

Self-Determination Theory and Self-Efficacy Theory: Can they work together to predict
physical activity in cardiac rehabilitation?

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ABSTRACT

Cardiovascular disease is currently the leading cause of death in Canada and other developed countries. Physical activity based cardiac rehabilitation programs have been shown to reduce the likelihood of subsequent cardiac events and even reverse the disease process. However, factors influencing physical activity in cardiac patients are still not clearly understood. The overall objective of this dissertation was therefore to better understand motivation and physical activity in a cardiac rehabilitation context. Specifically, theory-based motivational variables were studied as correlates of physical activity. To accomplish this objective, a two-purpose research approach was taken. First, two articles (Article-1 and Article-2) aimed to test and integrate concepts from two strong motivational theories: Self-Efficacy Theory (SET) and Self-Determination Theory (SDT) into one comprehensive model using the novel and rigorous approach of Noar and Zimmerman (2005). The second purpose of this dissertation was to extend the findings from the first purpose by investigating physical activity and motivational patterns over a 24-month period in cardiac patients (Article 3). With regards to the first purpose, Article-1 revealed that the integration of SDT and SET was feasible as the integrated model had good model fit, explained more variance in self-determined motivation, confidence, and physical activity and supported similar number of hypothesised links in a cross-sectional cardiac sample as well two other samples: primary care adults and university students. Due to the cross-sectional nature of Article-1, Article-2 tested the integrated SDT-SET model from cardiac patients with longitudinal data of patients following a cardiac rehabilitation program. Although no motivational variables predicted residual change in physical activity at 4-months, this longitudinal model was found to have good model fit. Across both articles, the integration of SDT and SET was found to be possible. However, more research is needed to further test the integration of these theories. As for the

second purpose of this dissertation, Article-3 investigated physical activity and motivational patterns of cardiac rehabilitation participants over the course of 24 months. Distinct patterns were found for physical activity, self-determined motivation, barrier self-efficacy and outcome expectations. In addition, individuals in the higher patterns of the motivational/expectancy variables had greater probability of being in the maintenance physical activity pattern compared to individuals in the other motivational/expectancy patterns. Therefore, this article extended findings from the first purpose by linking SDT and SET variables to long-term physical activity behaviour. SDT and SET should continue to be investigated together in order to increase our understanding of the mechanisms leading to greater motivation and subsequent increases in physical activity levels. Having a theoretically supported pathway to build motivation is ideal to inform future interventions and cardiac rehabilitation programs.

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CHAPTER 1 - INTRODUCTION

Cardiovascular disease is currently the leading cause of death in Canada representing 32.1% of all deaths (Public Health Agency of Canada, 2009). The prevalence of cardiovascular disease risk factors such as hypertension, diabetes and obesity have risen since 1994 (Lee et al., 2009), however, the mortality and hospitalization rates have decreased since then (Tu et al., 2009). As the authors pointed out, these reductions in mortality may only reflect a delay in cardiac events due to the advance of medicine, but they still urge that prevention strategies continue to be implemented. Preventing cardiovascular disease can help reduce the societal costs, as this disease accounts for 16.9% of all hospitalizations in Canada as well as 10.3% of all visits to a physician (Heart and Stroke Foundation of Canada, 2003; Public Health Agency of Canada, 2009). Consequently, cardiovascular disease places a \$22.2 billion financial burden on the Canadian health care system (Public Health Agency of Canada, 2009).

Cardiovascular disease is defined by the Heart and Stroke Foundation of Canada as a disease related to the cardiovascular system including disease of the heart and blood vessels (Heart and Stroke Foundation of Canada, 2003). Cardiovascular disease is the most encompassing term for all heart related diseases. Multiple factors are associated with developing cardiovascular disease such as one's heredity, social and physical environment and modifiable risk factors such as physical activity (Public Health Agency of Canada, 2009). Each play a specific role, but modifiable risk factors are the easiest to target for both primary and secondary prevention as they mostly consist of modifiable health behaviours (i.e. physical activity, diet/nutrition and smoking). Partaking in healthy lifestyle habits (i.e. being smoke-free, participating in regular physical activity and eating fruit and vegetables daily) can reduce the risk of myocardial infarction by more than 75% compared to those who do not engage in the same

