

UNDERSTANDING
HEALTH-RELATED
PHYSICAL ACTIVITY:
ATTRIBUTIONS,
SELF-EFFICACY,
AND INTENTION

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By

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ABSTRACT

Although physical activity above a certain threshold has been associated with numerous health benefits (Warburton, Nicol, & Bredin, 2006), most Canadians are not active enough to realize these benefits (Craig, Russell, Cameron, & Bauman, 2004). In order to examine individuals' own explanations of their health-related physical activity behaviour in terms of attributions, four studies testing elements of Weiner's (1986) attribution theory and Bandura's (1997) self-efficacy theory were conducted with a university sample. The results from the first study revealed that perceived outcome differentiated attributional explanations while objective outcome did not. Results also revealed that although predicted relationships concerning attribution-dependent emotions were largely unsupported, emotions were associated with outcomes. Further, results suggested that those making stable attributions reported more certainty of similar future outcomes than those making unstable attributions. Results in the second study suggested that attributional dimensions significantly improved the prediction of self-regulatory efficacy beyond that predicted by past success/failure to be active enough for health benefits alone. Stability appeared to be the most important attributional dimension in predicting self-efficacy. Results in the third study suggested self-regulatory efficacy significantly improved the prediction of future intention beyond that of past success/failure to be active enough for health benefits alone. The results from the fourth study supported the plausibility of self-regulatory efficacy partially mediating the relationship between stability of attributions for typical levels of exercise and intention to maintain those levels during a forthcoming final exam period for both moderate- and mild-intensity exercise. Results are discussed in the contexts of testing attribution theory and self-efficacy theory and improving understandings of physical activity behaviour.

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CHAPTER 1: INTRODUCTION

1.1 Background

It has been established that physical activity above a certain threshold is associated with a diminished risk of cardiovascular disease, diabetes, various cancers, hypertension, obesity, and osteoporosis as well as improved health and fitness (cf. Warburton et al., 2006 for a review). Yet, for the most part, physical activity is being engineered out of our daily lives to the point that adequate physical activity now must be chosen. Unfortunately, many do not, with 59% of adult Canadians not being active enough to gain health benefits (Craig et al., 2004).

Given this propensity to inactivity, it is important to consider what can be done to encourage people to become more active. In seeking solutions, understanding why individuals are or are not active at a level sufficient for health benefits¹ becomes important. In terms of approaches that could be adopted to examine the “whys” of being active, the cognitive paradigm has featured prominently in the last 30 years. Two cognitive theories that have received attention in the physical activity realm are attribution theory and self-efficacy theory.

1.2 Cognitive Theories

1.2.1 Attribution theory

Attribution theory is concerned with the conventions that individuals use in attempting to explain their behaviour (Weiner, 1986). The theoretical framework for attributions was founded on Heider’s (1958) “naive analysis of action” model wherein he proposed a model of *common-sense psychology* to describe the process by which people analyse outcomes and search for causes of the outcomes of everyday events. Building on Heider’s (1958) seminal work, Weiner (1986) also assumed that following experiences of success or failure in important events, people automatically search for the causes of the outcome.

¹ Within this thesis, the terms ‘physical activity for health benefits’ and ‘physical activity sufficient for health benefits’ are subsumed under the more general term, ‘health-related physical activity’.

Weiner (1986) believed that individuals search for causes for two main reasons. First, he believed that we are drawn towards mastery of ourselves and our environments, and as such, that we need to understand why things happen. Second, he believed that we also need to control ourselves and our environments, reasoning that understanding the causes of an outcome may provide valuable information for planning future actions in order to repeat or change the outcome if desired. Thus, Weiner's attribution theory is predicated upon the universality and adaptability of causal searches.

While identifying causes for outcomes is important, Weiner (1985; 1986) suggested that the dimensions underlying the causes are of greater significance, as they are believed to influence emotions, future expectations, and motivation. Weiner's (1986) attribution theory affords the classification of causal ascriptions along three dimensions. First, locus of causality denotes that we tend to attribute causes to factors either within ourselves or within the environment (i.e., internal/external). Second, as some causes are relatively constant while others may be variable, stability of attributions also is important. For example, while ability is typically perceived as stable, effort may fluctuate. Third, while some attributions are under volitional control, others are not. For example, while failing to get sufficient activity because of low effort may be controllable, failing because of illness may not. Thus, controllability of the attributions used is the third dimension within Weiner's model.

1.2.2 Attributions and physical activity

Given that being physically active is an important outcome that we do not always achieve, and attribution theory offers a way to understand how individuals explain important outcomes, it follows that examining attributions for activity outcomes would attract the attention of researchers. While there are considerably more studies concerning attributions and sport outcomes (e.g., Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003; Gernigon & Delloye, 2003; Graham, Kowalski, & Crocker, 2002; Rees, 2007; Wann & Schrader, 2000), there are a handful of studies examining attributions in the exercise or health-related physical activity area (e.g., Courneya & McAuley, 1993, 1996; Ingledew, Hardy, & Cooper, 1996; Minifee & McAuley, 1998; Shields, Brawley, & Lindover, 2005, 2006).

In terms of attributions, one important distinction that has arisen in the activity area concerns outcome type (Spink & Roberts, 1980). Addressing the type of outcome has been

deemed important as the question has arisen as to whether people tend to make attributions concerning objective outcomes, subjective outcomes, or both (Spink & Roberts, 1980). In the activity setting, Courneya and McAuley (1996) found that participants' perceptions of success (i.e., perceived outcome) in terms of attendance at an exercise program were more important for predicting attributions than actual attendance (i.e., objective outcome). In terms of attributions, regardless of their actual attendance, those who perceived themselves as more successful in attending an exercise class tended to make more internal, stable, and personally controllable attributions than those who perceived themselves as less successful. In one of the few attributional studies to examine exercise behaviour change outside of a structured exercise class, Minifee and McAuley (1998) found that those who perceived themselves as successful in their last attempt to positively change their activity levels tended to make internal, personally controllable, and stable attributions, while those who perceived themselves as unsuccessful tended to make internal, personally controllable, and unstable attributions.

1.2.3 Attribution-consequence relationships

Beyond qualification of attributions along dimensions, the main thrust of Weiner's model of attribution theory is that these dimensions lead to predictable results. While locus of causality and controllability are believed to interact with perceived outcomes in determining emotions, stability is believed to determine expectations regarding future outcomes (Weiner, 1985, 1986). In terms of specific predictions for expectations, it would be posited that one would expect a similar future outcome when an outcome is attributed to a stable cause. On the other hand, if an outcome is attributed to an unstable cause, one cannot be certain whether future outcomes will be similar or different. Future expectations, in turn, are believed to play an important role in determining intentions and future behaviour (Weiner, 1986).

In terms of emotions, both outcomes and attributional dimensions are believed to be important precursors (Weiner, 1985, 1986). People are expected to experience positive emotions following experiences of success and negative emotions following failure. However, the important contribution of attribution theory is the assertion that *how* we explain the outcomes (i.e., attributions), and not just the outcomes themselves, may influence emotional experiences. For example, Weiner (1985) suggested that feelings of pride following an outcome are influenced by locus of causality. Pride is expected when a positive outcome is attributed

internally. Also, guilt and shame are believed to be influenced chiefly by the controllability dimension (Weiner, 1985). Guilt is expected when a negative outcome is seen as caused by something personally controllable, while shame is expected when a negative outcome is caused by a personal attribute about which one can do nothing. Further, all of these emotional responses are believed to influence future decisions and actions (Weiner, 1986).

Weiner's model of attribution theory may provide a useful framework for the examination of people's own explanations (i.e., attributions) of why they are or are not sufficiently active for health benefits. Within his model, people can provide their own causes and then qualify those causes along three dimensions, which Weiner (1985) asserted may be part of lay psychology. Thus, in Weiner's (1986) model we have a framework for examining individual attributions for past outcomes, emotions, future expectations, and motivation.

1.2.4 Self-efficacy

Like attribution theory, self-efficacy is another cognitive theory that uses past experiences, at least in part, to explain possible future behaviour. Self-efficacy involves specific beliefs concerning one's ability to do what is necessary to bring about certain outcomes (Bandura, 1997). Within Bandura's (1986) broader social-cognitive theory, personal elements (e.g., self-efficacy) are believed to both affect and be affected by behaviour and the environment. While task self-efficacy is the form often examined in the activity literature (McAuley & Mihalko, 1998), the one discussed here is self-regulatory efficacy, which involves beliefs about one's ability to successfully manage oneself in specific situations (Ducharme & Brawley, 1995). Such self-efficacy emphasizes an agentic perspective (Bandura, 2001), which assumes that people are active agents, able to control their own thoughts, motivation, and behaviour.

Self-efficacy is influenced by past experiences, observation of others in similar situations, social persuasion, and physiological experiences, with past experiences believed to be the chief source of information used in forming self-efficacy beliefs (Bandura, 1997). For example, individuals who have been sufficiently active in the past would be expected to hold strong beliefs about their ability to maintain sufficient levels in the future, while individuals who have failed many times in their attempts to increase their activity level would likely have little confidence in their ability to be active. In turn, self-efficacy is thought to influence intentions, subsequent behaviour, and persistence in the face of challenges (Bandura, 1986). Bandura (1997) noted that

given that people experience numerous impediments to exercising, self-efficacy may be particularly important for overcoming these impediments, and getting sufficient exercise. Thus, it may not be surprising that self-efficacy has been frequently examined in studies of physical activity (Bauman, Sallis, Dzewaltowski, & Owen, 2002).

1.2.5 Self-efficacy and physical activity

Research has generally supported the connection between self-efficacy and physical activity behaviour (Bauman et al., 2002; McAuley & Blissmer, 2002). Many of the studies examining self-efficacy and physical activity have focused on the outcome of adherence. For example, a number of studies have found that self-efficacy predicted adherence in terms of attendance in exercise classes (e.g., Ducharme & Brawley, 1995; Shields et al., 2006; Woodgate, Brawley, & Weston, 2005). Also, Beets and colleagues (2007) found that self-efficacy to overcome barriers predicted physical activity behaviour among rural high-school girls. Those who tended to believe that they could be active in the face of impediments also tended to report higher levels of physical activity. In addition, Strachan and colleagues (2005) found that self-regulatory efficacy, when combined with self-identity as a runner, predicted running frequency among long-term runners. Those who had strong beliefs in their ability to schedule running tended to also report running more often.

1.2.6 Combining attribution and self-efficacy theories

Although there is an extensive literature detailing many correlates of physical activity, along with a number of models incorporating these correlates, most of the models do not explain substantial variance in physical activity behaviour (Baranowski, Anderson, & Carmack, 1998). For example, in the area of self-efficacy, McAuley and Mihalko (1998) noted that self-efficacy generally predicts only small to moderate amounts of variance in exercise adherence (R^2 range = .04 to .26). In the attribution area, Shields et al. (2006) found that attributions explaining success/failure to adhere in their exercise classes predicted 4% of the variance in participants' subsequent attendance at their exercise classes.

In order to better understand why people are or are not physically active, Baranowski and colleagues (1998) recommended testing theoretical models. Within Bandura's social-cognitive theory (1986), behaviour and cognitions are thought to interact, affecting and being affected by

each other. Thus, behaviour is believed to be purposeful and resulting from choices. As self-efficacy is believed to be chiefly influenced by past behaviour and attributions are used to explain past behaviour, it might be worth considering both attributions for past behaviour and self-efficacy in predicting future intentions and behaviour.

As noted by McAuley and Blissmer (2002), the relationship between attributions and self-efficacy may take two forms. First, and in line with Bandura (1986), self-efficacy beliefs may influence the ways in which people make attributions about their experiences. For example, individuals with low confidence in their ability to schedule exercise may attribute failure to exercise to internal and stable causes (e.g., lack of time management ability). On the other hand, as past experiences are believed to influence self-efficacy, one might expect personal explanations for past experiences, in the form of attributions, to influence self-efficacy. In addition, the relationship between self-efficacy and attributions may actually take both of these forms, in that self-efficacy may influence attributions, which may influence subsequent self-efficacy beliefs (McAuley & Blissmer, 2002). However, within the area of physical activity, researchers have typically considered the relationships as independent, with most of the attention given to the influence of self-efficacy on attributions (McAuley & Blissmer, 2002).

Bandura (1997; 2004) also has stated that self-efficacy may be particularly important for surmounting barriers, noting that in the absence of impediments, everyone can be efficacious. As regular exercise typically involves confronting and getting past numerous barriers, and the influence of self-efficacy may be particularly robust in the face of barriers, researchers may need to pay attention to salient barriers when examining self-efficacy concerning exercise.

While there are studies examining the tenets of Weiner's attribution theory in a physical activity setting (Courneya & McAuley, 1996), as well as studies examining the relationships between attributions, self-efficacy, and other social-cognitive constructs (Ingledeu et al., 1996), none of them involve examining the sufficiency of physical activity for health benefits using a recognized criterion. Most studies in the physical activity area involving attributions and self-efficacy have examined exercise-class attendance (e.g., Shields et al., 2006), attempts to positively change exercise behaviour (Minifee & McAuley, 1998), or aggregated attempts to make positive changes in health behaviours (Ingledeu et al., 1996). If we are interested in better understanding why people are or are not active at a level sufficient for health benefits, it may not

be adequate to study attendance of an exercise class or aggregated attempts to make positive changes in health behaviours.

To know if individuals' activity levels are actually sufficient for health benefits, we need to use a recognized criterion for activity. A minimum level of energy expenditure necessary for health benefits has been established as 3 kilocalories per kilogram of body mass per day (KKD) (Craig, Russell, Cameron, & Beaulieu, 1998). In addition, *Canada's Physical Activity Guide* (Canada, 1998) as endorsed by Health Canada, has set out the minimum level in practical terms. In order to better understand why people are or are not active enough for health benefits, it may similarly be important to include such a recognized criterion.

In an attempt to address these gaps in the literature, four studies examining attributions for health-related physical activity were conducted. The first study involved the examination of several tenets of Weiner's attribution theory (Weiner, 1985, 1986). First, the question of whether participants made attributions regarding objective or subjective outcomes was tested. Next, to better appreciate how people explain the causes of their attempts to be active enough for health benefits, and how these might influence their emotions (which may play a role in influencing subsequent motivation), relationships between outcomes, attributions and emotions were examined. Finally, Weiner's (1986) model suggests that stability of attributions influences future expectations and therefore, subsequent motivation, which has implications for designing interventions to encourage people to become more active. This relationship also was tested in the first study.

Given that attributions explain past experiences, and self-efficacy is believed to be influenced by past experiences, as well as to influence intentions (Bandura, 1986), it is possible that the combination of Weiner's (1986) attribution theory and Bandura's (1997) self-efficacy theory may be useful in understanding health-related physical activity behaviour. In the second study, relationships between success/failure to maintain a level of activity sufficient for health benefits, attributional dimensions and self-efficacy were examined. As intentions are believed to be an important link between cognitions and behaviour (Ajzen, 2002), relationships between success/failure to maintain a level of activity sufficient for health benefits, attributional dimensions, self-efficacy, and intentions were tested in the third study,

As an understanding of how these constructs might work in a causal chain may be useful in building better models of physical activity behaviour, a fourth study was conducted. Two of

the issues addressed in this study are as follows. First, it has been suggested that research involving mediators may be important in improving the understanding of physical activity behaviour (Bauman et al., 2002). Mediators are intervening variables believed to be necessary in order for initial variables to influence subsequent variables (Bauman et al., 2002). It is possible that self-regulatory efficacy might mediate the relationship between attributional dimensions and intentions for exercise behaviour. Second, Bandura (2004) mentioned that self-efficacy may be particularly important in the face of a significant impediment. Thus, it is possible that the influence of self-regulatory efficacy on intention to exercise might be particularly robust when individuals are faced with other activities that compete for their time. As such, the fourth study involved the testing of a model involving self-efficacy as a mediator between attributional dimensions for typical exercise levels and intentions to maintain those levels when faced with a potentially significant impediment, namely, a forthcoming final exam period.

1.2.7 Dissertation Structure

This dissertation contains three separate manuscripts that will be presented separately in the next three chapters. Study 1 will be presented in Chapter 2, Studies 2 and 3 will be presented in Chapter 3, and Study 4 will be presented in Chapter 4. Each of the next three chapters will include an introduction, methods, results, and discussion section. The dissertation will conclude with an overall discussion section.

CHAPTER 2: ATTRIBUTIONS FOR HEALTH-RELATED PHYSICAL ACTIVITY

2.1 Introduction

Studies examining attributions in the physical activity setting typically have used Weiner's (1985; 1986) attributional model. The main premise of the model is that following important outcomes, people automatically search for causes of the outcome. These causes can be described in terms of three dimensions: locus of causality, controllability, and stability. According to Weiner (1986), locus of causality refers to the positioning of the cause as internal or external to the person, controllability refers to whether or not the cause is subject to volitional control, and stability refers to whether the cause changes over time or not. Research on physical activity outcomes has typically found that those who perceive themselves as successful tend to report higher levels of internality, controllability, and stability than those who perceive themselves as failing (Courneya & McAuley, 1993, 1996; McAuley, 1991; Minifie & McAuley, 1998; Shields et al., 2005).

For the most part, these studies have typically involved the examination of attributions associated with activity adherence outcomes such as attendance in an exercise class (Courneya & McAuley, 1996; Shields et al., 2005) or simple physical activity change outcomes (Minifie & McAuley, 1998). However, most have not considered success at being active enough for health benefits as an outcome.

Understanding the attributions that individuals make for being successful/not successful at being active enough for health benefits would appear to be important for several reasons. First, while many adults recognize the importance of being physically active for health (Cameron, Craig, & Paolin, 2004), only 41% of Canadian adults are active enough to obtain optimal health benefits (Craig et al., 2004). Therefore, understanding why people think they are or are not active enough to achieve health benefits becomes important. Attribution theory, which is concerned with the attributional schemata that individuals use in order to make sense of their lives, forms one possible framework with which to investigate this issue.

Second, in much of the previous research examining physical activity there has been an implicit assumption that enhancing health was a motive for being active. While there might be general acceptance of this assumption, it also follows that individuals may be active for reasons other than health (e.g., time with friends). If one is interested in asking individuals why they are or are not active enough for health benefits, ascertaining whether their motives for being active reflect health assumes importance.

