appearance	8	.38	.24	.52	175.54	25.6
Academic	17	.17	.05	.30	133.12	8.3
Confidence	55	.33	.11	.55	627.82	11.6
Self-efficacy	29	.31	.05	.57	191.37	6.8
Family	9	.25	.09	.40	105.62	13.2
Self-understanding	9	.31	.08	.54	60.53	7.6
Well-being	43	.24	−.01	.48	298.92	7.1
Academic	30	.46	.23	.70	278.81	9.6
Academic-direct	7	.50	.19	.82	7.35	1.2
Academic-general	23	.45	.23	.67	158.02	11.7
Personality	235	.37	.10	.65	1,759.45	2.5
Assertiveness	23	.42	.20	.63	357.12	16.2
Reduction in aggression	7	.33	.03	.64	14.87	2.5
Achievement motivation	38	.36	.01	.72	68.40	1.8
Emotional stability	34	.49	.22	.76	241.94	7.3
Femininity	6	.10	−.07	.27	35.80	7.2
Internal locus of control	18	.30	.06	.54	181.62	10.7
Maturity	5	.32	.04	.60	13.35	3.3
Neurosis reduction	33	.31	−.01	.62	160.12	5.0
Masculinity	6	.26	.09	.44	30.29	6.1
Interpersonal	176	.32	−.00	.64	978.58	5.7
Behavior	4	.34	.10	.58	12.70	4.2
Cooperation	24	.34	−.05	.72	61.15	2.7
Interpersonal communication	49	.13	−.26	.53	173.08	3.6
Relating skills	21	.26	−.01	.53	159.05	8.0
Recidivism	3	.55	.31	.88	23.14	11.6
Social competence	74	.43	.14	.73	500.95	6.9
Adventuresome	69	.38	.14	.63	881.33	13.0
Challengeness	35	.39	.13	.66	338.79	.10.0
Flexibility	65	.42	.11	.73	322.97	5.0
Environmental awareness	5	.24	−.14	.62	106.34	26.6
Physical fitness	29	.40	.17	.62	471.57	15.4

Variable	No.	Mean	−1.96 *SE*	+1.96 *SE*	H_1	Ratio
		Follow up				
Leadership	58	.15	−.17	.48	80.87	1.4
Conscientiousness	2	−.28	−.53	.13	.03	.0
Decision making	2	.64	−.20	1.48	.05	.1
Leadership-general	13	.16	−.16	.48	15.41	1.3
Leadership-teamwork	15	.16	−.18	.50	12.16	.9
Organizational ability	13	.08	−.24	.40	14.48	.1
Time management	13	.21	−.11	.53	19.47	1.6
Values	3	.32	.01	.63	7.02	3.5
Self-concept	149	.23	.08	.38	959.04	6.5
Independence	2	.27	−.57	1.11	0.00	.0
Physical ability	8	.37	.24	.50	24.19	3.5
Peer relations	15	.20	.08	.32	57.52	4.1
General	16	.33	.17	.49	147.73	9.8
Physical appearance	9	.32	.18	.47	89.04	11.1
Academic	34	.30	.17	.43	204.84	6.2
Confidence	26	.14	−.04	.32	69.62	2.8
Self-efficacy	11	.21	−.10	.51	16.66	1.7
Family	11	.10	−.04	.24	25.97	2.6
Self-understanding	10	.16	−.04	.24	42.88	4.8
Well-being	4	−.09	−.28	.11	4.83	1.6
Academic	9	.21	−.07	.51	18.69	2.3
Academic-direct	4	.30	−.06	.66	5.93	2.0
Academic-general	5	.13	−.14	.40	4.22	1.1
Personality	76	.14	−.18	.46	191.11	2.5
Assertiveness	6	.10	−.19	.41	6.17	1.2
Reduction in aggression	3	.72	.27	1.18	3.33	1.7
Achievement motivation	15	.15	−.19	.48	13.34	1.0
Emotional stability	15	.11	−.18	.39	39.46	2.8
Locus of control	3	−.04	−.30	.22	3.91	2.0
Maturity	3	−.01	−.36	.34	29.31	14.7
Neurosis reduction	9	.24	−.16	.64	19.34	2.4
Interpersonal	36	.17	−.16	.50	78.81	2.3
Behavior	2	.01	−.32	.35	0.00	.0
Cooperation	5	.31	−.22	.85	29.17	7.3
Interpersonal communication	1	.10	−.12	.32		
Relating skills	1	.01	−.20	.22		
Recidivism	8	.10	−.25	.44	.50	.10
Social competence	19	.20	−.13	.53	45.84	2.5
Adventuresome	19	−.06	−.32	.19	42.81	2.4
Challengeness	11	.08	−.21	.37	6.56	.7
Flexibility	22	.08	−.24	.40	19.63	.94
Physical fitness	8	−.26	−.48	−.05	28.30	4.0

APPENDIX B

Life Effectiveness Questionnaire

B.1 LEQ-G

B.1.1 LEQ-G Instructions and Questionnaire

L.E.Q.-G©

PLEASE DO NOT TURN OVER YET

READ THE INSTRUCTIONS FIRST

This is a chance for you to consider how you think and feel about yourself in some ways. This is not a test - there are no right or wrong answers, and everyone will have different responses. It is important that you give your own views and that you be honest in your answers and do not talk to others while you think about your answers. They will be used only for research purposes and will in no way be used to refer to you as an individual at any time.

Over the page is a number of statements that are more or less true (that is like you) or more or less false (that is unlike you). Please use the eight point scale to indicate how true (like you) or how false (unlike you), each statement is as a description of you. Answer the statements as you feel now, even if you have felt differently at some other time in your life. Please do not leave any statements blank.

FALSE NOT LIKE ME						TRUE LIKE ME	
1	2	3	4	5	6	7	8
This statement doesnt describe me at all; it isn't like me at all.		More False than true		More True than false		This statement describes me very well; it is very much like me.	

SOME EXAMPLES

A. I am a fast thinker. 1 2 3 4 5 (6) 7 8

(In this example the 6 has been circled because the person answering believes the statement "I am a fast thinker" is sometimes true. That is the statement is sometimes like him/her.)

B. I am a good story teller. 1 (2) 3 4 5 6 7 8

(In this example the 2 has been circled because the person answering believes that the statement is mostly false and as far a he/she is concerned. That is, he/she feels he/she does not tell good stories.)

C. I enjoy working on puzzles. 1 2 3 4 5 6 7 (8)

(In this example the person has marked 8 because he/she really enjoys working on puzzles a great deal, therefore the statement is definitely true about him/her.)

★ ★ STOP: ARE YOU SURE WHAT TO DO? ★ ★

If yes, then please turn the page and write you name and today's date and circle your answers for all the statements.

If still unsure about what to do, **ASK FOR HELP.**

PLEASE GIVE HONEST, PRIVATE ANSWERS

LEQ-G.QSN
GER/JDB 1/89 SKF/BEM 11/92

L. E. Q. - G©

QID 0 1 | SID

NAME:_____ AGE:____yrs____mths TODAY'S DATE:____/____/____
(First) (Family)

MALE / FEMALE (circle one) COURSE:_____

(a) | (b)

STATEMENT	FALSE not like me							TRUE like me
01. I plan and use my time efficiently.	1	2	3	4	5	6	7	8
02. I am successful in social situations.	1	2	3	4	5	6	7	8
03. When working on a project, I do my best to get the details right.	1	2	3	4	5	6	7	8
04. I am flexible and adapt my thinking easily when plans change.	1	2	3	4	5	6	7	8
05. My actions are well organised using reason and facts.	1	2	3	4	5	6	7	8
06. I am generous and helpful to others.	1	2	3	4	5	6	7	8
07. I can be firm and assertive to get a job done.	1	2	3	4	5	6	7	8
08. I can stay calm in stressful situations.	1	2	3	4	5	6	7	8
09. I try to make the most of my time.	1	2	3	4	5	6	7	8
10. I am competent in social situations.	1	2	3	4	5	6	7	8
11. I try to get the best results when I do things.	1	2	3	4	5	6	7	8
12. I am open to the ideas and opinions of others.	1	2	3	4	5	6	7	8
13. My personal organisation is good.	1	2	3	4	5	6	7	8
14. I am an effective team member.	1	2	3	4	5	6	7	8
15. I can get people to work for me.	1	2	3	4	5	6	7	8
16. I stay calm and overcome anxiety in new or changing situations.	1	2	3	4	5	6	7	8
17. I do not waste time.	1	2	3	4	5	6	7	8
18. I communicate well with people.	1	2	3	4	5	6	7	8
19. I try to do the best that I possibly can.	1	2	3	4	5	6	7	8
20. I change my thinking or opinions easily if there is a better idea.	1	2	3	4	5	6	7	8
21. I use good sense and reason when making decisions.	1	2	3	4	5	6	7	8
22. I co-operate well with people.	1	2	3	4	5	6	7	8
23. I give clear instructions when I want something done.	1	2	3	4	5	6	7	8
24. I stay calm and do not get upset if people argue or are difficult with me.	1	2	3	4	5	6	7	8
25. I manage the way I use my time well.	1	2	3	4	5	6	7	8
26. I am confident in speaking up in social situations.	1	2	3	4	5	6	7	8
27. If I know I should do something I do it well.	1	2	3	4	5	6	7	8
28. I am open to new ideas.	1	2	3	4	5	6	7	8
29. I plan well and do not leave things to chance.	1	2	3	4	5	6	7	8
30. I work well with people.	1	2	3	4	5	6	7	8
31. I am a good leader when a task needs to be done.	1	2	3	4	5	6	7	8
32. I am generally calm and relaxed about things.	1	2	3	4	5	6	7	8
33. I am punctual and do things on time.	1	2	3	4	5	6	7	8
34. I am confident when speaking to others.	1	2	3	4	5	6	7	8
35. I try to make the best of every opportunity.	1	2	3	4	5	6	7	8
36. I am adaptable and flexible in my thinking and ideas.	1	2	3	4	5	6	7	8
37. I do things when they should be done and do not put them off.	1	2	3	4	5	6	7	8
38. I consider the feelings of other people when I work with them.	1	2	3	4	5	6	7	8
39. As a leader I motivate other people well when tasks need to be done.	1	2	3	4	5	6	7	8
40. I stay calm when things go wrong.	1	2	3	4	5	6	7	8
41. I get information and facts sorted out before I do things.	1	2	3	4	5	6	7	8
42. I am an active person and use my time well.	1	2	3	4	5	6	7	8
43. I maintain a positive and productive attitude when things go wrong.	1	2	3	4	5	6	7	8
44. I like to be busy and actively involved in things.	1	2	3	4	5	6	7	8
45. I know I have the ability to do anything I want to do.	1	2	3	4	5	6	7	8
46. I like getting into things.	1	2	3	4	5	6	7	8
47. I can cope effectively with difficult situations.	1	2	3	4	5	6	7	8
48. When I apply myself to something I am confident I will succeed.	1	2	3	4	5	6	7	8
49. I can perform with limited resources.	1	2	3	4	5	6	7	8
50. I like to be active and energetic.	1	2	3	4	5	6	7	8
51. I focus on the positive aspects of difficult situations.	1	2	3	4	5	6	7	8
52. I am confident in the success of my actions.	1	2	3	4	5	6	7	8
53. I like to get actively involved in new situations.	1	2	3	4	5	6	7	8
54. I believe I can do it.	1	2	3	4	5	6	7	8
55. I am resourceful in difficult situations.	1	2	3	4	5	6	7	8
56. I like to use my initiative and get action started.	1	2	3	4	5	6	7	8
57. I am confident in the decisions I make.	1	2	3	4	5	6	7	8
58. I work efficiently in difficult situations.	1	2	3	4	5	6	7	8
59. I like to be an active, 'get into it' person.	1	2	3	4	5	6	7	8
60. I have trust in myself.	1	2	3	4	5	6	7	8
61. I have the ability to work through long difficult tasks.	1	2	3	4	5	6	7	8
62. I like to make things happen.	1	2	3	4	5	6	7	8
63. When things become difficult I persevere.	1	2	3	4	5	6	7	8
64. I am in control of my destiny.	1	2	3	4	5	6	7	8

PLEASE CHECK THAT YOU'VE CIRCLED **ONE** NUMBER FOR EACH STATEMENT

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B.1.2 LEQ-G Variable Names and Items

Name	Item
tmpln011	I plan and use my time efficiently.
sosuc021	I am successful in social situations.
amdet031	When working on a project, I do my best to get the details right.
ifadp041	I am flexible and adapt my thinking easily when plans change.
odorg051	My actions are well organised using reason and facts.
ptgen061	I am generous and helpful to others.
tlfrm071	I can be firm and assertive to get a job done.
tmmst091	I can stay calm in stressful situations.
ecstr081	I try to make the most of my time.
socpt101	I am competent in social situations.
amrsl111	I try to get the best results when I do things.
ifoth121	I am open to the ideas and opinions of others.
odper131	My personal organisation is good.
ptmem141	I am an effective team member.
tlwrk151	I can get people to work for me.
ecnew161	I stay calm and overcome anxiety in new or changing situations.
tmwst171	I do not waste time.
socom181	I communicate well with people.
ampos191	I try to do the best that I possibly can.
ifchg201	I change my thinking or opinions easily if there is a better idea.
oddec211	I use good sense and reason when making decisions.
ptcop221	I cooperate well with people.
tlins231	I give clear instructions when I want something done.
ecpeo241	I stay calm and do not get upset when people argue or are difficult with me.
tmmng251	I manage the way I use my time well.
sospk261	I am confident in speaking up in social situations.
amido271	If I know I should do something I do it well.
ifnew281	I am open to new ideas.
odpln291	I plan well and do not leave things to chance.
ptwrk301	I work well with people.
tlled311	I am a good leader when a task needs to be done.
ecgen321	I am generally calm and relaxed about things.
tmpun331	I am punctual and do things on time.
socps341	I am adaptable and flexible in my thinking and ideas.
amopp351	I am confident when speaking to others.
ifadp361	I try to make the best of every opportunity.
odoff371	I do things when they should be done and do not put them off.
ptfel381	I consider the feelings of other people when I work with them.
tlmot391	As a leader I motivate other people well when a task needs to be done.

Name	Item
ecwrn401	I stay calm when things go wrong.
tminf411	I get information and facts sorted out before I do things.
tmact421	I am an active person and use my time well.
hrpro431	I maintain a positive and productive attitude when things go wrong.
aibus441	I like to be busy and actively involved in things.
scabi451	I know I have the ability to do anything I want to do.
aiget461	I like getting into things.
hrcop471	I can cope effectively with difficult situations.
scapp481	When I apply myself to something I am confident I will succeed.
hrper491	I can perform with limited resources.
aiene501	I like to be active and energetic.
hrpos511	I focus on the positive aspects of difficult situations.
scact521	I am confident in the success of my actions.
aiinv531	I like to get actively involved in new situations.
scbel541	I believe I can do it.
hrres551	I am resourceful in difficult situations.
aiini561	I like to use my initiative and get action started.
scdec571	I am confident in the decisions I make.
hreff581	I work efficiently in difficult situations.
aigii591	I like to be an active ‘get into it’ person.
sctru601	I have trust in myself.
hrtas611	I have the ability to work through long and difficult tasks.
aihap621	I like to make things happen.
hrpsv631	When things become difficult I persevere.
sccon641	I am in control of my destiny.

