



The effect of an outdoor orientation program on participants' biophilic expressions

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Published online: 13 May 2018
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Abstract The purpose of this study was to explore the effect of participation in an outdoor orientation program on first-year college students' relationships with the natural world. The theory of biophilia was used as a lens through which to understand human-nature relationships. Eighty-five first-year college students on a 21-day outdoor orientation program were assessed at the trip's beginning and end using the Kellert-Shorb Biophilic Values Indicator (KSBVI). The instrument provides a *biophilic profile*, a measure of how one relates to the natural world on each of nine separate subscales that collectively articulate expression of biophilic values: aesthetic, dominionistic, humanistic, moralistic, naturalistic, negativistic, scientific, symbolic and utilitarian. A repeated measures MANOVA was conducted to assess changes in the KSBVI subscales over time. Paired-sample *t*-tests were run to better understand the source and direction

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of change on the KSBVI subscale scores. These *t*-tests indicated statistically significant change from the pre to post scores in eight of the nine biophilic values. The KSBVI was shown to possess a level of sensitivity adequate for implementation in a pre-post design. Replication studies are recommended to further validate use of the KSBVI on adventure education programs in a pre-post format.

Keywords Biophilia · Adventure education · Outdoor orientation programs · Kellert-Shorb Biophilic Values Indicator (KSBVI) · Biophilic expression

Humans and the natural world: relating through outdoor programs

The relationship between humans and the natural world is a complex and often invisible, even intangible one. The setting of the natural environment, once part of everyday human existence, is no longer an eminent part of our development. Adventure education practitioners have often utilized the outdoor setting through various pursuits but have not necessarily appreciated it. These pursuits have been shown to have a wide variety of positive programmatic outcomes (Sibthorp 2003). The field of adventure education encompasses a range of philosophies, methodologies, program types, and intended educational outcomes (Ewert and Sibthorp 2014; Priest and Gass 2005; Warren et al. 2008). Within adventure education programs, the natural world is a significant component because of its dual roles as both a teacher and classroom (Herdman 1994; Paxton and McAvoy 2000). Despite the varied definitions of adventure education (Baker 2005; Ewert and Sibthorp 2014; Hayllar 1990; Loynes 2002; Medrick and Mitten 2011; Miles 1987; Priest 1986; Priest and Gass 2005), two important elements of adventure education programs are the use of problem-solving curricula and personal challenge (Priest and Gass 2005). The field of adventure education has grown, encompassing many other types of adventure programming, including summer camps, adventure therapy, outdoor and adventure skill-based programs, corporate training programs, outdoor orientation programs and other programs offered in a variety of natural settings (Ewert and Sibthorp 2014; Sibthorp 2003; Webb 1999).

Outdoor orientation programs (OOPs)

Recent years have seen an increasing trend in higher education in the United States in which incoming college students have the option to participate in Outdoor Orientation Programs (OOPs), the intent of which is to improve student transition to the college environment (Bell et al. 2010, 2014; Bell and Starbuck 2013). A typical OOP is a first-year college orientation program in which a small group of students (15 or fewer participants) engage in adventure experiences that include at least one overnight in an outdoor setting (Bell et al. 2010, 2014). Common goals for OOPs include improving college retention, promoting community and friendships among new students (Austin et al. 2009; Bell 2006; Gass et al. 2003), cultivating peer support networks, promoting self-growth and life skills (Bell et al. 2010; Bobilya et al. 2011; Hinton et al. 2007; Ribbe et al. 2016), and introducing students to their new homes, both on campus and in the

surrounding natural environments (Davis-Berman and Berman 1996; Frauman and Wryold 2009).

Historically, many OOPs have been grounded in the Outward Bound (OB) methodology (Bell et al. 2010) in which the natural world plays a fundamental role in the programming (Paxton and McAvoy 2000), serving as both participants' classroom and teacher (Friese et al. 1998; Herdman 1994). Furthermore, the natural environment is one of the five primary course components that have been found to impact participant outcomes on Outward Bound (OB) programs (McKenzie 2003). While OOPs have been shown to promote positive change in a number of areas related to the transition to college (Bell 2006; Bobilya 2004; Bobilya et al. 2011; Gass et al. 2003; Ribbe 2011; Ribbe et al. 2016), there has been less investigation into how these specific types of programs affect participants' relationships with the natural world.

One of the primary outcomes of nature or wilderness-based adventure education programs has been to foster the development of relationships among participants (Hayllar 1990; McAvoy et al. 1996; Miles 1995; Priest 1986). However, when the relationship between participants and the natural world has been given more direct programmatic attention, the pedagogical learning outcome has frequently been to develop more environmentally sustainable behaviors (Lee 2011; Litz and Mitten 2013; Loynes 2002; Martin 2004). Some practitioners and researchers have argued that the very definition of adventure education programs already includes acknowledgement of human-nature relationships (Beringer 2004; Henderson 1999; Mitten et al. 2017), and that these programs provide significant ecological content (Medrick and Mitten 2011; Mitten 2009). There are also advocates for a more liberal arts approach to adventure education that encompasses broadened nature-related topics such as the principles of ecopsychology (Henderson 1999) and deep ecology (Beringer 2004). Collectively, these perspectives highlight that a place exists within the context of adventure education programming for a deep understanding of human-nature relationships.