Third, the few studies that have examined attributions for physical activity change (Ingledeew et al., 1996; Schoeneman & Curry, 1990) assessed neither whether participants believed themselves to be getting sufficient physical activity to garner health benefits nor if they reported activity levels sufficient for health benefits. As Health Canada provides guidelines for activity levels sufficient for health benefits (*Canada's Physical Activity Guide*; 1998), one wonders whether the relationships found previously in activity settings could be supported with physical activity for health benefits.

In explaining the causes of outcomes, it has been recognized for some time that objective and perceived outcomes are not synonymous with respect to attributions (Spink & Roberts, 1980). This distinction between outcomes (i.e., objective versus perceived) has not gone unnoticed in the physical activity setting where researchers have noted that perceived outcomes may be as relevant as objective outcomes when individuals are engaging in a causal search (Maehr & Nicholls, 1980; Rejeski & Brawley, 1983; Shields et al., 2005). In fact, it has been suggested that perceived outcomes may be more important than objective outcomes when examining social cognitions in an activity setting (Courneya & McAuley, 1996; Shields et al., 2005). For instance, Courneya and McAuley (1996) found that actual exercise class attendance did not improve the prediction of attributional dimensions over that predicted by perceived success in class attendance. Given this distinction, the present study examined the relationships of both perceived and objective outcomes to attributional dimensions.

Within his attributional framework, Weiner (1985; 1986) also identifies the importance of emotions. In his framework, it has been proposed that both outcomes and attributions lead to emotions (e.g., guilt, pride, happiness; Weiner, Russell, & Lerman, 1979), which may influence motivation and future behaviour (Weiner, 1985, 1986). In research examining attributions and emotions within physical activity settings, two important findings have emerged that support this supposition. First, associations between perceived outcome and emotions (i.e., outcome-

dependent affect) have been reported, with successful outcomes associated with more positive emotions (Courneya & McAuley, 1993, 1996; Shields et al., 2005). Second, attribution-dependent affect relationships also have emerged wherein causal dimensions have been associated with emotions after an outcome (Courneya & McAuley, 1993, 1996; Ingledew et al., 1996; McAuley, 1991; McAuley, Poag, Gleason, & Wraith, 1990).

Beyond direct relationships with emotions, Weiner's model (1985; 1986) suggests specific interactions between outcomes and attributional dimensions. For example, attributing success to an internal cause is believed to enhance pride and competence (Weiner, 1986), while attributing failure to an internal cause is believed to decrease these emotions. In an activity setting, Courneya and McAuley (1996) tested interactions between perceived outcome and causal dimensions using aggregated measures of positive and negative affect. They found an interaction between perceived outcome and personal controllability in predicting positive affect. However, the specific interactions mentioned by Weiner (1985; 1986) have not yet been examined in regard to success/failure to be sufficiently active for health benefits.

While attributions have been linked to emotions in previous research, the variance accounted for in emotions by attributions over and above that generated by the outcome is often relatively small (Vlachopoulos, Biddle, & Fox, 1996). One possibility to explain this failure to account for more variance may reside in the fact that emotions in activity studies generally have been collapsed into positive and negative groupings prior to analysis (Courneya & McAuley, 1993, 1996; McAuley, 1991; Shields et al., 2005). Given that Weiner (1985; 1986) has predicted links between attributional dimensions and specific individual emotions, the present study followed the advice of McAuley and Blissmer (2002) and examined how outcomes and attributional dimensions might relate to individual emotions.

Weiner (1985; 1986) also suggested that the stability of a cause will be important in the formation of future behavioural expectancies. His expectancy principle states that changes in expectations of future success following an outcome are influenced by the perceived stability of the cause of the outcome (Weiner, 1985; 1986). He postulates that outcomes attributed to stable causes will be expected to be repeated in the future with a greater degree of certainty than outcomes attributed to unstable causes. In one of the few physical activity studies that have attempted to test Weiner's expectancy principle, Minifee and McAuley (1998) found a significant negative correlation between stability and expected behaviour change among

unsuccessful participants, and a positive correlation between stability and expected behaviour maintenance among successful participants. As Weiner (1985; 1986) mentions a number of constructs pertaining to future expectancies, the intent in this study was to examine the relationship between stability and expectancy using one that had not yet been examined with regard to physical activity for health benefits: certainty of similar future outcomes.

The main purpose of this study was to examine elements of Weiner's (1986; 1985) attributional model within the area of physical activity for health benefits. Although there is little in the extant research examining the relationship between physical activity for health benefits and attributional patterns, hypotheses were formulated using predictions emanating from Weiner's (1986) model as well as empirical findings that flow from the general physical activity literature. First, it was hypothesized that those participants who perceived themselves as successfully meeting *Canada's Physical Activity Guide* recommended activity levels would report higher levels of internality, stability, and personal controllability than those who perceived themselves as unsuccessful. Consistent with Courneya and McAuley (1996), a relationship between objective outcome (i.e., reporting physical activity sufficient for health benefits as defined by Craig, Russell, Cameron, and Beaulieu, 1998) and the attributional dimensions was not expected. In this hypothesis, attributional dimensions served as dependent variables and perceived and objective outcomes served as independent variables.

Second, hypotheses were made concerning both attribution-dependent and outcome-dependent emotions. It was hypothesized that perceptions of success/failure to maintain the recommended activity levels would interact with attributional dimensions to predict emotions consistent with those identified by Weiner (1985; 1986) as attribution dependent. Specifically, it was hypothesized that locus of causality would interact with perceived outcome to predict both competence and pride. Weiner (1985; 1986) suggested that individuals attributing success to more internal causes tend to experience higher levels of competence and pride, and those attributing failure to more internal causes tend to experience diminished self-esteem and pride. It also was hypothesized that personal controllability would interact with perceived outcome to predict both shame and guilt. In terms of shame, and consistent with Weiner (1985; 1986), uncontrollable attributions for failure were expected to lead to increased feelings of shame. For guilt, it was proposed that controllable attributions for failure would lead to increased feelings of guilt (Weiner, 1985; 1986). Beyond these attribution-dependent emotions, it was hypothesized

that perceived outcome alone would predict other emotions consistent with those identified by Weiner (1985; 1986) as outcome dependent (i.e., happy, pleased, depressed, disappointed, and upset). In these hypotheses, individual emotions served as dependent variables and perceived outcome, attributional dimensions, and the interaction terms (perceived outcome X each of the attributional dimensions) served as the independent variables.

Finally, it was hypothesized that outcomes (i.e., perceived success or failure to maintain the recommended physical activity level) attributed to stable causes would be expected to be repeated in the future with a greater degree of certainty than outcomes attributed to unstable causes. In this hypothesis, certainty of similar future outcomes served as the dependent variable and stability served as the independent variable.

2.2 Methods

2.2.1 *Participants and Design*

Participants for this cross-sectional study were 95 undergraduate students enrolled in a Kinesiology course. As the intent of this study was to examine individuals who were physically active for health benefits, participants were presented with a list of common reasons why people are active (i.e., enjoyment, health, social time, appearance, relaxation, energy, other) and asked to identify the three most important to them (see Appendix A). Individuals who did not rate health as one of their top three reasons for being active were deleted from further analyses ($n = 7$). In addition, data from three other participants were not used because they had missing values. This left 85 participants for the subsequent analyses. The mean age of the sample was 20.5 years ($SD = 2.1$) and included 55 females, 24 males, and 6 who did not indicate their sex.

2.2.2 *Procedures*

Approval for the study was obtained from the University Ethics Committee (see Appendix B). Prospective participants were approached during a class period and invited to participate in a study examining how individuals perceive the causes of their physical activity. All present class members (approximately 100) received study materials at the start of the class. Materials included a consent form, a sheet containing physical activity recommendations from *Canada's Physical Activity Guide*, and a battery of measures. Participants who completed an informed consent form were instructed to take as much time as was needed to complete the

questionnaire. In addition to the main constructs under study, general demographic information also was requested. All materials were collected by the author.

2.2.3 Measures

Perceived Outcome. To assess perceived outcome, participants were given recommendations from *Canada's Physical Activity Guide* and asked, "Were you successful __ or unsuccessful __ in maintaining the recommended activity level over the past month?" (see Appendix C).

Attributional Dimensions. The Revised Causal Dimensions Scale (CDSII; (McAuley, Duncan, & Russell, 1992) was used to measure participants' attributions for their success/failure in maintaining the recommended activity level over the past month. The CDSII allows participants to provide their own attribution for an outcome and then code that attribution along four causal dimensions: locus of causality (LOC), personal controllability (PC), external controllability (EC), and stability (ST). The dimension of external controllability was not examined in this study because the purpose was to test hypotheses flowing from Weiner's (1985; 1986) theory and none of these concerned this dimension.

In this study, participants were asked what they thought was the most important reason for their success/failure in maintaining Health Canada's recommended activity levels over the past month (see Appendix D). Using a 9-point Likert scale, participants then rated that reason using 9 items, with 3 items representing each of the dimensions of locus of causality, personal controllability, and stability. Values for each of the dimensions were averaged with higher scores indicating that attributions were more internal, personally controllable, and stable. The three dimensions showed acceptable internal reliability (Cronbach's (1951) alphas – locus of causality = .79; personal controllability =.85; stability =.84). The CDSII has been shown to have acceptable internal consistency and construct validity using similar populations (McAuley et al., 1992).

Certainty. A single item was included assessing certainty of similar future outcomes. Participants were asked, "How certain are you that you will achieve a similar outcome (i.e., successful or unsuccessful) over the next month?" with the outcome referring to that reported in the perceived outcome item (i.e., successful or unsuccessful in maintaining at least the level of

physical activity recommended in *Canada's Physical Activity Guide*). Participants rated their certainty on a scale of 1 ('completely uncertain') to 7 ('completely certain') (see Appendix E).

Objective outcome. The Modifiable Activity Questionnaire (MAQ) was used to assess physical activity levels (see Appendix F). This instrument has been shown to be a reliable and valid measure of self-reported physical activity (Kriska et al., 1990). While the original version assessed activity over 12 months, the version used here assessed leisure activity done for health benefits over four weeks. For each activity listed by a participant on the MAQ, the product of the metabolic cost of the activity (METs), average duration in minutes, and frequency during the four weeks was calculated, and then divided by 28. The values for each activity were summed to yield a total KKD (kcal/kg/day) value for each participant. As 3KKD has been recognized as the minimum level for health benefits for adults (Craig et al., 1998), activity level was dichotomized at 3KKD. In essence, scores were dichotomized to reflect activity sufficient for health benefits ($\geq 3\text{KKD}$) or not ($< 3\text{KKD}$).

Emotions. A measure including nine emotions (i.e., happy, pleased, disappointed, upset, competent, proud, ashamed, depressed, and guilty) representative of those previously identified by Weiner and colleagues (Weiner, 1985, 1986; Weiner et al., 1979) was used to assess emotional reactions (see Appendix G). Participants were asked, "Please indicate the extent to which you experience each of the following emotions as a function of your pattern of activity over the last month?" Each emotion was rated separately on a 9-point scale from 1 ('don't feel at all') to 9 ('feel very much'). Similar versions of this measure have been used in past studies of physical activity and emotion, with emotions collapsed into positive and negative groupings (Courneya & McAuley, 1993, 1996; Shields et al., 2005). However, in the current study emotions were analyzed separately, as recommended by McAuley and Blissmer (2002).

2.2.4 Analytical strategy

To test the first hypothesis, a MANOVA was run with the attributional dimensions of locus of causality, personal controllability, and stability serving as dependent variables and objective and perceived outcomes as the independent variables². The second set of hypotheses examining emotions was separated into attribution-dependent and outcome-dependent analyses.

² As the interaction between objective and perceived outcome was not of interest in examining this first hypothesis, only main effects for each of the outcomes are reported in the results section.

The former of these involved hierarchical regressions predicting four emotions consistent with those identified by Weiner (1985; 1986) as attribution-dependent ('competent', 'proud', 'ashamed', and 'guilty'). In an attempt to represent the sequential ordering of events, perceived outcome was entered first and attributional dimensions were entered second in each of the four regressions. In order to test for interactions, the products of perceived outcome and the three attributional dimensions (centred on each mean) were entered third. For the outcome-dependent analyses, five hierarchical regressions were run predicting emotions consistent with those identified by Weiner (1985; 1986) as outcome-dependent ('happy', 'pleased', 'depressed', 'disappointed', and 'upset'). In each of the five regressions, perceived outcome was entered on the first step, attributional dimensions on the second, and the products of perceived outcome and the three attributional dimensions (centred) on the third. In an effort to reduce family-wise error, a Bonferroni correction was used with this set of hypotheses examining emotions ($.05/9 = .006$). The third hypothesis was tested using an ANOVA with certainty of similar future outcome as the dependent variable and stability – dichotomized into 'stable' and 'unstable' at the midpoint – as the independent variable.

2.3 Results

2.3.1 Descriptives

Of the 85 participants, 65 rated themselves successful in meeting the recommended activity levels, while 20 rated themselves unsuccessful in doing so. In terms of objective outcome, 68 participants (80% of the sample) reported activity levels of 3KKD or more, while 17 (20%) reported levels under 3KKD. Concerning the entire sample, the mean score for certainty of similar future outcomes was above the midpoint, suggesting a moderately high degree of certainty. Average scores for emotions suggested high levels of positive emotions and low levels of negative emotions. Means for the 'successful' group suggested high levels of positive emotions, low levels of negative emotions, and a high degree of certainty of similar future outcomes. Means for the 'unsuccessful' group suggested, in general, moderate levels of all emotions, and a low degree of certainty of similar future outcomes. Descriptives for all variables are included in Table 2.1. Correlations between all variables are included in Appendix H. While correlations between perceived outcome, physical activity, and attributional dimensions are mostly between .2 and .5, those between emotions were higher (i.e., correlations ranging up to .87).

2.3.2 Main Analyses

Consistent with the first hypothesis, perceived outcome significantly discriminated the three attributional dimensions, $F(3, 79) = 11.1, p < .001$. Univariate tests revealed significant differences between successful and unsuccessful groups on all three dimensions: locus of causality, $F(1, 81) = 13.4, p < .001$, personal controllability, $F(1, 81) = 4.0, p < .05$, and stability, $F(1, 81) = 31.2, p < .001$. Means indicated that participants who viewed themselves as successful tended to attribute the cause of that outcome to higher levels of internality, personal controllability, and stability than those who viewed themselves as unsuccessful in meeting the recommended activity levels. As expected, the results revealed that objective outcome did not significantly predict the three attributional dimensions, $F(3, 79) = 1.7, p > .05$.

In terms of the second set of hypotheses, perceived outcome significantly predicted the positive emotions of competence, $F(1, 83) = 22.2, p < .001$, and pride, $F(1, 83) = 40.2, p < .001$, with successful participants tending to feel more competent and proud than unsuccessful participants (see Table 2.2). For the sake of clarity, only steps that have significant results will be reported in the Tables in this dissertation. Perceived outcome also predicted the negative emotions of shame, $F(1, 83) = 12.6, p < .006$, and guilt, $F(1, 83) = 22.6, p < .001$, with participants who perceived themselves as unsuccessful in meeting the recommended physical activity guidelines reporting feeling more ashamed and guilty than successful participants (see Table 2.2). The addition of attributional dimensions at Step 2 significantly improved the predictions of competence. The explained variance increased from 21% to 33% for competence, $F_{change}(3, 80) = 4.7, p < .006$, and from 33% to 46% for pride, $F_{change}(3, 80) = 6.3, p < .001$. In both cases, personal controllability was the only significant attributional dimension. The standardized betas suggested that those reporting higher levels of personal controllability also reported higher levels of competence and pride. On the other hand, the addition of attributional dimensions at Step 2 did not improve the predictions of shame and guilt. Also, contrary to the hypotheses, adding the interaction terms at Step 3 did not improve the predictions for any of the four attribution-dependent emotions.

Table 2.1. **Attribution, KKD, and Emotion Means by Perceived Outcome**

	Total (<i>n</i> = 85) Mean (SD)	'Successful' (<i>n</i> = 65) Mean (SD)	'Unsuccessful' (<i>n</i> = 20) Mean (SD)
Locus	6.5 (1.8)	6.9 (1.7)	5.3 (1.5)
Personal controllability	7.1 (1.6)	7.3 (1.5)	6.4 (1.6)
Stability	4.7 (2.2)	5.5 (1.9)	2.0 (0.7)
KKD	6.0 (4.2)	7.0 (4.3)	3.1 (2.0)
'certainty'	5.0 (2.0)	5.8 (1.4)	2.6 (1.5)
'happy'	7.1 (1.7)	7.6 (1.2)	5.8 (2.2)
'pleased'	6.8 (2.0)	7.5 (1.3)	4.7 (2.4)
'disappointed'	3.4 (2.4)	2.8 (1.9)	5.5 (2.8)
'upset'	2.8 (2.0)	2.3 (1.7)	4.3 (2.3)
'competent'	7.2 (1.6)	7.6 (1.2)	5.9 (2.1)
'proud'	6.4 (2.2)	7.2 (1.7)	4.2 (2.3)
'ashamed'	2.7 (2.1)	2.3 (1.8)	4.1 (2.5)
'depressed'	2.4 (1.8)	2.1 (1.5)	3.4 (2.1)
'guilty'	3.3 (2.4)	2.7 (1.9)	5.3 (2.7)

Table 2.2. **Summary of Results for Attribution-dependent Emotion Regressions**

	R ²	R ² change	Sig. F change	Sig. model F	Standardized Betas (sig.)
‘competent’					
Step 1 perceived outcome	0.21	0.21	.000	.000	0.46 (.000)
Step 2 perceived outcome	0.33	0.12	.005	.000	0.42 (.001)
LOC					-0.15 (.301)
PC					0.44 (.001)
Stability					-0.004 (.980)
‘proud’					
Step 1 perceived outcome	0.33	0.33	.000	.000	0.57 (.000)
Step 2 perceived outcome	0.46	0.13	.001	.000	0.42 (.000)
LOC					-0.16 (.231)
PC					0.37 (.002)
Stability					0.19 (.184)
‘ashamed’					
Step 1 perceived outcome	0.13	0.13	.001	.001	-0.36 (.001)
‘guilty’					
Step 1 perceived outcome	0.21	0.21	.000	.000	-0.46 (.000)

In terms of outcome-dependent emotions, perceived outcome significantly predicted all five emotions (see Table 2.3). First, in terms of the positive emotions, perceived outcome significantly predicted perceptions of happiness, $F(1, 83) = 22.9, p < .001$, and feeling pleased, $F(1, 83) = 46.4, p < .001$, with successful participants reporting feeling happier and more pleased with their activity levels than unsuccessful participants. In terms of the three negative emotions, perceived outcome significantly predicted all three – feeling depressed, $F(1, 83) = 9.0, p < .006$, feeling disappointed, $F(1, 83) = 23.4, p < .001$, and feeling upset, $F(1, 83) = 17.5, p < .001$. In terms of direction, those who perceived themselves as unsuccessful in meeting the recommended physical activity level tended to report higher levels of depression, disappointment, and upset as a function of their activity levels than those perceiving themselves as successful. The addition of attributional dimensions on the second step and the interaction terms on the third step did not significantly improve the predictions for any of the outcome-dependent emotions.