B.2 LEQ-H

B.2.1 LEQ-H Instructions and Questionnaire

SID

LEQ-H

PLEASE DO NOT TURN OVER YET

READ THESE INSTRUCTIONS

This is a chance for you to consider how you think and feel about yourself in some ways. **This is not a test** - there are no right or wrong answers, and everyone will have different responses. It is important that you give your own views and that you be honest in your answers and do not talk to others while you think about your answers. They will be used only for research purposes and will in no way be used to refer to you as an individual at any time.

Over the page are a number of statements that are more or less true (that is like you) or more or less false (that is unlike you). Please use the eight point scale to indicate how true (like you) or how false (unlike you), each statement is as a description of you. **Answer the statements as you feel now**, even if you have felt differently at some other time in your life. Please do not leave any statements blank.

FALSE NOT LIKE ME							TRUE LIKE ME
1	2	3	4	5	6	7	8
This statement doesn't describe me at all; it isn't like me at all		More false than true		More true than false		This statement describes me very well; it is very much like me.	

SOME EXAMPLES

A. I am a fast thinker. 1 2 3 4 5 (6) 7 8

(The 6 has been circled because the person answering believes the statement "I am a fast thinker" is sometimes true. That is, the statement is sometimes like him/her.)

B. I am a good storyteller. 1 (2) 3 4 5 6 7 8

(The 2 has been circled because the person answering believes that the statement is mostly false as far as he/she is concerned. That is, he/she feels he/she does not tell good stories.)

C I enjoy working on puzzles. 1 2 3 4 5 6 7 (8)

(The 8 has been circled because the person really enjoys working on puzzles a great deal, therefore the statement is definitely true about him/her.)

**** ARE YOU SURE WHAT TO DO? ****

If yes, then please turn the page over, write your name, today's date, and circle your answers for all the statements.

If still unsure about what to do, ASK FOR HELP.

PLEASE GIVE HONEST, PRIVATE ANSWERS

LEQ-H

NAME:_____ AGE:_____(years) DATE:____/____/_____

MALE / FEMALE (circle one) COURSE CODE:_____ GROUP:_____

STATEMENT	FALSE not like me							TRUE like me
01. I plan and use my time efficiently.	1	2	3	4	5	6	7	8
02. I am successful in social situations.	1	2	3	4	5	6	7	8
03. When working on a project, I do my best to get the details right.	1	2	3	4	5	6	7	8
04. I change my thinking or opinions easily if there is a better idea.	1	2	3	4	5	6	7	8
05. I can get people to work for me.	1	2	3	4	5	6	7	8
06. I can stay calm in stressful situations.	1	2	3	4	5	6	7	8
07. I like to be busy and actively involved in things.	1	2	3	4	5	6	7	8
08. I know I have the ability to do anything I want to do.	1	2	3	4	5	6	7	8
09. I do not waste time.	1	2	3	4	5	6	7	8
10. I am competent in social situations.	1	2	3	4	5	6	7	8
11. I try to get the best results when I do things.	1	2	3	4	5	6	7	8
12. I am open to new ideas.	1	2	3	4	5	6	7	8
13. I am a good leader when a task needs to be done.	1	2	3	4	5	6	7	8
14. I stay calm and overcome anxiety in new or changing situations.	1	2	3	4	5	6	7	8
15. I like to be active and energetic.	1	2	3	4	5	6	7	8
16. When I apply myself to something I am confident I will succeed.	1	2	3	4	5	6	7	8
17. I manage the way I use my time well.	1	2	3	4	5	6	7	8
18. I communicate well with people.	1	2	3	4	5	6	7	8
19. I try to do the best that I possibly can.	1	2	3	4	5	6	7	8
20. I am adaptable and flexible in my thinking and ideas.	1	2	3	4	5	6	7	8
21. As a leader I motivate other people well when tasks need to be done.	1	2	3	4	5	6	7	8
22. I stay calm when things go wrong.	1	2	3	4	5	6	7	8
23. I like to be an active, 'get into it' person.	1	2	3	4	5	6	7	8
24. I believe I can do it.	1	2	3	4	5	6	7	8

B.2.2 LEQ-H Variable Names and Items

Name	Item
tmpln011	I plan and use my time efficiently.
sosuc021	I am successful in social situations.
amdet031	When working on a project, I do my best to get the details right.
ifchg041	I change my thinking or opinions easily if there is a better idea.
tlwrk051	I can get people to work for me.
ecstr061	I can stay calm in stressful situations.
aibus071	I like to be busy and actively involved in things.
scabi081	I know I have the ability to do anything I want to do.
tmwst091	I do not waste time.
socpt101	I am competent in social situations
amrsl111	I try to get the best results when I do things.
ifnew121	I am open to new ideas.
tlled131	I am a good leader when a task needs to be done.
ecnew141	I stay calm and overcome anxiety in new or changing situations
aiene151	I like to be active and energetic.
scapp161	When I apply myself to something I am confident I will succeed.
tmmng171	I manage the way I use my time well.
socom181	I communicate well with people.
ampos191	I try to do the best that I possibly can.
ifadp201	I am adaptable and flexible in my thinking and ideas.
tlmot211	As a leader I motivate other people well when tasks need to be done.
ecwrn221	I stay calm when things go wrong.
aigii231	I like to be an active, ‘get into it’ person.
scbel241	I believe I can do it.

B.3 Administration Guidelines

B.3.1 Time 1 and Time 2

LEQ QUESTIONNAIRE ADMINISTRATION

These guidelines are to help make the administration of the "Life Effectiveness Questionnaire" (LEQ) easier, more effective, and standardised across different groups.

The LEQ is self-administering with full instructions given on the form. However, the quality and completeness of answers is improved if the following introductory sequence is followed.

1.FAMILIARITY: **Carefully read the questionnaire and complete it yourself.** Familiarity with the layout and instructions will help you answer participants' questions better.

2.TIMING: **Questionnaires at course start (TIME 1) need to be done before other course activity.** This is so responses are unaffected by the course.

An introduction could go 'Hi, my name is John Smith, welcome to Outward Bound, I will be your instructor for the course, now before we do anything else could you please get your pens and take a seat...'

3.SETTING: **Pick a place free of distractions for the participants.** Away from other groups, noise and activity, and in shade if hot.

4.SEATING: **Get the participants to sit apart with some space between themselves.** This lets participants give private answers that are honest and individual. Younger participants, especially, are sensitive to peer pressure, their friends views and ideas.

For example '...when you come back to take your seat please spread out so none of you are sitting together...'

4.INTRODUCTION: **Give it before handing out the questionnaire.** The questionnaire distracts participants from listening to you.

5.RATIONALE: **Keep reasons for the questionnaire brief, general, and disassociated directly from their course.** This does not create expectations that could affect the participants' answers.

For example '...We have been doing research since 1972 to find out more about people and what they think about themselves. This has helped us develop better programs. It is a continuing process and I am asking you for your help and contribution to the future, Could you please complete this questionnaire.... (hold up)'

6. ACCURATE RESPONSES: **Encourage the participants to answer honestly, thoughtfully, and as they feel right now.**

For example '...when you answer the questionnaire think about your answers carefully and be as honest as you can. There are no right or wrong answers, this is not a test, give your answers as you feel right now...'

7. CONFIDENTIALITY: **Reassure the participants of the confidentiality of their answers.** This will give the participants increased confidence to answer honestly.

For example '... the answers you give are confidential and will be entered, without your name, into a computer ...'

8. TIME LIMIT :**Ask participants to take as much time as they properly need.** This is so slower participants feel no pressure to hurry and not answer thoughtfully when other participants have already finished.

For example'...Please take as long as you need to give honest and thoughtful answers, there is no time limit..'

9. INSTRUCTIONS: **Get participants to read the questionnaire's instructions, first, and to ask you any questions before they start the questionnaire.** Otherwise some participants will not read, or not understand the instructions and incorrectly complete the questionnaire.

For example '...now I will hand the questionnaires out but before you start could you make sure that you carefully read the instructions and ask me any questions that you might have...'

10. DETAILS: **Remind the participants to fill in all details, age, male/female, course and name.** It is vital that these details are filled in, without them the answers given are useless.

For example '...has everybody remembered to circle whether you are a male or female, fill in your age, our course which is PBAT1295, and your name? Please do it now if you have not ...'

COLLECTION

11. Please check each questionnaire
a. questions correctly completed (one answer for each item)
b. participants' details are correctly and fully completed

Ask participants to signal finished by turning their questionnaire over so you can collect and check them individually. It is important that you respect participants' privacy and make it obvious that you are checking by a glance and not studying their answers.

For example '...when you have finished make sure you check your questionnaire so that it is complete, then turn it over and I will come, collect it and double-check that it is complete...'

12. When all the questionnaires are collected.
a. Thank the group for their participation
b. Remove the questionnaires from participants sight and attention
c. Place them into an labeled envelope/plastic bag showing questionnaire, course, instructor's name, and number of students, and forward them to the course coordinator as a top priority.

We hope that this guide is clear and useful. Thank you.

B.3.2 Time 3 (Letter 1)

Hi,

Believe it or not, it's now six months since you completed your Outward Bound Classic Challenge! Congratulations, again!

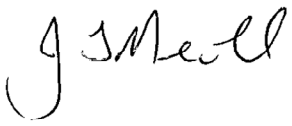
We've enclosed two things for you:

1. It's now useful for you to have another close look at how effective you are in your life and work. The questionnaire attached to this cover letter is designed for you to reassess your life as it is now. By completing this questionnaire and returning it to us in the enclosed postage paid envelope we can finish our evaluation of your course. Please be assured that your results are entirely confidential.
Please return this as soon as possible

After looking over your questionnaire it would be a good opportunity for you to set further goals for your future.
We wish you every success.

2. Information about our Extension Courses is also enclosed. People often wish to challenge themselves further after their first Outward Bound course. Extension Courses offer you a completely different experience that is still Outward Bound, with a group of people keen for some more fun, adventure and learning in their lives.
Please feel free to contact us for more information.

Thank you for your co-operation,



James Neill
Research Co-ordinator

B.3.3 Time 3 (Letter 2)

Hi,

About three weeks ago I sent you a questionnaire asking for your thoughts now more than six months has past since you completed your Classic Challenge course. As of today we have not received your reply.

The questionnaire enables you to have a close look at how your life has changed and how effective you feel in your work and life. By you completing this and returning it to us, we are then able to finalise our evaluation of your course. Without your final evaluation, unfortunately your other completed information is rendered invalid. Please be assured your reply is completely confidential.

In the event that your questionnaire has been misplaced, I have enclosed another one, along with a pre-paid envelope.

Please read the instructions carefully, if you have any queries feel free to contact me at Tharwa and I will be only too happy to answer your questions.

Best wishes,



James Neill
Research Co-ordinator

APPENDIX C

LEQ Variance-Covariance Matrices and Item Names

C.1 Study 1 (LEQ-G; *N* = 1,164)

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ecstr081 ecnew161 ecpeo241 ecgen321 ecwrn401
hrpro431 hrcop471 hrper491 hrpos511 hrres551 hreff581 hrtas611 hrpsv631
ifadp041 ifoth121 ifchg201 ifnew281 ifadp361
odorg051 odper131 oddec211 odpln291 odoff371
ptgen061 ptmem141 ptcop221 ptwrk301 ptfel381
scabi451 scapp481 scact521 scbel541 scdec571 sctru601 sccon641
sosuc021 socpt101 socom181 sospk261 socps341
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C.2 Study 1 (LEQ-H; *N* = 1,892)

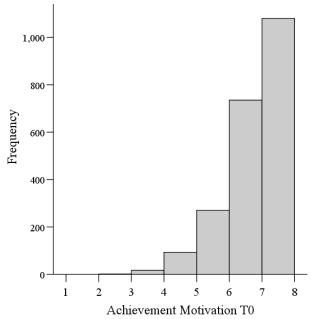
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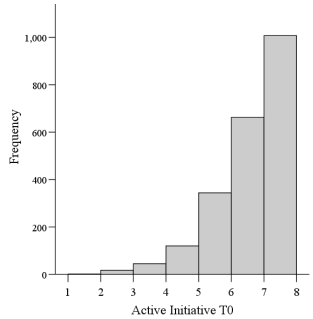
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APPENDIX D

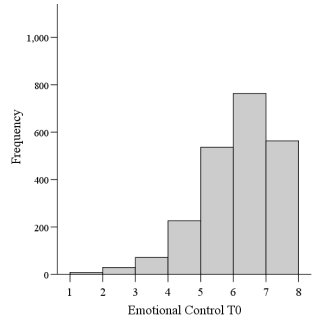
Histograms of LEQ Factors



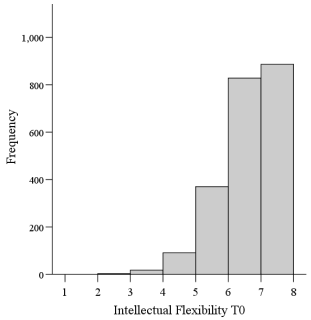
M = 6.68, *SD* = 0.98,
Sk = -0.81, Kurt = 0.63



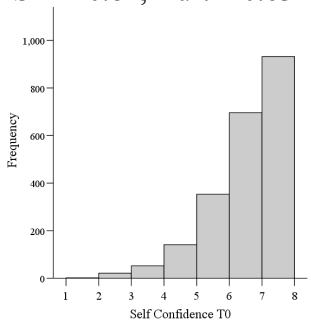
M = 6.53, *SD* = 1.18,
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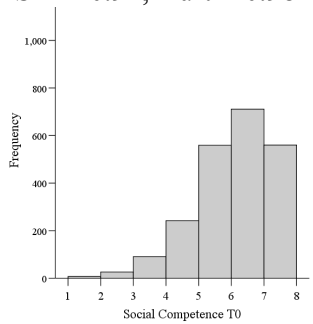
M = 5.99, *SD* = 1.22,
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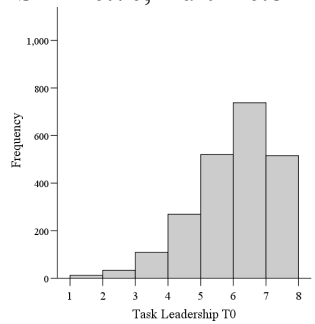
M = 6.49, *SD* = 0.96,
Sk = -0.64, Kurt = 0.51



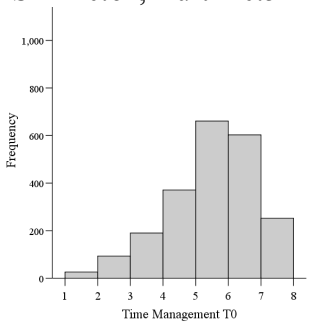
M = 6.44, *SD* = 1.17,
Sk = -0.91, *Kurt* = 0.84