To more thoroughly understand the importance of the natural world to human development, the specific impact that natural environments have on humans must be elucidated. Understanding the relationships between humans and the natural world may help to more accurately illustrate a program's effects on participants and help shape curricular development and staff training with specific learning outcomes in mind. Furthermore, increased understanding of a program's effects on human-nature relationships could also assist organizations in ensuring that they are effectively achieving environmental studies-related outcomes, which many articulate in program-related statements.

Biophilia

The emerging theory of "biophilia" (Fromm 1964) provides a broad lens through which to understand human relationships with the natural world. Biophilic expression or "the innate tendency to affiliate with life and lifelike processes" (Wilson 1984, p. 1), is one approach to investigating human-nature relationships during adventure education programs. Social ecologist Stephen R. Kellert's (2002) nine biophilic values or responses (see Table 1) provide a framework and vocabulary for articulating these relationships: aesthetic, dominionistic, humanistic, moralistic, naturalistic, negativistic,

Table 1 A typology of values of nature: nine biophilic values or responses

Value	Definition
Aesthetic	Physical attraction and appeal of nature
Dominionistic	Mastery and control of nature
Humanistic	Emotional bonding with nature
Moralistic	Ethical and spiritual relation to nature
Naturalistic	Exploration and discovery of nature
Negativistic	Fear and aversion of nature
Scientific	Knowledge and understanding of nature
Symbolic	Nature as a source of language and imagination
Utilitarian	Nature as a source of material and physical benefit

Adapted from Kellert 2002, p. 130

scientific, symbolic and utilitarian (p. 130). The theory of biophilia suggests that connecting with life and lifelike processes is an evolutionarily ingrained part of human existence, and its expression is enhanced or inhibited as a result of one's own specific experiences and learning (Kellert 1997, 2018; Wilson 1993). The relative strength of an individual's biophilic expression on each of the nine values comes about through the interplay of learning, cultural context, and direct experience with the natural world (Kellert 2018; Shorb and Schnoeker-Shorb 2010).

Measuring humans' relationships with the natural world

Understanding and being able to quantify how people relate to the natural environment helps educators, environmental planners, and others to manage their practice amid current global environmental pressures. Insight on how people think and feel about natural environments can be gained through the use of conservation psychology measures, as shown by Cartwright and Mitten (2018). Many conservation psychology measures exist, and they are structured in various ways. Through an evaluation of seventeen conservation psychology measures, Cartwright and Mitten (2018) determined that there were various functions performed by these measures, including detection of environmental views and a person's connection to nature. This current study focused on the use of one such indicator, the Kellert-Shorb Biophilic Values Indicator (KSBVI), which was designed to measure human-nature relationships through the lens of the theory of biophilia. The (KSBVI) consists of 99 Likert statements used to measure nine values of affinity for nature (see Table 1). While it was the longest and therefore the most time consuming (to complete) scale assessed (Cartwright and Mitten 2018), the measures achieved via this instrument can provide a graduated indication of respondents' relationships to the natural world (Shorb and Schnoeker-Shorb 2010). Furthermore, researchers can use it to assess changes in participants' self-reported biophilic expressions. The KSBVI is intended to articulate a person's nuanced and individual relationship with the natural world, independently of whether or not this person subscribes to a worldview deemed to be pro-environmental. The design of the KSBVI and the vocabulary of the nine distinct biophilic expressions

suggests that the instrument could provide a level of clarity not possible using other instruments focused on the study of how individuals relate to the natural world. The KSBVI is concerned with *how* individuals relate to the natural world rather than *if* or *to what degree* they relate to the natural world.

Kellert-Shorb Biphilic Values Indicator The KSBVI, designed as an educational tool, offers insight into the human relationship with the natural world by measuring relative expressions of each of the nine different biophilic responses (Shorb and Schnoeker-Shorb 2010). Responses to the 99 Likert statements are designed to provide a measure of one's relationship to the natural world at a given moment in time, with the resulting aggregated responses representing an individual's *biophilic profile*. The biophilic values are theorized as common to all people, so there is the possibility that enhanced awareness of these values can help people to understand why different relationships with the natural environment exist, perhaps illuminating ways toward more cooperative engagements with nature (Shorb and Schnoeker-Shorb 2010). To date, the KSBVI has been administered to approximately 500 people (T. Shorb, personal communication, March 25, 2018). It has been utilized primarily as a means of promoting greater understanding of biophilia through describing a person's rich spectrum of responses to the natural environment, often towards the aim of increasing self-awareness and community connections via a more nuanced dialogue concerning human-nature relationships (T. Shorb & Y. Schnoeker-Shorb, personal communication, February 18, 2012). The survey was designed to aid in "attempting to comprehend the feelings, thoughts, beliefs, motives, and behaviors through which people interpret and develop their interactions with the natural world" (Shorb and Schnoeker-Shorb 2008, p. 6). The KSBVI has continued to be used to foster self-awareness and as a community building tool (T. Shorb, personal communication, April 12, 2018). It has also been used in college classrooms as a means of teaching about biophilic responses and in ongoing, yet unpublished, research projects (J. Seaman, personal communication, July 7, 2017).

