



Promoting exercise behaviour: An integration of persuasion theories and the theory of planned behaviour

Lee W. Jones^{1*}, Robert C. Sinclair², Ryan E. Rhodes³
and Kerry S. Courneya¹

¹Faculty of Physical Education, University of Alberta, Canada

²Department of Psychology, Laurentian University, Canada

³School of Physical Education, University of Victoria, Canada

Objectives. The purpose of this study was to examine the effectiveness of a theoretical integrated persuasive message on exercise motivation in college students.

Method. Four hundred and fifty introductory psychology students (M age = 20.02 years; SD = 3.94) were randomly assigned to reading positively or negatively framed strong messages advocating exercise. The messages were attributed to a credible source, a non-credible source or to a no-source control condition. Theory of planned behaviour (TPB) constructs (i.e. attitude, subjective norm, perceived behavioural control) and cognitive responses (i.e. thought listing) were measured immediately and 2 weeks following the delivery of the intervention.

Results. Unfortunately, the results did not corroborate previous research, as we did not find any significant effects between experimental groups on any psychological or behavioural variable.

Conclusions. There may be several potential explanations for the lack of effects, including the interaction between the type of persuasive information (TPB implications) and sources of persuasion and how these persuasive messages are processed (elaboration likelihood model/cognitive response implications). The theoretical implications of this research are discussed with a view towards future directions for exercise promotion initiatives using theoretically driven interventions.

It is now widely accepted that regular exercise is associated with a significant decline in all-cause mortality (Manson *et al.*, 2002; Myers, Froelicher, Do, Partington, & Atwood, 2002) and improvements in numerous other disease states, such as cancer (Friedenreich, 2001), cardiovascular disease (Kohl, 2001), and type 2 diabetes mellitus (Knowler *et al.*, 2002). Despite these unparalleled benefits, recent health statistics

* Correspondence should be addressed to Lee W. Jones, Faculty of Physical Education, University of Alberta, E-424 Van Vliet Center, Canada T6G 2H9 (e-mail: lee.jones@ualberta.ca).

indicate that only 15–20% of adult Americans perform the recommended amount of physical exercise and 30–40% engage in no leisure-time physical exercise (Centers for Disease Control and Prevention, 2000).

In recent years, researchers have started to acknowledge the value of using behavioural theory as the basis of their interventions (National Institutes of Health, 1997). Currently, there are many behavioural theories available to help design and evaluate theoretically driven exercise interventions: the transtheoretical model (Prochaska & Velicer, 1997), social cognitive theory (Bandura, 1986), health belief model (Rosenstock, 1974) and protection motivation theory (Robberson & Rogers, 1988). One well-researched social cognitive model of expectancy value is the theory of planned behaviour (TPB) (Ajzen, 1991). The TPB proposes that behavioural intention is the proximal determinant of future behaviour. The model further proposes that intention is influenced by three conceptually independent constructs: attitude, subjective norm and perceived behavioural control. Attitude is the individual's favorable or unfavourable evaluation of the behaviour in question, whereas subjective norm reflects the perceived social pressure to perform or not to perform the behaviour. Finally, perceived behavioural control reflects a person's perception of the ease or difficulty of performing the behaviour. Empirical reviews of the TPB have confirmed the efficacy of this model in the prediction and understanding of various health behaviours, including exercise (Armitage & Connor, 2001; Godin & Kok, 1996; Rhodes & Courneya, *in press*). To date, however, no study has attempted to design and implement an exercise intervention based on the theoretical tenets of the TPB. Furthermore, several research initiatives have had relatively little success in changing targeted social-cognitive concepts using social cognitive-based theoretically driven exercise interventions (Baranowski, Anderson, & Carmack, 1998; Sallis, 2001).

An alternative approach that may be potentially relevant in motivating individuals to exercise is adopting theories of persuasion and attitude change from marketing and advertising research. Few researchers in the exercise domain have considered theories of persuasion as a framework on which to design effective exercise interventions (*cf.* Jones, Sinclair, & Courneya, 2003). One widely embraced model is Petty and Cacioppo's dual-processing model – the elaboration likelihood model (ELM) (Petty & Cacioppo, 1986). The basic premise of the ELM is that attitude change depends upon the likelihood that an issue or argument will be elaborated upon (*i.e.* thought about). Petty and Cacioppo (1981) proposed that there are basically two routes to attitude change. When motivation and/or ability to process a persuasive message are relatively high, persuasion is more likely to occur as a function of relatively careful scrutiny and consideration of the arguments presented (systematic or central route processing). In contrast, when motivation and/or ability to process the message are relatively low, individuals conserve cognitive effort by relying on simple inferences (*e.g.* source characteristics) (peripheral or heuristic route processing). The model further states that if the new attitude results from the central route, it is likely to be more enduring than one formed from the peripheral route (Petty & Cacioppo, 1986).