M = 5.94, *SD* = 1.21,
Sk = -0.65, *Kurt* = 0.38

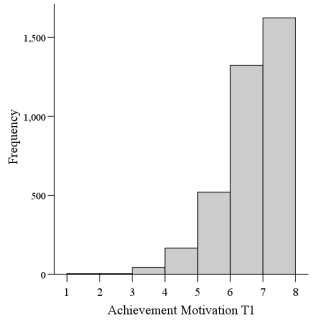


M = 5.87, *SD* = 1.26,
Sk = -0.72, *Kurt* = 0.49

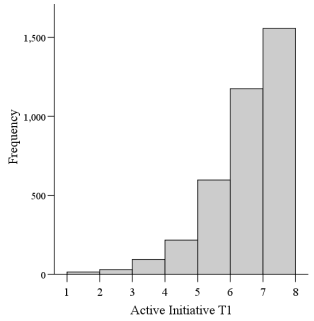


M = 5.31, *SD* = 1.35,
Sk = -0.55, *Kurt* = 0.13

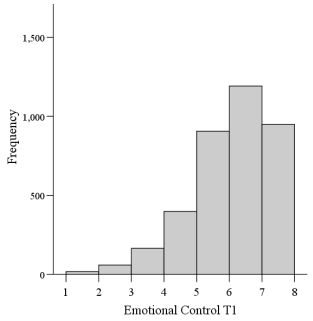
Figure D-1 Histograms and descriptive statistics for LEQ-H T0 (*N* = 2,196)



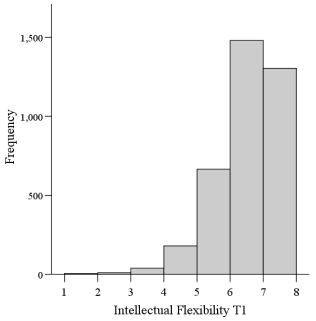
M = 6.55, *SD* = 1.01,
Sk = -0.90, *Kurt* = 1.33



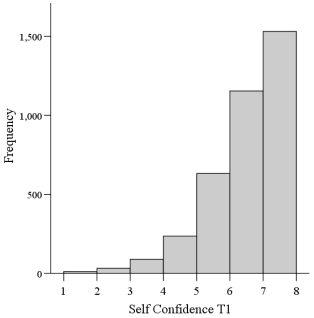
M = 6.43, *SD* = 1.23,
Sk = -1.00, *Kurt* = 1.36



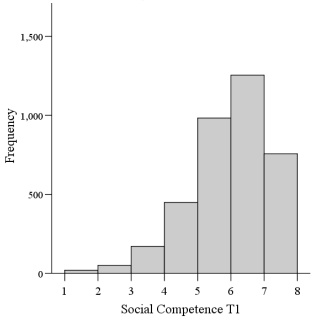
M = 5.92, *SD* = 1.27,
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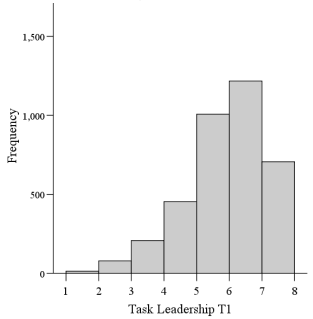
M = 6.38, *SD* = 0.98,
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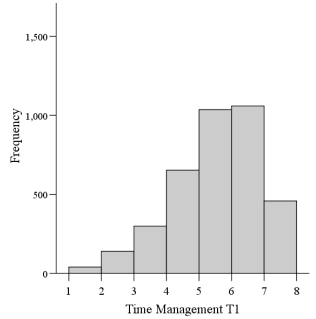
M = 6.40, *SD* = 1.20,
Sk = -0.97, *Kurt* = 1.14



M = 5.80, *SD* = 1.21,
Sk = -0.70, *Kurt* = 0.71

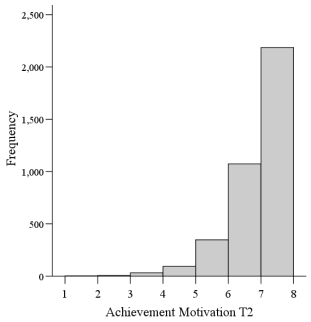


M = 5.74, *SD* = 1.25,
Sk = -0.68, *Kurt* = 0.44

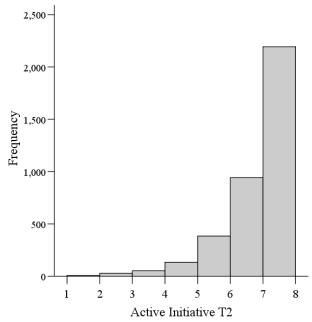


M = 5.37, *SD* = 1.34,
Sk = -0.57, *Kurt* = 0.10

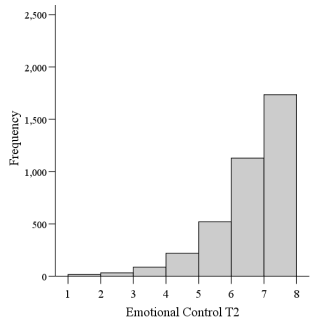
Figure D-2 Histograms and descriptive statistics for LEQ-H T1 (*N* = 3,685)



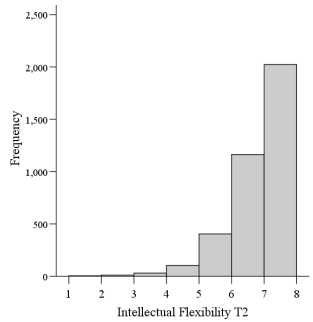
M = 6.85, *SD* = 0.94,
Sk = -1.14, *Kurt* = 1.94



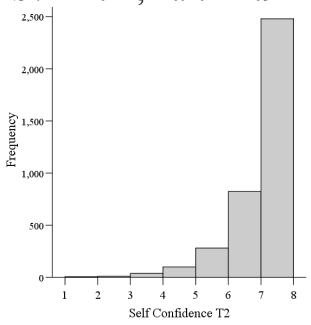
M = 6.79, *SD* = 1.13,
Sk = -1.32, *Kurt* = 2.32



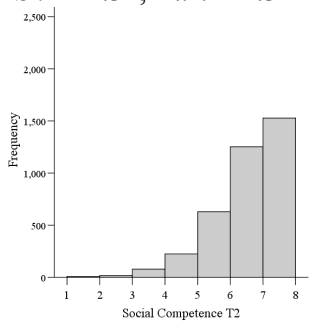
M = 6.48, *SD* = 1.21,
Sk = -1.15, *Kurt* = 1.79



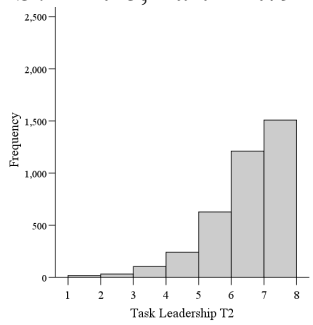
M = 6.73, *SD* = 0.97,
Sk = -1.14, *Kurt* = 2.33



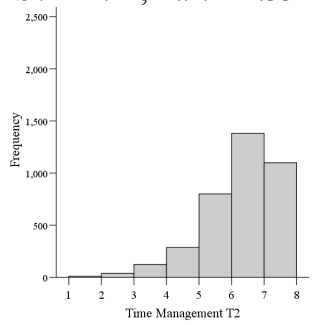
M = 6.98, *SD* = 1.03,
Sk = -1.59, *Kurt* = 3.67



M = 6.38, *SD* = 1.11,
Sk = -0.96, *Kurt* = 1.43

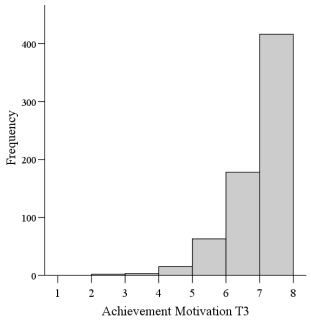


M = 6.33, *SD* = 1.21,
Sk = -1.05, *Kurt* = 1.47

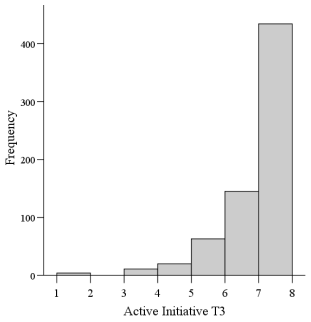


M = 6.11, *SD* = 1.15,
Sk = -0.92, *Kurt* = 1.19

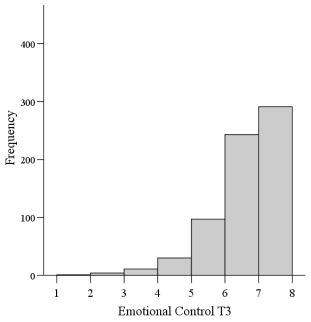
Figure D-3 Histograms and descriptive statistics for LEQ-H T2 (*N* = 3,738)



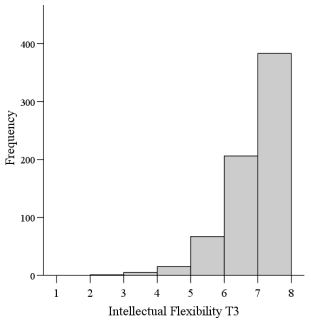
M = 6.90, *SD* = 0.94,
Sk = -1.14, *Kurt* = 1.81



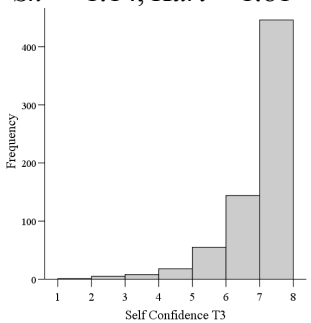
M = 6.92, *SD* = 1.12,
Sk = -1.56, *Kurt* = 3.50



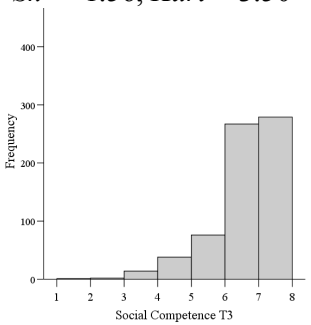
M = 6.48, *SD* = 1.07,
Sk = -1.01, *Kurt* = 1.86



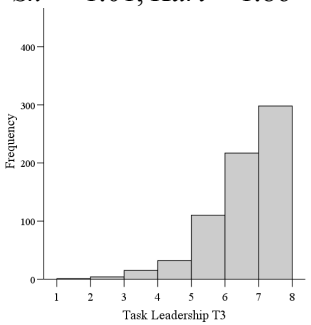
M = 6.78, *SD* = 0.91,
Sk = -0.97, *Kurt* = 1.71



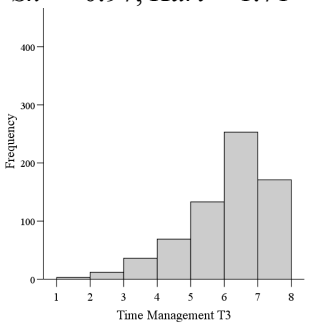
M = 6.94, *SD* = 1.08,
Sk = -1.64, *Kurt* = 3.42



M = 6.46, *SD* = 1.07,
Sk = -1.1, *Kurt* = 2.01

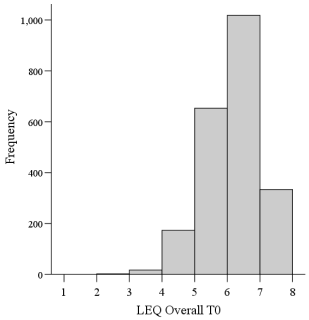


M = 6.7, *SD* = 1.12,
Sk = -1.01, *Kurt* = 1.59

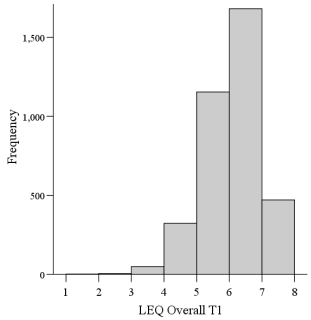


M = 5.94., *SD* = 1.26,
Sk = -0.98, *Kurt* = 1.58

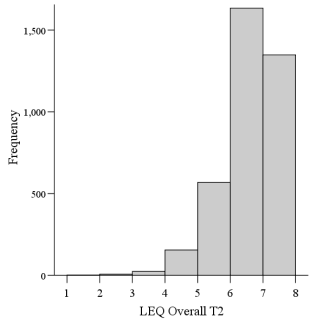
Figure D-4 Histograms and descriptive statistics for LEQ-H T3 (*N* = 677)



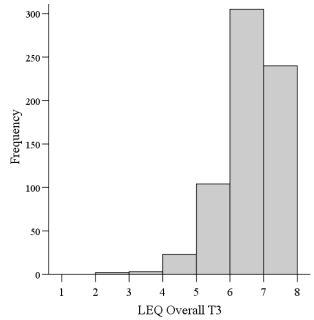
M = 6.16, *SD* = 0.80,
Sk = -0.48, *Kurt* = 0.21,
N = 2,196



M = 6.07, *SD* = 0.84,
Sk = -0.63, *Kurt* = 0.67,
N = 3,685



M = 6.58, *SD* = 0.84,
Sk = -1.11, *Kurt* = 2.10,
N = 3,738



M = 6.61, *SD* = 0.81,
Sk = -0.98, *Kurt* = 1.58,
N = 677

Figure D-5 Histograms and descriptive statistics for LEQ-H Overall by Time

APPENDIX E

LEQ Changes Over Time

E.1 Normalised LEQ T1 Factor Score *SD*s for Calculation of ES_ns

LEQ Factor	Time 1 SD_n
Achievement Motivation	.98723
Active Initiative	.98294
Emotional Control	.94775
Intellectual Flexibility	.96285
Self Confidence	.98384
Social Competence	.97827
Task Leadership	.94595
Time Management	.96324

E.2 Participant Age Effects on Changes in LEQ Overall and Factor Scores

E.2.1 Adolescent

Adolescent program participants with T1 to T2 LEQ and Participant Age data (n = 696) were categorised into three age groups - 11 to 13 year olds (n = 174), 14 to 15 year olds (n = 416), and 16 to 18 year olds (n = 106), with no age data available for two participants[127]. ES_ns indicated small-moderate LEQ Overall changes for 11 to 13 year olds (0.25) and 14 to 15 year olds (0.31), with moderate changes for 16 to 18 year olds (0.47). However, these ES_ns all had overlapping 99.9% CIs.

To inferentially test whether Participant Age was associated with T1 to T2 LEQ changes, a 2 (T1 to T2) by 9 (LEQ factor) by 3 (Participant Age) full-factorial MDMANOVA was conducted. Of interest was a small, non-significant multivariate interaction between Time and Participant Age (Wilk's $\lambda = .987$, F (2, 693) = 4.43, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .01$), and a small, non-significant multivariate interaction between Time, LEQ factor, and Participant Age (Wilk's $\lambda = .970$, F (14, 1376) = 1.52, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .02$). Overall, these results indicated no significant variation in the amount of short-term change for LEQ Overall across the three Adolescent Program age groups, and the patterns of change for the LEQ factors were consistent across the three Adolescent age groups, although a trend towards stronger outcomes for older adolescents was noted.

[127] OBA Extension Program participants were not included (n = 36) because they included a substantial proportion of participants under 30 years old.