Results for the final hypothesis examining certainty of similar future outcomes revealed a significant main effect for stability, $F(1, 74) = 35.6, p < .001$. Means indicated that participants who rated the cause of their outcome as stable also tended to report more certainty regarding similar future outcomes ($M = 6.1$) than those who rated the cause of their outcome as unstable ($M = 3.8$).

Table 2.3. **Summary of Results for Outcome-dependent Emotion Regressions**

	R ²	R ² change	Sig. F change	Sig. model F	Standardized Betas (sig.)
‘happy’ Step 1 perceived outcome	0.22	0.22	.000	.000	0.47 (.000)
‘pleased’ Step 1 perceived outcome	0.36	0.36	.000	.000	0.60 (.000)
‘depressed’ Step 1 perceived outcome	0.10	0.10	.004	.004	-0.31 (.004)
‘disappointed’ Step 1 perceived outcome	0.22	0.22	.000	.000	-0.47 (.000)
‘upset’ Step 1 perceived outcome	0.17	0.17	.000	.000	-0.42 (.000)

2.4 Discussion

The results of this study provide support for several relationships specified in Weiner's model of attribution theory (1985; 1986) as applied to the health-related physical activity context. The results supported relationships between perceived outcome and attributional dimensions, perceived outcome and emotions, as well as stability and certainty of similar future outcomes. However, Weiner's (1985; 1986) specified relationships between attributional dimensions and individual emotions were largely unsupported by these results.

In support of the first hypothesis, objective outcome did not significantly differentiate attributional dimensions. This supports previous findings with exercise class participants (Courneya & McAuley, 1996). As noted by Courneya and McAuley (1996), the fact that perceived and objective outcomes are often somewhat different suggests factors other than objective success/failure play a role in individuals' judgements regarding their perceived success/failure.

Also consistent with the first hypothesis, participants who perceived themselves as successfully maintaining *Canada's Physical Activity Guide* recommended activity levels reported higher levels of internality, personal controllability, and stability than those who perceived themselves as unsuccessful. This extends the findings of Courneya and McAuley (1996), Shields et al. (2005), and Ingledew et al. (1996), who examined attributions as they related to either exercise class attendance or change in health behaviour, to perceptions of success/failure in being active enough to achieve health benefits.

The attributional pattern that emerged in this study deserves comment. Specifically, while successful participants tended to report significantly more internal, personally controllable, and stable attributions than unsuccessful participants, it is noteworthy that only in the dimension of stability were the mean values decidedly on different sides of the scale midpoint. Specifically, the attributions for both successful and unsuccessful groups tended to reflect internality and personal controllability, whereas the attributions reported by the successful group tended to be stable while those reported by the unsuccessful group tended to be unstable. These results appear to support the *personal changeability* pattern identified in earlier literature (Anderson, 1983; Schoeneman & Curry, 1990), which involves making internal, personally controllable, and stable attributions for success, and internal, personally controllable, but unstable attributions for

failure (Schoeneman & Curry, 1990). In terms of future outcomes, it is a particularly optimistic pattern as it emphasizes personal responsibility for outcomes and the reversibility of failure.

While the identification of attributional patterns as personally changeable is interesting, the more important question in the health-related physical activity area is whether or not particular attributional patterns for failure are associated with more positive future outcomes. Although personally changeable attributional patterns for failure appear optimistic, other attributional patterns may be equally facilitative of future success. For example, researchers in other areas suggest that those who tend to make self-serving attributions (i.e., externalizing blame for failure or internalizing responsibility for success) may perform better on academic and athletic tasks than those who do not (Peterson & Barrett, 1987; Seligman, Nolen-Hoerksma, Thornton, & Thornton, 1990). As this has not been studied in the health-related activity area, there is a need to conduct prospective studies (McAuley & Blissmer, 2002) that examine the question of whether or not different attributional patterns (e.g., personal changeability versus self-serving) for past physical activity levels have implications for subsequent levels of activity.

In terms of emotions, it was expected that perceived outcome and attributional dimensions would interact to predict attribution-dependent emotions. The proposed outcome-attribution interactions specified by Weiner (1985; 1986) were unsupported in this study. However, results showed a main effect for perceived outcome that revealed that the unsuccessful group tended to report less competence and pride than the successful group. Results also showed a main effect for attributional dimensions that revealed more feelings of competence and pride as personal controllability increased, regardless of perceived outcome.

Combining these findings, it is not unreasonable to think that individuals who perceive themselves as unsuccessful in maintaining sufficient activity, but see the cause of the failure as more personally controllable, could be expected to experience more competence than those who see the cause of the failure as personally uncontrollable. Indeed, this may relate to the personal changeability pattern mentioned above, which emphasizes responsibility for all outcomes and the reversibility of failure. In the case of failure, if we see the cause as under our control and unstable, we may still feel competent as well as optimistic about future outcomes. Our results suggest a similar pattern for pride. While unsuccessful participants reported less pride than successful participants, all participants tended to report higher levels of pride from their activity levels when they attributed the outcome to factors reflecting higher levels of personal

controllability. Nonetheless, these findings seem less intuitive than those predicted from Weiner's (1986) model.

Although Weiner's (1986) model suggests that locus of causality should predict pride and other self-esteem-related emotions, personal controllability was the only significant attributional dimension to emerge in our results. Previous research in exercise and sport settings has pointed to controllability as possibly being the most important dimension affecting emotions (Courneya & McAuley, 1996; Ingledew et al., 1996; McAuley, 1991). For example, Courneya and McAuley (1996) found only one significant interaction involving affect, and that was between perceived outcome and personal controllability in predicting positive affect. More recently, Rees, Ingledew, and Hardy (2005) suggested that controllability may be the key dimension in causal thinking about sport outcomes. It is possible that this is also the case with physical activity for health benefits.

Although Weiner (1985; 1986) states that controllable attributions for failure should be associated with feelings of guilt while uncontrollable attributions for failure should be associated with feelings of shame, neither relationship emerged in the current study. Furthermore, the interactions between perceived outcome and attributional dimensions did not have any significant effect on any of the attribution-dependent emotions. Some possible explanations for the lack of support for Weiner's (1985; 1986) hypothesized relationships in the results are as follows.

First, a number of factors may have led to low power in the current analyses surrounding emotions. Courneya and McAuley (1996) noted that multiple regression involving multiplicative interaction terms may suffer from low power, and therefore opted to employ ANOVA in their analysis. However, using ANOVA for the emotion hypotheses would have called for analyses with a 2 (success/failure) by 6 (internal/external locus of causality, high/low personal controllability, stable/unstable) matrix. With 12 cells to fill and a limited sample size, empty cells were anticipated. As such, regression was chosen instead, with the acknowledgement of the risk of low power. In addition, as Weiner (1985) notes, while his specified relationships between outcomes, attributional dimensions, and emotions are dominant in our culture, they are not invariant. One might need to increase the size of a sample more in order to adequately test for these relationships.

Second, given that all the participants stated that benefit to health was an important motive for them to be active, it is possible that their perceptions of success/failure to maintain the recommended physical activity levels may have overridden the impact of attributional dimensions on emotions. That is, these emotions may have been more outcome-dependent than attribution-dependent for our participants, suggesting a direct relationship of outcomes to emotions that is not mediated by attributional dimensions. This fits with previous physical activity researchers who have suggested that perceptions of success may be more important influences on emotions than attributions (Vlachopoulos et al., 1996).

Third, as suggested by others (Graham et al., 2002), it also is possible that attributions may be weak predictors of emotions. This study investigated the relationships between attributional dimensions and individual emotions in an effort to maximize sensitivity to these relationships. Although adding attributional dimensions to the models significantly improved the prediction of both competence and pride, the results did not support the predicted relationships. As such, while the results suggest that attributional dimensions may, in some cases, be strong direct predictors of emotions, the findings also may suggest that relationships specified by Weiner (1985; 1986) between attributional dimensions and emotions are weak even when tested with individual emotions. As this is the first study of Weiner's (1985; 1986) proposed relationships between outcomes, attributional dimensions, and individual emotions when examining success/failure to maintain physical activity sufficient for health benefits, additional research is needed to test these relationships.

In contrast to the findings with attribution-dependent emotions, results supported Weiner's (1985; 1986) specified relationships concerning outcome-dependent emotions. The results suggested that perceived outcomes are associated with outcome-dependent emotions. This extends the findings of Shields et al. (2005) beyond aggregated positive/negative emotions for health-motivated activity. As per the suggestions of McAuley and Blissmer (2002), individual emotions were tested separately and perceived outcome predicted each of them. Attributional dimensions did not improve any of the models. This supports Weiner's (1986) contention that outcome-dependent emotions are attribution-independent.

The current results also supported the final hypothesis that outcomes attributed to stable causes would be anticipated to be repeated with greater certainty than those attributed to unstable causes. While Courneya and McAuley (1996) did not find the expected interaction between

outcome and stability, they operationalized outcome differently from what was done in this study. Weiner (1986) specifies his expectancy principle using a variety of constructs, including expectancy of success as used in the Courneya and McAuley (1996) study and certainty of similar future outcomes, as used in this study. Weiner's (1986) third corollary suggests that stability will directly predict certainty of similar future outcomes, which takes previous outcome into account. This study may be the first to investigate the relationship between stability of causes and certainty of similar future outcomes using health-motivated activity sufficient for health benefits. Future research is needed to address the question of whether different operationalizations of Weiner's (1985; 1986) expectancy principle ought to be considered equivalent.

While the present study provided insight into relationships specified in Weiner's model of attribution theory (1985; 1986) among those who are active for health benefits, its limitations should be recognized. First, participants in this study were primarily young, active students in a Kinesiology course. While the percentage of individuals in this sample attaining activity levels sufficient for health benefits (i.e., $\geq 3\text{KKD}$) was higher than that typically reported for Canadian adults (80% versus 41%), this may reflect both the fact that this was a sample of young adults where activity levels are typically higher (58% of Canadians aged 18-24 are sufficiently active; Craig et al., 2004), as well as the fact that participants were enrolled in a Kinesiology course, which carries an expectation of interest and involvement in physical activity. Given the uniqueness of this sample, future research should investigate these relationships in samples representative of the general population.

Second, there may have been insufficient power for the multiple regressions used to test emotion relationships. Future research should include larger samples in order to provide more sensitivity to interactions.

Finally, correlations between emotions approached .90 in some instances.. As Weiner's (1985; 1986) model specifies relationships concerning individual emotions, the aim in this study was to test these individual relationships. However, the high correlations that emerged suggest that participants may not have discriminated between emotions, and as such, that some of these could be aggregated in future research. Future researchers might consider testing a smaller number of relationships or using different measures of emotions.

Despite its limitations, the current study had a number of strengths. First, while previous investigations of Weiner's model (1985; 1986) of attribution theory have been conducted in the area of physical activity, to our knowledge none have done so with physical activity sufficient for health benefits using an established set of guidelines (e.g., *Canada's Physical Activity Guide*) as the outcome. As researchers and practitioners are often concerned with activity for health benefits and helping people gain those benefits, this may be considered an important advance. In addition, as Weiner (1986) suggests that attributional searches occur when the outcome is important to the individual, health benefits were important reasons for physical activity among all our participants.

Second, this study is one of the first to investigate how perceived outcome and attributional dimensions relate to individual emotions as suggested by McAuley and Blissmer (2002). This is an important step in testing Weiner's (1986) model applied to physical activity for health benefits.

Third, while previous research in the exercise domain has examined relationships between attributional dimensions and expectations of future success, the current study may be the first to directly investigate the connection between stability of cause and certainty of similar future outcomes regarding physical activity for health benefits. Future studies in this area should similarly frame questions concerning future expectations around Weiner's (1985; 1986) expectancy principle and corollaries.

Finally, the current study found that attributional dimensions varied depending upon perceived outcome in maintaining the recommended level of physical activity among those who were active for health reasons. While the results support a *personally changeable* pattern for failure, which appears hopeful for more successful outcomes in the future, research has not yet shown whether personally changeable attributions for failure lead to more successful future outcomes than other attributional patterns. Future research should address this.

While this study presented a test of the applicability of Weiner's (1986) model of attribution theory, some (Baranowski et al., 1998) have suggested that testing theoretical models may yield a better understanding of physical activity behaviour. In an effort to address this suggestion, two studies were conducted examining attributions, self-efficacy, and intention concerning health-related physical activity.

CHAPTER 3: SELF-EFFICACY, ATTRIBUTIONS, AND INTENTIONS FOR HEALTH-RELATED PHYSICAL ACTIVITY

3.1 Introduction

While there is general agreement that physical activity is important for physical health, most adults are not active enough to gain the benefits (Craig et al., 2004). This latter fact has not gone unnoticed by researchers who have attempted to address the issue by designing and testing an array of physical activity interventions. One construct that has featured prominently in physical activity interventions is self-efficacy (McAuley & Blissmer, 2002), which is defined as an individual's beliefs concerning his/her ability to do what is necessary to produce certain outcomes (Bandura, 1997). A large body of research literature suggests that self-efficacy may play a pivotal role in affecting behaviour both directly and indirectly through a variety of other cognitive variables (Bandura, 2001).

Despite well-established associations between constructs like self-efficacy and physical activity (Bauman et al., 2002), overall, the results of research on physical activity behaviour have been less than encouraging as attempts to explain it generally predict less than a third of the variance, and interventions aimed at changing physical activity behaviour often have little or no effect (Baranowski et al., 1998). In order to improve our understanding of physical activity behaviour, Baranowski and colleagues (1998) have recommended conducting basic behavioural research. Testing basic constructs from different models may result in finding better targets for interventions. In this vein, research into both the determinants and effects of self-efficacy in the area of health-related physical activity may benefit by including constructs from other models.

Past experiences, observation of other persons, social persuasion, and physiological experiences are all believed to be important sources of self-efficacy information, with past experiences/behaviour featuring prominently (Bandura, 1997). Research has supported the role of self-efficacy as an outcome of past exercise behaviour (McAuley & Courneya, 1992; McAuley, Courneya, & Lettunich, 1991). Given the importance of self-referent thought in the formulation of self-efficacy beliefs (Bandura, 1986), it is not unreasonable to question whether it

is past experiences or the ways in which individuals think about their past experiences (i.e., attributions) that most influence self-efficacy.

Attribution theory provides a useful framework for examining how individuals explain why they are successful or unsuccessful in their actions. Weiner's (1986) model of attribution theory suggests that following important outcomes, individuals seek causes (i.e., attributions) to explain the outcomes they have experienced. Weiner argued that these attributions are the variables to consider when an understanding of motivation is being sought.

While identification of these attributional causes was deemed important, it was further argued by Weiner (1986) that the underlying dimensions of the causes, conceptualized in terms of the dimensions of locus of causality, controllability, and stability, were the key factors influencing emotions, motivation, and expectations of future outcomes. Research in the physical activity area has provided some support for Weiner's model (Courneya & McAuley, 1993, 1996; Shields et al., 2005). In addition, researchers looking at exercise and other health behaviours have found relationships between attributions and self-efficacy (Ingledeew et al., 1996; McAuley, 1991; Shields et al., 2006). However, as noted by McAuley and Blissmer (2002), more studies have examined the effects of self-efficacy on attributions than the reverse relationship.

Social cognitive theories, including both attribution and self-efficacy, assume that past behaviour has an impact upon future intentions, although the direct impact of past behaviour on intentions is often untested. However, in a recent study, Brickell and colleagues (2006) found a significant correlation ($r = .70$) between past sport and exercise behaviour and intentions. In addition, Armitage (2005) found that past attendance at a gym significantly improved the prediction of future intention to be regularly active measured at follow-up over that predicted by intention measured at baseline.

Similarly, social cognitive theory assumes that self-efficacy influences future behavioural intentions (Bandura, 1986) and Weiner's (1986) attribution theory assumes that attributions influence future motivation. While the relationship between self-efficacy and intention is well-established in the area of physical activity (Ducharme & Brawley, 1995; McAuley & Mihalko, 1998; Rodgers & Brawley, 1996), research involving attributions or both self-efficacy and attributions predicting intentions has been sparse. Nonetheless, some research in the exercise area has supported these relationships as well (Shields et al., 2006).

As noted above, the relationships among constructs from both self-efficacy theory and attribution theory have received some support in previous studies of exercise. However, the behaviours of interest in these studies were usually either adherence to prescribed activity programs or exercise frequency, with this typically occurring in structured exercise settings. As physical activity outside of structured exercise programs and sports also contributes to health benefits, one wonders if the expected relationships would be supported if the behaviours encompassed daily living activities chosen for health benefits. Specifically, what relationships would emerge if past behaviour, attributions, self-efficacy, and intention to be active concerned participants' success/failure to maintain a level of physical activity in their daily living sufficient for health benefits?

In order to address this, two studies were conducted. The purpose of the first study (i.e., Study 2 as it relates to the sequencing in this dissertation) was to examine the relationships among success/failure to maintain a level of physical activity sufficient for health benefits (i.e., past behaviour), attributional dimensions and self-efficacy. The behaviour of interest in this study was maintaining a level of physical activity sufficient for health benefits as defined by *Canada's Physical Activity Guide* (Canada, 1998). First, it was hypothesized that past physical activity behaviour, dichotomized to reflect success/failure to maintain a level of physical activity sufficient for health benefits (Craig et al., 1998), would significantly predict self-regulatory efficacy to maintain at least the level of physical activity recommended in *Canada's Physical Activity Guide* over the next month where self-regulatory efficacy involves confidence in one's ability to do what is necessary to schedule an activity (Ducharme & Brawley, 1995).