One key variable in the persuasion process is the characteristics of the source presenting the message (Chaiken, 1980; DeBono & Harnish, 1988). Source credibility can be described as 'the degree to which a communication source/channel is perceived as trustworthy and competent by the receiver' (Rogers & Shoemaker, 1971). Research suggests that when source credibility is perceived to be low, individuals discount the appeals or arguments presented in the message. Conversely, when source credibility is

perceived to be high, people tend to counterargue less and are more easily influenced by the message (Grewal, Gotlieb, & Marmorstein, 1994).

Another key variable that may affect the impact of persuasive communications is message frame. According to the ELM, message framing can affect elaboration through the mechanism invoked by individual expectation (Zhang & Buda, 1999). In other words, negatively framed messages may be processed more carefully because they are attention grabbing and violate peoples' expectancies. Conversely, people are accustomed to reading arguments in a positive frame, consequently their expectancies are not violated (Zhang & Buda, 1999). Kahneman and Tversky's prospect theory (1979) offers an alternative explanation. Prospect theory holds that individuals respond differentially to messages depending on the frame (i.e. benefits vs. risks). The theory further postulates that the influence of the message frame is affected by the type of behaviour being promoted. Research suggests that detection behaviours (e.g. mammography screening) are perceived as more risky than prevention behaviours (e.g. exercise) and are best promoted by negatively framed messages (Williams, Clarke, & Borland, 2001). Conversely, prevention behaviours are seen as risk averse, and best promoted by positively framed messages (Rothman, Salovey, Antone, Keough, & Martin, 1993; Schneider *et al.*, 2001).

Initial empirical support for the use of persuasion theory in promoting physical exercise comes from Jones *et al.* (2003) who investigated the effects of source credibility and message frame on college students' intentions to engage in physical exercise. Participants receiving a positively framed communication from a credible source elaborated more and reported more positive exercise intentions and behaviours than participants in the other conditions. In addition, it may also be beneficial to integrate the postulates of persuasion theory with belief-based models in the exercise domain. Specifically, persuasion theories permit the understanding of different sources of persuasion and how these persuasive messages are processed and internalized. Conversely, belief-based models (e.g. TPB) offer guidance and understanding of which social cognitive constructs are relevant to specific types of persuasive information and the processing routes through which this information may translate into intention and behaviour.

Based on this rationale, the purpose of this study was to examine the effectiveness of a theoretical integrated persuasive message on exercise motivation. The primary purpose of the present study was to replicate our earlier findings (Jones *et al.*, 2003). Specifically, we expected that participants reading a persuasive message in a positive frame attributed to a credible source would elaborate more and report more positive beliefs than participants in any other condition. Also, in our previous study, effects were indicated for intention and behaviour, however, we found no effects for attitude although additional potential mediating TPB variables were not measured (i.e. subjective norm, perceived control) (Ajzen, 1991). Therefore, in this study we also wanted to extend our previous findings, as such we assessed the complete TPB to explore alternative potential processing routes (i.e. subjective norm, perceived control) through which a persuasive message may have its effects on exercise motivation. An exploratory purpose was to explore the type of processing (central vs. systematic) in which participants engaged after reading a persuasive message advocating exercise. Finally, we also wanted to explore the utility of a TPB-based exercise intervention. Some investigators have noted that the next step in TPB research is to assess the effects of belief-based exercise interventions (Ajzen, 2002a; Blue, Wilbur, & Marston-Scott, 2001). In this investigation our persuasive messages were targeted towards instrumental

attitudinal aspects of physical exercise. This TPB construct was specifically targeted because health-oriented materials constitute the majority of physical exercise promotion strategies and research has demonstrated that instrumental attitude is a consistent correlate of intention and behaviour in the exercise domain (Rhodes & Courneya, 2003; Rhodes, Courneya, & Hayduk, 2002).

Method

Participants

Participants were 314 female and 136 male introductory psychology students (M age = 20.02 years; $SD = 3.94$) at the University of Alberta. All were volunteers who participated in order to fulfil partially a course requirement.

Design and procedures

Under the auspices of a study addressing impression formation based on arguments that a person presents, participants completed a measure of exercise behaviour at an initial session conducted in groups of 15–35. Participants were then randomly assigned to reading background information describing a credible source (i.e. a medical doctor) a non-credible source (i.e. a high school science student) or no (control) source. They were then randomly assigned to reading positively or negatively framed strong messages advocating exercise. These messages were apparently written by the source. In order of presentation, attitudes, subjective norm, perceived behavioural control, exercise intentions and cognitive responses were then measured. Finally, impressions of the source were measured. Ninety-two per cent of the original sample returned for the scheduled second experimental session, 2 weeks later. Here participants again completed measures of exercise behaviour, attitude, subjective norm, perceived behavioural control and behavioural intention. Once measures were completed all participants were debriefed.

Instruments

Regular exercise was defined for all participants as vigorous intensity three or more times per week for at least 30 minutes each time. Given the college sample of participants who may already be engaging in reasonable levels of moderate physical exercise (e.g. walking to college daily, etc.), we felt that focusing on vigorous exercise would be more indicative of actual leisure-time exercise. Participants were asked to use this definition when answering all exercise-related questions.