Table E-1 M*s and* SD*s for T1 and T2 LEQ Factor Scores for Adolescent Programs by Participant Age*

		11 to 13 years		14 to 15 years		16 to 18 years		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	1	6.49	1.19	6.54	1.11	6.58	1.07	6.53	1.13
	2	6.70	1.14	6.74	1.06	6.94	0.90	6.76	1.06
Active Initiative	1	6.34	1.32	6.38	1.38	6.57	1.34	6.40	1.36
	2	6.54	1.40	6.55	1.31	6.89	1.19	6.60	1.32
Emotional Control	1	5.73	1.36	5.82	1.47	5.88	1.39	5.81	1.43
	2	5.94	1.50	6.14	1.43	6.57	1.11	6.15	1.42
Intellectual Flexibility	1	6.14	1.07	6.35	1.09	6.27	1.07	6.29	1.08
	2	6.21	1.21	6.53	1.14	6.66	0.90	6.47	1.13
Self Confidence	1	6.31	1.24	6.39	1.28	6.47	1.24	6.38	1.26
	2	6.83	1.23	6.84	1.20	7.04	0.91	6.87	1.17
Social Competence	1	5.81	1.35	5.98	1.23	6.01	1.20	5.94	1.26
	2	6.09	1.21	6.33	1.19	6.49	1.03	6.30	1.18
Task Leadership	1	5.50	1.34	5.53	1.34	5.56	1.30	5.53	1.33
	2	5.76	1.35	6.10	1.35	6.27	1.16	6.04	1.33
Time Management	1	5.39	1.25	5.46	1.33	5.39	1.44	5.43	1.32
	2	5.74	1.30	5.91	1.23	6.23	1.21	5.92	1.25
Overall	1	5.96	0.84	6.06	0.90	6.09	0.88	6.04	0.88
	2	6.23	0.95	6.39	0.95	6.64	0.76	6.39	0.93
n			174		416		106		696

Table E-2 *ES_ns and CIs for T1 to T2 LEQ Factor Scores for Adolescent Programs by Participant Age*

	11 to 13 years			14 to 15 years			16 to 18 years			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.01	0.22	0.46	0.03	0.20	0.37	0.10	0.37	0.64	0.16	0.23	0.31
Active Initiative	-0.04	0.21	0.46	-0.02	0.14	0.29	0.03	0.27	0.51	0.11	0.18	0.25
Emotional Control	-0.04	0.20	0.45	0.10	0.27	0.45	0.28	0.56	0.84	0.22	0.30	0.38
Intellectual Flexibility	-0.16	0.10	0.37	0.03	0.21	0.39	0.06	0.39	0.71	0.13	0.21	0.29
Self Confidence	0.23	0.51	0.78	0.26	0.43	0.60	0.24	0.51	0.78	0.25	0.32	0.39
Social Competence	-0.02	0.23	0.48	0.17	0.33	0.49	0.17	0.42	0.67	0.25	0.32	0.39
Task Leadership	-0.06	0.22	0.50	0.33	0.50	0.66	0.33	0.60	0.87	0.37	0.44	0.52
Time Management	0.06	0.31	0.56	0.28	0.22	0.36	0.39	0.68	0.97	0.33	0.40	0.47
Overall	0.08	0.25	0.42	0.20	0.31	0.42	0.30	0.47	0.65	0.23	0.30	0.38
n			174			416			106			696

E.2.2 Young Adult

Young Adult program participants with T1 to T2 LEQ and Participant Age data were available for two sub-program types. The first sub-type of Young Adult programs were Sail Training programs (10 days; $n = 470$) which tended to operate with 15 to 24 year olds, with a small proportion of 25 to 32 year olds. The second sub-type of Young Adult programs were Outward Bound Australia Standard and Classic Courses (22 to 28 days, $n = 1430$) which tended to operate with 17 to 30 year olds ($n = 1430$), with a small proportion of 31 to 38 year olds. Relations between Participant Age and LEQ outcomes were analysed separately for Sail Training and OBA Standard/Challenge Programs. Participants in the Scientific Exploration programs were not included in these analyses ($n = 21$) due to the small sample and wide age range.

E.2.3 Sail Training

T1 to T2. There were 470 Sail Training program participants with T1 to T2 LEQ and Participant Age data. Participants were divided into three age groups - 15 to 18 year olds ($n = 255$), 19 to 21 year olds ($n = 114$), and 22 to 32 year olds ($n = 101$). There were similar ES_ns with overlapping 99.9% CIs for participants in each of the three age groups, 0.40, 0.34, and 0.38 respectively.

To inferentially test whether Participant Age was associated with T1 to T2 LEQ changes, a 2 (T1 to T2) by 8 (LEQ factor) by 3 (Participant Age) full-factorial MDMANOVA was conducted. Of interest was a non-significant multivariate interaction between Time and Participant Age (Wilk's $\lambda = .999$, $F\ (1, 468) = 0.39$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$), and a non-significant multivariate interaction between Time, LEQ factor, and Participant Age (Wilk's $\lambda = .992$, $F\ (7, 462) = 0.54$, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .01$). Overall, these results indicated no differences in the amount of short-term change for LEQ Overall for the three different Sail Training program age groups, and that this pattern was consistent across the LEQ factors.

Table E-3 M*s and* SD*s for T1 and T2 LEQ Factor Scores for Young Adult Sail Training Programs by Participant Age*

		15 to 18 years		19 to 21 years		22 to 32 years		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	1	6.59	0.98	6.60	0.98	6.85	0.90	6.65	0.97
	2	6.81	1.00	6.79	1.16	7.06	0.82	6.86	1.01
Active Initiative	1	6.62	1.17	6.54	1.21	6.79	1.02	6.64	1.15
	2	6.95	1.22	6.77	1.17	7.12	0.95	6.95	1.16
Emotional Control	1	6.12	1.17	6.01	1.13	6.21	1.06	6.11	1.14
	2	6.54	1.16	6.36	1.15	6.70	0.95	6.53	1.12
Intellectual Flexibility	1	6.49	0.99	6.45	0.96	6.63	0.83	6.51	0.95
	2	6.77	1.00	6.63	1.08	7.01	0.69	6.79	0.97
Self Confidence	1	6.53	1.18	6.48	1.21	6.82	1.03	6.58	1.16
	2	6.93	1.18	6.83	1.25	7.11	0.93	6.94	1.15
Social Competence	1	6.08	1.03	5.87	1.22	6.15	1.03	6.05	1.08
	2	6.61	1.07	6.32	1.28	6.65	0.97	6.55	1.11
Task Leadership	1	5.99	1.13	5.90	1.35	6.20	0.95	6.01	1.16
	2	6.52	1.26	6.39	1.35	6.61	1.13	6.51	1.26
Time Management	1	5.60	1.22	5.39	1.32	5.62	1.27	5.55	1.26
	2	6.15	1.20	5.96	1.28	6.10	1.28	6.09	1.24
Overall	1	6.25	0.79	6.15	0.88	6.41	0.71	6.26	0.80
	2	6.66	0.80	6.51	1.02	6.80	0.75	6.65	0.90
n			255		114		101		470

Table E-4 *ES_ns and CIs for T1 to T2 LEQ Factor Scores for Young Adult Sail Training Programs by Participant Age*

	15 to 18 years			19 to 21 years			22 to 32 years			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	0.08	0.25	0.41	-0.02	0.25	0.53	0.02	0.24	0.46	0.13	0.25	0.36
Active Initiative	0.19	0.34	0.48	0.00	0.22	0.44	0.10	0.33	0.55	0.20	0.31	0.41
Emotional Control	0.21	0.38	0.56	0.09	0.32	0.56	0.18	0.44	0.70	0.26	0.38	0.50
Intellectual Flexibility	0.12	0.31	0.51	-0.01	0.24	0.49	0.17	0.44	0.70	0.19	0.32	0.45
Self Confidence	0.24	0.41	0.58	0.12	0.34	0.57	0.05	0.30	0.56	0.25	0.37	0.50
Social Competence	0.35	0.53	0.70	0.16	0.43	0.69	0.26	0.48	0.70	0.37	0.49	0.61
Task Leadership	0.33	0.53	0.72	0.22	0.46	0.70	0.15	0.44	0.73	0.36	0.49	0.63
Time Management	0.30	0.47	0.64	0.21	0.46	0.71	0.14	0.41	0.68	0.33	0.45	0.58
Overall	0.28	0.40	0.52	0.17	0.34	0.51	0.22	0.38	0.55	0.30	0.38	0.47
n			255			114			101			470

T0 to T3. There were 247 Sail Training program participants with T0 to T3 LEQ and Participant Age data. Participants were divided into three age groups - 15 to 18 year olds (n = 136), 19 to 21 year olds (n = 66), and 22 to 32 year olds (n = 45). ES_ns indicated small differences between groups (0.40, 0.23, and 0.34 respectively), but with overlapping CIs.

To inferentially test whether Participant Age was associated with T0 to T3 LEQ changes, a 2 (T0 to T3) by 8 (LEQ factor) by 3 (Participant Age) full-factorial MDMANOVA was conducted. Of interest was a non-significant multivariate interaction between Time and Participant Age (Wilk's $\lambda = .993$, F (2, 244) = 0.92, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .01$), and a non-significant multivariate interaction between Time, LEQ factor, and Participant Age (Wilk's $\lambda = .912$, F (14, 476) = 1.61, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$). Overall, these results indicated that there was no overall difference in the amount of change in LEQ Overall scores between T0 and T3 for the three different Sail Training program age groups, and that this pattern was consistent across the LEQ factors.

Table E-5 M*s and* SD*s for T0 and T3 LEQ Factor Scores for Young Adult Sail Training Programs by Participant Age*

		15 to 18 years		19 to 21 years		22 to 32 years		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	0	6.91	0.87	6.90	0.85	7.13	0.73	6.95	0.85
	3	7.00	0.96	6.73	0.95	7.10	0.74	6.95	0.93
Active Initiative	0	6.86	1.08	6.63	1.20	6.92	0.91	6.81	1.09
	3	7.12	1.14	6.78	1.18	7.25	0.74	7.05	1.10
Emotional Control	0	6.25	1.13	5.75	1.33	6.27	0.93	6.12	1.17
	3	6.65	1.12	6.25	1.03	6.76	0.94	6.56	1.08
Intellectual Flexibility	0	6.78	0.91	6.34	1.12	6.83	0.73	6.67	0.96
	3	6.99	0.87	6.57	0.98	7.04	0.68	6.89	0.89
Self Confidence	0	6.71	1.11	6.45	1.23	6.81	0.78	6.66	1.10
	3	7.12	1.05	6.73	1.26	7.33	0.69	7.06	1.07
Social Competence	0	6.29	1.10	6.14	1.24	6.45	0.76	6.28	1.09
	3	6.76	1.00	6.55	1.08	6.70	0.80	6.70	0.99
Task Leadership	0	6.09	1.20	5.98	1.48	6.30	0.86	6.10	1.23
	3	6.76	1.04	6.54	1.26	6.73	0.80	6.69	1.07
Time Management	0	5.43	1.28	5.45	1.37	5.72	1.15	5.49	1.28
	3	6.12	1.24	5.63	1.48	6.33	1.05	6.03	1.30
Overall	0	6.42	0.71	6.20	0.92	6.55	0.58	6.38	0.76
	3	6.82	0.77	6.47	0.92	6.91	0.62	6.74	0.80
n			136		66		45		247

Table E-6 *ES_ns and CIs for T0 and T3 LEQ Factor Scores for Young Adult Sail Training Programs by Participant Age*

	15 to 18 years			19 to 21 years			22 to 32 years			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	0.08	0.25	0.41	-0.46	-0.18	0.10	-0.45	-0.02	0.40	-0.15	0.02	0.19
Active Initiative	0.19	0.34	0.48	-0.18	0.16	0.50	-0.09	0.32	0.73	0.07	0.26	0.44
Emotional Control	0.21	0.38	0.56	0.01	0.39	0.77	0.09	0.48	0.88	0.20	0.40	0.59
Intellectual Flexibility	0.12	0.31	0.51	-0.06	0.21	0.59	-0.18	0.25	0.68	0.03	0.24	0.45
Self Confidence	0.25	0.41	0.58	0.12	-0.07	0.28	0.21	0.56	0.92	0.22	0.40	0.59
Social Competence	0.35	0.53	0.70	0.00	0.35	0.70	-0.10	0.26	0.63	0.19	0.39	0.58
Task Leadership	0.33	0.53	0.72	0.22	0.16	0.47	0.03	0.40	0.77	0.34	0.53	0.71
Time Management	0.30	0.47	0.64	0.21	-0.19	0.15	0.07	0.50	0.92	0.25	0.43	0.61
Overall	0.28	0.40	0.52	0.00	0.23	0.46	0.08	0.34	0.61	0.20	0.33	0.46
n			136			66			45			247

E.2.4 OBA Standard/Challenge

T1 to T2. There were 1,427 OBA Standard/Challenge program participants with T1 to T2 LEQ and Participant Age data. Participants were divided into three age groups - 16 to 20 year olds (n = 588), 21 to 25 year olds (n = 551), and 26 to 38 year olds (n = 288). ES_ns indicated similar results for the three age groups - 0.59, 0.68, and 0.59 respectively - with overlapping 99.9% CIs.

To inferentially test whether Participant Age was associated with T1 to T2 LEQ changes, a 2 (T1 to T2) by 8 (LEQ factor) by 3 (Participant Age) was conducted. Of interest was a non-significant multivariate interaction between Time and Participant Age (Wilk's $\lambda = .997$, F (2, 1424) = 2.38, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$), and a significant multivariate interaction between Time, LEQ factor, and Participant Age (Wilk's $\lambda = .974$, F (14, 2836) = 2.70, $p < .001$, $\eta^2 = .00$, $\eta_p^2 = .01$). Overall, these results indicate no overall short-term difference in the amount of change for the three different OBA Standard/Challenge program age groups but that there was a different pattern of change by Participant Age for at least some of the LEQ factors, a small effect.

A series of eight follow-up MDANOVAs were conducted to examine the interaction between Time (1 and 2) and Participant Age for each of the LEQ factor scores. These results did not find significant Time by Participant Age interactions for any of the LEQ factors (F (2, 1424), $p > .001$). Thus, despite the significant multivariate interaction, it appears that the pattern of short-term LEQ outcomes for participants in OBA Standard/Challenge programs was similar for the three age groups.