Biophilia in adventure education programming Kellert and Derr (1998) investigated the effects on biophilic values of participation in programs conducted by the National Outdoor Leadership School (NOLS), the Student Conservation Association (SCA), and OB. Their analysis was conducted using the framework of biophilic expressions (Table 1). Findings revealed connections between program outcomes and biophilic expressions. They further suggested that specific program activities and experiences might resonate with participants through the lens of each biophilic subscale, with the exception of the symbolic (Kellert and Derr 1998). It is unclear why the symbolic expression was "omitted from the description," and no explanation was given (Kellert and Derr 1998, p. 63). In interpreting their results through the framework of the biophilic expressions, they illustrated how the examined programs provided opportunities for participants to engage with the natural world through the biophilic expressions. As a consequence, Kellert and Derr theorized that "immersion and challenge in the outdoors" could potentially encourage the development of the nine biophilic expressions (p. 63).

The current study builds on such research by using the KSBVI to evaluate participants' biophilic expressions at the conclusion of an outdoor orientation program with the intent to evaluate the potential effects of program participation on first-year

students' biophilic expressions. In short, the purpose of this study was to explore the possible effects of participation in an outdoor orientation program on participants' biophilic expressions.

Methods

Program and participants

The OOP at the centre of this study was the new student orientation program of Prescott College (USA) which involved all new undergraduate students in a 21-day backpacking trip, travelling in various areas on the Mogollon Rim of the White Mountains in Arizona. The purpose of the program is to facilitate the transition to college through forming bonds with peers and learning about their new academic and geographic home (K. Preziosi, personal communication, June 21, 2012). The Prescott College orientation program began in 1968 (Bell et al. 2010) and is the second oldest OOP in the United States. The program's components are similar to OB, with opportunities to practice leadership, communication, and backpacking, and ends with a solitary reflection experience (solo) lasting up to 72 h. Throughout the course, participants aimed to develop technical, leadership, and interpersonal skills, with instructors coaching their skill development. There was a concurrent academic component to the trip which involved preparing and teaching classes to peers, regular journal reflection activities, and creation of a portfolio that included a total of ten plant and animal observations, coupled with drawings and information gathered from observation and field guides. The 2012 program consisted of 13 groups of up to twelve participants, with an average group size of 9–10 participants per group. Most groups had two instructors, and two groups had three. Participants were balanced among groups with regard to participants' prior experience, personal background, and age. Group discussions focused on themes that included the transition to college, ecological concepts, sense of place, and academic interests.

Participants were included in the study based on criterion sampling (Patton 2002). The participants eligible for the study were those enrolled in the new student orientation program in August and September, 2012. Of the 126 students who participated in the program, 85 completed both pre and post surveys. Male ($n = 39$) and female ($n = 46$) participants ranged in age from 16 to 50, with 70% of the sample being between the ages of 16–20. Participation in the study was completely voluntary; participants could withdraw at any point. The project was reviewed and approved by the Prescott College Institutional Review Board (IRB) prior to data collection.

Data collection

The primary form of biophilic data collection for this study was the KSBVI. This was administered in a pre and post survey format, firstly on campus before students departed for their fieldtrip and again in the field on the final night of the trip. The primary aim of the study was to investigate possible effects of participation in the new student orientation program on participants' *biophilic profiles*. Participants' pre and post scores were calculated for each of the nine subscales, resulting in individual

biophilic profiles. Mean pre and post KSBVI scores were then calculated for each biophilic subscale by averaging the scores of all participants.

Subscales of the KSBVI The KSBVI consists of 99 items, with 11 items for each of the nine biophilic values: aesthetic, dominionistic, humanistic, moralistic, naturalistic, negativistic, scientific, symbolic and utilitarian (2002, pp. 130–131). Aesthetic biophilic expression is defined as a connection with nature through the appreciation of beauty (Kellert 1996), and it serves the adaptational advantage of highlighting those natural features that aid in survival (Shorb and Schnoeker-Shorb 2010). This expression is characterized by emotions of harmony, security, inspiration, and awe (Kellert 1993, 1996). Dominionistic biophilic expression is defined as “mastery and control” of the natural world (Kellert 2002, p. 130), and it can be enacted through succeeding in the face of challenging situations in the natural environment (Shorb and Schnoeker-Shorb 2010). This expression is also speculated to relate to the development of skills that would be helpful in challenging situations in the natural world (Kellert and Derr 1998). Humanistic biophilic expression primarily reflects an emotional connection to the natural world, however Shorb and Schnoeker-Shorb (2010) noted that an additional common expression of this biophilic response is through connection with others when in a natural setting. Kellert and Derr (1998) conjectured that participants would enact the humanistic expression via bonding within a small hike group. Moralistic biophilic expression is defined as the “ethical and spiritual connection to nature” (Kellert 2002, p. 130). Naturalistic biophilic expression centers on “satisfaction derived from direct contact with nature,” (Kellert 1993, p. 45), and encompasses feelings of immersion in the moment (Kellert 1996). Negativistic biophilic expression is defined as “fear and aversion of nature” (Kellert 2002). Scientific biophilic expression refers to the connection to the natural world via empirical study (Kellert 1996). Symbolic biophilic expression is defined as finding inspiration for language, meaning, and symbolism from the natural world (Kellert 2002). Processes like language acquisition and language comprehension are common enactments of symbolic biophilic expression (Kellert 1996). In their interpretation of extended Wilderness Experience Program (WEP) outcomes through the lens of biophilia, Kellert and Derr (1998) chose not to include symbolic biophilic expression as a category that participants resonated with during these types of programs. It is unclear why they did not choose to include this subscale (Kellert and Derr 1998). Finally, Utilitarian biophilic expression is defined as looking to nature “as a source of material and physical benefit” (Kellert 2002, p. 130). Kellert and Derr (1998) theorized that participants on a WEP would enact the utilitarian expression via the behaviors related to relying upon the natural world for survival.