Behavioural beliefs were drawn from previous research (Courneya, 1995) and were rated on a 7-point expectancy scale that ranged from 1 (*extremely unlikely*) to 7 (*extremely likely*). The specific health beliefs were: (i) feel better and improve my well-being, (ii) improve my general health, (iii) relieve my stress, (iv) maintain my optimal weight, and (v) maintain my social interactions. Each health belief was preceded by the statement 'If I were to exercise regularly over the next two weeks at a vigorous intensity, it would help me . . .' (Ajzen, 2002b).

Exercise attitudes were measured using the 7-point bipolar adjective scales as suggested by Ajzen (2002b). Four items tapped the *instrumental* (e.g. useful–useless, wise–foolish) aspect of attitude (Cronbach's alpha index of internal consistency = .83 for Time 1 and .85 for Time 2) and four items tapped the *affective* (e.g. enjoyable–unenjoyable, boring–interesting) aspect (Cronbach's alpha index of internal

consistency = .82 for Time 1 and .84 for Time 2). Principal factoring with an oblique rotation factor analysis confirmed the two-factor structure. The first factor explained 45.61% of the variance in affective attitude and the second factor explained 11.60% of the variance in instrumental attitude. The statement that preceded the adjectives was 'For me, over the next two weeks exercising regularly is . . .'

Subjective norm was measured using three items: (i) 'Most people who are important to me would think I should exercise vigorously over the next two weeks', (ii) 'Most people who are important to me would approve of me exercising vigorously over the next two weeks', and (iii) 'Most people who are important to me would support me exercising vigorously over the next two weeks'. All items were rated on 7-point scales that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*) (Ajzen, 2002b). The means of these items formed a single internal consistent measure of subjective norm (Cronbach's alpha index of internal consistency = .82 for Time 1 and .81 for Time 2).

Perceived behavioural control was measured using four items: (i) 'For me, exercising over the next two weeks is . . .' rated on a 7-point scale from 1 (*extremely easy*) to 7 (*extremely difficult*), (ii) 'Whether or not I exercise regularly in the next two weeks is entirely up to me' rated on a 7-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*), (iii) 'How much personal control do you feel you have over exercising regularly over the next 2 weeks?' rated on a 7-point scale from 1 (*very little control*) to 7 (*complete control*), and (iv) 'How much do you feel that exercising regularly in the next two weeks is beyond your control?' rated on 7-point scale from 1 (*not at all*) to 7 (*very much*) (Ajzen, 2002b). The means of these items formed a single internal consistent measure of perceived control (Cronbach's alpha index of internal consistency = .74 for Time 1 and .73 for Time 2).

Exercise intention was assessed by three items (Courneya, 1995): (i) 'In the next two weeks my goal is to exercise vigorously' rated on a 7-point scale from 1 (*not at all*) to 7 (*every day*), (ii) 'I intend to exercise vigorously at least every other day over the next two weeks' rated on 7-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*), and (iii) 'Over the next two weeks, I intend to exercise vigorously at least times per week' rated on a 7-point scale (Ajzen, 2002b). The means of these items formed a single internal consistent measure of exercise intention (Cronbach's alpha index of internal consistency = .89 for Time 1 and .92 for Time 2).

Exercise behaviour in the prior month was assessed using a subsection of the Godin Leisure Time Exercise Questionnaire (Godin & Shephard, 1985). The question assessed the frequency of strenuous exercise (e.g. jogging, aerobics). Only leisure time exercise sessions lasting 30 minutes or longer were included. The statements that preceded questions in the experiment described strenuous exercise, therefore, mild and moderate exercise were not included as measures of exercise behaviour due to their incongruence with our definition of regular exercise in the TPB constructs.

Source expertise was rated as follows. After reading the persuasive message, participants completed a brief impression-formation questionnaire assessing the source of the arguments. Ratings included: (i) level of knowledge, (ii) competence, (iii) intelligence, (iv) credibility, (v) likeability and (vi) expertise. All questions were rated on 7-point scales anchored at 1 (*not at all*) and 7 (*extremely*). The mean of items 1, 2, 3, 4 and 6 formed an internally consistent index of source expertise (Cronbach's alpha index of internal consistency = .84). Item 5 served as an index of likeability.

Thought content was assessed with a thought-listing procedure (Petty & Cacioppo, 1986) commonly used in research involving the ELM. Participants were asked to list any thoughts they had while reading the passage supporting physical exercise. Respondents' thoughts were later coded as positive (referring to positive comments regarding the communication) or negative (referring to negative comments regarding the communication).¹ Furthermore, following the thought-listing procedure, participants were also asked to recall, in as much detail as possible the exact reasons that the person gave supporting physical exercise.²

Source expertise, framing and messages

Participants received background information regarding a pamphlet that was part of an information package promoting healthy lifestyles and active living, and which could be taken home by patients following their discharge from hospital. In the credible source condition, the background information stated 'Sally Martin is a medical doctor who is currently practicing at the University Hospital in Edmonton. She received her medical degree from Stanford University and is a member of the Royal College of Physicians and Surgeons.' In the non-credible source condition, the background information stated 'Sally Martin is a high school student enrolled in Biology 30 at Harry Ainlay Composite High School. She is currently volunteering at the University Hospital in Edmonton. She is a member of the High School Biological Sciences Association.' In the control condition, no source was stated.