Table E-7 M*s and* SD*s for T1 and T2 LEQ Factor Scores for by Participant Age for Young Adult OBA Standard/Challenge Programs*

		16 to 20 years		21 to 25 years		26 to 38 years		T x Age	Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*M*	*SD*
Achievement Motivation	1	6.38	1.04	6.44	1.04	6.44	1.00	1.35	6.42	1.03
	2	6.84	1.00	6.92	0.88	6.81	0.83		6.86	0.92
Active Initiative	1	6.39	1.22	6.42	1.18	6.25	1.24	0.26	6.37	1.21
	2	6.87	1.12	6.94	0.95	6.73	1.06		6.86	1.05
Emotional Control	1	6.02	1.22	5.90	1.22	5.66	1.34	6.34	5.90	1.25
	2	6.62	1.21	6.72	1.05	6.51	1.10		6.64	1.13
Intellectual Flexibility	1	6.43	0.98	6.32	0.98	6.25	0.96	1.41	6.35	0.98
	2	6.86	0.96	6.85	0.90	6.73	0.88		6.83	0.92
Self Confidence	1	6.37	1.14	6.36	1.20	6.13	1.27	1.40	6.32	1.20
	2	7.11	0.99	7.19	0.84	6.96	0.92		7.11	0.92
Social Competence	1	5.69	1.20	5.66	1.26	5.58	1.22	1.52	5.66	1.23
	2	6.51	1.08	6.50	1.00	6.28	1.09		6.46	1.06
Task Leadership	1	5.71	1.23	5.69	1.23	5.59	1.26	5.69	5.68	1.24
	2	6.36	1.24	6.57	1.05	6.33	1.13		6.44	1.15
Time Management	1	5.11	1.40	5.21	1.39	5.19	1.39	1.02	5.17	1.39
	2	6.10	1.12	6.31	1.08	6.23	1.02		6.21	1.09
Overall	1	6.01	0.85	6.00	0.86	5.89	0.90	2.37	5.98	0.86
	2	6.66	0.86	6.75	0.71	6.57	0.78		6.68	0.79
n			588		551		288	1,427		1,427

Table E-8 *ES_ns and CIs for T1 to T2 LEQ Factor by Participant Age for Young Adult OBA Standard/Challenge Programs*

	16 to 20 years			21 to 25 years			26 to 38 years			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	0.35	0.49	0.62	0.36	0.49	0.61	0.18	0.36	0.54	0.38	0.46	0.54
Active Initiative	0.30	0.42	0.55	0.34	0.45	0.57	0.23	0.40	0.57	0.35	0.43	0.51
Emotional Control	0.40	0.55	0.69	0.59	0.72	0.85	0.53	0.70	0.86	0.56	0.64	0.73
Intellectual Flexibility	0.35	0.49	0.63	0.44	0.58	0.72	0.33	0.51	0.69	0.44	0.53	0.61
Self Confidence	0.57	0.71	0.84	0.64	0.77	0.89	0.55	0.72	0.90	0.65	0.73	0.82
Social Competence	0.61	0.74	0.88	0.60	0.73	0.86	0.43	0.61	0.79	0.71	0.80	0.76
Task Leadership	0.45	0.59	0.73	0.65	0.79	0.92	0.45	0.64	0.82	0.59	0.68	0.76
Time Management	0.62	0.76	0.89	0.75	0.88	1.01	0.63	0.81	1.00	0.73	0.82	0.90
Overall	0.50	0.59	0.69	0.59	0.68	0.77	0.47	0.59	0.72	0.57	0.63	0.68
n			588			551			288			1,427

Note. The sample is from Young Adult OBA Standard/Challenge programs.

T0 to T3. There were 359 OBA Standard/Challenge program participants with T0 to T3 LEQ and Participant Age data. Participants were divided into three age groups - 15 to 18 year olds (n = 149), 19 to 21 year olds (n = 134), and 22 to 32 year olds (n = 76). ES_ns for LEQ Overall were similar for the three age groups - 0.30, 0.41, and 0.28 respectively.

To inferentially test whether Participant Age was associated with T0 to T3 LEQ changes, a 2 (T0 to T3) by 8 (LEQ factor) by 3 (Participant Age) full-factorial MDMANOVA was conducted. Of interest was a non-significant multivariate interaction between Time and Participant Age (Wilk's $\lambda = .992$, F (2, 356) = 1.42, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .01$), and a non-significant multivariate interaction between Time, LEQ factor, and Participant Age (Wilk's $\lambda = .986$, F (14, 700) = 0.32, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$). Overall, these results indicate no overall long-term difference in the amount of change for the three different OBA Standard/Challenge program age groups, and that this pattern was similar across the eight LEQ factors.

Table E-9 M*s and* SD*s for T0 and T3 LEQ Factor by Participant Age for Young Adult OBA Standard/Challenge Programs*

		15 to 18 years		19 to 21 years		22 to 32 years		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	0	6.74	0.98	6.81	0.99	6.82	0.93	6.78	0.97
	3	6.85	0.97	7.04	0.90	6.90	0.85	6.93	0.92
Active Initiative	0	6.62	1.20	6.64	1.04	6.63	1.06	6.63	1.11
	3	6.88	1.22	7.01	1.01	6.82	0.92	6.92	1.09
Emotional Control	0	6.10	1.17	6.05	1.10	5.96	1.03	6.05	1.11
	3	6.44	1.09	6.61	0.95	6.32	1.04	6.48	1.03
Intellectual Flexibility	0	6.58	0.91	6.63	0.85	6.49	0.94	6.58	0.89
	3	6.77	0.93	6.83	0.82	6.70	0.88	6.78	0.88
Self Confidence	0	6.59	1.09	6.40	1.27	6.34	1.17	6.47	1.18
	3	7.01	1.00	6.94	1.05	6.75	1.12	6.93	1.05
Social Competence	0	5.83	1.19	5.84	1.33	5.96	1.05	5.86	1.21
	3	6.31	1.14	6.44	1.09	6.42	0.77	6.38	1.05
Task Leadership	0	5.89	1.16	5.76	1.24	5.85	1.19	5.83	1.19
	3	6.38	1.11	6.40	1.11	6.40	0.98	6.39	1.08
Time Management	0	5.49	1.33	5.37	1.42	5.69	1.27	5.49	1.35
	3	5.81	1.23	5.93	1.33	6.05	1.11	5.91	1.24
Overall	0	6.23	0.75	6.19	0.78	6.22	0.77	6.21	0.76
	3	6.56	0.82	6.65	0.75	6.54	0.72	6.59	0.77
n			149		134		76		359

Table E-10 *ES_ns and CIs for T0 and T3 LEQ Factor Scores for Young Adult OBA Standard/Challenge Programs by Participant Age*

	15 to 18 years			19 to 21 years			22 to 32 years			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.16	0.13	0.42	-0.04	0.25	0.54	-0.29	0.07	0.43	-0.01	0.16	0.34
Active Initiative	0.00	0.27	0.54	0.12	0.38	0.63	-0.17	0.15	0.48	0.12	0.29	0.45
Emotional Control	0.01	0.30	0.59	0.25	0.49	0.74	0.05	0.32	0.60	0.21	0.38	0.54
Intellectual Flexibility	-0.07	0.22	0.51	-0.02	0.23	0.49	-0.20	0.22	0.64	0.05	0.23	0.40
Self Confidence	0.12	0.40	0.69	0.18	0.46	0.75	0.07	0.41	0.74	0.25	0.43	0.60
Social Competence	0.18	0.42	0.67	0.26	0.51	0.76	0.01	0.37	0.73	0.29	0.44	0.60
Task Leadership	0.21	0.42	0.63	0.27	0.53	0.79	0.15	0.45	0.75	0.32	0.47	0.61
Time Management	-0.06	0.23	0.53	0.13	0.41	0.69	-0.05	0.54	0.42	0.13	0.30	0.47
Overall	0.11	0.30	0.49	0.23	0.41	0.59	0.04	0.28	0.52	0.22	0.34	0.45
n			149			134			76			359

E.2.5 Adult programs

Adult program participants with T1 to T2 data (n = 319) were divided into three age groups - 28 to 35 year olds (n = 108), 36 to 45 year olds (n = 147), and 46 to 65 year olds (n = 64), with no age data available for two participants. ES_ns were similar (0.43, 0.39, and 0.36 respectively), with overlapping CIs.

To inferentially test whether Participant Age was associated with T1 to T2 LEQ changes, a 2 (T1 to T2) by 8 (LEQ factor) by 3 (Participant Age) full-factorial MDMANOVA was conducted. Of interest was a non-significant multivariate interaction between Time and Participant Age (Wilk's $\lambda = .994$, F (2, 316) = .91, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .01$), and a small, non-significant multivariate interaction between Time, LEQ factor, and Participant Age (Wilk's $\lambda = .941$, F (14, 620) = 1.37, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .03$). Overall, these results indicate no overall short-term difference in the amount of change for the three different Adult Program age groups, and that this pattern was consistent across the LEQ factors.

Table E-11 M*s and* SD*s for T1 and T2 LEQ Factor Scores for Adult Programs by Participant Age*

		28 to 35 years		36 to 45 years		46 to 65 years		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	1	6.50	1.00	6.60	0.83	6.69	0.84	6.59	0.89
	2	6.68	0.92	6.76	0.86	6.89	0.83	6.76	0.87
Active Initiative	1	6.04	1.13	6.28	1.12	6.40	0.97	6.22	1.10
	2	6.59	1.10	6.61	1.12	6.69	1.04	6.62	1.10
Emotional Control	1	5.62	1.21	5.73	1.01	5.73	1.20	5.69	1.12
	2	6.28	1.05	6.30	1.00	6.33	1.25	6.30	1.07
Intellectual Flexibility	1	6.26	0.88	6.44	0.85	6.38	0.96	6.37	0.89
	2	6.56	0.79	6.77	0.80	6.77	0.92	6.70	0.83
Self Confidence	1	6.01	1.27	6.19	1.14	6.28	1.11	6.14	1.18
	2	6.77	0.92	6.78	1.12	6.84	0.86	6.79	1.00
Social Competence	1	5.41	1.37	5.53	1.16	5.69	1.16	5.52	1.23
	2	6.06	1.12	6.01	1.11	5.90	1.37	6.00	1.17
Task Leadership	1	5.58	1.30	5.58	1.19	5.69	1.39	5.60	1.27
	2	6.03	1.20	6.00	1.16	6.03	1.37	6.02	1.22
Time Management	1	5.34	1.37	5.24	1.26	5.55	1.31	5.34	1.31
	2	5.92	1.08	5.88	1.16	6.08	1.20	5.93	1.14
Overall	1	5.85	0.84	5.95	0.66	6.05	0.76	5.94	0.75
	2	6.36	0.76	6.39	0.79	6.44	0.85	6.39	0.79
n			108		147		64		319

Table E-12 *ES_ns and CIs for T1 to T2 LEQ Factor Scores for Adult Programs by Participant Age*

	28 to 35 years			36 to 45 years			46 to 65 years			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.08	0.18	0.44	-0.04	0.18	0.39	-0.08	0.22	0.53	0.04	0.19	0.33
Active Initiative	0.22	0.47	0.72	0.10	0.30	0.50	0.02	0.28	0.55	0.22	0.35	0.49
Emotional Control	0.27	0.53	0.79	0.29	0.48	0.68	0.19	0.52	0.85	0.37	0.51	0.64
Intellectual Flexibility	0.08	0.31	0.54	0.13	0.36	0.59	0.08	0.44	0.80	0.21	0.36	0.51
Self Confidence	0.35	0.62	0.89	0.35	0.57	0.79	0.16	0.50	0.84	0.43	0.57	0.72
Social Competence	0.29	0.51	0.73	0.20	0.41	0.62	-0.17	0.22	0.62	0.26	0.41	0.55
Task Leadership	0.12	0.37	0.63	0.17	0.36	0.55	-0.02	0.30	0.61	0.22	0.35	0.49
Time Management	0.50	0.44	0.68	0.24	0.50	0.76	0.24	0.42	0.60	0.31	0.46	0.62
Overall	0.26	0.43	0.66	0.24	0.39	0.54	0.14	0.36	0.58	0.30	0.40	0.50
n			108			147			64			319

E.2.6 Family

Family program participants with T1 to T2 data (n = 108) were divided into two age groups - 12 to 20 year olds (n = 58), and 31 to 56 year olds (n = 50). ES_ns were slightly higher for younger (0.45) than older participants (0.33), although the CIs were overlapping.

To inferentially test whether Participant Age was associated with T1 to T2 LEQ changes, a 2 (T1 to T2) by 8 (LEQ factor) by 2 (Participant Age) full-factorial MDMANOVA was conducted. Of interest was a small, non-significant multivariate interaction between Time and Participant Age (Wilk's $\lambda = .984$, F (1, 106) = 1.75, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .02$), and a small-medium, non-significant multivariate interaction between Time, LEQ factor, and Participant Age (Wilk's $\lambda = .913$, F (7, 100) = 1.37, $p > .001$, $\eta_p^2 = .00$, $\eta_p^2 = .09$).

Overall, these results indicate no significant overall short-term difference in the amount of change for the two different Family Program age groups, and that this pattern was consistent across the LEQ factors. ES_ns, however, indicated a trend towards greater change for 12 to 20 year olds ($ES_n = 0.45$), than 31 to 56 year olds ($ES_n = 0.33$), particularly for Achievement Motivation, Social Competence, Task Leadership, and Time Management. On the other hand, there was a trend towards 31 to 56 year olds reporting greater short-term change for Intellectual Flexibility. None of the trends, however, were statistically significant.

Table E-13 M*s and* SD*s for T1 and T2 LEQ Factor Scores for Family Programs by Participant Age*

		12 to 20 years		31 to 56 years		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*
Achievement Motivation	1	6.79	0.80	6.94	0.70	6.86	0.76
	2	7.06	0.75	6.92	0.78	7.00	0.76
Active Initiative	1	6.37	1.42	6.44	1.01	6.40	1.24
	2	6.83	1.13	6.81	1.03	6.82	1.08
Emotional Control	1	5.68	1.31	5.93	1.05	5.79	1.20
	2	6.30	1.31	6.51	1.06	6.40	1.20
Intellectual Flexibility	1	6.45	0.74	6.36	0.78	6.41	0.75
	2	6.63	1.03	6.71	0.77	6.67	0.91
Self Confidence	1	6.45	1.14	6.42	0.85	6.44	1.01
	2	6.97	0.96	6.84	0.84	6.91	0.90
Social Competence	1	5.94	1.09	5.90	0.88	5.92	0.99
	2	6.52	0.98	6.20	0.87	6.37	0.94
Task Leadership	1	5.58	1.18	6.12	0.95	5.83	1.11
	2	6.32	1.13	6.55	0.92	6.43	1.04
Time Management	1	5.48	1.09	5.87	1.16	5.66	1.13
	2	6.07	1.00	6.24	0.94	6.15	0.97
Overall	1	6.09	0.77	6.25	0.62	6.16	0.71
	2	6.59	0.78	6.60	0.71	6.59	0.75
n			58		50		108

Table E-14 *ES_ns and CIs for T1 to T2 LEQ Factor Scores for Family Programs by Participant Age*

	12 to 20 years			31 to 56 years			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.05	0.32	0.70	-0.35	-0.02	0.31	-0.09	0.17	0.42
Active Initiative	-0.06	0.38	0.82	0.05	0.35	0.65	0.10	0.37	0.63
Emotional Control	0.05	0.53	1.00	0.21	0.53	0.85	0.24	0.53	0.81
Intellectual Flexibility	-0.20	0.26	0.72	0.03	0.39	0.75	0.03	0.32	0.61
Self Confidence	0.17	0.48	0.79	0.12	0.42	0.71	0.24	0.45	0.66
Social Competence	0.22	0.53	0.85	-0.04	0.27	0.58	0.19	0.41	0.63
Task Leadership	0.24	0.63	1.02	0.10	0.41	0.73	0.28	0.53	0.78
Time Management	0.18	0.45	0.72	-0.10	0.29	0.67	0.12	0.39	0.66
Overall	0.22	0.45	0.68	0.11	0.33	0.55	0.22	0.40	0.57
n			58			50			108

E.2.7 Corporate

Corporate program participants with T1 to T2 data (n = 466) were divided into three age groups - 16 to 22 year olds (n = 134), 23 to 30 year olds (n = 158), and 31 to 63 year olds (n = 174), with no age data available for five participants. ES_ns indicated a trend towards higher outcomes with younger Corporate program participants (0.43, 0.40, 0.35 respectively), but these overall outcomes had overlapping CIs.