Second, it was hypothesized that attributional dimensions for perceived success/failure to maintain at least the level of physical activity recommended in *Canada's Physical Activity Guide* would significantly improve the prediction of self-regulatory efficacy to maintain the recommended activity level over the next month beyond that of past physical activity alone. In these hypotheses, self-regulatory efficacy served as the dependent variable and past physical activity behaviour and attributional dimensions served as the independent variables.

The purpose of the second study (i.e., Study 3 as sequenced in this dissertation) was to examine the relationships between health-motivated physical activity, attributions, self-efficacy, and intention. First, it was hypothesized that past physical activity, once again dichotomized to reflect success/failure to maintain a level sufficient for health benefits (Craig et al., 1998), would

significantly predict intention to maintain a level of physical activity ‘sufficient for health benefits’ over the next month. Second, it was hypothesized that attributional dimensions for perceived success/failure to maintain a level of physical activity ‘sufficient for health benefits’ would improve the prediction of intention to do the same beyond that of past physical activity alone. Finally, it was hypothesized that confidence in one’s ability to schedule physical activity sufficient for health benefits (i.e., self-regulatory efficacy) over the next month would significantly improve the prediction of intention to do the same amount of activity over that predicted by attributional dimensions and past physical activity. In these hypotheses, intention served as the dependent variable and past physical activity, attributional dimensions, and self-regulatory efficacy served as the independent variables.

One important difference between these two studies that should be noted concerns the behaviour about which individuals made attributions. In Study 3, individuals made attributions about ‘physical activity sufficient for health benefits’ (i.e., it was left to the individual participants to define what level of activity was necessary for health benefits). This contrasts with Study 2 where attributions were made about success/failure to maintain a level of activity sufficient for health benefits as defined externally (i.e., by recommendations outlined in *Canada’s Physical Activity Guide*).

3.2 Study 2

Methods

3.2.1 Participants and Design

Participants for this cross-sectional descriptive study were 95 students from an undergraduate Kinesiology course. In order to ensure that all participants were physically active for health reasons, participants were presented with a list of reasons why people are active (enjoyment, health, social time, appearance, relaxation, energy, and other) and asked to identify the three most important to them (see Appendix A). Seven individuals did not rate health as one of their top three reasons for physical activity, and as such, were deleted from further analyses. In addition, data from three others were not used because they had missing values. This resulted in 85 participants ($M_{\text{age}} = 20.5$ years; $SD = 2.1$) for the subsequent analyses. The sample included 55 females, 24 males, and 6 who did not declare their sex.

3.2.2 Procedures

Approval for the study was obtained from the University Ethics Committee (see Appendix B). After receiving permission from the class instructor, prospective participants were approached during a class period by the author and invited to participate in a study examining how active individuals perceive the causes of their physical activity. All present class members (approximately 100) received study materials at the start of the class and completed them at that time. Materials included a consent form, demographic items, a statement of recommendations for physical activity from *Canada's Physical Activity Guide*, and the battery of measures. Individuals who completed the consent form handed in their completed materials when they were finished.

3.2.3 Measures

Physical activity. The Modifiable Activity Questionnaire (MAQ) was used to assess physical activity levels. It has been shown to be a reliable and valid measure of self-reported physical activity (Kriska et al., 1990). While the original version assessed leisure and occupational activity over 12 months, the version used here assessed leisure activity done for health benefits over four weeks. Individuals listed all the activities done (at least partially) for health benefits over the last month (see Appendix F). For each activity listed by a participant, the product of the metabolic cost (METs), average duration in minutes, and frequency during the past four weeks was calculated, and then divided by 28. The values for each activity were summed to yield a total KKD (kcal/kg/day) value for each participant. Finally, as 3KKD has been recognized as the minimum energy expenditure level for health benefits in adults (Craig et al., 1998), activity level was dichotomized at 3KKD in order to reflect activity sufficient for health benefits ($\geq 3\text{KKD}$) or not ($< 3\text{KKD}$).

Attributional Dimensions. Participants were given the guidelines for achieving the physical activity level recommended in *Canada's Physical Activity Guide* (Canada, 1998) and were asked to report whether they had been successful or unsuccessful in maintaining the recommended level of physical activity over the past month (see Appendix C). The Revised Causal Dimensions Scale (CDSII; McAuley et al., 1992) was used to measure participants' attributions for their success/failure in maintaining the recommended activity level over the past

month (see Appendix D). The CDSII has been shown to have acceptable internal consistency and construct validity using similar populations (McAuley et al., 1992).

The CDSII allows participants to provide their own attribution for an outcome and then code that attribution along four causal dimensions. Only three of these were used in the current study: locus of causality (LOC), personal controllability (PC), and stability (ST). As the relationship of external controllability to self-regulatory efficacy was not of interest in this study, it was not included. Participants were asked what they thought was the most important reason for their success/failure in maintaining the recommended activity level over the past month. Using a 9-point Likert scale, participants then coded that reason using 9 items, with 3 items representing each of the three dimensions (LOC, PC, and ST). Values for each of the dimensions were averaged with higher scores indicating that attributions were more internal, personally controllable, and stable. The dimensions showed acceptable internal reliability (Cronbach's (1951) alphas – locus of causality = .79; personal controllability = .85; stability = .84).

Self-regulatory efficacy. Participants responded to four questions assessing self-regulatory efficacy (see Appendix I). These questions were adapted from those used in previous research (Shields et al., 2005). While the questions used in the Shields and colleagues (2005) study concerned one's efficacy in attending an exercise class, the questions in the present study were changed to reflect confidence in one's ability to schedule physical activity into daily life that met or exceeded the level recommended in *Canada's Physical Activity Guide* over the next month. For example, one question asked participants how sure they were that they would be able to fit in physical activity at or above the recommended level every week for the next month. Participants responded on an 11-point percentage scale (0% → 100%). Internal reliability was acceptable ($\alpha = .93$). Scores on the four items were averaged and scaled to provide scores between 0 and 10.

3.2.4 Analytical Strategy

To test the hypotheses that (1) past physical activity would predict self-regulatory efficacy and that (2) attributional dimensions would predict self-regulatory efficacy beyond that predicted by past physical activity, a hierarchical regression was run with success/failure to maintain an activity level sufficient for health benefits ($\geq / < 3\text{KKD}$) entered on the first step and

the three attributional dimensions (locus, personal controllability, and stability) entered on the second step to predict self-regulatory efficacy.

3.3 Results

3.3.1 Descriptives

Descriptive statistics for all measured variables are included in Table 3.1. Participants reported an average of 6.0 KKD, suggesting a very active sample. Sixty-eight participants (80%) reported activity levels sufficient for health benefits (i.e., ≥ 3 KKD), while seventeen (20%) reported levels below the criterion. The average energy expenditures within these groups were 7.1KKD and 1.9KKD, respectively. Average attributional dimension scores suggested that participants tended to make internal, controllable, and slightly unstable attributions for their perceived success/failure to meet the recommended physical activity level. The average self-efficacy score suggested strong self-efficacy to schedule physical activity at or above the recommended level over the forthcoming month.

3.3.2 Main Analyses

The results from the hierarchical regression revealed that past physical activity predicted self-regulatory efficacy at Step 1, $F(1, 83) = 7.5, p < .01$, with success/failure to be active at a level sufficient for health benefits predicting 8% of the variance in self-regulatory efficacy. The standardized beta coefficient suggested that those who reported being active enough to attain health benefits (i.e., ≥ 3 KKD) also reported greater self-regulatory efficacy than those who reported activity levels insufficient for optimal health benefits (i.e., < 3 KKD). At Step 2, attributional dimensions significantly improved the prediction of self-regulatory efficacy over that of past physical activity, $F_{\text{change}}(3, 80) = 7.1, p < .001$, with explained variance increasing from 8% to 28%. The final model was significant, $F(4, 80) = 7.6, p < .001$. In terms of individual relationships in the final model, the standardized beta coefficients suggested relationships between two of the attributional dimensions and self-efficacy with higher personal controllability and stability being associated with higher self-regulatory efficacy (see Table 3.2)³.

³ To determine if the effect of attributions on self-regulatory efficacy depended upon success/failure to maintain activity sufficient for health benefits, the regressions were re-run with interaction terms (sufficiency of physical activity X attributions) included at Step 3. The addition of the interaction terms was not significant $F_{\text{change}}(3, 77) = 1.9, p > .10$.

Table 3.1. Attribution, Self-efficacy and KKD Means for Study 2 (n=85)

	Mean (SD)
Locus	6.5 (1.8)
Personal controllability	7.1 (1.6)
Stability	4.7 (2.2)
Self-regulatory efficacy	7.5 (1.8)
KKD	6.0 (4.2)

Table 3.2. Summary of Results for Self-regulatory Efficacy Regression in Study 2

	R ²	R ² change	Sig. F change	Sig. model F	Standardized Betas (sig.)
Self-regulatory Efficacy (n=85)					
Step 1	0.08	0.08	.008	.008	
physical activity					0.29 (.008)
Step 2	0.28	0.19 ⁴	.000	.000	
physical activity					0.13 (.251)
locus					-0.19 (.225)
personal controllability					0.28 (.046)
stability					0.40 (.007)

⁴ Rounding error accounts for discrepancies between R² change and R².

Another study was conducted to replicate as well as extend the findings of Study 2. Similar to Study 2, Study 3 assessed past physical activity, attributional dimensions and self-efficacy. However, it also included a measure of intention. A further extension in Study 3 included a change to the activity behaviour of interest. The behaviour of interest in Study 2 involved the maintenance of at least the activity level recommended by Canada's Physical Activity Guide. The behaviour of interest in Study 3 was changed to reflect the maintenance of a level of physical activity sufficient for health benefits as defined by the participant. Given that over half of Canadians aged 18-24 do not know the minimum amount of activity required for health benefits (Cameron et al., 2004), it was deemed important to examine models both where published criteria are and are not provided to participants.

3.4 Study 3

Methods

3.4.1 Participants and Design

Participants for this cross-sectional descriptive study were drawn from an undergraduate Health Studies course (N = 83). Similar to Study 2, participants were presented with a list of reasons why people are active (enjoyment, health, social time, appearance, relaxation, energy, and other) and asked to rank the three most important to them. Eight individuals did not rate health as one of their top three reasons for physical activity and, as such, their data were omitted in subsequent analyses. In addition, data from three other participants were not used because of missing values. This resulted in a sample of 72 participants for the subsequent analyses with a mean age of 20.6 years ($SD = 2.3$). The sample included 46 females and 26 males.

3.4.2 Procedures

Approval for the study was obtained from the University Ethics Committee (see Appendix B). After receiving permission from the class instructor, prospective participants were approached during a class period by the author and invited to participate in a study examining how individuals perceive the causes of their physical activity. All present class members (approximately 85) received study materials at the start of the class and completed them at that time. Materials included a consent form, demographic items, and the battery of measures. Members who provided consent completed the inventories during the class period.

3.4.3 Measures

Physical activity. The Modifiable Activity Questionnaire (MAQ) was used to assess physical activity levels (see Appendix F). Energy expenditure values, in the form of KKD, were calculated for each participant in the same manner as that described in Study 2. Similar to Study 2, values were dichotomized into success (i.e., ≥ 3 KKD) or failure (i.e., < 3 KKD) to maintain a level of activity sufficient for health benefits.

Attributional Dimensions. After completing the MAQ, participants were asked whether they had been successful or unsuccessful in maintaining a level of physical activity sufficient for health benefits over the past month (see Appendix J). This differed from Study 2 where participants were provided with guidelines (i.e., Canada's Physical Activity Guide) before being asked whether they had been successful or not in maintaining a level of physical activity meeting the guidelines.

The Revised Causal Dimensions Scale (CDSII; (McAuley et al., 1992) was used to measure participants' attributions for their perceived success/failure in maintaining a level of activity sufficient for health benefits over the past month. As noted above, the CDSII allows participants to provide their own attribution for an outcome and then code that attribution along four causal dimensions: locus of causality (LOC), personal controllability (PC), external controllability (EC), and stability (ST). As was the case in Study 2, the external controllability dimension was not included in this study. Participants responded on a 9-point scale to the CDSII questions concerning their stated reason for their success/failure. As in Study 2, values for each of the dimensions were averaged with higher scores indicating that attributions were more internal, personally controllable, and stable. The three dimensions showed acceptable internal reliability (Cronbach's (1951) alphas – LOC = .65; PC = .90; stability = .81).

Self-regulatory efficacy. Using the same instrument as in Study 2 (but without reference to *Canada's Physical Activity Guide*), participants were asked how sure they were that they could schedule physical activity into their daily lives at a level sufficient for health benefits every week for the next month (see Appendix K). Evaluation of the four items in the instrument revealed that internal reliability was acceptable ($\alpha = .93$). Scores on the four items were summed and scaled to provide values between 0 and 10.

Intention. Participants were presented with three items concerning intent to do physical activity at a level sufficient for health benefits every week for the next month (see Appendix L).

Participants indicated their level of agreement with the intention statements on a 7-point scale. For example, one item stated, “I intend to be physically active every week during the next month at a level sufficient for health benefits.” Internal reliability was found to be acceptable ($\alpha = .94$). Scores on the three items were summed and divided by three to provide a score between 1 and 7, with higher scores reflecting a stronger intention.

3.4.4 Analytical strategy

In order to replicate the results from Study 2, a hierarchical regression was run with success/failure to maintain an activity level sufficient for health benefits ($\geq / < 3\text{KKD}$) entered on the first step and the three attributional dimensions (locus, personal controllability, and stability) entered on the second step to predict self-regulatory efficacy.

To test the hypotheses that (1) reported past physical activity would predict intention, (2) that attributional dimensions would significantly improve the prediction of intention beyond that of reported past physical activity, and (3) that self-regulatory efficacy would further significantly improve the prediction of intention, a hierarchical regression was run with reported activity level sufficient for health benefits entered first ($\geq / < 3\text{KKD}$), attributional dimensions entered second, and self-regulatory efficacy entered third to predict intention to be active enough for health benefits over the next month.

3.5 Results

Descriptive statistics for all measured variables are included in Table 3.3. Participants reported an average of 4.8 KKD, suggesting an active sample. Thirty-nine participants (54%) reported activity levels sufficient for health benefits (i.e., $\geq 3\text{KKD}$) while 33 (46%) reported levels below the cut-off. The average energy expenditures within these groups were 7.3KKD and 1.8KKD, respectively. Average attributional dimension scores suggested that participants tended to make internal, controllable, and slightly unstable attributions for their exercise patterns. Mean self-efficacy and intention scores suggested high levels of both across all intensity levels.

Table 3.3. **Attribution, Self-efficacy, KKD, and Intention Means in Study 3**
(n=72)

	Mean (SD)
Locus	6.1 (1.7)
Personal controllability	6.9 (1.8)
Stability	4.4 (2.1)
Self-regulatory efficacy	6.3 (2.2)
KKD	4.8 (3.9)
Intention	5.5 (1.4)

3.5.1 Replication analyses

The results from the hierarchical regression (see Table 3.4) revealed that success/failure to maintain a level of activity sufficient for health benefits ($\geq / <3\text{KKD}$) predicted self-regulatory self-efficacy at Step 1, $F(1, 70) = 11.2, p < .01$. Success/failure to be sufficiently active predicted 14% of the variance in self-regulatory efficacy. The standardized beta suggested that maintaining a level of activity sufficient for health benefits ($\geq 3\text{KKD}$) was associated with higher self-regulatory efficacy. Consistent with the results from Study 2, attributional dimensions significantly improved the prediction of self-efficacy, $F_{\text{change}}(3, 67) = 4.1, p \leq .01$, with explained variance increasing from 14% to 27%. The final model was significant, $F(4, 67) = 6.3, p < .001$. The standardized betas suggested that higher reported stability was associated with higher levels of self-regulatory efficacy⁵.

3.5.2 Intention analyses

Results from the hierarchical regression predicting intention revealed that activity level predicted intention at Step 1, $F(1, 70) = 8.7, p < .01$, accounting for 11% of the variance in intent to be sufficiently active for health benefits each week over the next month. The standardized beta suggested that past activity levels sufficient for health benefits were associated with greater intention to be sufficiently active over the next month than past activity levels not sufficient for health benefits. At Step 2, attributional dimensions did not improve the prediction of intention, $F_{\text{change}}(3, 67) = 0.4, p > .05$. However, the inclusion of self-regulatory efficacy at Step 3 significantly improved the prediction of intention, $F_{\text{change}}(1, 66) = 57.3, p < .001$, increasing the predicted variance in intention to 53%. The final model was significant, $F(5, 66) = 15.0, p < .001$, with self-regulatory efficacy the only significant predictor. The standardized beta indicated that higher reported self-regulatory efficacy was associated with higher scores on intention (see Table 3.5)⁶.

⁵ To determine if the effect of *attributional dimensions on self-regulatory efficacy* depended upon success/failure to maintain activity sufficient for health benefits, the regressions were re-run with interaction terms (activity level X attributions) included at step 3. The addition of the interaction term at step 3 did not improve the prediction, $F_{\text{change}}(3, 64) = 1.0, p > .10$.

⁶ To determine if the effect of *self-regulatory efficacy on intention* depended upon success/failure to maintain activity sufficient for health benefits, the regressions were re-run with the interaction term included. The interaction term did not improve the prediction of intention, $F_{\text{change}}(1, 65) = 1.5, p > .10$.

Table 3.4. **Summary of Results for Self-regulatory Efficacy Regression in Study 3**

	R ²	R ² change	Sig. F change	Sig. model F	Standardized Betas (sig.)
Self-regulatory efficacy (Study 3 replication; N=72)					
Step 1	0.14	0.14	.001	.001	
physical activity					0.37 (.001)
Step 2	0.27	0.13	.010	.000	
physical activity					0.15 (.234)
locus					0.10 (.514)
personal controllability					-0.03 (.858)
stability					0.37 (.010)

Table 3.5. **Summary of Results for Intention Regression.**

	R ²	R ² change	Sig. F change	Sig. model F	Standardized Betas (sig.)
Intention (n=72)					
Step 1	0.11	0.11	.004	.004	
physical activity					0.33 (.004)
Step 3	0.53	0.41 ⁷	.000	.000	
physical activity					0.15 (.158)
locus					0.01 (.946)
personal controllability					-0.01 (.958)
stability					-0.18 (.132)
self-regulatory efficacy					0.75 (.000)

⁷ Rounding error accounts for discrepancies between R² change and R².