lifestyle behaviours (Ford et al., 2009; Yusuf et al., 2004). To further support this point, a review on the effects of physical activity and diet on the risk of non-communicable disease revealed that high intake of fruit and vegetables and regular physical activity were protective factors for coronary heart disease while obesity was a risk factor (Popkin, Kim, Rusev, Du, & Zizza, 2006). Changing these risk factors is crucial since 9 in 10 Canadians aged 20 and over have at least 1 modifiable risk factor for cardiovascular disease (Public Health Agency of Canada, 2009). Unfortunately, these distributions are not known in the cardiac population. However, it is safe to assume that the percentage of modifiable risk factors would be higher in the cardiac population since these behaviours are linked with cardiovascular disease. A recent study revealed that individuals with coronary heart disease were less likely to comply with physical activity recommendations than individuals without coronary heart disease (Zhao, Ford, Li, & Mokdad, 2008). Another study revealed that 33.2% of cardiac patients met the recommended physical activity compared to 45.7% of non-cardiac population (Wofford, Grennlund, Croft, & Labarthe, 2007). These authors therefore stressed the need to increase cardiac patients' physical activity.

Cardiovascular Disease and Cardiac Rehabilitation

Physical activity training has been utilized within cardiac rehabilitation as one avenue to prevent further cardiac complications in individuals who have experienced a cardiac event. Indeed, cardiac rehabilitation focuses on preventing further onset or complications of cardiovascular disease in individuals who have experienced a cardiac event, characterizing it as secondary prevention. Specifically, the Canadian Association of Cardiac Rehabilitation defines cardiac rehabilitation as

"the enhancement and maintenance of cardiovascular health through individualized programs designed to optimize physical, psychological, social, vocational, and emotional

status. This process includes the facilitation and delivery of secondary prevention through risk factor identification and modification in an effort to prevent disease progression and recurrence of cardiac events" (Stone, 1999).

Overall, cardiac rehabilitation programs have been successful at improving individuals' cardiovascular health (Ketola, Sipila, & Makela, 2000; Leon et al., 2005) showing reductions in cardiac and all cause mortality when compared to usual care (Brown, Noorani, Taylor, Stone, & Skidmore, 2003; Taylor et al., 2004). In addition, cardiac rehabilitation programs have been found to be cost-effective and can help save resources and reduce costs to the health care system (Brown et al., 2003).

As highlighted by the definition, cardiac rehabilitation often consists of multifactor-multibehaviour interventions which include medical aid, diet/nutrition guidance, psychological assessments and a physical activity program (Daly et al., 2002). Indeed, physical activity is a central component of cardiac rehabilitation since physical activity was shown to prevent subsequent cardiac events and/or to reverse the disease process within individuals previously diagnosed (Warburton, Whitney Nicol, & Bredin, 2006). A systematic review demonstrated that "physical activity only" cardiac rehabilitation had a greater impact on reducing total mortality and, to a smaller extent, cardiac related mortality when compared to multifactor/multibehaviour cardiac rehabilitation (Jolliffe et al., 2001). Another meta-analysis of randomized control trials of exercise-based cardiac rehabilitation revealed that this type of cardiac rehabilitation reduced cardiac mortality, all-cause mortality, levels of total cholesterol, levels of triglyceride and systolic blood pressure (Taylor, Brown, Ebrahim, Jolliffe, Noorani, Rees, et al., 2004). More recently, Conn and colleagues (Conn, Hafdahl, Moore, Nielsen, & Brown, 2009) revealed that "physical activity only" interventions in cardiac individuals were best at changing physical

activity behaviour over multiple health behaviour interventions. Finally, Brown and colleagues (2003) also revealed long-term economic benefits of physical activity in cardiac rehabilitation to be between US\$ 4 950 to US\$ 21 800 per life-year gained. Evidently, increasing physical activity within cardiac rehabilitation is important for cardiac patients and the health care system. Consequently, more research investigating the correlates of physical activity behaviour in cardiac rehabilitation is needed (Petter, Blanchard, Kemp, Mazoff, & Ferrier, 2009).