To inferentially test whether Participant Age was associated with T1 to T2 LEQ changes, a 2 (T1 to T2) by 8 (LEQ factor) by 3 (Participant Age) full-factorial MDMANOVA was conducted. Of interest was a non-significant multivariate interaction between Time and Participant Age (Wilk's $\lambda = .997$, F (2, 463) = 0.79, $p > .001$, $\eta^2 = .00$, $\eta_p^2 = .00$), and a small, significant multivariate interaction between Time, LEQ factor, and Participant Age (Wilk's $\lambda = .917$, F (14, 914) = 2.89, $p < .001$, $\eta^2 = .00$, $\eta_p^2 = .04$). Overall, these results indicate no overall short-term difference in the amount of change for the three different Corporate Program age groups but that the pattern of change over time varied significantly across the LEQ factors.

A series of eight follow-up MDANOVAs were conducted to examine the interaction between Time (T1 and T2) and Participant Age for each of the LEQ factor scores. These results indicated no significant Time by Participant Age interactions (F (2, 1426), $p > .001$). However, there was a non-significant trend towards higher changes for younger participants, particularly for Social Competence and Task Leadership.

Although T0 to T3 data were available for 45 Corporate program participants, these data were not used to analyse possible effects of Participant Age because it was considered that the cell sizes would be too small.

Table E-15 M*s and* SD*s for T1 and T2 LEQ Factor Scores for Corporate Programs by Participant Age, with Time x Age ANOVAs*

		16 to 22 years		23 to 30 years		31 to 63 years		T x Age	Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*M*	*SD*
Achievement Motivation	1	6.80	0.88	6.70	0.81	6.82	0.75	2.00	6.77	0.81
	2	7.06	0.78	7.00	0.73	6.97	0.79		7.01	0.77
Active Initiative	1	6.76	0.99	6.54	1.08	6.51	0.98	0.82	6.59	1.02
	2	7.01	0.88	6.77	0.93	6.84	0.97		6.87	0.93
Emotional Control	1	6.38	1.08	6.13	1.09	6.06	1.10	1.02	6.18	1.10
	2	6.80	0.96	6.59	1.09	6.61	0.99		6.66	1.02
Intellectual Flexibility	1	6.69	0.89	6.44	0.88	6.44	0.89	0.76	6.51	0.89
	2	6.99	0.85	6.85	0.77	6.76	0.95		6.86	0.87
Self Confidence	1	6.78	0.95	6.59	0.99	6.51	0.94	0.44	6.62	0.97
	2	7.14	0.96	7.04	0.78	6.94	0.87		7.04	0.87
Social Competence	1	5.97	1.06	6.02	1.20	5.91	1.00	3.75	5.96	1.09
	2	6.59	0.93	6.43	1.11	6.30	1.00		6.42	1.02
Task Leadership	1	5.97	1.07	5.91	1.12	6.28	0.96	4.18	6.06	1.06
	2	6.57	1.00	6.40	1.04	6.63	0.90		6.53	0.98
Time Management	1	5.65	1.09	5.65	1.12	5.89	1.14	3.91	5.74	1.12
	2	6.36	0.87	6.29	1.01	6.33	1.07		6.33	0.99
Overall	1	6.37	0.69	6.25	0.69	6.30	0.71	0.77	6.30	0.70
	2	6.82	0.73	6.67	0.71	6.67	0.73		6.71	0.73
n			134		158		174	466		466

Table E-16 *ES_ns and CIs for T1 to T2 LEQ Factor Scores for Corporate Programs by Participant Age*

	16 to 22 years			23 to 30 years			31 to 63 years			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	0.05	0.29	0.52	0.13	0.32	0.51	0.02	0.18	0.35	0.15	0.26	0.37
Active Initiative	0.03	0.25	0.47	-0.02	0.18	0.38	0.13	0.31	0.49	0.14	0.25	0.36
Emotional Control	0.15	0.38	0.62	0.22	0.42	0.63	0.30	0.49	0.68	0.32	0.44	0.56
Intellectual Flexibility	0.10	0.36	0.63	0.23	0.45	0.66	0.18	0.38	0.58	0.27	0.40	0.53
Self Confidence	0.19	0.42	0.65	0.22	0.43	0.63	0.22	0.41	0.61	0.30	0.42	0.54
Social Competence	0.35	0.57	0.80	0.17	0.38	0.60	0.17	0.35	0.52	0.31	0.43	0.54
Task Leadership	0.33	0.56	0.79	0.26	0.46	0.65	0.16	0.33	0.49	0.33	0.44	0.55
Time Management	0.38	0.59	0.80	0.33	0.54	0.76	0.20	0.39	0.58	0.38	0.50	0.61
Overall	0.27	0.43	0.58	0.26	0.40	0.54	0.23	0.35	0.48	0.31	0.39	0.47
n			134			158			174			466

E.2.8 Special

Special program participants with T1 to T2 data (n = 95) were divided into two age groups - 13 to 17 year olds (n = 52), and 18 to 41 year olds (n = 43). ES_ns for LEQ Overall indicated slightly smaller outcomes for adolescent (0.50) compared to adult (0.61) Special program participants, however these groups had overlapping CIs.

To inferentially test whether Participant Age was associated with T1 to T2 LEQ changes, a 2 (T1 to T2) by 8 (LEQ factor) by 2 (Participant Age) full-factorial MDMANOVA was conducted. Of interest was a non-significant multivariate interaction between Time and Participant Age (Wilk's $\lambda = 1.00$, F (1, 93) = .01, $p >$ .001, $\eta^2 = .00$, $\eta_p^2 = .00$), and a small-moderate, non-significant multivariate interaction between Time, LEQ factor, and Participant Age (Wilk's $\lambda = .913$, F (7, 87) = 1.19, $p >$ .001, $\eta^2 = .00$, $\eta_p^2 = .09$).

Overall, these results indicate no significant overall short-term difference in the amount of change for the two different Special Program age groups, and that this pattern was consistent across the LEQ factors. ES_ns indicated a trend towards greater change for adults than adolescents, particularly for Social Competence, Intellectual Flexibility, Task Leadership, Emotional Control, and Self Confidence, whereas there was a trend indicating greater change for adolescents than for adults for Time Management and Active Initiative. None of these trends, however, were statistically significant.

Table E-17 M*s and* SD*s for T1 and T2 LEQ Factor Scores for Special Programs by Participant Age*

		13 to 17 years		18 to 41 years		Total	
LEQ Factor	Time	*M*	*SD*	*M*	*SD*	*M*	*SD*
Active Initiative	1	5.79	1.90	6.66	0.99	6.18	1.61
	2	6.51	1.46	6.95	1.15	6.71	1.34
Achievement Motivation	1	6.16	1.51	6.49	0.89	6.31	1.27
	2	6.60	1.24	7.13	0.94	6.84	1.14
Emotional Control	1	5.05	1.71	5.75	1.40	5.37	1.61
	2	5.70	1.79	6.50	1.43	6.06	1.67
Intellectual Flexibility	1	6.11	1.42	6.29	1.18	6.19	1.31
	2	6.34	1.23	6.66	1.20	6.48	1.22
Self Confidence	1	6.07	1.92	6.72	1.10	6.36	1.63
	2	6.66	1.56	7.30	0.90	6.95	1.34
Social Competence	1	5.54	1.63	5.71	1.24	5.62	1.46
	2	6.28	1.24	6.61	1.27	6.43	1.26
Task Leadership	1	5.15	1.54	5.63	1.27	5.37	1.44
	2	5.88	1.35	6.39	1.44	6.11	1.41
Time Management	1	4.86	1.52	5.57	1.10	5.18	1.39
	2	5.81	1.62	6.21	1.13	5.99	1.43
Overall	1	5.59	1.22	6.10	0.70	5.82	1.04
	2	6.22	1.17	6.72	0.93	6.45	1.09
n			52		43		95

Table E-18 *ES_ns and CIs for T1 to T2 LEQ Factor Scores for Special Programs by Participant Age*

	13 to 17 years			18 to 41 years			Total		
LEQ Factor	.0005	.5000	.9995	.0005	.5000	.9995	.0005	.5000	.9995
Achievement Motivation	-0.08	0.40	0.87	0.27	0.75	1.24	0.22	0.56	0.89
Active Initiative	-0.06	0.51	1.07	-0.09	0.31	0.72	0.07	0.42	0.77
Emotional Control	-0.02	0.51	1.04	0.08	0.69	1.30	0.20	0.59	0.98
Intellectual Flexibility	-0.44	0.20	0.85	-0.10	0.41	0.93	-0.11	0.30	0.71
Self Confidence	-0.11	0.46	1.03	0.05	0.61	1.16	0.14	0.53	0.91
Social Competence	-0.01	0.60	1.21	0.34	0.86	1.38	0.32	0.72	1.12
Task Leadership	0.07	0.57	1.06	0.22	0.71	1.21	0.29	0.63	0.97
Time Management	0.19	0.76	1.33	0.08	0.57	1.05	0.31	0.67	1.04
Overall	0.11	0.50	0.89	0.27	0.61	0.96	0.34	0.55	0.77
n			52			43			95

APPENDIX F

Multi-Level Analyses

F.1 T1 to T2

F.1.1 Achievement Motivation

Standardised T1 and T2 Achievement Motivation scores were used as the response variable in three nested multi-level models (MLMs). Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 385.520, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (11) = 62.520, $p < .05$. There was significant random variance at each level for each model.

Significant positive fixed effects for Time in Model 2 and 3 indicated that Achievement Motivation scores increased between T1 and T2 ($\beta_1 = .166$, $SE = .008$, $t = 20.75$, $p < .05$). None of the fixed interaction effects between Time and the explanatory variables were significant.

Table F-1 *MLA Parameter Estimates and Model Fits for Achievement Motivation (T1 to T2)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	-.006	.021	-0.29	-.007	.021	-0.33	-.006	.021	-0.29
β_1 Time (1 to 2)				.166	.008	20.75*	.166	.008	20.75*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.014	.008	-1.75
β_3 Participant Age							-.015	.013	-1.15
β_4 Group Gender							.001	.010	0.10
β_5 Group Size							.004	.011	0.36
β_6 Program Length							.045	.035	1.29
β_7 Program Type - Adolescent							.056	.073	0.77
β_8 Program Type - Young Adult							.096	.095	1.01
β_9 Program Type - Adult							.053	.054	0.98
β_{10} Program Type - Family							.025	.030	0.83
β_{11} Program Type - Corporate							.065	.061	1.07
β_{12} Program Type - Special							.049	.026	1.88
Random									
σ^2_v Between-Group	.054	.010	5.40*	.054	.010	5.40*	.054	.010	5.40*
σ^2_u Between-Participant	.481	.020	24.05*	.508	.020	25.40*	.512	.020	25.60*
σ^2_e Between-Time	.467	.012	38.92*	.412	.011	37.45*	.404	.010	40.40*
Model fit									
-2 log Λ			16,313.23			15,927.71			15,865.19
Δ -2 log Λ						385.52*			62.52*
Total fixed effects			0			1			12

Note. * $p < .05$

F.1.2 Active Initiative

Standardised T1 and T2 Active Initiative scores were used as the response variable in three nested MLMs. Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 395.89, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (11) = 56.79, $p < .05$. There was significant random variance at each level for each model.

There were significant fixed effects for Time, for the interaction between Time and Participant Gender, and for the interaction between Time and Program Length. The effect of Time was positive, indicating increased scores between T1 and T2 ($\beta_1 = .162$, $SE = .008$, $t = 20.25$, $p < .05$). The interaction between Time and Participant Gender was negative, indicating that males tended to report a greater increase between T1 and T2 than females ($\beta_2 = -.016$, $SE = .008$, $t = -2.00$, $p < .05$). The interaction between Time and Program Length was positive, indicating that participants in longer programs tended to report a greater increase between T1 and T2 ($\beta_6 = .082$, $SE = .034$, $t = 2.41$, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-2 *MLA Parameter Estimates and Model Fits for Active Initiative (T1 to T2)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	-.002	.020	-0.10	-.002	.020	-0.10	-.003	.020	-0.15
β_1 Time (1 to 2)				.162	.008	20.25*	.163	.008	20.38*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.016	.008	-2.00*
β_3 Participant Age							.009	.012	0.75
β_4 Group Gender							-.008	.009	-0.89
β_5 Group Size							.006	.010	0.60
β_6 Program Length							.082	.034	2.41*
β_7 Program Type - Adolescent							.074	.071	1.04
β_8 Program Type - Young Adult							.076	.092	0.83
β_9 Program Type - Adult							.077	.052	1.48
β_{10} Program Type - Family							.048	.029	1.66
β_{11} Program Type - Corporate							.078	.059	1.32
β_{12} Program Type - Special							.037	.025	1.48
Random									
σ^2_v Between-Group	.037	.009	4.11*	.037	.009	4.11*	.037	.009	4.11*
σ^2_u Between-Participant	.530	.021	25.24*	.556	.020	27.80*	.559	.020	27.95*
σ^2_e Between-Time	.433	.011	39.36*	.380	.010	38.00*	.374	.010	37.40*
Model fit									
-2 log Λ			16,170.34			15,774.45			15,717.66
Δ -2 log Λ						395.89*			56.79*
Total fixed effects			0			1			12

Note. * $p < .05$

F.1.3 Emotional Control

Standardised T1 and T2 Emotional Control scores were used as the response variable in three nested MLMs. Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 707.12, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (11) = 78.25, $p < .05$. There was significant random variance at each level for each model.

There were significant fixed effects for Time, for the interaction between Time and Participant Age, for the interaction between Time and Group Gender, and for the interactions between Time and each of the six Program Types. The effect of Time was positive, indicating increased Emotional Control scores between T1 and T2 ($\beta_1 = .231$, $SE = .008$, $t = 28.88$, $p < .05$). The interaction between Time and Participant Age was positive, indicating that older participants tended to report a greater increase between T1 and T2 than younger participants ($\beta_3 = .040$, $SE = .013$, $t = 3.08$, $p < .05$). The interaction between Time and Group Gender was negative, indicating that single-sex groups tended to report a greater increase between T1 and T2 than co-educational groups ($\beta_4 = -.021$, $SE = .010$, $t = -2.10$, $p < .05$). The interactions between Time and Program Type were all positive, indicating that participants in these programs tended to report additional increases over time above and beyond the fixed main effect for Time. The ratio of parameter estimates to their *SE*s indicated the relative size of these effects. Ranging from strongest to weakest, the *t*-values were: Young Adult (3.84), Family (3.38), Special (2.85), Adult (2.96), Corporate (2.85), and Adolescent (2.83) programs. None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-3 *MLA Parameter Estimates and Model Fits for Emotional Control (T1 to T2)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.001	.020	0.05	.001	.020	0.05	-.001	.020	-0.05
β_1 Time (1 to 2)				.231	.008	28.88*	.232	.008	29.00*
Interactions with Time (Fixed)									
β_2 Participant Gender							.002	.008	0.25
β_3 Participant Age							.040	.013	3.08*
β_4 Group Gender							-.021	.010	-2.10*
β_5 Group Size							.007	.011	0.64
β_6 Program Length							-.047	.035	-1.34
β_7 Program Type - Adolescent							.204	.072	2.83*
β_8 Program Type - Young Adult							.361	.094	3.84*
β_9 Program Type - Adult							.157	.053	2.96*
β_{10} Program Type - Family							.098	.029	3.38*
β_{11} Program Type - Corporate							.174	.061	2.85*
β_{12} Program Type - Special							.079	.026	3.04*
Random									
σ^2_v Between-Group	.043	.009	4.78*	.043	.009	4.78*	.042	.009	4.67*
σ^2_u Between-Participant	.437	.020	21.85*	.490	.019	25.79*	.494	.019	26.00*
σ^2_e Between-Time	.518	.013	39.85*	.411	.011	37.36*	.402	.010	40.20*
Model fit									
-2 log Λ			16,527.79			15,820.67			15,742.420
Δ -2 log Λ						707.12*			78.25*
Total fixed effects			0			1			12

Note. * $p < .05$

F.1.4 Intellectual Flexibility

Standardised T1 and T2 Intellectual Flexibility scores were used as the response variable in three nested MLMs. Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 422.18, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (11) = 59.29, $p < .05$. There was significant random variance at each level for each model.