3.6 Studies 2 and 3 Discussion

The results of Study 2 provided insight into how individuals' past physical activity behaviour and their attributions of why they were or were not active enough for health benefits related to self-regulatory efficacy. Specifically, while reported past physical activity predicted self-regulatory efficacy, attributional dimensions significantly improved the prediction. The results from Study 3 replicated these results in terms of predicting self-regulatory efficacy, as well as provided some evidence as to how past physical activity, attributional dimensions and self-regulatory efficacy relate to future behavioural intention. Past physical activity predicted intention, and self-efficacy significantly improved the prediction. Attributional dimensions did not improve the prediction of intention beyond that predicted by past physical activity.

Success/failure to report past physical activity sufficient for health benefits predicted 8% to 14% of the variance in self-efficacy to schedule activity sufficient for health benefits across the two studies. The finding that reported past physical activity behaviour significantly predicted self-efficacy was consistent with the predictions of self-efficacy theory as past experiences are believed to be an important source of self-efficacy information (Bandura, 1977, 1997). From an empirical perspective, previous research in the physical activity area also has supported the fact that past behaviour is associated with self-efficacy (McAuley & Courneya, 1992; McAuley et al., 1991). The present results serve to extend this support to now include physical activity sufficient for health benefits. Results suggest that those who are active enough for health benefits tend to have higher confidence in their ability to do what is necessary to schedule physical activity sufficient for health benefits into their daily living activities in the future.

A similar relationship was found between past behaviour and intention wherein success/failure to report past physical activity sufficient for health benefits predicted 11% of the variance in future behavioural intention to complete activity sufficient for health benefits over the subsequent month. This result is consistent with previous research in the area of sport and exercise (Armitage, 2005; Brickell et al., 2006), which has found a positive relationship between past behaviour and future intentions.

Consistent with the hypothesis, the current results also revealed that attributional dimensions significantly added to the prediction of self-regulatory efficacy beyond that predicted by reported past physical activity levels. The addition of attributional dimensions following past behaviour increased the predicted variance from 8% to 28% in Study 2 and from 14% to 27% in

Study 3. These findings are consistent with other research, which has reported that attributions are related to self-efficacy when examining exercise progress (McAuley, 1991). Further, Shields and colleagues (2006) found that attributional dimensions predicted 11% and 16% of the variance in self-regulatory efficacy early and late in an exercise program. The current findings support the results of McAuley (1991) and Shields and colleagues (Shields et al., 2006), and extend them to include success/failure to maintain physical activity sufficient for health benefits. In terms of attributional dimensions, stability was related to self-regulatory efficacy in both studies, while personal controllability predicted self-regulatory efficacy in only Study 2. Further research is necessary to determine whether such differences might be due to different outcomes or differences between samples.

The current results also suggest that how individuals explain the causes of their past experiences *improves* the prediction of self-efficacy beyond that predicted by past experiences. While success/failure to maintain activity sufficient for health benefits predicted self-regulatory efficacy, the addition of attributional dimensions in both studies significantly improved the proportion of predicted variance. Given that past exercise patterns also have been associated with attributional patterns in previous research (McAuley, 1991), one might wonder whether attributions mediate the past behaviour/self-efficacy relationship. The present concurrent design precluded the examination of mediation (Baron & Kenny, 1986). As such, future research in the area of physical activity for health is necessary to determine whether attributions mediate the relationship between past behaviour and self-efficacy or whether past behaviour and attributions work in an additive fashion to predict self-regulatory efficacy.

Another finding in these studies worth noting concerns the fact that past physical activity and attributional dimensions predicting self-regulatory efficacy for health-motivated activity were consistent across both studies, despite different outcomes being explained (i.e., clear guidelines for what constitutes activity sufficient for health benefits were provided in Study 2, but not Study 3). The consistency of findings across the two studies increases the reliability and generalizability of the results, given that participants came from a Kinesiology and Health Sciences classes, respectively. The results also provide preliminary support for the suggestion that it is not only our past success/failure at being sufficiently active that predicts our self-efficacy to schedule activity sufficient for health benefits in the future, but also how we explain our success/failure at being sufficiently active.

Consistent with the final hypothesis, self-regulatory efficacy significantly improved the prediction of intention over that predicted by past physical activity, increasing the proportion of explained variance from around 10% to 50%. In keeping with the results of previous research (Ducharme & Brawley, 1995), this suggests that those who are confident in their ability to do what is necessary to fit in enough physical activity for health benefits also intend to do so. While Rodgers and colleagues (2002) suggested that self-regulatory efficacy exerts a stronger influence on behaviour than on behavioural intention, the current results suggest that self-regulatory efficacy is still a strong predictor of intention in the area of physical activity for health benefits. Further research is necessary to determine how task self-efficacy and self-regulatory efficacy relate to intention and subsequent behaviour in the area of physical activity for health benefits, and to determine whether these relationships differ depending upon the type of physical activity and motivation for doing it.

Contrary to the hypothesis, attributional dimensions did not significantly improve the prediction of intention beyond that of past physical activity. This does not support previous research with exercise class participants (Shields et al., 2006), which found attributional dimensions predicted intention to attend exercise classes. One possible explanation for this discrepancy may involve differences in outcomes. In this vein, it is worth noting that although the current results were not consistent with the results of Shields and colleagues (2006), they were in agreement with the results of Ingledeew and colleagues (1996), who examined a more general outcome (i.e., a variety of health behaviours across different settings). Specifically, the difference in results may relate to the fact that while Shields et al. (2006) used a specific outcome (i.e., adherence in terms of attending exercise classes), a general outcome was used in the Ingledeew et al. (1998) study, as well as in the present study. As attributions are believed to refer to specific outcomes (Weiner, 1986), it is possible that the lack of relationship between attributional dimensions and intention in Study 3 was due to the fact that attributions referred to the rather general outcome of physical activity sufficient for health benefits. Given that attributional dimensions might be better predictors of intention if they are context specific, it is possible that attributional dimensions more strongly predict intentions when they refer to a more specific outcome.

Another possible explanation concerns the setting of physical activity. Ingledeew et al. (1998) examined a number of health behaviours across settings that would have included both

structured and unstructured activities. Similar to the current findings, their findings revealed no direct relationship between attributional dimensions and intention with either successful or unsuccessful participants. As significant differences have been found in the intrapersonal and social correlates of physical activity done in structured versus unstructured settings as identified by individuals active enough for health benefits (Spink et al., 2006), it is possible that structured and unstructured activity environments are sufficiently different to require theoretical models with different constructs.

Given that it has been argued that structured versus unstructured physical activity settings may differ in volitional control (Bryan & Rocheleau, 2002), one might wonder if the importance of attributional dimensions is similarly affected by the level of volitional control people have within a setting. For instance, previous researchers have found that perceived behavioural control was more highly related to intentions with resistance training than with aerobic training (Bryan & Rocheleau, 2002), reasoning that participants experienced less volitional control in resistance training than in aerobic training. Further, it has been suggested that perceived behavioural control would be a more important predictor of intentions in structured than unstructured settings (Bostick, 2004). Future research is required in order to determine how the importance of attributional dimensions in predicting intentions is affected by differences between structured and unstructured physical activity settings.

As is the case with most field research, these studies had limitations that should be acknowledged. First, the samples were drawn from a Kinesiology class and an introductory Health Science class (non-Kinesiology students). For the most part, participants were largely young, active, and we can assume given their course selection, interested in health. In addition, females were overrepresented in the samples. While results may generalize to some university student populations, they may not generalize to other populations. Future research should be conducted with samples from other populations.

Second, these studies were cross-sectional and did not include measures of subsequent behaviour. When it comes to physical activity for health benefits, in order to develop a complete picture, measures of subsequent behaviour are essential. As noted by Weinstein (2007), research on behavioural intentions is no substitute for research that examines actual behaviour. Thus, future researchers should strive to include a measure of subsequent physical activity.

Despite its limitations, this research has a number of strengths. First, results lend support to relationships among past experiences, attributional dimensions, self-regulatory efficacy, and intention. Specifically, attributional dimensions improved the prediction of self-regulatory efficacy beyond that predicted by past behaviour alone, suggesting that both past experiences as well as how people think about their past experiences impact self-regulatory efficacy. In addition, self-regulatory efficacy significantly improved the prediction of intention beyond that predicted by past experiences alone, suggesting that confidence in ability to manage one's schedule may be important in forming intentions to be active.

Second, although previous research has examined relationships between physical activity, attributional dimensions, self-efficacy, and intentions, to my knowledge, none have done so by explicitly addressing activity sufficient for health benefits. All measures in the current studies targeted the health aspect of physical activity.

Finally, while previous research involving attributional dimensions and self-efficacy has generally investigated relationships in a structured exercise setting, the present research involved physical activity done for health benefits regardless of setting. Although many people are active in structured exercise environments, many get much of their activity outside these settings. That some of these results differed from previous findings in a structured setting supports the contention that we may need different models for different types of activities (Baranowski et al., 1998; Spink et al., 2006)

These results prompt questions concerning how these constructs might relate in a causal manner. In order to test the plausibility of one such model, where self-efficacy mediates the relationship between attributional dimensions and future intention, a final study was conducted.

CHAPTER 4: SELF-EFFICACY AS A MEDIATOR BETWEEN ATTRIBUTIONS AND INTENTIONS TO BE ACTIVE DURING FINAL EXAMS

4.1 Introduction

Despite wide recognition that physical activity is important for health, nearly half of young adult Canadians aged 18-24 are not active enough to receive the optimal health benefits (Craig et al., 2004). As health is recognized as an important value in our culture (Conrad, 1994; Spyros, Moraitis, Kouvaris, & Galanopoulou, 1977), it may not be surprising that individuals attempt to explain their activity behaviours by assigning perceived causes (i.e., attributions) to their success or failure to be active. For example, Minifee and McAuley (1998) found that those who perceived themselves as successful in their last attempt to positively change their exercise behaviour made internal, stable, and personally controllable attributions, while those who perceived themselves as unsuccessful tended to make internal, unstable, and personally controllable attributions.

If we are interested in understanding physical activity behaviour, it may important to examine attributions as they are believed to influence cognitions associated with future motivated behaviour. For instance, attributions for past activity behaviour are believed to influence future behaviour through the mediator of future expectancy (Weiner, 1986). Specifically, Weiner (1985; 1986) posited that stability of attributions is a key attributional dimension associated with certainty of similar future outcomes. Further, in keeping with social cognitive theory (Bandura, 1986), researchers in the physical activity area have suggested that attributions may provide information to individuals who are forming future intentions for physical activity behaviour (Shields et al., 2006).

Attributions also have been suggested to influence self-efficacy (Shields et al., 2006; Weiner, 1986), which has been implicated as a marker for future behaviour (Bandura, 1997). Self-efficacy, which concerns individuals' beliefs in their abilities to do what is necessary to bring about specific outcomes (Bandura, 1997), has received considerable support in predicting

physical activity behaviour (Bauman et al., 2002). Self-efficacy also is believed to influence intentions (Bandura, 1997). Research in the physical activity realm has supported this claim with those who have strong beliefs in their abilities to do what is necessary in order to exercise also being the ones who likely intend to do so (Ducharme & Brawley, 1995).

For the most part, the existing studies in the physical activity area are cross-sectional in nature. Although these studies help in our understanding of physical activity behaviour, researchers have underscored the importance of examining mediational models (Baranowski et al., 1998; Bauman et al., 2002) in order to improve our understanding of physical activity behaviour and to find appropriate targets for interventions. Mediators are intervening (or third) variables that account for at least part of the influence of one variable upon an outcome. For example, self-efficacy to schedule exercise may be an intervening variable that helps to explain why attributions may have positive effects on intentions to exercise.

This supposition, that self-efficacy might mediate the relationship between attributions and intentions, has been investigated previously in an activity setting (Shields et al., 2006). While Shields and colleagues' (2006) results did not support a mediational hypothesis, they offered one possibility to explain their unexpected finding. They suggested that the timing of their measurements may have had an impact. Kenny (2006) has suggested that tests of mediation are more powerful when the interval between measurements is not excessive. In the Shields et al. (2006) study, six weeks separated the assessment of attributions, self-efficacy and intentions, which the authors suggested may have been too long for the effects of mediation to be detected.

Whereas Shields et al. (2006) did not find self-efficacy acting as a mediator between attributions and intentions to be active, their results provided guidance and prompted questions for the current research. First, as Shields and colleagues (2006) had a long time interval between measurements, it is possible that results would support self-efficacy as a mediator between attributions and intentions if the measures had a shorter interval between them.

Second, although Shields and colleagues (2006) found evidence for an additive relationship between attributions and self-efficacy in predicting intentions, it is possible that self-efficacy would mediate the relationship between attributions and intentions when participants were faced with a potent impediment to exercise. As noted by Bandura (2004), it is easy to be efficacious if there are no impediments to overcome. However, in the face of severe impediments, those who are less efficacious may be more prone to giving up whereas those with

higher efficacy may be more likely to view the impediments as surmountable and keep pursuing the behaviour.

In the physical activity realm, schoolwork has been found to be an important impediment that limits physical activity among university students (Gyurcsik, Spink, Bray, Chad, & Kwan, 2006). Scheduling exercise when faced with the considerable time constraints and emotional stress associated with an exam period may be challenging. As a result, it is conceivable that students busy with exams change their intentions to maintain typical activity levels based upon whether they believe they are able to schedule it or not. Thus, it was expected that self-efficacy to schedule activity would be a particularly important variable for university students during a busy time of study when academic outcomes might be as, or more, compelling than being active.

Finally, as Shields and colleagues (2006) investigated the effects of attributional dimensions as a block, one might wonder which attributional dimensions are actually related to intentions. Weiner (1986) suggested that attributional dimensions have different effects, with stability being the key to future expectations. Future expectations, in turn, are believed to influence intentions (Weiner, 1986). Thus, Weiner's model of attribution theory provided the rationale for predicting that stability would be the strongest attributional dimension to predict intentions.

The purpose of Study 4 was to examine whether self-regulatory efficacy would mediate the relationship between attributional dimensions for typical exercise levels and intentions to maintain these levels during final exams among university students. It was hypothesized that self-regulatory efficacy would mediate the positive relationship between stability of attributions and intentions to maintain typical exercise levels. In particular, it was expected that the effect of the attributional dimension of stability in predicting intentions would be diminished when self-efficacy was added to the regression equation. Although attributional dimensions were not found to significantly improve the prediction of future intentions beyond that of past experience alone in Study 3, it was suggested that the general nature of the outcome (i.e., success/failure to be active enough for health benefits) may have played a role in decreasing the magnitude of the relationship between attributional dimensions and intention. As specific outcomes (i.e. different activity intensities) were to be used in this study, the relationship between attributional dimensions and intention found in other studies (Shields et al., 2006) was expected. Further,

Bandura's social-cognitive theory (1986) includes attributions, self-efficacy, and intention, and provides a rationale for this mediational model.

While the importance of examining models to predict actual behaviour is acknowledged (Weinstein, 2007), it would have been too difficult to measure exercise levels among university students writing their final exams. In addition, theorists have repeatedly cited intentions as an important predictor of behaviour (Ajzen, 2002; Bandura, 1997). As such, it was decided that measuring intentions to maintain typical exercise levels would be an acceptable alternative for both practical and theoretical reasons.

As previous researchers have suggested that people may think of strenuous physical activity in ways that differ from how they think about moderate or mild exercise, (Winters, Petosa, & Charlton, 2003; Dunton & Schneider, 2006), different models may be necessary to understand different activity intensities (cf. also Baranowski et al., 1998). As such, separate analyses were conducted for three different exercise intensities as reported by the participants (i.e., strenuous, moderate, and mild exercise).

4.2 Methods

4.2.1 Participants and Design

Participants for this prospective descriptive study were 123 undergraduate students. Data were collected on three occasions, each one week apart near the end of a university semester. On the first occasion, participants reported their typical levels of strenuous, moderate, and mild exercise. Next, they rated their attributions for their total typical exercise levels. On the second occasion, participants again reported their typical levels of exercise and then rated their self-regulatory efficacy to maintain those levels of strenuous, moderate, and mild exercise during the forthcoming final exam period. Finally, on the third occasion, participants again reported their typical levels of exercise and then rated their intentions to maintain those levels during the forthcoming final exam period. As noted above, separate analyses were conducted for strenuous, moderate, and mild intensity exercise.

Data from participants were excluded for several reasons including missing data across the three assessment points ($n_{\text{strenuous}}=0$; $n_{\text{moderate}}=1$; $n_{\text{mild}}=0$), reported exercise frequencies of '0' (i.e., no activity reported) at any time point ($n_{\text{strenuous}}=10$; $n_{\text{moderate}}=6$; $n_{\text{mild}}=8$), or because of reported exercise frequencies deemed to be outliers based upon inspection of histograms

($n_{\text{strenuous}}=3$; $n_{\text{moderate}}=0$; $n_{\text{mild}}=1$). As a result, data from 13 participants were removed from the ‘strenuous’ intensity category, 7 from the ‘moderate’ intensity category, and 9 from the ‘mild’ intensity category. Participants who remained for the analyses included 110 (of the sample of 123) participants in the ‘strenuous’ category ($M_{\text{age}} = 19.9$ years ($SD = 2.5$); 67 females and 43 males), 116 participants in the ‘moderate’ category ($M_{\text{age}} = 20.0$ years ($SD = 3.1$); 74 females and 42 males) and 114 participants in the ‘mild’ category ($M_{\text{age}} = 20.1$ years ($SD = 3.1$); 70 females and 44 males).

4.2.2 Procedures

Approval for the study was obtained from the University Ethics Committee (see Appendix B). Prospective participants were approached during a class period and invited to participate in a study examining how individuals perceive the causes of their physical activity. As noted above, data collection occurred on three occasions, each one week apart. On the first occasion, all present class members (approximately 150) received study materials at the start of the class. Materials included a consent form and measures of exercise and attributional dimensions. Participants who completed a consent form were instructed to take as much time as was needed to complete the questionnaire. In addition to the main constructs, general demographic information also was requested. At the next two testing sessions, questionnaires involving exercise and self-regulatory efficacy and exercise and intentions were completed by all those present in the class. Only data from those present on all three occasions were included in this study. All materials were collected by research assistants.