The pamphlet presented three strong arguments advocating 'lower vs. increased risk' health consequences of participating/not participating in regular vigorous physical exercise and three arguments advocating 'acquire vs. fail to acquire' specific health consequences associated with physical exercise. Issues included physiological, psychological and psychosocial aspects of exercise. Students read factually equivalent messages apart from slight wording changes to reflect framing manipulations. In the positive frame condition, examples included, 'By *participating* in regular physical exercise you will lower your risk of coronary heart disease and other chronic diseases such as obstructive pulmonary disease, cancer, osteoporosis, obesity, and diabetes' and 'By accumulating at least 30 minutes or more of physical exercise on most or preferably all days of the week you *will* also acquire the additional mental health benefits such as decreased depression, increased self-esteem, decreased anxiety, increased quality of life and increased confidence.' In the negative frame, examples included 'By *not participating* in regular physical exercise you will increase your risk of coronary heart disease and other chronic diseases such as obstructive pulmonary disease, cancer, osteoporosis, obesity, and diabetes' and 'By not accumulating at least 30 minutes or more of physical exercise on most or preferably all days of the week you *will fail* to acquire the additional mental health benefits such as decreased depression, increased self-esteem, decreased anxiety, increased quality of life, and increased confidence.'

¹ A judge was trained to count the number of positive, negative and neutral thoughts. In order to assess reliability, a second judge coded a subset of the data in a different random order. The interjudge reliabilities were .93, .93 and .82 for positive, negative and neutral thoughts, respectively.

² A judge was trained to count the number of arguments recalled. In order to assess reliability, a second judge independently coded a subset of the data in a different random order. The interjudge reliability was .94.

Results³

Manipulation check

A 3 (Source Credibility) $\times$ 2 (Frame) analysis of variance (ANOVA) was conducted on the measure of source expertise. There was a significant main effect for source credibility, $F(2, 443) = 27.78, p < .001$. The credible source ($M = 5.40$; $SD = .78$) was perceived as significantly more credible than the non-credible source ($M = 4.73$; $SD = .75$, $p < .001$) and the control source ($M = 5.20$; $SD = .68$, $p = .026$). There was also a significant main effect for frame, $F(1, 443) = 5.64, p < .02$. The source in the positive frame condition ($M = 5.20$; $SD = .78$) was perceived as more credible than in the negative frame condition ($M = 5.02$; $SD = .84$). Furthermore, there were no source effects on ratings of overall liking of the person presenting the messages. However, there was a main effect for frame on liking, $F(1, 441) = 29.40, p < .001$. The positive frame condition ($M = 4.89$; $SD = .95$) led to more positive impressions of the source than did the negative frame ($M = 4.38$; $SD = 1.10$).

Theory of planned behaviour variables

A series of 3 (Source) $\times$ 2 (Frame) repeated measures ANOVAs were conducted on TPB variables. Results indicated no source by frame interaction or time main effects for any TPB variable; belief 1 ($p = .375$), belief 2 ($p = .091$), belief 3 ($p = .765$), belief 4 ($p = .227$), belief 5 ($p = .827$), instrumental attitude ($p = .233$), affective attitude ($p = .934$), subjective norm ($p = .388$), perceived control ($p = .922$) and intention ($p = .172$). However, several main effects of source credibility and message frame were indicated. Significant source credibility effects were indicated for behavioural belief 2 'improve my general health' $F(2, 407) = 3.33, p = .037$. Specifically, participants reading a message attributed to a non-credible source reported significantly more positive beliefs ($M = 5.00$, $SD = 1.38$) than participants reading a persuasive message attributed to a credible source ($M = 4.60$, $SD = 1.47$) or a no source control condition ($M = 4.70$, $SD = 1.41$). Significant framing effects were indicated for behavioural belief 1 'feel better and improve my well-being' $F(1, 407) = 4.10, p = .044$. Participants reading a positively framed message reported significantly more positive beliefs ($M = 6.20$, $SD = .91$) than participants reading a negatively framed message ($M = 6.00$, $SD = 1.05$). Significant effects were also indicated for behavioural belief 4 'maintain my optimal weight' $F(1, 407) = 5.57, p = .019$. Participants reading a positively framed message reported significantly more positive beliefs ($M = 5.93$, $SD = 1.13$) than participants reading a negatively framed message ($M = 5.68$, $SD = 1.32$) (Tables 1 and 2).