Physical Activity Correlates

In order to understand which factors could help increase physical activity, an abundance of research has been conducted. A number of reviews have synthesized and summarized findings to determine key variables associated with physical activity, including demographic, environmental and individual level factors (see Sherwood & Jeffery, 2000; Trost, Owen, Bauman, Sallis, & Brown, 2002). Within the individual level, motivational variables have been found to be the strongest and most consistent predictors of physical activity (Pan et al., 2009; Trost et al., 2002), including with a cardiac population (Petter et al., 2009). Since these motivational variables are modifiable and frequently have a theoretical base, they have been deemed crucial to investigate and to utilize in health behaviour research (Baranowski, Anderson, & Carmack, 1998; Baranowski, Cullen, Nicklas, & Thompson, 2003). Indeed, using theoretical frameworks to guide research helps to further understand the behaviour change process, and to direct and evaluate future interventions (Improved Clinical Effectiveness through Behavioural Research Group, 2006).

While there exists many theoretical explanations of physical activity, Self-Efficacy Theory (SET; Bandura, 1997) has emerged as a strong theory in the physical activity domain since its main construct, self-efficacy, has shown to be one of the most reliable and strongest

predictors of physical activity (Pan et al., 2009), including for those following a cardiac rehabilitation program (Petter, et al., 2009). Second, motivational variables from Self-Determination Theory (SDT; Deci & Ryan, 1985; Deci & Ryan, 2002) have received increased attention in the physical activity domain and are being strongly encouraged for physical activity research (Biddle & Nigg, 2000; Wilson, Mack, & Grattan, 2008). Both theories are based on the ideology that humans are agents of their actions. In short, agency, specifically regarding an internalist view, refers to the fact that humans possess internal structures that allow them to make choices regarding their actions (Sugarman & Sokol, in press). As such, SDT and SET conceptualize agency differently. In SET, individuals act when they feel capable and able to attain the goal (i.e., self-efficacy). Although SDT entertains the idea that feelings of capability/competence are important, the theorists believe that autonomy plays more of a central role. If one feels autonomous in their actions, the likelihood of behaviour enactment and sustainability is greater (Deci & Ryan, 2000). Therefore, self-determined motivation is the driving force of one's action. Despite some of these differences, both theories converge on the idea that humans are active contributors of their behaviour.

Given that SET and SDT are based on the same meta-theoretical concept of agency and are two well supported and highly recommended motivational theories used to understand health/physical activity, the main purpose of this dissertation was to test and integrate these two theories simultaneously to predict physical activity within a cardiac rehabilitation setting. In the following sections, a description of each theory and relevant empirical evidence supporting the use of SDT and SET in physical activity is presented. Next, past research combining specific constructs from both theories and recommended steps for proper theory integration are outlined and a look into physical activity behaviour change is provided.

Self-Efficacy Theory

In Self-Efficacy Theory (SET; Bandura, 1997), behaviour is influenced by both self-efficacy and outcome expectations, where outcome expectation partially mediates the self-efficacy-behaviour relationship (see figure 1). Self-efficacy is defined as the “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments [e.g., physical activity]” (Bandura, 1997, p.3). Self-efficacy has been outlined as being task specific, meaning that various forms of self-efficacy can exist for any given behaviour. Three different types of self-efficacy were assessed in this dissertation, namely task, barrier, and scheduling self-efficacy. Task self-efficacy refers to one’s confidence in his/her ability to do a task (Bandura, 1997), and in this case participate in physical activity. For example, a cardiac patient would rate how confident they are to participate in physical activity for at least 1 to 7 days a week. Barrier self-efficacy is defined by how confident an individual feels to participate in physical activity when faced with specific barriers associated with physical activity (Blanchard, Rodgers, Courneya, Daub, & Knapik, 2002). For example, a cardiac patient who indicates a high level of confidence to participate in physical activity when faced with bad weather and when experiencing side effects from medication would have high barrier self-efficacy. Finally, scheduling self-efficacy examines one’s confidence to organize their time and responsibilities around physical activity (DuCharme & Brawley, 1995; Woodgate, Brawley, & Weston, 2005). For example, a cardiac patient with high scheduling self-efficacy would report being confident in organizing their time around their physical activity sessions no matter what happens.