In the KSBVI, participants are asked to rate the degree to which they agree/disagree with each of the items in the nine subscales (biophilic values) on a 4-point Likert scale (4 – strongly agree to 1 – strongly disagree; Shorb and Schnoeker-Shorb 2010). Eleven items are summed for each subscale to produce nine separate scores, with each subscale score ranging from 11 to 44. A score of 44 indicates the highest possible expression. Internal reliability of the KSBVI was assessed by calculating pre alpha scores for each subscale. Alpha scores can range from excellent to unacceptable ($\alpha > .9$ – Excellent, $\alpha > .8$ – Good, $\alpha > .7$ – Acceptable, $\alpha > .6$ – Questionable, $\alpha > .5$ – Poor, and $\alpha < .5$ – Unacceptable (George and Mallery 2003). Alpha scores for the KSBVI subscales in this sample ranged from acceptable to unacceptable. In particular, the Aesthetic

($\alpha = .42$), Symbolic ($\alpha = .45$), and Utilitarian ($\alpha = .48$) subscales produced unacceptable alphas at the pre assessments. The Dominionistic subscale was in the poor range, and the Negativistic ($\alpha = .65$), Humanistic ($\alpha = .66$), Naturalistic ($\alpha = .69$), Scientific ($\alpha = .68$), and Moralistic ($\alpha = .67$) subscales were in the questionable range. However, when calculated as a total score, and not by individual subscales, the KSBVI pre score was acceptable, $\alpha = .75$. In other words, the measure as a whole has acceptable internal stability.

Data analyses

Only complete pre and post data sets were included in the analysis, resulting in a final sample size of 85 participants (67% of the original sample). To ensure anonymity, participant's names were removed from the dataset, and ID numbers were used to match pre and post data. Pre and post KSBVI scores for each of the nine biophilic expressions for each participant were calculated by summing the responses on the 11 items associated with each subscale. The resulting *biophilic profiles* were averaged across all participants to produce mean pre and post KSBVI scores for each of the biophilic expressions. First, internal reliability estimates were calculated for each subscale and the total KSBVI. Next, correlations between the pre KSBVI subscales were calculated. Finally, a repeated measures Multivariate Analysis of Variance (MANOVA; Rausch et al. 2003) was conducted to assess change in KSBVI scores over time. A series of paired-samples *t*-tests were then conducted to conduct pair-wise comparisons for each subscale.

Correlations were run to examine the relationships between the nine biophilic expressions as measured by the KSBVI. The results of these correlation analyses are illustrated in Table 2.

Change in KSBVI scores over time

A repeated measures MANOVA was conducted to assess change in the KSBVI subscales over time. The MANOVA model included Time (2) and Time*Subscale

Table 2 Correlations between pre KSBVI scores

	Aes.	Dom.	Hum.	Moral.	Natural.	Negativ.	Scient.	Symbol.
Dominionistic	.169							
Humanistic	.285**	.012						
Moralistic	.265*	−.274*	.300**					
Naturalistic	.184	−.201	.378**	.396**				
Negativistic	.130	.123	.049	−.049	−.216*			
Scientific	−.060	−.145	.255**	.182	.621**	−.248*		
Symbolic	.118	.384**	.228*	−.096	−.041	.358**	−.021	
Utilitarian	.277*	.450**	.218*	−.184	.140	.042	.075	.345**

* $p \leq 0.05$; ** $p \leq 0.01$

factors. There was a significant main effect of time, $F(1, 84) = 8.48$, $p = .01$ and a significant Time*KSBVI interaction, $F(8, 77) = 5.97$, $p < .01$. This means that there are differences between the pre and post scores (i.e., time), without taking the subscale factor into account. Paired-sample t -tests were then run to better understand the source and direction of change on the KSBVI subscale scores. These t -tests indicated statistically significant change from the pre to post scores in eight of the nine biophilic values. Table 3 presents the results of the analyses of change in biophilic expression. It is noteworthy that the alpha scores for the aesthetic and symbolic subscales were found to be in the “unacceptable” range, meaning that the results for these two subscales should be interpreted cautiously.