4.2.3 Measures

Exercise behaviour. The Godin Leisure-Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985) was used to assess exercise behaviour (see Appendix M). This instrument has been shown to be a reliable and valid measure of self-report exercise behaviour (Godin & Shephard, 1997). While the original version assessed typical number of bouts per week of strenuous, moderate, and mild intensity leisure-time exercise of greater than 15-minutes duration, the version used here was modified slightly to capture leisure-time exercise bouts lasting at least 10 minutes. This change in time period was made to reflect recommendations in *Canada’s Physical Activity Guide* (Canada, 1998), which states that health benefits can be accrued in bouts

of activity lasting at least 10 minutes. Examples of strenuous (e.g., running, squash, basketball), moderate (e.g., fast walking, easy bicycling, volleyball), and mild (e.g., yoga, golf, easy walking) intensity activities were provided for participants to guide their reporting of exercise within each intensity category.

Although only the exercise data from the first measurement occasion were used in the analyses, typical strenuous, moderate, and mild intensity exercise frequencies were measured on all three occasions to provide a reference for the participants to answer the self-efficacy and intention measures. To assess whether participants were consistent in reporting ‘typical’ exercise frequencies across all measurement occasions, correlations within each intensity level across measurement occasions were calculated. The coefficients ranged from 0.72 to 0.94.

Attributional Dimensions. The Revised Causal Dimensions Scale (CDSII; (McAuley et al., 1992) was used to measure participants’ attributions for their typical amount of exercise (see Appendix N). The CDSII has been shown to have acceptable internal consistency (average alphas ranged from 0.67 to 0.82) with similar populations, and evidence supporting its construct validity has been reported (McAuley et al., 1992).

The CDSII allows participants to provide their own attribution for an outcome and then code that attribution along four causal dimensions: locus of causality (LOC), personal controllability (PC), external controllability (EC), and stability (ST). As the external controllability dimension was not of interest in this study, it was not included. Thus, only three of the dimensions were used. Participants were asked what they thought was the most important cause of the typical amount of exercise they had reported on the LTEQ (i.e., referring to all exercise intensities together). Using a 9-point Likert scale, participants then coded that cause using 9 items, with 3 items representing each of the dimensions of locus of causality (LOC), personal controllability (PC), and stability (ST). Values for each of the dimensions were averaged with higher scores indicating that attributions were more internal, personally controllable, and stable.

The dimensions showed acceptable internal reliability for all three exercise intensities (Cronbach’s (1951) alphas for LOC = 0.61, 0.63, 0.66; PC = 0.70, 0.71, 0.72; ST = 0.67, 0.73, 0.73 for ‘strenuous’, ‘moderate’, and ‘mild’ intensity samples, respectively) using the criterion outlined by Nunnally and Bernstein (1994). Attributional dimensions were measured on the first occasion only.

Self-regulatory efficacy. After reporting their typical exercise pattern on the LTEQ, participants were asked how sure they were that they could do what was necessary to maintain this typical exercise pattern each week during the forthcoming 3-week final exam period. Separate 4-item scales were completed for each of the three exercise intensities. Participants responded regarding each intensity level by filling in the frequency that they had reported on the LTEQ and then rated their confidence to do what was necessary to maintain this reported exercise level on an 11-point percentage scale (i.e., 0% to 100%; see Appendix O). For example, one item from the strenuous intensity scale asked participants how sure they were that they would be able to fit in strenuous exercise each week during the forthcoming final exam period the same number of times they had reported for their typical week. Similar self-regulatory efficacy items have been used in previous research concerning exercise class attendance (Shields et al., 2005).

Scores on the four items for each intensity level were summed and scaled to provide self-regulatory efficacy scores between 0 and 10 for each of strenuous, moderate, and mild intensity levels. Internal reliability was acceptable for all three scales (Cronbach's (1951) alphas for 'strenuous', 'moderate', and 'mild' intensities were 0.95, 0.94, 0.96, respectively). Self-regulatory efficacy was measured on the second occasion.

Intention. Participants were asked about their intentions to do their typical exercise intensity frequencies as reported on the LTEQ during the forthcoming final exam period. Three items for each exercise intensity level (i.e., strenuous, moderate, and mild) were used. Participants indicated their level of agreement with the intention statements on a 7-point scale, with a higher value representing a greater intention to be active (see Appendix P). For example, one item on the strenuous scale stated, "I will try to do strenuous exercise _____ times (enter number from previously reported activity on the LTEQ) every week from April 7 to 28" (i.e., the final exam period). Scores on the three items for each intensity level were summed and divided by three to provide separate intention scores between 1 and 7 for strenuous, moderate, and mild intensity exercise. Internal reliability was acceptable for all three scales (Cronbach's (1951) alphas for 'strenuous', 'moderate', and 'mild' intensities were 0.96, 0.92, 0.97, respectively). Intentions were measured on the third occasion.

4.2.4 Analytical strategy

As suggested by Baron and Kenny (1986), four steps are necessary to establish a mediation relationship. In this study, the first step involved regressing intention on attributional dimensions. The second step involved regressing self-efficacy on attributional dimensions. The third step involved regressing intention on both attributional dimensions and self-efficacy. The final step (given satisfaction of criteria at all other steps) involved inspecting the difference in the magnitude of relationship between attributional dimensions on intention with and without self-efficacy. Full mediation would see the effect between attributional dimensions and intention reduced to zero with self-efficacy in the equation, while partial mediation would involve an incomplete reduction in the effect⁸.

In cases where self-efficacy appeared to mediate the effect of attributional dimensions on intention, the significance of the mediation was tested using the equation recommended by Frazier and colleagues (2004). The *Aroian test* (also recommended by Preacher and Leonardelli, 2001)⁹ indirectly tests the significance of mediation by testing the paths from the predictor to the mediator and mediator to the criterion. As it has been suggested that a sample of at least 500 is required for accurate estimates of the proportion of variance predicted by mediators (MacKinnon, Warsi, & Dwyer, 1995), this was not calculated in this study.

Two additions were made in these analyses. First, separate analyses were conducted for each of the three exercise intensity levels (strenuous, moderate, and mild). Second, as it has been suggested that models involving only cognitive variables (i.e., excluding actual behaviour) may overestimate the effects of the cognitive predictors (Weinstein, 2007), the analyses testing for mediation were replicated controlling for reported 'typical' exercise behaviour. This was done by repeating the steps of the mediational analyses while including the appropriate typical exercise levels reported at time 1 on the LTEQ for each intensity level.

⁸ In order to examine this, the regression at the first step was re-run excluding non-significant attributional dimensions, and Steps 2 and 3 included only significant attributional dimensions.

⁹ The equation for the Aroian test is: $z\text{-value} = a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2 + s_a^2*s_b^2)$; where a is the unstandardized beta for the predictor at Step 2, b is the unstandardized beta for the mediator at Step 3, and s_a and s_b are the corresponding standard error values.

4.3 Results

4.3.1 Descriptives

Descriptives for all variables are included in Table 4.1. Participants reported averages of 3.6 bouts of strenuous, 3.5 bouts of moderate and 4.6 bouts of mild exercise per week suggesting a very active sample. Average attributional dimension scores suggested that participants tended to make internal, controllable, and stable attributions for their exercise patterns. Mean self-efficacy and intention scores suggested high levels of both across all intensity levels.

4.3.2 Main Analyses

4.3.2.1 Strenuous exercise

The results for the hierarchical regressions testing for mediation in the attribution – self-efficacy – intention relationship with strenuous exercise are presented in Table 4.2. Results for Step 1 suggested that while attributional dimensions as a block predicted intention, $F(3,106) = 3.3, p < .05$, none of the individual dimensions significantly predicted intention ($p > .10$). Following the plan to test for the mediation of only those attributional dimensions that actually predicted intention, further tests of mediation were not conducted for strenuous exercise.

4.3.2.2 Moderate exercise

The results for the hierarchical regressions testing mediation for moderate exercise are presented in Table 4.3. Results for Step 1 suggested that the three attributional dimensions significantly predicted intention, $F(3,112) = 3.5, p < .05$, with stability being the significant predictor ($p < .05$)¹⁰. At Step 2, stability significantly predicted self-efficacy, $F(1,114) = 5.9, p < .05$, accounting for 5% of the variance. Together, stability and self-efficacy predicted intention at Step 3, $F(2,113) = 41.0, p < .001$, accounting for 42% of the variance in intention. An examination of Steps 1 and 3 (see Table 4.3) suggested that the association between stability and intention appeared to decrease with the inclusion of self-efficacy. As the beta weight was still significantly greater than zero ($p < .06$), this result suggested partial mediation. The results for the Aroian test revealed a Z - score of 2.30 ($p < .05$), suggesting that the mediation was significant.

¹⁰ When the analysis was re-run with only the significant predictor included, a significant positive relationship emerged between stability and intention at Step 1, $F(1,114) = 9.4, p < .05$, predicting 8% of the variance in intention. The unstandardized beta for stability predicting intention for moderate exercise was 0.216, and the standardized beta was 0.275 (sig. = .003).

Table 4.1. **Activity Level, Attributions, Self-efficacy and Intention Means**

Variable (n)	Mean (SD)
Typical 'strenuous' exercise frequency (110)	3.6 (1.7)
LOC (110)	7.4 (1.1)
PC (110)	7.7 (0.9)
Stability (110)	5.8 (1.6)
Self-regulatory efficacy for strenuous exercise (110)	6.9 (2.3)
Intention to maintain strenuous exercise (110)	5.4 (1.6)
Typical 'moderate' exercise frequency (116)	3.5 (2.1)
LOC (116)	7.4 (1.2)
PC (116)	7.7 (1.0)
Stability (116)	5.6 (1.7)
Self-regulatory efficacy for moderate exercise (116)	7.2 (1.9)
Intention to maintain moderate exercise (116)	5.3 (1.3)
Typical 'mild' exercise frequency (114)	4.6 (3.2)
LOC (114)	7.3 (1.3)
PC (114)	7.6 (1.0)
Stability (114)	5.6 (1.7)
Self-regulatory efficacy for mild exercise (114)	7.8 (2.2)
Intention to maintain mild exercise (114)	5.4 (1.5)

Table 4.2 Attribution and Self-efficacy Predicting Intention Relationship for Strenuous Exercise (n = 110)

Steps	Beta	SE Beta	95% CI	Standardized Beta (<i>p</i> - value)	R ²
Step 1: Outcome: intention					0.09
Predictor: - LOC	.153	.165	-.174, .481	.108 (.355)	
- PC	.269	.191	-.109, .646	.160 (.162)	
- Stability	.104	.099	-.094, .301	.104 (.300)	

Table 4.3 Attribution and Self-efficacy Predicting Intention Relationship for Moderate Exercise (n = 116)

Steps	Beta	SE Beta	95% CI	Standardized Beta (<i>p</i> - value)	R ²
Step 1: Outcome: intention					0.09
Predictor: - LOC	.088	.127	-.163, .339	.081 (.488)	
- PC	.053	.152	-.248, .355	.038 (.727)	
- Stability	.181	.078	.026, .336	.231 (.022)	
Step 2: Outcome: self-efficacy					0.05
Predictor: stability	.253	.105	.046, .460	.221 (.017)	
Step 3: Outcome: intention					0.42
Mediator: self-efficacy	.413	.050	.313, .512	.602 (.000)	
Predictor: stability	.112	.058	-.002, .226	.142 (.055)	

The results for hierarchical regressions testing for mediation while controlling for typical levels of moderate exercise are presented in Table 4.4. All steps for mediation were met in a similar manner with self-efficacy appearing to partially mediate the relationship between stability and intention. The results for the Aroian test revealed a Z - score of 2.31 ($p < .05$), suggesting the mediation was once again significant. As the results with and without typical moderate exercise levels included in the predictions appear quite similar, the inclusion of reported typical moderate exercise did not seem to change the results from those that only included cognitive variables.

4.3.2.3 Mild exercise

The results for the hierarchical regressions examining mild exercise are presented in Table 4.5. Results for Step 1 suggested that the three attributional dimensions significantly predicted intention, $F(3,110) = 7.0, p < .05$, with stability emerging once again as the significant predictor ($p < .05$)¹¹. At Step 2, stability was significantly associated with self-efficacy, $F(1,112) = 6.5, p < .05$, predicting 6% of the variance. Stability and self-efficacy predicted intention at Step 3, $F(2,111) = 61.6, p < .001$, accounting for 53% of the variance. Finally, the relationship between stability and intention appeared to decrease with the inclusion of self-efficacy (see Steps 1 and 3 in Table 4.5), once again suggesting partial mediation. The results for the Aroian test revealed a Z - score of 2.44 ($p < .05$), suggesting that self-efficacy significantly mediated the relationship between stability and intention to maintain typical levels of mild exercise during the exam period.

The results for hierarchical regressions testing for mediation controlling for typical levels of mild exercise are presented in Table 4.6. All steps for mediation were met in a similar manner with self-efficacy appearing to partially mediate the relationship between stability and intention. The results for the Aroian test revealed a Z - score of 2.37 ($p < .05$), suggesting once again that self-efficacy significantly mediated the relationship between stability and intention, while controlling for frequency of mild exercise. As with moderate intensity exercise, the results with and without typical mild exercise levels included in the equation appeared quite similar.

¹¹ Examining only the significant predictor revealed that stability significantly predicted intention at Step 1, $F(1,112) = 17.3, p < .001$, accounting for 13% of the variance in intention. The unstandardized beta for stability predicting intention for mild exercise was .313. The standardized beta was .375 (sig. = .000).

Table 4.4. **Attribution and Self-efficacy Predicting Intention Relationship for Moderate Exercise, Controlling for Activity Level (n = 116)**

Steps	Beta	SE Beta	95% CI	Standardized Beta (<i>p</i> - value)	R ²
Step 1: Outcome: intention					0.10
Predictor: - exercise	.073	.057	-.041, .186	.116 (.208)	
- LOC	.090	.126	-.160, .341	.083 (.476)	
- PC	.026	.153	-.277, .330	.019 (.863)	
- Stability	.187	.078	.033, .342	.239 (.018)	
Step 2: Outcome: self-efficacy					0.05
Predictor: exercise	.067	.084	-.099, .233	.073 (.426)	
Stability	.255	.105	.048, .463	.223 (.016)	
Step 3: Outcome: intention					0.43
Mediator: self-efficacy	.409	.050	.309, .508	.596 (.000)	
Predictor: exercise	.050	.045	-.039, .139	.080 (.268)	
Stability	.115	.058	.001, .229	.146 (.049)	

Table 4.5. **Attribution and Self-efficacy Predicting Intention Relationship for Mild Exercise (n = 114)**

Steps	Beta	SE Beta	95% CI	Standardized Beta (<i>p</i> - value)	R ²
Step 1: Outcome: intention					0.16
Predictor: - LOC	.223	.137	-.048, .495	.189 (.106)	
- PC	-.023	.162	-.344, .299	-.015 (.890)	
- Stability	.246	.083	.082, .411	.288 (.004)	
Step 2: Outcome: self-efficacy					0.06
Predictor: stability	.295	.116	.066, .524	.234 (.012)	
Step 3: Outcome: intention					0.53
Mediator: self-efficacy	.438	.046	.348, .529	.644 (.000)	
Predictor: stability	.184	.058	.070, .298	.215 (.002)	

Table 4.6. Attribution and Self-efficacy Predicting Intention Relationship for Mild Exercise, Controlling for Activity Level (n = 114)

Steps	Beta	SE Beta	95% CI	Standardized Beta (p - value)	R ²
Step 1: Outcome: intention					0.20
Predictor: - exercise	.089	.040	.010, .168	.193 (.027)	
- LOC	.223	.135	-.043, .490	.189 (.100)	
- PC	-.026	.159	-.342, .289	-.018 (.868)	
- Stability	.239	.082	.077, .401	.279 (.004)	
Step 2: Outcome: self-efficacy					0.10
Predictor: exercise	.141	.061	.019, .262	.207 (.024)	
Stability	.282	.114	.057, .507	.224 (.015)	
Step 3: Outcome: intention					0.53
Mediator: self-efficacy	.429	.047	.336, .522	.630 (.000)	
Predictor: exercise	.029	.031	-.032, .091	.063 (.346)	
Stability	.184	.058	.070, .298	.215 (.002)	

4.4 Discussion

This study examined whether self-efficacy would mediate the relationship between attributional dimensions and intention to do mild, moderate, or strenuous intensity leisure-time exercise for individuals who were faced with a potentially significant impediment. Specifically, the study tested whether self-regulatory efficacy might mediate the relationship between attributional dimensions for ‘typical’ exercise levels and intentions to maintain those typical levels during a forthcoming final exam period. The results suggested that self-efficacy may have partially mediated the relationship between attributional dimensions and intentions for both moderate and mild exercise levels. On the other hand, a test for mediation with the strenuous exercise intensity was not conducted as none of the individual attributional dimensions significantly predicted intention for that exercise intensity level.

The results of this study represent the first evidence supporting self-regulatory efficacy as a possible mediator between stability of attributions and intentions to be active. It appears that self-efficacy to schedule typical levels of moderate and mild exercise may have partially mediated the effects of stability of attributions on intentions to maintain typical levels of exercise in a forthcoming final exam period. This suggests that while stability of attributions may influence future intentions, part of this influence may be explained by self-regulatory efficacy. Although definitive statements regarding causality cannot be made on the basis of these results, we can say that it is plausible that, with moderate and mild intensity exercise, causality flows from stability to intentions, at least partially through self-regulatory efficacy.

While these results for mild and moderate activity levels partially supported the hypothesis, they contrast with a past study by Shields et al. (2006). Although Shields and colleagues (2006) found significant relationships between attributional dimensions, self-efficacy, and intentions in an activity setting, their results suggested an additive relationship rather than a mediational one. The discrepancy between the current results and those in the Shields et al. (2006) study may have resulted from a number of methodological differences between the two studies. First, measurement of intentions in their study occurred 6 weeks after measurement of attributional dimensions and self-efficacy, while in the present study the measurement of attributional dimensions, self-efficacy, and intentions occurred on three occasions, each one week apart. The tighter timing between assessments in this study may have increased the correspondence between self-efficacy and intentions as suggested by Kenny (1996).