Elaboration/cognitive responses

A series of 3 (Source) $\times$ 2 (Frame) ANOVAs was conducted on elaboration/cognitive response variables (i.e. number of arguments recalled, valence). Results indicated

³ Despite a number of research studies consistently demonstrating that instrumental attitude is significantly correlated with both intention and behaviour in the exercise domain, we felt that a homogenous sample of college students may already know that exercise is good for them. To test this assumption, we sort to determine if instrumental attitude could distinguish between exercisers and non-exercisers (exercise was defined as 'vigorous intensity exercise performed three or more times a week for at least 30 minutes per session'). Results indicated that non-exercisers reported significantly less positive instrumental attitudes than exercisers ($p < .001$). Based on these findings, we examined the effects of the intervention on non-exercisers alone. The results indicated no significant effects, suggesting that the intervention target (instrumental attitude) was not the major limiting factor for the lack of effects. Consequently, we present the analyses for the complete sample of 450.

Table 1. Descriptive statistics for TPB variables and cognitive responses (immediate effects)

Variable	Positive frame (<i>n</i> = 210)			Negative Frame (<i>n</i> = 203)		
	Non-credible (<i>n</i> = 65)	Control (<i>n</i> = 78)	Credible (<i>n</i> = 67)	Non-credible (<i>n</i> = 69)	Control (<i>n</i> = 65)	Credible (<i>n</i> = 69)
Theory of planned behaviour						
Belief 1	6.1 (0.9)	6.1 (0.8)	6.3 (0.8)	6.1 (1.0)	6.1 (0.8)	6.0 (1.2)
Belief 2	4.9 (1.4)	4.5 (1.3)	4.8 (1.5)	5.0 (1.4)	5.0 (1.6)	4.5 (1.6)
Belief 3	6.2 (0.8)	6.2 (0.9)	6.3 (0.9)	6.1 (1.1)	6.1 (0.9)	6.1 (0.9)
Belief 4	6.0 (1.1)	6.0 (1.0)	5.9 (1.3)	5.6 (1.4)	5.8 (1.2)	5.9 (1.2)
Belief 5	5.6 (1.6)	5.6 (1.4)	5.7 (1.3)	5.6 (1.4)	5.8 (1.2)	5.7 (1.4)
Instrumental attitude	5.8 (0.8)	5.6 (1.1)	5.8 (1.0)	5.7 (1.0)	5.7 (1.0)	5.5 (1.0)
Affective attitude	4.7 (1.0)	4.6 (1.2)	4.7 (1.1)	4.6 (1.2)	4.7 (1.3)	4.6 (1.1)
Subjective norm	5.4 (1.2)	5.4 (1.1)	5.6 (1.1)	5.6 (1.2)	5.5 (1.2)	5.4 (1.2)
Perceived control	5.1 (1.3)	5.0 (1.3)	5.3 (1.2)	5.0 (1.4)	5.0 (1.2)	5.2 (1.1)
Intention	3.9 (1.6)	4.0 (1.6)	4.3 (1.6)	4.3 (1.5)	3.9 (1.5)	4.0 (1.6)
Cognitive responses						
Valence	1.1 (3.1)	1.6 (2.3)	1.9 (2.5)	0.6 (2.6)	0.5 (2.5)	0.2 (2.7)
Recall	4.2 (1.9)	4.0 (1.9)	4.3 (2.4)	3.8 (2.2)	4.2 (1.8)	4.2 (2.2)

Note. Data are presented as the mean, standard deviations are presented in parentheses.

Table 2. Descriptive statistics for TPB variables and exercise behaviour (delayed effects)

Variable	Positive frame (<i>n</i> = 210)			Negative frame (<i>n</i> = 203)		
	Non-credible (<i>n</i> = 65)	Control (<i>n</i> = 78)	Credible (<i>n</i> = 67)	Non-credible (<i>n</i> = 69)	Control (<i>n</i> = 65)	Credible (<i>n</i> = 69)
Theory of planned behaviour						
Belief 1	6.2 (0.9)	6.1 (1.0)	6.1 (1.1)	6.0 (1.0)	6.0 (1.0)	5.8 (1.2)
Belief 2	5.1 (1.4)	4.5 (1.5)	4.7 (1.3)	5.0 (1.4)	4.8 (1.3)	4.5 (1.5)
Belief 3	6.2 (0.9)	6.2 (0.7)	6.2 (1.1)	6.2 (0.9)	6.0 (0.9)	5.9 (1.0)
Belief 4	6.1 (1.0)	5.9 (1.1)	5.7 (1.3)	5.6 (1.4)	5.6 (1.3)	5.7 (1.3)
Belief 5	5.7 (1.2)	5.7 (1.3)	5.6 (1.3)	5.6 (1.4)	5.8 (1.2)	5.7 (1.2)
Instrumental attitude	5.6 (1.0)	5.7 (1.0)	5.8 (0.9)	5.7 (0.9)	5.7 (0.9)	5.5 (1.1)
Affective attitude	4.7 (1.2)	4.8 (1.1)	4.9 (1.1)	4.6 (1.3)	4.5 (1.4)	4.6 (1.1)
Subjective norm	5.7 (0.8)	5.5 (1.2)	5.6 (1.1)	5.7 (1.0)	5.5 (1.1)	5.3 (1.2)
Perceived control	5.1 (1.1)	5.2 (1.0)	5.2 (1.1)	5.2 (1.1)	4.9 (1.1)	5.0 (1.2)
Intention	3.9 (1.6)	4.1 (1.4)	4.1 (1.6)	4.1 (1.4)	3.6 (1.5)	3.8 (1.7)
Exercise behaviour						
Strenuous – frequency	2.0 (1.8)	2.3 (1.4)	2.2 (1.9)	2.4 (1.9)	2.1 (1.6)	2.2 (1.8)
Strenuous – duration	46.1 (41.0)	40.3 (32.2)	38.1 (32.6)	44.3 (40.5)	47.7 (42.5)	38.3 (36.7)
Strenuous – minutes	141.7 (230.1)	108.8 (114.6)	118.1 (148.9)	136.2 (149.2)	124.7 (135.5)	113.4 (144.5)