These results show that the following scores (averaged from the 85 *biophilic profiles*) increased from pre to post: aesthetic, humanistic, moralistic, naturalistic, and scientific. The following scores decreased from pre to post: negativistic, symbolic, and utilitarian. The dominionistic score neither increased nor decreased. For these latter three biophilic expressions (negativistic, symbolic, utilitarian) the scores were initially below 26 on the KSBVI scale, and they decreased during the program. The scores that clustered above 30 initially all increased, while those three of the four that were below 26 decreased. Thus, those biophilic expressions with the highest scores increased while, conversely, those with the lowest scores decreased, with the exception of the unchanged dominionistic score. The two biophilic expressions with the largest amount of change were the scientific and aesthetic, which both increased. It is worth repeating that the aesthetic subscale had alpha scores in the “unacceptable” range at both the pre and post-test, indicating that this result should also be interpreted cautiously.

Discussion

Overall, the results of the study indicate that participants related to the natural world through the aesthetic, humanistic, moralistic, naturalistic, and scientific biophilia expressions more strongly than they related through the dominionistic, negativistic,

Table 3 Paired sample t -tests for program participants’ changes from pre to post biophilic expression

Subscale	M_{pre}	SD_{pre}	M_{post}	SD_{post}	SES	t	p
Aesthetic	32.26	2.90	33.40	2.43	0.39	3.93	.00
Dominionistic	23.06	3.47	22.64	3.84	0.18	1.33	.19
Humanistic	32.44	3.53	33.30	3.76	0.24	2.40	.02
Moralistic	38.41	3.35	39.67	2.95	0.39	3.54	.001
Naturalistic	36.64	3.56	38.04	3.69	0.25	3.80	.00
Negativistic	23.54	3.74	22.87	3.43	0.57	-2.37	.02
Scientific	30.13	3.77	32.26	3.84	0.18	5.14	.00
Symbolic	21.17	2.85	20.46	2.72	0.12	-2.21	.03
Utilitarian	25.77	3.81	25.09	3.73	0.38	-2.04	.04

df for all t -tests were (84); M Mean, SES standardized effect size

scientific, and symbolic expressions, as measured by the KSBVI in both pre and post tests. The average scores for the aesthetic, humanistic, moralistic, naturalistic, and scientific biophilic expressions were each above 30 on the KSBVI scoring rubric. The lowest expressions were the negativistic, dominionistic, utilitarian, and symbolic, as participants scored below 26 on each of these expressions for both the pre and post scores. These results suggest that participants in this study tended to relate more strongly to the natural world through aesthetic, naturalistic, humanistic, scientific, and moralistic biophilic expressions and related more weakly through negativistic, dominionistic, utilitarian, and symbolic biophilic expressions. The higher initial scores and the increase in scores during the program are two separate results that suggest that participants had a stronger relationship with the natural world through the five highest-scoring biophilic expressions. Similarly, the lower initial scores for the other four expressions and the decrease in scores for three of the four lowest expressions are separate results that both suggest participants' weaker relationships with the natural world as understood through the lens of these biophilic expressions and as measured by their KSBVI scores.

These results confirm many of Kellert and Derr's (1998) speculations that "immersion and challenge in the outdoors" (p. 63), like that found in an OOP, could foster the development of biophilic expressions. In other words, these results support Kellert and Derr's (1998) assertion that a wilderness program, such as an OOP, could provide rich opportunities to engage at least some of the biophilic expressions. The results also align with and augment Kellert and Derr's (1998) discussion of how the biophilic expressions might be fostered in the context of AE programming, as the KSBVI provides a specific, empirical manner in which to observe noted changes in biophilic expression which can be overlaid onto Kellert and Derr's (1998) discussion of the theory of biophilia in the context of AE. Combining the KSBVI scores with Kellert and Derr's (1998) observations further suggests that: a) the biophilic values may serve as a feasible lens through which to measure and through these measures to understand human-nature relationships in the context of a wilderness program; and b) observing the effects of program participation through this framework aligns with previous work linking participant experiences to the biophilic subscales.

Reliability analyses revealed that, when calculated for each subscale, the alpha scores ranged from good to unacceptable, however using the KSBVI as a total score produced acceptable levels of internal stability. In other words, taken as whole the KSBVI is an internally stable measure. These findings indicate that the aesthetic and symbolic subscales were not internally consistent, meaning that the *t*-test results for these subscales should be interpreted cautiously.

These varied reliability scores for the subscales and the instrument as a whole align with an understanding of the biophilic expressions as being interrelated and indicates that the biophilic expressions interacted with each other and operated in a form of conjunction, as opposed to functioning in isolated and mutually exclusive ways. This suggests the need for future investigation into ways to improve internal reliability of the KSBVI subscales along with further psychometric evaluation of the KSBVI. One option is item reduction analyses, both to determine which specific questions on the measure correspond most closely to the intended biophilic expression, and as a means of identifying questions to possibly revise if they contribute to low reliability, especially for the aesthetic and symbolic subscales.