There were significant fixed effects for Time and for the interaction between Time and Participant Age. The effect of Time was positive ($\beta_1 = .184$, $SE = .009$, $t = 20.44$, $p < .05$), indicating increased scores between T1 and T2. The interaction between Time and Participant Age was positive, indicating that older participants tended to report a greater increase between T1 and T2 than younger participants ($\beta_3 = .029$, $SE = .014$, $t = 2.07$, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-4 *MLA Parameter Estimates and Model Fits for Intellectual Flexibility (T1 to T2)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	-.001	.020	-0.05	-.001	.020	-0.05	-.002	.020	-0.10
β_1 Time (1 to 2)				.184	.009	20.44*	.185	.009	20.56*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.004	.009	-0.44
β_3 Participant Age							.029	.014	2.07*
β_4 Group Gender							-.01	.010	-1.00
β_5 Group Size							-.008	.011	-0.73
β_6 Program Length							.037	.037	1.00
β_7 Program Type - Adolescent							.083	.076	1.09
β_8 Program Type - Young Adult							.130	.099	1.31
β_9 Program Type - Adult							.063	.056	1.13
β_{10} Program Type - Family							.036	.031	1.16
β_{11} Program Type - Corporate							.091	.064	1.42
β_{12} Program Type - Special							.027	.027	1.00
Random									
σ^2_v Between-Group	.047	.009	5.22*	.047	.009	5.22*	.046	.009	5.11*
σ^2_u Between-Participant	.424	.020	21.20*	.459	.019	24.16*	.462	.019	24.32*
σ^2_e Between-Time	.527	.013	40.54*	.459	.012	38.25*	.451	.012	37.58*
Model fit									
-2 log Λ			16,558.16			16,135.98			16,076.69
Δ -2 log Λ						422.18*			59.29*
Total fixed effects			0			1			12

Note. * $p < .05$

F.1.5 Self Confidence

Standardised T1 and T2 Self Confidence scores were used as the response variable in three nested MLMs. Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 923.58, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (11) = 84.36, $p < .05$. There was significant random variance at each level for each model).

There were significant fixed effects for Time, for the interaction between Time and Participant Gender, and for the interactions between Time and each of the six Program Types. The effect of Time was positive, indicating increased scores between T1 and T2 ($\beta_1 = .280$, $SE = .009$, $t = 31.11$, $p < .05$). The interaction between Time and Participant Gender was positive, indicating that female participants tended to report a greater increase between T1 and T2 than male participants ($\beta_2 = .027$, $SE = .009$, $t = 3.00$, $p < .05$). The interactions between Time and Program Type were all positive, indicating that participants in each Program Type tended to report increases over Time above and beyond the fixed main effect for Time. The ratio of parameter estimates to their *SE*s indicated the relative size of these effects. Ranging from strongest to weakest, the *t*-values were: Adult (3.25), Special (3.22), Adolescent (3.05), Family (3.03), Corporate (3.03), and Young Adult (2.96) programs. None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-5 *MLA Parameter Estimates and Model Fits for Self Confidence (T1 to T2)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	-.002	.018	-0.11	-.002	.018	-0.11	-.004	.018	-0.22
β_1 Time (1 to 2)				.280	.009	31.11*	.281	.008	35.13*
Interactions with Time (Fixed)									
β_2 Participant Gender							.027	.009	3.00*
β_3 Participant Age							.020	.013	1.54
β_4 Group Gender							-.009	.010	-0.90
β_5 Group Size							.013	.011	1.18
β_6 Program Length							.056	.036	1.56
β_7 Program Type - Adolescent							.226	.074	3.05*
β_8 Program Type - Young Adult							.288	.097	2.97*
β_9 Program Type - Adult							.179	.055	3.25*
β_{10} Program Type - Family							.091	.030	3.03*
β_{11} Program Type - Corporate							.188	.062	3.03*
β_{12} Program Type - Special							.087	.027	3.22*
Random									
σ^2_v Between-Group	.027	.008	3.38*	.027	.008	3.38*	.027	.007	3.86*
σ^2_u Between-Participant	.372	.019	19.58*	.450	.019	23.68*	.455	.019	23.95*
σ^2_e Between-Time	.601	.015	40.07*	.445	.011	40.45*	.434	.011	39.45*
Model fit									
-2 log Λ			16,838.51			15,914.93			15,830.57
Δ -2 log Λ						923.58*			84.36*
Total fixed effects			0			1			12

Note. * $p < .05$

F.1.6 Social Competence

Standardised T1 and T2 Social Competence scores were used as the response variable in three nested MLMs. Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 849.24, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (11) = 124.14, $p < .05$. There was significant random variance at each level for each model.

There were significant fixed effects for Time, for the interaction between Time and Participant Gender, and for the interaction between Time and Participant Age. The effect of Time was positive, indicating increased scores between T1 and T2 ($\beta_1 = .253$, $SE = .008$, $t = 31.63$, $p < .05$). The interaction between Time and Participant Gender was negative, indicating that males tended to report a greater increase between T1 and T2 than females ($\beta_2 = .-.033$, $SE = .008$, $t = -4.13$, $p < .05$). The interaction between Time and Participant Age was negative, indicating that younger participants tended to report a greater increase over Time than older participants ($\beta_3 = -.031$, $SE = .013$, $t = -2.38$, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-6 *MLA Parameter Estimates and Model Fits for Social Competence (T1 to T2)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	-.002	.018	-0.11	-.002	.018	-0.11	-.002	.018	-0.11
β_1 Time (1 to 2)				.253	.008	31.63*	.253	.008	31.63*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.033	.008	-4.13*
β_3 Participant Age							-.031	.013	-2.38*
β_4 Group Gender							-.007	.010	-0.70
β_5 Group Size							.001	.011	0.09
β_6 Program Length							.010	.034	0.29
β_7 Program Type - Adolescent							-.011	.071	-0.15
β_8 Program Type - Young Adult							.084	.093	0.90
β_9 Program Type - Adult							.037	.052	0.71
β_{10} Program Type - Family							.012	.029	0.41
β_{11} Program Type - Corporate							.019	.060	0.32
β_{12} Program Type - Special							.021	.025	0.84
Random									
σ^2_v Between-Group	.025	.008	3.13*	.025	.007	3.57*	.025	.008	3.13*
σ^2_u Between-Participant	.446	.020	22.30*	.510	.020	25.50*	.518	.020	25.90*
σ^2_e Between-Time	.529	.014	37.79*	.401	.010	40.10*	.385	.010	38.50*
Model fit									
-2 log Λ			16,602.76			15,753.52			15,629.38
Δ -2 log Λ						849.24*			124.14*
Total fixed effects			0			1			12

Note. * $p < .05$

F.1.7 Task Leadership

Standardised T1 and T2 Task Leadership scores were used as the response variable in three nested MLMs. Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 818.20, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (11) = 61.97, $p < .05$. There was significant random variance at each level for each model.

There were significant fixed effects for Time and for the interaction between Time and each the six Program Types. The effect of Time was positive, indicating increased scores between T1 and T2 ($\beta_1 = .244$, $SE = .008$, $t = 30.50$, $p < .05$). The interactions between Time and Program Type were positive, indicating that participants in these Program Types tended to report additional increases above and beyond the fixed main effect for Time. The ratio of parameter estimates to their *SE*s indicated the relative size of these effects. Ranging from strongest to weakest, the *t*-values were: Young Adult (3.14), Special (2.84), Adolescent (2.81), Family (2.79), Corporate (2.70), and Adult (2.55). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-7 *MLA Parameter Estimates and Model Fits for Task Leadership (T1 to T2)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.001	.020	0.05	.001	.020	0.05	-.001	.020	-0.05
β_1 Time (1 to 2)				.244	.008	30.50*	.245	.008	30.63*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.015	.008	-1.88
β_3 Participant Age							-.008	.013	-0.62
β_4 Group Gender							.009	.010	0.90
β_5 Group Size							-.019	.011	
β_6 Program Length							-.019	.034	-0.56
β_7 Program Type - Adolescent							.200	.071	2.82*
β_8 Program Type - Young Adult							.289	.092	3.14*
β_9 Program Type - Adult							.133	.052	2.56*
β_{10} Program Type - Family							.081	.029	2.79*
β_{11} Program Type - Corporate							.162	.060	2.70*
β_{12} Program Type - Special							.071	.025	2.84*
Random									
σ^2_v Between-Group	.042	.009	4.67*	.042	.009	4.67*	.041	.009	4.56*
σ^2_u Between-Participant	.450	.020	22.50*	.509	.019	26.79*	.512	.019	26.95*
σ^2_e Between-Time	.508	.013	39.08*	.389	.010	38.90*	.382	.010	38.20*
Model fit									
-2 log Λ			16,494.95			15,676.75			15,614.78
Δ -2 log Λ						818.20*			61.97*
Total fixed effects			0			1			12

Note. * $p < .05$

F.1.8 Time Management

Standardised T1 and T2 Time Management scores were used as the response variable in three nested MLMs. Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 1089.60, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (11) = 149.48, $p < .05$. There was significant random variance at each level for each model).

There was a significant, positive fixed effect for Time, indicating increased scores between T1 and T2 ($\beta_1 = .298$, $SE = .008$, $t = 37.25$, $p < .05$). None of other fixed interaction effects between Time and the explanatory variables were significant.

Table F-8 *MLA Parameter Estimates and Model Fits for Time Management (T1 to T2)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	-.007	.019	-0.37	-.007	.019	-0.37	-.008	.019	-0.42
β_1 Time (1 to 2)				.298	.008	37.25*	.299	.008	37.38*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.009	.008	-1.13
β_3 Participant Age							-.007	.013	-0.54
β_4 Group Gender							-.019	.010	-1.90
β_5 Group Size							-.008	.011	-0.73
β_6 Program Length							.057	.035	1.63
β_7 Program Type - Adolescent							.095	.072	1.32
β_8 Program Type - Young Adult							.171	.094	1.82
β_9 Program Type - Adult							.092	.053	1.74
β_{10} Program Type - Family							.042	.029	1.45
β_{11} Program Type - Corporate							.104	.060	1.73
β_{12} Program Type - Special							.036	.026	1.38
Random									
σ^2_v Between-Group	.036	.008	4.50*	.036	.008	4.50*	.036	.008	4.50*
σ^2_u Between-Participant	.370	.019	19.47*	.459	.019	24.16*	.468	.018	26.00*
σ^2_e Between-Time	.593	.015	39.53*	.416	.011	37.82*	.397	.010	39.70*
Model fit									
-2 log Λ			16,801.31			15,711.71			15,562.23
Δ -2 log Λ						1089.60*			149.48*
Total fixed effects			0			1			12

Note. * $p < .05$

F.1.9 Summary

A series of three nested MLA models were applied to standardised T1 and T2 LEQ Overall and factor scores as response variables (N = 3,064). In response to Research Question 2b1.1, random variance for LEQ Overall was attributable to Time (54%), Participant (41%), and Group (5%). For the LEQ factors, random variance attributable to Time ranged between 43% (Active Initiative) and 60% (Self Confidence), Participant ranged between 37% (Self Confidence) and 54% (Active Initiative), and Group ranged between 2% (Task Leadership) and 5% (Achievement Motivation).

The fixed effect of Time (1 to 2) was significant for LEQ Overall and for each of the LEQ factors, supporting Hypothesis 2b1.1. Significant fixed effect interactions between T1 and T2 and each of the independent variables were as follows, addressing Research Question 2b1.2.

Participant Gender was a negative predictor of changes in Active Initiative and Social Competence, indicating that males tended to report greater increases between T1 and T2 than females for these factors, and a positive predictor of changes in Self Confidence, indicating that females tended to report greater increases for this factor.

Participant Age was a significant, positive predictor of T1 to T2 changes in Emotional Control and Intellectual Flexibility, and a negative predictor of changes in Social Competence. Thus, older participants tended to report greater changes in Emotional Control and Intellectual Flexibility, and younger participants tended to report greater changes in Social Competence.

Group Gender was a negative predictor of T1 to T2 changes in Emotional Control, indicating that single-sex groups tended to report a greater increase than co-educational groups.

Group Size was not a significant predictor.

Program Length parameter estimates were mostly positive, but non-significant, except for a positive, significant effect for Active Initiative.

Finally, each of the six Program Types were significant, positive predictors of changes in Emotional Control, Self Confidence, Task Leadership, and LEQ Overall.

F.2 T0 to T3

F.2.1 Descriptive statistics

There was some missing independent variable data. This reduced the T0 to T3 listwise sample by 36.0% (by 239 out of 663 cases) to 424 cases. This sizable reduction was mainly because Group Size was not available for Young Adult sail training voyages. The 424 participants with T0 to T3 LEQ and independent variable data each belonged to one of 72 unique groups. In this sample, the groups had an average of size of 5.89 (*SD* = 3.64), ranging from 1 to 27. This is considerably less, due to listwise elimination of missing data, than the average size of group to which participants originally belonged, which was 12.38 participants (*SD* = 1.95; range 3 to 27).

There were 249 males and 175 females (58.7% and 41.3% respectively). The average age was 23.58 years (*SD* = 6.73; range 16 to 58 years). For Group Gender, 398 participants were in co-education groups and 26 participants were in single-sex groups (93.9% and 6.1% respectively). The average Program Length was 20.63 days (*SD* = 5.54, range 5 to 26). For Program Type, the breakdown was 0 Adolescent (0%), 368 Young Adult (86.8%), 0 Adult (0%), 0 Family (0%), 45 Corporate (10.6%), and 11 Special (2.6%) participants.

F.2.2 Multi-level models

Nine sets of three MLAs were conducted with standardised T0 to T3 LEQ scores as response variables (total = 27). The three MLMs were applied to each of the nine response variables (LEQ Overall and the eight LEQ factors).

As with the MLAs of T1 to T2 data, three models were fitted for each of the LEQ outcomes: a variance components model (Model 1), a variance components model with Time as a fixed effect (Model 2), and a variance components model with Time and interactions between Time and Participant, Group, and Program variables as fixed effects (Model 3). The critical 95% χ^2 value for comparing models with 1 *df* is 3.84 and with 5 *df* is 11.07.