Note. Data are presented as the mean, standard deviations are presented in parentheses.

significant message framing effects for valence only $F(1, 443) = 22.80, p < .001$. Specifically, participants reading a positively framed message reported more positive arguments minus negative arguments ($M = 1.53, SD = 2.47$) than participants reading a message in a negative frame ($M = .36, SD = 2.74$). This effect occurred in the context of a marginal source $\times$ frame interaction for valence, $F(2, 443) = 2.85, p < .06$ (Table 1).

Exercise behaviour

A series of 3 (Source) $\times$ 2 (Frame) ANOVAs was conducted on exercise behaviour variables (i.e. strenuous frequency, strenuous duration, total strenuous minutes). Results indicated no source by frame interaction or main effects for any exercise behaviour outcome (Table 2).

Attitude change and central vs. systematic processing⁴

To explore the type of processing (central vs. systematic) in which participants engaged after reading a persuasive message, we used two separate moderated regression analyses. The first analysis assessed prior exercise behaviour, whereas the second analysis examined the number of arguments recalled as proximal determinants of type of processing. These analyses followed Cohen's (1992) guidelines for testing moderators using OLS regression. Using this procedure, independent variables of the potential interaction effect (i.e. message frame) are entered first into the regression equation in the first block, subsequent independent variables are entered in the second block (i.e. prior exercise behaviour or number of arguments recalled) as predictors of the dependent variable (i.e. instrumental attitude). Next, a variable created from the interaction of the independent variables (message frame $\times$ prior exercise behaviour or message frame $\times$ number of arguments recalled) is entered as a predictor in the regression equation. Evidence of a moderator effect is provided if this interaction variable adds significant variance to the overall regression equation. Neither prior exercise behaviour [$F_{change}(3, 443) = 0.26, p > .05$] nor the number of arguments recalled [$F_{change}(3, 444) = 0.10, p > .05$] was found to act as a proxy for the type of processing in which participants engaged after reading a persuasive message advocating exercise.

Discussion

This study examined the effectiveness of an integrated persuasive message on exercise motivation in college students. This is the first study to design and implement an exercise intervention based on the theoretical postulates of the TPB. Unfortunately, however, we did not find any significant effects between experimental condition and any TPB or exercise behaviour outcome over the 2-week intervention. There may be several potential explanations for the lack of effects, including the interaction between the type of persuasive information (TPB implications) and sources of persuasion and how these persuasive messages are processed (ELM/cognitive response implications). The theoretical implications of this research are discussed with a view towards

⁴ We thank an anonymous reviewer for suggesting this approach to this analysis.

directions for exercise promotion future initiatives using theoretically driven interventions.

Type of persuasive information – theory of planned behaviour implications

The TPB proposes that behavioural intention is the proximal determinant of future behaviour. The model further proposes that intention is influenced by three conceptually independent constructs: attitude, subjective norm and perceived control. In this study, we focused our attention on exercise attitude, more specifically, instrumental aspects of regular physical exercise. However, a health-oriented persuasive message had virtually no effect on this outcome and subsequent exercise intentions and behaviour. Ajzen (2002a) and others (Fishbein, von Haeften, & Appleyard, 2001) have theorized that although a concept may be significantly correlated with intention and/or behaviour, little will be achieved if there is little room for change in the designated target. One may conclude that targeting the health benefits of exercise in a homogenous sample of well-educated college students (who may already be aware of the benefits of exercise) may be futile because of a ceiling effect in the targeted construct and hence our lack of effects. However, previous empirical research (e.g. Rhodes & Courneya, 2003; Rhodes *et al.*, 2002) and the results of the current study indicate that instrumental attitude was significantly correlated with both intention and exercise behaviour (Table 3). Closer inspection of the data indicates that the overall sample mean for this construct was 5.67 (on a 7-point scale) indicating significant room for improvement and no evidence of a ceiling effect. To further test this theorizing, we also determined if instrumental attitude could distinguish between exercisers and non-exercisers in the current study. Results indicated that non-exercisers reported significantly lower positive instrumental attitudes than exercisers ($p < .001$) (analysis not presented), suggesting that the intervention target or the type of persuasive information (i.e. the health benefits of exercise) was not the major limiting factor for the lack of effects.