Second, both self-efficacy and intentions in this study referred to maintenance of typical exercise levels during a forthcoming final exam period, reasonably expected to be a period of high academic and time pressure. As it has been suggested that self-efficacy may be important in the face of a significant impediment (Bandura, 1997, 2004), self-efficacy may have been particularly salient in this study.

Finally, while Shields and colleagues (2006) kept attributional dimensions together as a block for their analyses, the current study examined the relationships using individual attributional dimensions. Besides supporting the hypothesis concerning stability, excluding non-significant attributional dimensions in the test of self-efficacy as a mediator between stability and intentions may have maximized power, as tests of mediation tend to have low power (Frazier et al., 2004).

In the case of both moderate and mild exercise, stability of attributions for typical exercise levels predicted intention to maintain those levels. Those who felt that the causes of their typical levels of moderate and mild exercise were stable also intended to maintain those levels throughout the impending final exam period. This supports the contention of Weiner (1986) that stability of attributions influences future intentions.

Stability of attributions also predicted self-regulatory efficacy with moderate and mild intensity exercise. With moderate exercise, stability predicted 5% of the variance, while with mild intensity exercise stability predicted 6% of the variance in self-regulatory efficacy. While statistically significant, these levels of explained variance are small, and may provide one reason why only partial mediation was found in this study. As noted by Baranowski and colleagues (1998), a relatively weak association between a predictor variable and a mediator limits the degree of mediation. Furthermore, this weak association also may suggest that there may be better predictor variables of self-efficacy than stability of attributions. While explanations of past experiences are believed to be important, to help strengthen the relationship between attributions and self-efficacy, future researchers might want to consider examining additional attributional dimensions (e.g., Kelley's model; 1967).

The results of this study also revealed that self-efficacy to schedule typical levels of moderate and mild exercise predicted intention. Those individuals who believed they could schedule their typical levels of mild and moderate exercise during their final exam period also intended to do so. Self-efficacy appeared to be a particularly strong predictor of intention,

increasing predicted variance from 8% to 42% with moderate exercise, and from 13% to 53% with mild exercise beyond that predicted by the attributional dimension of stability alone. These results are at odds with previous research (Rodgers et al., 2002), which found that while self-regulatory efficacy strongly predicted subsequent behaviour, it was a weaker predictor of intentions.

It is possible that the effect of self-regulatory efficacy on intentions was heightened in the present study because of the presence of a salient impediment. Bandura (2004) noted that self-efficacy is necessary in order to surmount impediments to being active. As Bandura (1997) also suggested that intentions may be viewed as proximal goals guiding behaviour, one would expect that self-efficacy in the face of a salient impediment would show a strong association with intention. Thus, the fact that self-regulatory efficacy predicted a large amount of variance in intention to maintain moderate and mild intensity exercise levels may support Bandura's assertion that self-efficacy is particularly important in the face of impediments (Bandura, 1997, 2004). However, as comparative statements cannot be made based on the design used in this study, future research should test the relative strength of self-regulatory efficacy both during and outside of times of significant impediments to exercise.

In addition, although it was assumed in this study that final exams might present an impediment to maintaining typical levels of exercise, other perceptions are plausible. For example, some might see an impending final exam period as a positive challenge. As such, future research should consider measuring the extent to which a supposed impediment presents a negative or positive challenge, and how such a distinction might relate to the relationships examined in this study.

Although attributional dimensions together significantly predicted intention to maintain typical levels of strenuous exercise, contrary to the hypothesis, stability of attributions did not emerge as significant. In fact, none of the individual attributional dimensions emerged as significant when examining strenuous activity. One possible explanation for this finding may result from the fact that attributions in this study concerned participants' total typical exercise levels. Rather than suggesting that individual attributional dimensions do not relate to intention to maintain typical levels of strenuous exercise, the results may suggest that strenuous exercise is sufficiently different from moderate and mild exercise to warrant separate attributions. It is possible that people's attributions for why they engage in strenuous exercise may differ from

their attributions for why they engage in moderate and mild exercise. That is, these results might support previous suggestions that individual models may be necessary for different activities and different intensities of activities (Baranowski et al., 1998; Winters et al., 2003).

While there does not appear to be any research addressing this in the attribution area, previous research examining other correlates of activity have suggested that people may think of activities of different intensities in different ways. For example, Winters and colleagues (2003) found that social-cognitive variables were differentially related to exercise intensities, and suggested that a different set of correlates may be involved with moderate exercise versus vigorous exercise. Also, Dunton and Schneider (2006) found that self-efficacy for vigorous exercise differed from self-efficacy for walking for transportation. In these studies, vigorous activity was differentiated from both moderate and mild activity suggesting that vigorous (i.e., strenuous) activity may be different from other intensities. Further research examining separate attributions for different exercise intensities is necessary to examine which dimensions predict self-efficacy, intentions, and subsequent behaviour, and whether self-efficacy mediates the relationship between attributional dimensions and intentions with strenuous exercise levels.

Although this speculation may provide a possible reason for why results differed between strenuous and the other exercise intensities, it does not address the question of why stability, in particular, did not emerge as significant. It is not immediately obvious why this might have occurred, although it might simply be the case that strenuous exercise is different from other exercise intensities and that individual attributional dimensions are not differentiated by individuals. However, as attributions in this study concerned all typical exercise regardless of intensity, this is mere speculation. Again, future research involving separate attributions for different exercise intensities is required to examine this issue.

One of the interesting findings in this study was the fact that no differences were found between models when levels of reported typical exercise were controlled or excluded. This contrasts with Weinstein (2007), who has suggested that models that exclude actual behaviour may overestimate the influence of perceptions. With both moderate and mild exercise, the current results revealed that self-regulatory efficacy may have partially mediated the relationship between stability of attributions and intentions to maintain typical levels in the future. Indeed, neither the raw beta weights nor the magnitude of attenuation by the mediator were appreciably

changed by the inclusion of typical frequencies of exercise in the regressions suggesting that past behaviour did not appreciably influence these perceptions in this study.

While this study offers insight into the relationships examined, its limitations also should be noted. First, attributions in this study referred to all typical exercise, whereas self-efficacy and intentions had separate scales for each exercise intensity. Given the suggestion above concerning the strenuous intensity level, it might be prudent for future researchers to examine separate attributions for each exercise intensity, as increased correspondence between measures may strengthen relationships. Second, the results of this study may have limited generalizability, given that participants were active university students. One might wonder how these relationships would look in a less active sample, where levels of both self-efficacy and intention may be lower. Third, intentions to maintain typical exercise levels were assessed in this study. Although this was done for pragmatic reasons, the importance of examining models to predict actual behaviour is underscored (Weinstein, 2007).

Bearing its limitations in mind, this study has a number of strengths. First, while past research found an additive relationship between attributional dimensions and self-regulatory efficacy in predicting intentions (Shields et al., 2006), the present results suggested that self-efficacy may have partially mediated the relationship between stability of attributions and intentions for moderate and mild exercise behaviour. Thus, we have the first evidence in the physical activity area for a plausible causal chain among attributions, self-efficacy and intention.

Second, separate analyses were conducted for strenuous, moderate, and mild exercise intensities. While the results for moderate and mild exercise were similar, those for strenuous exercise differed, supporting the previous suggestion that individuals may think of different intensities of exercise in different ways (Burton et al., 2005; Dunton & Schneider, 2006; Winters et al., 2003).

Third, as self-efficacy is believed to be important for surmounting impediments (Bandura, 1997), and schoolwork is a frequently mentioned as a salient barrier (i.e., impediment) to exercise among university students (Gyurcsik et al., 2006), this study looked at intentions and self-efficacy to schedule typical exercise levels during final exams. The results revealed that self-regulatory efficacy was indeed a robust predictor of intentions to maintain typical exercise levels during the forthcoming final exam period.

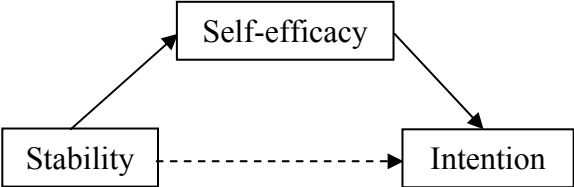
CHAPTER 5: GENERAL DISCUSSION

Previous attempts to understand physical activity behaviour have assumed that it was a health behaviour. Given that there are a number of reasons for being physically active that do not necessarily involve physical health (e.g., time with friends), physical activity may not always be considered a health behaviour. This thesis examined physical activity as a health behaviour.

As physical activity is associated with decreased risk of cardiovascular disease (Taylor et al., 2004), diabetes (Jeon, Loken, Hu, & van Dam, 2007), and some cancers (Chao et al., 2004; Monninkhof et al., 2007), as well as improved fitness (Kemi et al., 2005), one might expect that most individuals would try to be active. However, national statistics suggest otherwise as over one-half of adult Canadians are not sufficiently active for health benefits (Craig et al., 2004).

In many contemporary attempts to understand physical activity behaviour, cognitive approaches have featured prominently (Bauman et al., 2002). Among cognitive theories, attribution theory and self-efficacy theory have received research attention in studying motivation for physical activity. In order to better understand health-related physical activity behaviour and to test the application of attribution (Weiner, 1985, 1986) and self-efficacy (Bandura, 1977, 1997) theories in this area, four studies were conducted. A brief summary of the relationships examined in the four studies in this dissertation is presented in Table 5.1. As can be seen, most of the proposed relationships were supported.

Table 5.1 Summary of Studies

Study	Relationship examined	Result
1	Perceived outcome → attributional dimensions Objective outcome - X - attributional dimensions	Support Support
1	Attributional dimensions X perceived outcome → emotions Perceived outcome → emotions	No support Support
1	Stability → certainty of similar future outcomes	Support
2 & 3	Attributions (beyond past behaviour) → self-efficacy	Support
3	Attributions (beyond past behaviour) → intention Self-efficacy (beyond past behaviour & attributions → intention	No support Support
4		Partial support

5.1 Outcomes and Attributional Dimensions

In terms of Weiner's (1985; 1986) attribution theory, results from these studies suggested that perceived success/failure in meeting the recommended activity level for health benefits was more important than actually having been sufficiently active for health benefits in predicting attributions. In a study of exercise class participants, Shields et al. (2005) found a similar result in that individuals' own perceptions concerning success/failure mattered most when it came to attributions, emotions, and expectations regarding future activities. Together, these results suggest that people may have their own goals and criteria for success/failure regarding physical activity, and that objective success/failure by scientific criteria may not be particularly important to lay persons.

If this is correct, it may be important to shape perceptions of success in the direction of the threshold for health benefits. In face-to-face communications, for instance, health professionals may wish to encourage people to focus on the processes involved in becoming more physically active by including 'how-to' components in messages concerning health-related physical activity (Olson & Zanna, 1987), rather than emphasizing the hard line of a specific level of energy expenditure necessary for health benefits. This suggestion appears to be consistent with the findings of a recent study (Spink, Reeder, Chad, Wilson, & Nickel, in press), which found that patients increased their activity level when counselled by physicians who focused on the self-regulatory skills necessary to be more active rather than on actual activity outcomes.

Beyond the importance of perceptions of success or failure regarding physical activity in determining attributions, results from these studies also suggested a *personal changeability* pattern (Schoeneman & Curry, 1990). This implies that unsuccessful people may take responsibility for their failure and believe that they can do something to change the future outcomes – a relatively optimistic position.

If it can be shown that those who make personally changeable attributions for failure are actually more successful in being active in the future, then interventions aimed at shaping attributions for failure in personally changeable ways should be designed. Essentially, in cases where individuals have perceived themselves as having failed to be sufficiently active, it is possible that those who attribute their failure to stable causes may be at risk for giving up. In these cases, it may be beneficial to use a form of attributional retraining with these individuals, helping them to reshape their attributions in personally changeable ways. For example,

messages may be geared toward helping people who have failed to be physically active in the past to attribute their failure to internal, personally controllable, and unstable causes. However, additional research is necessary to determine whether or not people who make personally changeable attributions for failure fare any better on subsequent outcomes in health behaviour.

5.2 Attributions, Emotions, and Future Expectations

Weiner's (1986) attributional model includes specific predictions concerning outcome-dependent and attribution-dependent emotions. In effect, while some emotions are believed to flow directly from perceptions of the outcome, others are believed to be influenced by attributions concerning the outcome. One of the findings from this set of studies suggested that perceptions regarding success/failure to meet the recommended activity levels for health benefits predicted feeling happy, pleased, depressed, disappointed, and upset – emotions predicted to be outcome-dependent by Weiner (Weiner, 1985, 1986). On the other hand, and contrary to the hypothesis, perceived outcome and attributions did not interact to influence attribution-dependent emotions (e.g., competent, proud, ashamed, guilty).

Three possible explanations for this finding follow. First, it is possible that attributions may be weak predictors of emotions. That is, contrary to Weiner's (1986) model of attribution theory, emotions may be chiefly influenced by outcomes, and only weakly influenced by attributions concerning the causes of outcomes. Second, it also is possible that while attributions may matter in some cases, outcomes may have overridden the influence of attributions in influencing emotions in this case. In effect, perceptions of success or failure may have been so salient that any influence of attributions on emotions was washed out. If correct, then it could be that individuals' views of success or failure in health-related physical activity are so important in influencing emotions that it does not particularly matter *how* one explains success or failure. Third, it also is plausible that there may have been insufficient power to detect the hypothesized interactions between outcomes and attributions in predicting emotions.

Weiner's (1986) model also suggests that stability of attributions influences future expectations. Results suggested that stability of attributions predicted future expectations in the form of certainty of similar future outcomes. Those individuals who rated the cause of their perceived outcome as stable were more certain that future outcomes would be similar than were

those who rated the cause as unstable. This supports Weiner's (1986) model, and suggests that stability of attributions for past outcomes are related to expectations of future outcomes.

From a health perspective, one would hope that those who are already sufficiently active would see the cause of that success as stable – something that will continue, and as a result, expect to continue to be sufficiently active in the future. For individuals who have failed to be sufficiently active in the past, it is hoped that they would make unstable attributions, leaving room for positive change in the future. However, that is not always the case. People may not always make personally changeable attributions for failure. Further, those who have failed to be sufficiently active in the past and made stable attributions for their failure may be the ones most in need of support and intervention.

5.3 Attributional Dimensions and Self-Efficacy

Differences were found in people's explanations for past experiences, depending upon whether they defined the experience as successful or unsuccessful. As self-efficacy is believed to be influenced by past experiences, it seemed reasonable to question whether it is really past experiences in and of themselves or people's explanations for past experiences that influence self-efficacy.

Results suggested that how we think about past experiences (i.e., attributions) may be important in influencing self-efficacy, rather than past experiences in and of themselves. Individuals' attributions for perceived success/failure to be active enough for health benefits improved the prediction of self-efficacy to schedule activity sufficient for health benefits beyond that predicted by actual success/failure to be active enough for health benefits (i.e., 3KKD; Craig et al., 1998). In terms of attributional dimensions, stability appeared to be most important in predicting self-efficacy. Stability is believed to influence future expectations in Weiner's (1986) model. And results supported this contention. While it is recognized that outcome expectancies and self-efficacy are not the same (Bandura, 1995), it makes sense that stability was associated with self-efficacy as both relate to expectations regarding the future and both are believed to be related to future intentions (Bandura, 1997; Weiner, 1986).

5.4 Attributional Dimensions, Self-efficacy, and Intention

In seeking to understand physical activity behaviour, actual behaviour and intent to be active are of great importance. Given that both attributions (Weiner, 1986) and self-efficacy (Bandura, 1977, 1997) are believed to influence intention, it seemed reasonable to investigate how both attributions and self-efficacy together would relate to intention. The results strongly suggested that self-efficacy improved the prediction of intentions to be active enough for health benefits beyond that predicted by past behaviour. Thus, when it comes to physical activity for health benefits, people may not form intentions based solely upon past behaviour. Rather, self-efficacy to schedule activity sufficient for health benefits also may be important.

Results suggested that stability may relate to self-efficacy and self-efficacy may relate to intentions. As both attributions and self-efficacy are believed to influence intentions (Weiner, 1986; Bandura, 1997), and attributions may inform self-efficacy beliefs (Shields et al., 2006; Weiner, 1986), the plausibility of a model involving self-efficacy mediating the effects of attributions on intentions was tested.

Results suggested that for typical levels of moderate and mild exercise, stability may influence intentions to maintain these typical levels, and that part of the influence may be explained by self-regulatory efficacy. This has implications for designing interventions, in that interventions that change attributions may also impact self-efficacy and intentions. For example, returning to the attributional retraining example suggested above, it is plausible that messages geared toward helping people change their attributions may influence their intentions to be active, through changes in self-efficacy beliefs.

On the other hand, no individual attributional dimensions predicted intentions for strenuous exercise. As attributional dimensions, as a block, significantly predicted intentions for strenuous exercise, the results do not suggest that attributions are unimportant for intentions regarding strenuous exercise. Rather, as previous research has suggested that people may think of exercise of different intensities in different ways (Winters et al., 2004; Dunton & Schneider, 2006), it is possible that participants' attributions of the causes of their strenuous exercise may have differed from their attributions of the causes of their moderate and mild exercise. However, participants were requested to make only one set of attributions for their total typical exercise levels (including all intensities). This procedure may have decreased the correspondence between attributional dimensions and intention, which was intensity-specific. So while it is

possible that people's attributions for strenuous exercise may differ from their attributions for moderate or mild exercise, additional research examining this is necessary. Future researchers may wish to plan their measurement of attributional dimensions carefully around different intensities of activity.

Nonetheless, results suggest that for mild and moderate exercise, the stability of attributions for previous exercise behaviour may influence both self-regulatory beliefs and intentions. This is important in that mild and moderate intensities of exercise are most likely the intensities that would apply most to those who are not yet active enough for health benefits.

Although these studies provide insight into cognitions regarding health-related physical activity behaviour, like most field studies, there are limitations that should be noted. First, participants were more active than is typical for similarly-aged Canadians (Craig et al., 2004). Because of this, the results may not generalize to less active populations. For example, future research should examine these relationships among those contemplating physical activity.

Second, participants in these studies were mostly young adults. Since both youth (Cameron, Wolfe, & Craig, 2007) and older adults (Craig et al., 2004) have been identified as populations tending to be insufficiently active, additional research with both younger and older populations is needed.