Changes in biophilic expression during a 21-day outdoor orientation program

The results of the repeated measures MANOVA revealed that there is a main effect of Time when comparing pre and post scores on the nine Biophilia expressions. This indicates that pre scores are significantly different from post scores. The Time*Subscale interaction effect indicates that how the scores changed over time differed according to each of the nine subscales. The results of the paired-samples *t*-tests showed change on eight of the nine KSBVI subscales (see Table 3), indicating that a 21-day OOP influenced participants' biophilic expressions in different ways specific to each subscale. The effect sizes for changes in each of the nine subscales ranged from small to medium ($d = .18-.57$). While the majority of the changes had small effect sizes, it may be worth noting that these changes occurred after only 21 days and as part of a university OOP.

These changes indicate that the KSBVI was sensitive enough to detect changes from pre to post. The results detailed below outline findings dealing with the nature of each biophilic expression, and include findings about the stability of biophilia as a personality trait, a snapshot of mean KSBVI scores among participants, the ability of biophilic expression to change based on learning and experiences, and some observations about quantity and direction of observed change.

Aesthetic biophilic expression Participants connected to the natural world through aesthetic features during the program as indicated by a statistically significant increase in mean aesthetic KSBVI scores pre to post. These findings seem to mirror what Kellert and Derr (1998) found in participant testimonials, as many in their study cited enduring memories of the beauty of the land. Overall, this suggests that participants derived connection through the beauty of the natural world – the natural environments and the scenery of the southwestern United States – and this way of relating. As this is one of the subscales determined unreliable by the previously discussed alpha scores, this result should be interpreted more cautiously than some of the results for subscales with higher alpha scores.

Dominionistic biophilic expression Participants' dominionistic biophilic expressions were unchanged over the course of the OOP. Though participants showed a measurable expression of the dominionistic biophilic response, participation in this OOP appears to have had no effect on this biophilic subscale. Based on the primary researcher's own observations, curricular components that could encourage its development in future OOPs might include learning and practicing navigation and route-finding skills, back-country cooking skills, and general backpacking techniques. Additionally, the use of skills related to the Leave No Trace (LNT) principles could lead to future enactments of the dominionistic expression that are valued as positive or healthy.

Humanistic biophilic expression Participants' humanistic KSBVI scores increased significantly from pre to post. There is a possibility that the humanistic biophilic expression was also enacted via the community building and group development that occurred during the program. These findings are similar to other studies that have identified increased feelings of community on an OOP (Bobilya et al. 2011; Wolfe and Kay 2011), improved outcomes related to group dynamics on both an OOP (Wolfe and

Kay 2011) and on a general WEP (Ewert and McAvoy 2000), and the initiation of enduring friendships through participation on an OOP (Gass et al. 2003).

It is also possible that the cultivation of a sense of place through immersion in the natural landscape led to an increase in the humanistic expression. Sense of place is defined as “the variety of affective and cognitive bonds that people form to a particular environment” (Hutson and Bailey 2008), and a sense of place can help people to “identify and respond to the emotional and spiritual bonds that people form with certain spaces” (Williams and Stewart 1998, p. 18). In this way, a sense of place would likely resonate with both the moralistic and humanistic biophilic responses.

Moralistic biophilic expression There was a high initial mean moralistic KSBVI score (38.41), along with an increase in these scores during the program. These results suggest that participants’ experiences of the natural world on the trip were strongly mediated by an ethical and spiritual connection, and that this connection increased during the program. These findings align with prior research showing wilderness program participation to result in increases in concern for the natural environment among Outward Bound Western Canada participants (McKenzie 2003) and gains in feelings of stewardship and spiritual connection among college outdoor orientation program participants (Bobilya et al. 2011). The change in moralistic expression, coupled with instructors’ observations that there were numerous group discussions about the intrinsic value of the natural world, may confirm the speculation from Kellert and Derr (1998) that participants on a WEP would enact moralistic biophilic expression through feelings of spirituality and humility. Finally, a high average moralistic biophilic expression suggests that this particular program provided opportunities for connection to the natural environment beyond simply using it as a program backdrop.

Naturalistic biophilic expression Participants began the study with a high average KSBVI score in naturalistic expression (36.64) and there was also a statistically significant increase in participants’ averaged naturalistic biophilic expression during the program. This suggests that participants connected to the natural world through the physical use of their bodies in the larger natural environment. These results suggest that the immersive nature of this program, with backpacking as the primary daily activity for nearly 3 weeks, could have been a factor contributing to increases in naturalistic biophilic expression. This OOP emphasized hiking, direct observation of plants and animals, and navigation over remote terrain. These three activities were hypothesized by Kellert and Derr to be parts of a WEP that would promote cultivation of naturalistic biophilic expression (1998). These results support Kellert’s assertion that one primary enactment of naturalistic biophilic expression is through the practice of outdoor skills, including hiking, tracking, and orienteering (1993, p. 46). Finally, the increase from pre to post supports Kellert and Derr’s (1998) hypothesis that participation on an extended wilderness program would encourage a strong naturalistic biophilic expression.