Nevertheless, it may be fruitful for researchers to target additional TPB constructs in which individuals generally hold weaker beliefs (i.e. subjective norm, perceived control, affective attitude). Again, a closer inspection of affective attitude and perceived control indicated sample means of 4.70 and 5.11 (on 7-point scales) respectively. Thus, it appears that these constructs have considerable room for change and seem to be important determinants of both intention and behaviour in the exercise domain (Armitage & Connor, 2001; Lowe, Eves, & Carroll, 2002) (also see Table 2). From an applied perspective, these findings suggest that persuasive messages focusing on either enjoyable/fun elements or aspects of control and ability may strengthen these beliefs, which may in turn significantly influence exercise intentions and behaviour (Armitage & Connor, 2001; Blue *et al.*, 2001; Lowe *et al.*, 2002; Rhodes & Courneya, 2003). Obviously, some TPB constructs are more amenable to change than others (Fishbein *et al.*, 2001). For example, it may be easier to persuade an individual that adopting regular physical exercise may have numerous health benefits, compared with persuading an individual that an exercise programme is fun and enjoyable or completely within their control. Moreover, beliefs based on direct experience are inherently more difficult to change than those derived from alternative sources (e.g. family, friends) (Fishbein *et al.*, 2001). It could be argued that the majority of college students have had various levels of direct experience with exercise participation, therefore, convincing these individuals that exercise can be fun may be incongruent

Table 3. Pearson correlations among the TPB, cognitive responses and exercise behaviour

Variable	1	2	3	4	5	6	7	8	9	10	<i>M</i>	<i>SD</i>
1. Condition		.05	.07	.01	.01	.00	.08	.12*	.04	.00	—	—
2. Intention			.46**	.36*	.44*	.29*	.14**	.09	.19**	.48**	4.10	1.55
3. Perceived control				.19**	.35**	.21**	.08	.07	.14**	.36**	5.11	1.23
4. Instrumental attitude					.53**	.38**	.21**	.16**	.13**	.21**	5.67	.98
5. Affective attitude						.21**	.21**	.11*	.19**	.33**	4.66	1.13
6. Subjective norm							.17**	.12*	.10*	.14**	5.50	1.21
7. Likeability								.54**	.23**	.06	4.64	1.03
8. Expertise									.24**	.01	5.11	.81
9. Valence										.12*	.97	2.68
10. Exercise behaviour											124.20	157.35

Note. Exercise behaviour is measured by self-reported strenuous minutes of exercise per week. The theory of planned behaviour and cognitive response outcomes are measured scales ranging from 1 to 7.

* $p < .05$; ** $p < .001$ (two-tailed).

with their previous experiences and as such, is going to present a major challenge to health and exercise professionals who are designing and implementing exercise initiatives (Lowe *et al.*, 2002).

Processing and source of persuasive messages – elaboration/cognitive responses implications

Processing of persuasive message

Unfortunately, our results did not support our previous findings or the postulates of ELM research. Despite the lack of source and interaction effects, the results of the current study were generally consistent with the postulates of prospect theory. As predicted, data from the current study support Tversky's and Kahneman's hypothesis that positively framed arguments are more effective than negatively framed messages for promoting prevention behaviours such as physical exercise. Positive impressions of the source have been associated with higher levels of persuasion (Cialdini, 1984; Greenwald, Brook, & Ostrom, 1968; Sharma, 1999). According to cognitive response theory (Greenwald *et al.*, 1968) persuasion depends on the favourability of thoughts available at the time of information processing. Therefore, if the message conveys positive affect individuals are more likely to increase the strength and number of arguments supporting the message claims (Petty & Cacioppo, 1981). However, individuals reading a persuasive message attributed to a source that is conveying negative affect are likely to believe that the persuasive argument does not have their interests in mind, this will increase the strength and number of counter arguments, resulting in decreased persuasion (Cialdini, 1984).

The failure to demonstrate contentions of ELM research that state that individuals are more easily influenced by a credible source than by a non-credible source is rather interesting. Previous reports suggest that when individuals read a persuasive message attributed to a credible source they tend to counterargue less and are, therefore, more influenced by the arguments in the message (Grewal *et al.*, 1994). According, to our manipulation check, the credible source (medical doctor) was perceived as more credible than our non-credible (high school student) and control source conditions. Therefore, these results suggest that source factors may not play an important role in persuading college students to engage in regular physical exercise. In this population, a persuasive message advocating the benefits of engaging in regular physical exercise may be effective regardless of the perceived credibility of the source.