Third, these results are limited to healthy populations. Examination of these relationships in special populations such as those with specific disease conditions would appear needed and fruitful. For example, researchers might want to consider populations with chronic diseases like arthritis where people may often experience a high degree of joint immobility/stiffness or chronic pain. One might expect chronic joint problems or pain to be a common attribution for failing to be active in this population, and that this attribution would be seen as stable. While results in the current research suggested that those who perceive themselves as unsuccessful may tend to make internal, personally controllable and unstable attributions, one might not expect such optimistic attributions in a population dealing with chronic disease-related conditions.

Fourth, these studies examined attributions and measures of future motivation (e.g., intentions). While these are important for developing a better understanding of physical activity behaviour, as others have pointed out (Weinstein, 2007), research predicting subsequent behaviour also is necessary.

Fifth, in three of the studies, physical activity, attributions, self-efficacy, and intention referred to activity sufficient for health benefits, either with or without specified guidelines. It is possible that correspondence between these variables may have been greater with a more recognizable behaviour. That is, activity sufficient for health benefits or meeting activity guidelines may not be as accessible, for instance, as an outcome such as frequency of exercise. Future researchers may wish to consider this when examining health-related physical activity.

Finally, samples in three of these studies did not include those who did not identify 'health' as one of the key reasons why they were active. In separating physical activity for health benefit as a special subset of physical activity behaviour, it may be important for future researchers to examine differences between attributions for physical activity for health versus physical activity for other reasons.

Despite these limitations, the four studies comprising this dissertation present a stream of connected research, which makes notable contributions in two areas. First, this research tests aspects of Weiner's (1985, 1986) attribution theory and Bandura's (1977, 1997) self-efficacy theory, as well as testing models incorporating elements of both. Second, this research contributes to the literature concerning health-related physical activity.

In terms of the contribution to attribution theory as it relates to physical activity, the results from these studies suggest that the dimension of stability may be particularly important. Stability appeared to be the attributional dimension most clearly differentiated by perceptions of success/failure to be sufficiently active. Also, stability appeared to be related to future expectations, scheduling self-efficacy, and intentions.

In examining self-efficacy in the activity area, results suggested that self-regulatory efficacy may be a particularly strong predictor of intention. Two of the studies combined constructs from attribution theory and self-efficacy and results suggested that how we explain behaviour, in terms of attributions, may be important for both self-efficacy and intentions. Although neither stability nor self-efficacy are new targets for interventions, results supported the contention that changes in self-regulatory efficacy may influence intention, as self-regulatory efficacy appeared to be a potent predictor of intention. On the other hand, while results suggested that targeting stability of attributions may be one way to effect change in self-regulatory efficacy, as stability did not appear to be a particularly strong predictor of self-regulatory efficacy, there may be better predictors that need to be identified and tested.

The second contribution of the results of these studies is to the health-related physical activity literature. Concerted effort was made to ensure that measures in the studies tapped into health aspects. For instance, participants in three of the studies included only those for whom 'health' was an important reason for their own physical activity levels. Also, attributions, self-efficacy, and intentions referred to levels of physical activity sufficient for health benefits in several cases. This is important in that most previous research has involved examining adherence behaviour in exercise classes, with little or no consideration of its connection to health. That the results of the fourth study suggest that how people explain their previous typical exercise levels in terms of stability relates to their confidence and intent to maintain these exercise levels in the face of a potentially stressful and busy time has implications for guiding future research and the creation of interventions aimed at helping people become active for health benefits.

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Appendix A: Reasons for Being Physically Active

Being active is important for many reasons. Which are the three most important reasons for you? (Rank them as 1, 2, and 3)

- Enjoyment**
- Health**
- Social time**
- Appearance**
- Relaxation**
- Energy**
- Other:** _____



University of Saskatchewan
Behavioural Research Ethics Board (Beh-REB)

22-Mar-2006

Certificate of Approval

PRINCIPAL INVESTIGATOR Kevin Spink	DEPARTMENT Kinesiology	BEH# 06-47
STUDENT RESEARCHER(S) Darren Nickel		
INSTITUTION (S) WHERE RESEARCH WILL BE CARRIED OUT University of Saskatchewan Saskatoon SK		
SPONSORING AGENCIES UNFUNDED		
TITLE Examining Attributions for Physical Activity		
CURRENT APPROVAL DATE 22-Mar-2006	CURRENT RENEWAL DATE 01-Mar-2007	

CERTIFICATION


The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS

The term of this approval is five years. However, the approval must be renewed on an annual basis. In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions:
<http://www.usask.ca/research/ethical.shtml>.

APPROVED.


Valerie Thompson, Chair
Behavioural Research Ethics Board
University of Saskatchewan

Please send all correspondence to:

Ethics Office
University of Saskatchewan
Room 306, Kirk Hall, 117 Science Place
Saskatoon, SK S7N 5C8
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Appendix C: Recommendations from *Canada's Physical Activity Guide*

Health Canada (*Canada's Physical Activity Guide*) recommends that you maintain a certain level of activity in order to achieve health benefits. This can occur in different ways...

You could do:

- **at least 60 minutes of light activity every day (e.g., light walking, volleyball,...) accumulated in bouts of at least 10 minutes or more**
- OR**
- **30-60 minutes of moderate activity at least 4 days per week (e.g., brisk walking, swimming,...) accumulated in bouts of at least 10 minutes or more**
- OR**
- **20-30 minutes of vigorous activity at least 4 days per week (e.g., jogging, hockey,...) accumulated in bouts of at least 10 minutes or more**
- OR**
- **Some combination of the above**

Using the above descriptions as a guide, were you successful__ or unsuccessful__ in maintaining the recommended activity level over the **past month**? (check one)

Appendix D: Attributions for Success/Failure to Meet Health Canada's Recommended Activity Level (CDSII)

What do you think is the **most important reason for your** success/failure in maintaining the recommended activity level over the **past month**?
(please write in the space provided)

Instructions: Think about the reason you have written above. The items below concern your impressions or opinions of this cause of your success/failure. Circle one number for each of the following questions.

Is this cause of your success/failure something:

That reflects an aspect of yourself 9 8 7 6 5 4 3 2 1 That reflects an aspect of the situation

Manageable by you 9 8 7 6 5 4 3 2 1 Not manageable by you

Permanent 9 8 7 6 5 4 3 2 1 Temporary

You can regulate 9 8 7 6 5 4 3 2 1 You cannot regulate

Inside of you 9 8 7 6 5 4 3 2 1 Outside of you

Stable over time 9 8 7 6 5 4 3 2 1 Variable over time

Something about you 9 8 7 6 5 4 3 2 1 Something about others

Over which you have power 9 8 7 6 5 4 3 2 1 Over which you have no power

Unchangeable 9 8 7 6 5 4 3 2 1 Changeable

Appendix F: Physical Activity (MAQ)

Aerobics	Badminton	Basketball	Boxing	Biking/Cycling
Bowling	Cardio machine	Dance (specify)	Figure skating	Gymnastics
Ice Hockey	Martial Arts	Racquetball	Ringette	Running/jogging
Running/Jogging	Skipping	Skiing-X country	Skiing-Downhill	Snowboarding
Soccer	Speed Skating	Street/Floor hockey	Swimming-synchro	Swimming-Laps
Tennis	Track & Field	Volleyball	Wrestling	Walking
Wall Climbing	Weight lifting	Yoga	Other:	

Please complete **TABLE 1** below as it relates to your involvement in physical activity in the past month.

1. Browse through the activities above and circle those that you have done in the ***past month only***. Remember: only include activities done (at least partially) for health benefits (i.e., only include sports if a main reason for participation was for health benefits). Next, transfer these activities into the first column of Table 1 below. If any activities are not listed above, please add them yourself.

If you did not participate in any physical activity during the past month, go to the next question.

- Record in the next columns, the number of times you did that activity during each week.
- In the next column, record the average (not total) number of minutes you were *actually active* each time (do not include time spent changing clothes, stretching, standing around, etc).
- In the last column, record the average intensity at which you were active: Light (slight change from normal breathing), Moderate (above normal breathing), or Heavy (heavy breathing).

TABLE 1

Activity	Number of Times Doing the Activity				Average Number of <u>Minutes</u> You Were Actually active EACH Time	Intensity L = Light M = Moderate H = Heavy
	Week 1	Week 2	Week 3	Week 4		

Appendix H: Correlations Between Variables in Study 1

Perceived Outcome	Physical Activity	LOC	PC	Stability	Competent	Happy	Pleased	Proud	Ashamed	Depressed	Disappointed	Guilty	Upset	Certain
Perceived Outcome	.56	.40	.24	.67	.46	.47	.60	.57	-.36	-.31	-.47	-.46	-.42	.71
Physical Activity		.15	.05	.44	.31	.34	.41	.42	-.36	-.32	-.44	-.43	-.38	.41
LOC			.70	.65	.32	.35	.37	.39	-.25	-.18	-.25	-.30	-.33	.45
PC				.54	.43	.24	.32	.46	-.31	-.11	-.24	-.31	-.19	.34
Stability					.41	.43	.51	.57	-.32	-.22	-.37	-.45	-.29	.65
Competent						.68	.76	.74	-.58	-.60	-.68	-.58	-.60	.41
Happy							.87	.74	-.55	-.60	-.63	-.55	-.57	.47
Pleased								.86	-.61	-.61	-.75	-.64	-.62	.55
Proud									-.58	-.53	-.67	-.61	-.56	.54
Ashamed										.63	.63	.78	.64	-.33
Depressed											.74	.58	.83	-.19
Disappointed												.64	.81	-.43
Guilty													.62	-.34
Upset														-.42

Appendix I: Self-regulatory Efficacy to Meet Health Canada's Recommended Activity Level

a) How sure are you that you will be able to fit in physical activity at or above the Health Canada recommended level every week for the next month? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

b) How sure are you that you will be able to plan and prepare in advance so that nothing interferes with you completing physical activity at or above the Health Canada recommended level every week for the next month? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

c) How sure are you that you will be able to make it a priority to do physical activity at or above the Health Canada recommended level every week for the next month? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

d) How sure are you that you will be able to rearrange your schedule so that you do physical activity at or above the Health Canada recommended level every week for the next month? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix J: Attributions for Success/Failure to be Active Enough for Health Benefits (CDSII)

Using what you reported in Table 1 (i.e., MAQ; see Appendix F), do you think that you were successful ___ or unsuccessful ___ in maintaining a level of activity sufficient for health (i.e., cardiovascular) benefits over the **past month**? (check one)

What do you think is the **most important reason for your** success/failure in maintaining at least a level of activity sufficient for health benefits over the **past month**? (please write in the space provided)

Instructions: Think about the reason you have written above. The items below concern your impressions or opinions of this cause of your success/failure. Circle one number for each of the following questions.

Is this cause of your success/failure something:

That reflects an aspect of yourself 9 8 7 6 5 4 3 2 1 That reflects an aspect of the situation

Manageable by you 9 8 7 6 5 4 3 2 1 Not manageable by you

Permanent 9 8 7 6 5 4 3 2 1 Temporary

You can regulate 9 8 7 6 5 4 3 2 1 You cannot regulate

Inside of you 9 8 7 6 5 4 3 2 1 Outside of you

Stable over time 9 8 7 6 5 4 3 2 1 Variable over time

Something about you 9 8 7 6 5 4 3 2 1 Something about others

Over which you have power 9 8 7 6 5 4 3 2 1 Over which you have no power

Unchangeable 9 8 7 6 5 4 3 2 1 Changeable

Appendix K: Self-regulatory Efficacy to be Active Enough for Health Benefits

a) How sure are you that you will be able to fit in physical activity at a level sufficient for health benefits every week for the next month? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

b) How sure are you that you will be able to plan and prepare in advance so that nothing interferes with you completing physical activity at a level sufficient for health benefits every week for the next month? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

c) How sure are you that you will be able to make it a priority to do physical activity at a level sufficient for health benefits every week for the next month? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

d) How sure are you that you will be able to rearrange your schedule so that you do physical activity at a level sufficient for health benefits every week for the next month? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix L: Intention to Be Active Enough for Health Benefits

a) I intend to be physically active every week during the next month at a level sufficient for health benefits. (circle response)

1 2 3 4 5 6 7
agree disagree

b) I will try to be physically active every week during the next month at a level sufficient for health benefits. (circle response)

1 2 3 4 5 6 7
definitely true definitely false

c) I plan to be physically active every week during the next month at a level sufficient for health benefits. (circle response)

1 2 3 4 5 6 7
strongly agree strongly disagree

Appendix M: Typical Exercise Levels (LTEQ)

During a **typical 7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 10 minutes** during your free time? (write on each line the appropriate number)

Times Per Week

a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY)

(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE (NOT EXHAUSTING)

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE (MINIMAL EFFORT)

(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snowmobiling, easy walking)

Appendix N: Attributions for Typical Exercise Levels (CDSII)

We are interested in knowing why you have been active at the level that you noted in #1a-c¹² above. Please identify the **most important cause** of your typical amount of exercise in the space provided below.

Instructions: Think about the reason you have written above. The items below concern your impressions or opinions of this cause. Please circle one number for each of the following questions.

Is this cause something:

That reflects an aspect of yourself 9 8 7 6 5 4 3 2 1 That reflects an aspect of the situation

Manageable by you 9 8 7 6 5 4 3 2 1 Not manageable by you

Permanent 9 8 7 6 5 4 3 2 1 Temporary

You can regulate 9 8 7 6 5 4 3 2 1 You cannot regulate

Inside of you 9 8 7 6 5 4 3 2 1 Outside of you

Stable over time 9 8 7 6 5 4 3 2 1 Variable over time

Something about you 9 8 7 6 5 4 3 2 1 Something about others

Over which you have power 9 8 7 6 5 4 3 2 1 Over which you have no power

Unchangeable 9 8 7 6 5 4 3 2 1 Changeable

¹² #1a-c referred to typical number of strenuous, moderate, and mild exercise bouts per week in LTEQ (see Appendix M for LTEQ)

Appendix O: Self-regulatory Efficacy for Typical Exercise Levels

The following items concern your confidence in maintaining your typical exercise pattern from April 7 to 28 (exam period). For each of questions, you will need to write the typical levels from 1 a-c (i.e., LTEQ; see Appendix M) in the appropriate spaces below and then circle your response for each item.

a) How sure are you that you will be able to fit in **strenuous** exercise _____ times (enter value from 1a ¹³ above) every week from April 7 to 28? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

b) How sure are you that you will be able to prepare in advance so that nothing interferes with you completing **strenuous** exercise _____ times (enter value from 1a above) every week from April 7 to 28? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

c) How sure are you that you will be able to make it a priority to do **strenuous** exercise _____ times (enter value from 1a above) every week from April 7 to 28? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

d) How sure are you that you will be able to rearrange your schedule so that you do **strenuous** exercise _____ times (enter value from 1a above) every week from April 7 to 28? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

a) How sure are you that you will be able to fit in **moderate** exercise _____ times (enter value from 1b above) every week from April 7 to 28? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

b) How sure are you that you will be able to prepare in advance so that nothing interferes with you completing **moderate** exercise _____ times (enter value from 1b above) every week from April 7 to 28? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

c) How sure are you that you will be able to make it a priority to do **moderate** exercise _____ times (enter value from 1b above) every week from April 7 to 28? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

d) How sure are you that you will be able to rearrange your schedule so that you do **moderate** exercise _____ times (enter value from 1b above) every week from April 7 to 28? (please circle appropriate level)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

cont'd next page

¹³ 1 a, b, and c referred to typical number of strenuous, moderate, and mild exercise bouts per week (Appendix M)

Appendix O: Self-regulatory Efficacy cont'd.

a) How sure are you that you will be able to fit in **mild** exercise _____ times (enter value from 1c above) every week from April 7 to 28? (please circle appropriate level)
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

b) How sure are you that you will be able to prepare in advance so that nothing interferes with you completing **mild** exercise _____ times (enter value from 1c above) every week from April 7 to 28? (please circle appropriate level)
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

c) How sure are you that you will be able to make it a priority to do **mild** exercise _____ times (enter value from 1c above) every week from April 7 to 28? (please circle appropriate level)
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

d) How sure are you that you will be able to rearrange your schedule so that you do **mild** exercise _____ times (enter value from 1c above) every week from April 7 to 28? (please circle appropriate level)
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix P: Intention to Maintain Typical Exercise Levels

The following items concern your intentions to do your typical exercise from April 7 to 28 (exam period). You will need to enter the typical levels from 1a-c (i.e., LTEQ; see Appendix M) above in the appropriate spaces and then circle your response for each item.

a) I intend to do **strenuous** exercise _____ times (enter number from item 1a above) every week from April 7 to 28. (please circle appropriate response)

1 2 3 4 5 6 7
extremely unlikely extremely likely

b) I will try to do **strenuous** exercise _____ times (enter number from item 1a above) every week from April 7 to 28. (please circle appropriate response)

1 2 3 4 5 6 7
definitely true definitely false

c) I plan to do **strenuous** exercise _____ times (enter number from item 1a above) every week from April 7 to 28. (please circle appropriate response)

1 2 3 4 5 6 7
strongly disagree strongly agree

a) I intend to do **moderate** exercise _____ times (enter number from item 1b above) every week from April 7 to 28. (please circle appropriate response)

1 2 3 4 5 6 7
extremely unlikely extremely likely

b) I plan to do **moderate** exercise _____ times (enter number from item 1b above) every week from April 7 to 28. (please circle appropriate response)

1 2 3 4 5 6 7
strongly disagree strongly agree

c) I will try to do **moderate** exercise _____ times (enter number from item 1b above) every week from April 7 to 28. (please circle appropriate response)

1 2 3 4 5 6 7
definitely true definitely false

a) I plan to do **mild** exercise _____ times (enter number from item 1c above) every week from April 7 to 28. (please circle appropriate response)

1 2 3 4 5 6 7
strongly disagree strongly agree

b) I intend to do **mild** exercise _____ times (enter number from item 1c above) every week from April 7 to 28. (please circle appropriate response)

1 2 3 4 5 6 7
extremely unlikely extremely likely

c) I will try to do **mild** exercise _____ times (enter number from item 1c above) every week from April 7 to 28. (please circle appropriate response)

1 2 3 4 5 6 7
definitely true definitely false