The models initially specified three random levels (Group, Participant, and Time). However, the solutions did not converge for over half of the response variables. Consequently, the models were simplified by reducing them to two levels

(Participant and Time). As a result, only the Emotional Control solution failed to converge.

F.2.3 LEQ Overall

Standardised T0 and T3 LEQ Overall scores were used as the response variable in three nested MLMs. Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 77.70, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (5) = 19.53, $p < .05$. There was significant random variance at each level for each model.

There were significant fixed effects for Time, for the interaction between Time and Group Gender, and for the interaction between Time and Group Size. The effect of Time was positive, indicating increased scores between T0 and T3 (β_1 = .216, SE = .023, t = 9.39, $p < .05$). The interaction between Time and Group Gender was positive, indicating that participants in co-educational groups tended to report more positive change between T0 and T3 than single-sex groups (β_4 = .079, SE = .033, t = -3.13, $p < .05$). The interaction between Time and Group Size was negative, indicating that participants in larger groups tended to report less positive change over Time (β_5 = -.075, SE = .024, t = -3.13, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-9 *MLA Parameter Estimates and Model Fits for LEQ Overall (T0 to T3)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.000	.041	0.00	.000	.041	0.00	.000	.041	0.00
β_1 Time (1 to 2)				.216	.023	9.39*	.216	.023	9.39*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.045	.024	-1.88
β_3 Participant Age							-.008	.032	-0.25
β_4 Group Gender							.079	.033	2.39*
β_5 Group Size							-.075	.024	-3.13*
β_6 Program Length							-.001	.039	-0.03
Random									
σ^2_u (between-participant variance)	.441	.053	8.32*	.488	.052	9.38*	.498	.052	9.58*
σ^2_e (between-time variance)	.558	.038	14.68*	.464	.032	14.50*	.443	.030	14.77*
Model fit									
-2 log Λ			2,313.47			2,235.77			2,216.24
Δ -2 log Λ						77.70*			19.53*
Total fixed effects			0			1			5

Note. * $p < .05$

F.2.4 Achievement Motivation

Standardised T0 and T3 Achievement Motivation scores were used as the response variable in three nested MLMs. The third model explained significantly more variance than the second model (Model 2 to 3 $\Delta \chi^2$ (5) = 29.16, $p < .05$), but the second model did not explain more variance than the first model (Model 1 to 2 $\Delta \chi^2$ (1) = 3.26, $p > .05$). There was significant random variance at each level for each model).

The fixed effect of Time was not significant ($\beta_1 = .046$, $SE = .025$, $t = 1.84$, $p < .05$). However, the interactions between Time and Group Gender and between Time and Group Size were significant. The interaction between Time and Group Gender was positive, indicating that participants in co-educational groups tended to report more positive change between T0 and T3 than single-sex groups ($\beta_4 = .121$, $SE = .036$, $t = 3.36$, $p < .05$). The interaction between Time and Group Size was negative, indicating that participants in smaller groups tended to report more positive change between T0 and T3 ($\beta_5 = -.101$, $SE = .026$, $t = -3.88$, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-10 *MLA Parameter Estimates and Model Fits for Achievement Motivation (T0 to T3)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.000	.041	0.00	.000	.041	0.00	.000	.041	0.00
β_1 Time (1 to 2)				.046	.025	1.84	.046	.024	1.92*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.020	.025	-0.80
β_3 Participant Age							-.024	.034	-0.71
β_4 Group Gender							.121	.036	3.36*
β_5 Group Size							-.101	.026	-3.88*
β_6 Program Length							-.021	.041	-0.51
Random									
σ^2_u (between-participant variance)	.456	.053	8.60*	.458	.053	8.64*	.476	.053	8.98*
σ^2_e (between-time variance)	.543	.037	14.68*	.539	.037	14.57*	.503	.035	14.37*
Model fit									
-2 log Λ			2,306.64			2,303.38			2,274.22
Δ -2 log Λ						3.26			29.16*
Total fixed effects			0			1			5

Note. * $p < .05$

F.2.5 Active Initiative

Standardised T0 and T3 Active Initiative scores were used as the response variable in three nested MLMs. Each model explained significantly more variance based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 24.48, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (5) = 13.65, $p < .05$. There was significant random variance at each level for each model).

There were significant fixed effects for Time, for the interaction between Time and Participant Gender, and for the interaction between Time and Group Gender. The effect of Time was positive, indicating increased scores T0 and T3 (β_1 = .111, *SE* = .022, t = 5.05, $p < .05$). The effect of the interaction between Time and Participant Gender was negative, indicating that males tended to report more positive change between T0 and T3 (β_2 = -.064, *SE* = .022, t = -2.91, $p < .05$). The effect of the interaction between Time and Group Gender was positive, indicating that participants in co-educational groups tended to report more positive change between T0 and T3 than single-sex groups (β_4 = .067, *SE* = .032, t = 2.09, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-11 *MLA Parameter Estimates and Model Fits for Active Initiative (T0 to T3)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.000	.043	0.00	.000	.043	0.00	.000	.043	0.00
β_1 Time (1 to 2)				.111	.022	5.05*	.111	.022	5.05*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.064	.022	-2.91*
β_3 Participant Age							-.033	.031	-1.06
β_4 Group Gender							.067	.032	2.09*
β_5 Group Size							-.017	.023	-0.74
β_6 Program Length							-.007	.037	-0.19
Random									
σ^2_u (between-participant variance)	.559	.056	9.98*	.571	.055	10.38*	.578	.055	10.51*
σ^2_e (between-time variance)	.440	.030	14.67*	.415	.029	14.31*	.402	.028	14.36*
Model fit									
-2 log Λ			2,246.29			2,221.81			2,208.15
Δ -2 log Λ						24.48*			13.65*
Total fixed effects			0			1			5

Note. * $p < .05$

F.2.6 Emotional Control

Standardised T0 and T3 Emotional Control scores were used as the response variable in three MLMs. However, none of the three models converged and thus it was not possible to produce MLM parameter estimates.

F.2.7 Intellectual Flexibility

Standardised T0 and T3 Intellectual Flexibility scores were used as the response variable in three nested MLMs. The second model explained significantly more variance than the first model (Model 1 to 2 $\Delta \chi^2$ (1) = 13.02, $p < .05$), but the third model did not explain more variance than the second model (Model 2 to 3 $\Delta \chi^2$ (5) = 10.04, $p > .05$). There was significant random variance at each level for each model).

There were significant fixed effects for Time, for the interaction between Time and Group Gender, and for the interaction between Time and Group Size. The effect of Time was positive, indicating increased scores T0 and T3 ($\beta_1 = .096$, $SE = .026$, $t = 3.69$, $p < .05$). The interaction between Time and Group Gender was positive, indicating that participants in co-educational groups tended to report greater positive change between T0 and T3 than participants in single-sex groups ($\beta_4 = .076$, $SE = .038$, $t = 2.00$, $p < .05$). The interaction between Time and Group Size was negative, indicating that participants in smaller groups tended to report more positive change between T0 and T3 ($\beta_5 = -.058$, $SE = .027$, $t = -2.15$, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-12 *MLA Parameter Estimates and Model Fits for Intellectual Flexibility (T0 to T3)*

	Model 1			Model 2			Model 3		
Effects	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.000	.040	0.00	.000	.040	0.00	.000	.040	0.00
β_1 Time (1 to 2)				.096	.026	3.69*	.096	.026	3.69*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.035	.027	-1.30
β_3 Participant Age							-.006	.037	-0.16
β_4 Group Gender							.076	.038	2.00*
β_5 Group Size							-.058	.027	-2.15*
β_6 Program Length							-.012	.044	-0.27
Random									
σ^2_u (between-participant variance)	.391	.053	7.38*	.400	.052	7.69*	.407	.052	7.83*
σ^2_e (between-time variance)	.608	.042	14.48*	.590	.040	14.75*	.576	.040	14.40*
Model fit									
-2 log Λ			2,335.03			2,322.02			2,311.98
Δ -2 log Λ						13.02*			10.04
Total fixed effects			0			1			5

Note. * $p < .05$

F.2.8 Self Confidence

Standardised T0 and T3 Self Confidence scores were used as the response variable in three nested MLMs). Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 49.16, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (5) = 20.85, $p < .05$. There was significant random variance at each level for each model).

There were significant fixed effects for Time, for the interaction between Time and Group Size, and for the interaction between Time and Group Gender. The effect of Time was positive, indicating increased scores between T0 and T3 (β_1 = .177, *SE* = .024, $t = 7.38$, $p < .05$). The interaction between Time and Group Gender was positive, indicating that participants in co-educational groups tended to report greater positive change between T0 and T3 than participants in single-sex groups (β_4 = .101, *SE* = .035, $t = 2.89$, $p < .05$). The interaction between Time and Group Size was negative, indicating that participants in smaller groups tended to report more positive change between T1 and T2 (β_5 = -.058, *SE* = .025, $t = -2.32$, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-13 *MLA Parameter Estimates and Model Fits for Self Confidence (T0 to T3)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.000	.041	0.00	.000	.041	0.00	.000	.043	0.00
β_1 Time (1 to 2)				.177	.024	7.38*	.177	.024	7.38*
Interactions with Time (Fixed)									
β_2 Participant Gender							.000	.025	0.00
β_3 Participant Age							.000	.034	0.00
β_4 Group Gender							.101	.035	2.89*
β_5 Group Size							-.058	.025	-2.32*
β_6 Program Length							.004	.041	0.10
Random									
σ^2_u (between-participant variance)	.428	.053	8.08*	.508	.035	14.51*	.484	.033	14.67*
σ^2_e (between-time variance)	.570	.039	14.62*	.460	.052	8.85*	.472	.052	9.08*
Model fit									
-2 log Λ			2,319.28			2,270.13			2,249.28
Δ -2 log Λ						49.16*			20.85*
Total fixed effects			0			1			5

Note. * $p < .05$

F.2.9 Social Competence

Standardised T0 and T3 Social Competence scores were used as the response variable in three nested MLMs. The second model explained significantly more variance than the first model (Model 1 to 2 $\Delta \chi^2$ (1) = 71.96), but the third model did not explain more variance than the second model (Model 2 to 3 $\Delta \chi^2$ (5) = 6.85, $p >$ .05). There was significant random variance at each level for each model.

There were significant fixed effects for Time. The effect of Time was positive, indicating increased scores between T0 and T3 (β_1 = .208, *SE* = .023, t = 9.04, $p < .05$). None of the fixed interaction effects between Time and the explanatory variables were significant.

Table F-14 *MLA Parameter Estimates and Model Fits for Social Competence (T0 to T3)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.000	.041	0.00	.000	.041	0.00	.000	.041	0.00
β_1 Time (1 to 2)				.208	.023	9.04*	.208	.023	9.04*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.021	.024	-0.88
β_3 Participant Age							.015	.033	0.45
β_4 Group Gender							.026	.034	0.76
β_5 Group Size							-.046	.025	-1.84
β_6 Program Length							.025	.040	0.63
Random									
σ^2_u (between-participant variance)	.448	.053	8.45*	.491	.052	9.44*	.495	.052	9.52*
σ^2_e (between-time variance)	.551	.038	14.50*	.465	.032	14.53*	.458	.031	14.77*
Model fit									
-2 log Λ			2,310.39			2,238.42			2,231.57
Δ -2 log Λ						71.96*			6.85
Total fixed effects			0			1			5

Note. * $p < .05$

F.2.10 Task Leadership

Standardised T0 and T3 Task Leadership scores were used as the response variable in three nested MLMs. Each model explained significantly more variance than the previous model, based on changes in 2 x loglikelihoods - Model 1 to 2 $\Delta \chi^2$ (1) = 85.94, $p < .05$; Model 2 to 3 $\Delta \chi^2$ (5) = 19.57, $p < .05$. There was significant random variance at each level for each model.

There were significant fixed effects for Time, for the interaction between Time and Participant Gender, and for the interaction between Time and Group Size. The effect of Time was positive, indicating increased scores between T0 and T3 (β_1= .216, *SE* = .022, $t = 9.82$, $p < .05$). The interaction between Time and Participant Gender was negative, indicating that males tended to report more positive change over Time ($\beta_2 = -.051$, *SE* = .022, $t = -2.32$, $p < .05$). The interaction between Time and Group Size was negative, indicating that participants in smaller groups tended to report more positive change between T0 and T3 ($\beta_5 = -.074$, *SE* = .023, $t = -3.22$, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-15 *MLA Parameter Estimates and Model Fits for Task Leadership (T0 to T3)*

Effects	Model 1 Est.	*SE*	*t*	Model 2 Est.	*SE*	*t*	Model 3 Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.000	.042	0.00	.000	.042	0.00	.000	.042	0.00
β_1 Time (1 to 2)				.216	.022	9.82*	.216	.022	9.82*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.051	.022	-2.32*
β_3 Participant Age							-.011	.030	-0.37
β_4 Group Gender							.029	.032	0.91
β_5 Group Size							-.074	.023	-3.22*
β_6 Program Length							.022	.037	0.59
Random									
σ^2_u (between-participant variance)	.491	.054	9.09*	.538	.053	10.15*	.547	.053	10.32*
σ^2_e (between-time variance)	.508	.035	14.51*	.414	.028	14.79*	.396	.027	14.67*
Model fit									
-2 log Λ			2,182.58			2,202.15			2,182.58
Δ -2 log Λ						85.94*			19.57*
Total fixed effects			0			1			5

Note. * $p < .05$

F.2.11 Time Management

Standardised T0 and T3 Time Management scores were used as the response variable in three nested MLMs. The second model explained significantly more variance than the first model (Model 1 to 2 $\Delta \chi^2$ (1) = 44.87, $p < .05$), but the third model did not explain more variance than the second model (Model 2 to 3 $\Delta \chi^2$ (5) = 7.86, $p > .05$). There was significant random variance at each level for each model.

There were significant fixed effects for Time and for the interaction between Time and Group Size. The effect of Time was positive, indicating increased scores between T0 and T3 ($\beta_1 = .167$, $SE = .024$, $t = 6.96$, $p < .05$). The interaction between Time and Group Size was negative, indicating that participants in smaller groups tended to report more positive change between T0 and T3 ($\beta_5 = -.064$, $SE = .025$, $t = -2.56$, $p < .05$). None of the other fixed interaction effects between Time and the explanatory variables were significant.

Table F-16 *MLA Parameter Estimates and Model Fits for Time Management (T0 to T3)*

	Model 1			Model 2			Model 3		
Effects	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*
Main (Fixed)									
β_0 Intercept	.000	.041	0.00	.000	.041	0.00	.000	.041	0.00
β_1 Time (1 to 2)				.167	.024	6.96*	.167	.024	6.96*
Interactions with Time (Fixed)									
β_2 Participant Gender							-.022	.025	-0.88
β_3 Participant Age							.000	.034	0.00
β_4 Group Gender							.010	.035	0.29
β_5 Group Size							-.064	.025	-2.56*
β_6 Program Length							-.030	0.41	-0.07
Random									
σ^2_u (between-participant variance)	.444	.053	8.38*	.472	.052	9.08*	.477	.052	9.17*
σ^2_e (between-time variance)	.555	.038	14.61*	.499	.034	14.68*	.490	.034	14.41*
Model fit									
-2 log Λ			2,312.13			2,267.25			2,259.39
Δ -2 log Λ						44.87*			7.86
Total fixed effects			0			1			5

Note. * $p < .0$