An exploratory purpose of this study was to examine motivation/type of processing (i.e. prior exercise behaviour and number of arguments recalled) in which participants engaged after reading a persuasive message advocating physical exercise. Unfortunately, the results indicated no significant effects, providing no evidence of the type of processing. Obviously, in this study, we found no overall effects on any TPB or exercise behaviour variable, therefore it may be difficult to determine the type of attitude change route processing if no attitude change occurred.

Channel of message delivery

This study used a one-page written pamphlet to deliver the persuasive message advocating exercise. This channel of message delivery was chosen because health-oriented messages (in print media) represent the majority of current physical exercise promotion strategies. Our results failed to corroborate previous mass media-based trials demonstrating positive changes in physical activity and adherence following the

delivery of print media designed on the theoretical tenets of social cognitive models of behaviour change (cf. Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998 for a review). The lack of corroboration may be explained in part by subtle differences in methodology. First, previous trials examined the effectiveness of print materials in combination with additional behavioural interventions (e.g. face-to-face counselling, telephone-support counselling). As such, the isolated effects of print media alone are difficult to ascertain. Second, these studies examined the effectiveness of media campaigns in community-type populations, therefore, generalizations to a college student population may be inappropriate. Nevertheless, these findings suggest that print media may be an ineffective strategy to motivate college students to participate in regular exercise. From an applied perspective, alternative and more costly methods of exercise message delivery (e.g. television, Internet-based promotions) may be required if significant changes in psychological and behavioural outcomes are to be achieved.

Target audience

It is also important to examine the target audience of the persuasive message. The health-oriented message had virtually no effects on influencing exercise motivation in college students. Interestingly, ELM theorists have suggested that enhancing personal relevance of an issue may enhance message elaboration (Petty & Cacioppo, 1986). Pallak and Pittman (1972) suggested that pro-attitudinal messages are seen as similar to one's own opinion and are, therefore, more accepted. In this study, 49% of participants met the American College of Sports Medicine (1998) guidelines of accumulating at least 30 minutes of at least moderate intensity exercise on most (i.e. 5), and preferably all, days of the week (i.e. 150 minutes of moderate/strenuous intensity exercise per week) and 65% of participants accumulated at least 90 minutes of strenuous/moderate intensity exercise per week. Therefore, it could be argued that a pamphlet describing the benefits of physical exercise was personally involving for the majority of participants in this study. Our results suggest that even though the persuasive message was accepted by the sample, pro-attitudinal messages advocating exercise appeared too weak to motivate college students to scrutinize the message content.

The lack of corroboration between ELM theorizing and the current study may be partially explained by the persuasive messages themselves. Although, the messages were pro-attitudinal for the majority of participants, they generally described the benefits of exercise for all adults and were not specific to college students. Consequently, the message content was not particularly relevant or personally involving and was therefore not scrutinized. The applied implications of these findings confirm the efficacy of tailoring message content (Green *et al.*, 2002) or incorporating belief-based information that is relevant to the target population when designing and implementing behaviour change interventions (Ajzen, 2002a; Fishbein *et al.*, 2001).

Limitations

It is important to address the limitations of this investigation. First, the study used a homogenous sample of college students, which may limit the generalizability of the findings. With regard to the effects of source credibility and message frame, future research should replicate the current study in a more diverse population such as older and clinical samples. This type of study would provide important information not only on the relative strengths and weaknesses of the frame in which the exercise information

is presented, but also on the effects of the source presenting this information. From a TPB perspective, the specificity of the findings are such that generalizations to other populations would prove irrelevant, therefore, generalizations can only be made to the specific population and behaviour being investigated.

Second, we relied on self-reported measures of exercise behaviour, rather than objective measures of physical exercise. However, self-report is the most common and practical method used in the exercise literature and has demonstrated consistent validity and reliability (see, e.g. Godin, Jobin, & Bouillon, 1986; who report a validity coefficient of .54 between our self-report measure and VO_2 max; see also Godin & Shephard, 1985). Still, future studies may consider objective measures of exercise behaviour such as attendance at a fitness centre or activity monitoring. Third, we collected no pre-intervention measures of TPB variables, therefore, conclusions regarding the efficacy of the intervention may be problematic. Nevertheless, the well-established study design, large sample size and random assignment to groups should address any potential threats to the internal validity of the study. Finally, the results of the current study did not support the inclusion of persuasion variables in belief-based models of attitude change (i.e. TPB). However, this study examined only the source and the frame of the message, future studies should also examine how other aspects of the message (number of arguments, channel delivery) and recipient (age, personality, need for involvement) can influence persuasive messages promoting exercise and other health behaviours.

Conclusions

This study investigated the effectiveness of an integrated persuasive message on exercise motivation in college students. We attempted to replicate and extend the results of previous research and to explore the utility of behavioural intervention based on the TPB. Unfortunately, we found virtually no effects between experimental groups on TPB, cognitive responses and exercise outcomes. These results have important practical implications for exercise and health psychologists who are designing exercise promotion initiatives.

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