Negativistic biophilic expression The mean negativistic biophilic expression decreased significantly from pre to post OOP. Since the adaptive benefit of negativistic biophilic expression is the avoidance of potential harm to humans (Kellert 1997), it would be expected that safely navigating the hazards present in wilderness travel would result in opportunities for expression of this value. One interpretation for the decrease in

negativistic biophilic expression is that it may indicate a decrease in maladaptive, or unhealthy enactments of this expression, possibly with simultaneous increases in adaptive, or healthy enactments.

An unhealthy enactment of any given biophilic expression would be the behaviors stemming from the expression that are ultimately detrimental to the health of the person carrying them out. Conversely, a healthy enactment of a biophilic expression would be behaviors stemming from a specific biophilic expression that are deemed beneficial to the health of the person carrying them out. The authors acknowledge that a judgment of whether or not a particular enactment of a biophilic expression is healthy is necessarily rooted in the value system imposed by the person making the judgment.

In the context of the negativistic biophilic expression, the following hypothetical examples illustrate two ways that the results could have been influenced by a decrease in unhealthy enactments with a simultaneous increase in healthy enactments. First, if participants entered the program with a debilitating fear of insects, then this could be dubbed an unhealthy initial enactment of the negativistic expression. If participants then developed an increased tolerance for insects through regular interactions during the program, and this fear decreased, then this would represent a decrease in this maladaptive enactment of the negativistic biophilic expression. Conversely, an example of the development of a healthy enactment of the negativistic expression might be a participant's development of a deeper understanding of how to read storm cycles, along with the development of accompanying strategies to mitigate the risk of being struck by lightning. In this scenario, the increased awareness and diligence towards thunder storms would represent a healthy and beneficial fear of an aspect of the natural world, and thus a healthy enactment of the biophilic expression.

In their analysis, Kellert and Derr (1998) observed that most participants on an extended WEP at some point during the trip experienced fear and anxiety stemming from a heightened understanding of potentially harmful parts of the natural world. The participants also reported overcoming this fear as a positive experience. It is possible that a shift from more maladaptive to adaptive negativistic enactments occurred on this OOP, mirroring Kellert and Derr's (1998) observations of participants finding empowerment through overcoming fears and learning healthy ways of coping with apprehensions stemming from aspects of the natural environment. Since fear of the natural world may be on the rise in younger populations coming from industrialized backgrounds (Louv 2006; Mitten and Woodruff 2010), it would make sense that positive, extended direct experience in a wilderness context could result in a reduction of these anxieties among many participants in an OOP.

Another, opposing theory is the notion that cultivating an appreciation for the dangers in the natural world could lead to increases in negativistic biophilic expression. In other words, the development of judgment and decision-making skills, found to increase on a wilderness program (Sibthorp et al. 2007), would lead one to expect negativistic biophilic expression to increase through the healthy development of sound judgment.

Scientific biophilic expression The mean scientific biophilic expression significantly increased from pre to post suggesting that participants cultivated a strong scientific biophilic connection during the program. Science-related activities made up a significant part of this curriculum in this OOP, as participants learned the names of plants and

animals, drew pictures of plant and animal species, learned about natural processes at play, and participated in classes and discussions exploring a variety of scientific concepts. In addition, participants were actively engaged with the natural environment through empirical inquiry. The results suggest that a major focus of this OOP is connecting to the natural world through scientific means, as this expression had the largest increase from pre to post, with a t -value of 5.19. The researchers speculate that the aforementioned student portfolios, which comprised a portion of the program curriculum, may have had a role in cultivating students' connections to the natural world through a scientific lens.

Symbolic biophilic expression This biophilic expression had the lowest mean initial score of all nine biophilic values (21.17) and decreased from pre to post. The low average post symbolic score suggests that participants on this OOP were only minimally relating to the natural world through this biophilic expression (as compared with other forms of biophilic expression), and that this relationship decreased during the trip. It is not immediately apparent why this was so. However, the phrasing of some of the items for the symbolic expression on the KSBVI may have affected participant responses in a way that affected the results for this subscale. Some items asked participants to select between responses that juxtaposed direct experience in the natural world with connection via symbolic means. Yet, a participant may have connected to the natural world via both direct experience and symbolic means. It is possible that the opposite of connecting to the natural world via symbolic representations may not be via direct experience, but rather by *not* connecting via symbolic sources. In other words, connection to the natural world via symbolic representations and connection through direct experience may not be mutually exclusive. If some participant responses were affected by having to select between these two, then it is possible that there could have been a diminished numerical representation of the symbolic biophilic expression.

Utilitarian biophilic expression The change from pre to post for mean utilitarian biophilic expression was a significant decrease. Despite having a lower average post score, participants were still engaging with the natural environment through its use and function, however this way of relating decreased during the program. Kellert and Derr (1998) theorized that participants on a WEP would enact the utilitarian expression via the behaviors related to relying upon the natural world for survival. Some such activities that were intrinsic to this particular program that may have resulted in the enactment of the utilitarian biophilic expression include finding water sources, searching for adequate campsites, and arranging nightly bear hangs. The overall decrease in this expression may support prior work highlighting participants' feelings of appreciation for the natural world through participation on a WEP (Kellert and Derr 1998; Sibthorp et al. 2011). The decrease in utilitarian biophilic expression may be related to an increase in moralistic biophilic expression, as revealed in the findings. It is possible that the teaching of LNT principles affected participants' utilitarian expressions, along with an increase in understanding and appreciation of the plants and animals inhabiting this environment.

Theory of biophilia

These results provide numerous insights into the theory of biophilia, as they illustrate an empirical testing of the concept. While the work that went into the development of the typology of biophilic values was rooted in the exploration of people's relationships with the natural world, much of the subsequent work elaborating the nature of biophilic expression has been of a theoretical nature (Kellert 1997, 2002, 2012; Kellert et al. 2008). This study has provided an opportunity to explore biophilic expression empirically. The pre and post surveying of participants with the KSBVI has also provided a method to better understand the expression of biophilia, as measured by this instrument.

Changes in biophilic expression during the program

It was observed that mean biophilic expressions tended to cluster together into two groups on the KSBVI scoring scale. There was one cluster of higher KSBVI scores (aesthetic, moralistic, humanistic, naturalistic, scientific) and another cluster of lower scores (negativistic, symbolic, utilitarian). These two sets of scores subsequently showed change in opposite directions during the course, with the higher scores increasing, and the lower scores decreasing. In other words, those expressions that were over 30 for the pre and post tests showed increases during the program, and the scores that were below 26 for the pre and post tests showed decreases during the program (with the exception of the dominionistic expression which did not show significant change).

The finding of clustered scores moving together in opposite directions could indicate a relationship among biophilic subscales in which the different scores interacted with one another. According to this notion, the direction of change for certain biophilic expressions could have had a subsequent effect on direction of change for other expressions. This phenomenon could have played out with certain scores mutually reinforcing each other during the trip, resulting in clustered scores moving together. Conversely, the opposite could have occurred, with increases in some scores leading to decreases in others, as may have happened with utilitarian and moralistic biophilic values. The scope of this study makes any causal relationships difficult to pinpoint, but this relationship and possible pattern of interaction among the subscales is worthy of further investigation.

While the biophilic expressions themselves are not couched in a value system with certain biophilic expressions labelled as either positive or negative, it is worth acknowledging that there may have been larger cultural factors in play, wherein the norms of a WEP position certain biophilic expressions as having a positive or negative connotation. In other words, it is possible that the observed clustering could reflect larger cultural value systems that deem relating to the natural world via certain biophilic expressions as positive and others as negative. If this were, in fact, the case, and if the negativistic, dominionistic, and utilitarian biophilic expressions were viewed in a negative light, then it is possible that this culturally-rooted conceptualization could have played into these scores being lower at pre-test and then subsequently further decreasing over the duration of the program to post-test. It is beyond the scope of this study to clarify this issue.

Conclusion

The aim of this study was to apply the KSBVI to an OOP conducted as a WEP in a pre and post format to assess its reliability in measuring programmatic effects on biophilic expression. This study represented the first use of the KSBVI in the field of adventure education and in a pre-post format. The results of reliability testing indicate that the instrument is internally stable and reliable when tested as a whole, however some of the subscales had unacceptable alpha scores, and should thus be interpreted with caution. The KSBVI was found to still have utility when used in a pre-post design, despite these ranging reliability scores and despite the instrument's intended creation for self-assessment and community-building purposes. In other words, despite the limitations that have been indicated about the internal stability scores for some of the subscales, the results of this study support that the KSBVI can be used to assess various *biophilic profiles* of participants in an outdoor orientation program. The KSBVI was sensitive enough to detect change in participants' biophilic expression scores on 8 of the 9 subscales from pre to post, regardless of the significant correlations between participants' scores at those assessment points. In other words, the KSBVI had enough statistical power to detect changes in those subscales over time with a moderate sample size.

Future research would benefit from including moderation analyses to explore the influence of a number of factors, including geographic area of upbringing, gender, age, population density in area of upbringing, amount of time spent in the natural world during childhood, and previous OOP or summer camp experience. Because the primary reasons for change in biophilic expression are theorized to be direct experience, social learning, and cultural conditioning (Shorb and Schnoeker-Shorb 2010), future research should combine an assessment of biophilic expression with other data that can assist in understanding the relationships between curricular components and changes in KSBVI scores.

Overall, the results of this study demonstrate that studying the effects of an OOP on participants' relationships with the natural world through the lens of biophilia can provide insight into participant growth and programmatic outcomes. This lens could prove useful for educators and program directors interested in a deeper understanding of their programs. In such a situation, students might complete the KSBVI after their return from the field as a way to spark dialogue and reflection about their experiences in the natural world, and as a means of articulating their relationships, connections, and observations from the field.

Integrating the vocabulary of biophilia into the field of AE could assist researchers and practitioners by providing a framework with which to more deeply understand connections that participants make with different components of the natural world. Using the KSBVI to measure participants' *biophilic profiles*, and possible changes to these *biophilic profiles*, could offer a new source of information to better understand the human nature relationship and influencing factors. Continued research may provide insight into how programmatic components resonate with the various biophilic expressions. This heightened understanding of human-natural relationships could benefit practitioners, participants, and researchers in continuing to explore the effects of AE programming on biophilic expression.

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