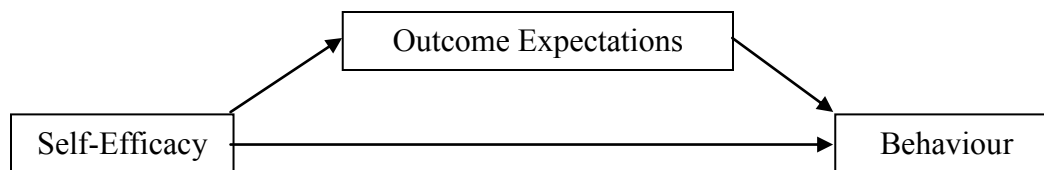


Figure 1. Self-Efficacy Theory based model.

Self-efficacy and Physical Activity

Self-efficacy has been found to be a consistent predictor across a variety of health behaviours, such as adherence to medication and rehabilitation, sexual risk behaviours, addictive behaviours (Luszczynska & Schwarzer, 2005) and physical activity (Petter et al., 2009; Trost et al., 2002). In the physical activity arena, self-efficacy has been strongly related to physical activity across different populations, such as older adults (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003), adults with diabetes (Allen, 2004), sedentary adults (Blanchard et al., 2007), and, of interest, cardiac patients (Blanchard et al., 2002; Blanchard, Reid et al., 2007; Millen & Bray, 2008). Promising results have indicated that self-efficacy based interventions are also helpful in aiding participants to adopt physical activity. For example, in a recent study stemming from the theory-based Physical Activity Counselling trial (Fortier et al., 2007), the intervention group had moderately higher barrier and task self-efficacy compared to the control group at mid and then end of the intervention. In addition, the intervention-physical activity adoption relationship was mediated by both task and barrier self-efficacy (Blanchard et al., 2007). In another randomized control trial, barrier self-efficacy was found to mediate the intervention-physical activity relationship (Lewis et al., 2006). All three types of self-efficacies predicted the maintenance of running behaviour (Strachan, Woodgate, Brawley, & Tse, 2005). Specifically, scheduling self-efficacy accounted for more variance than barrier self-efficacy with regards to running frequency.

Specific to a cardiac population, Millen & Bray (2009) revealed that the intervention group, who received a theory-based instruction manual and Thera-Band resistive bands for resistance training, saw greater increases in self-efficacy and outcome expectations compared to a wait-list control group, in an intervention after cardiac rehabilitation. They also showed a partial mediation between self-efficacy and frequency of resistance training. In addition, Bray and Cowen (2004) conducted a longitudinal study which followed cardiac patients for 5 months and revealed that task self-efficacy increased over this time period. In a similar study, Millen and Bray (2008) demonstrated that task and barrier self-efficacy were strong predictors of physical activity. Another investigation revealed cross-lagged effects between task self-efficacy, physical activity and nutrition in a 12 week cardiac rehabilitation program (Evon & Burns, 2004). These researchers showed that change in initial levels of task self-efficacy predicted changes in physical activity and nutrition but the inverse was not found (Evon & Burns, 2004). Recently, Tulloch, Reid, Fortier, Slovinec D'Angelo, Morrin, Beaton, et al. (2008) tested a Social Cognitive Theory model of physical activity adoption and maintenance within a cardiac population and found that barrier self-efficacy was a predictor of physical activity at 6 and 12 months. In another study, cardiac individuals who transitioned to higher stages of change reported higher task and barrier self-efficacy than those who did not transition to higher stages (Reid, Tulloch, Kocourek, & Morrin, 2007). Finally, scheduling self-efficacy predicted physical activity maintenance in individuals within a cardiac rehabilitation program (Woodgate et al., 2005). Overall, self-efficacy has been demonstrated as a strong predictor of physical activity in cardiac individuals, however very few studies have investigated scheduling self-efficacy within this population setting (Woodgate & Brawley, 2008). In addition, Millen and Bray (2008) acknowledges that using scheduling self-efficacy in addition to task and barrier self-efficacy

would be an important contribution to the literature. This dissertation aims to fill this void by assessing three types of self-efficacy.

Outcome Expectations and Physical Activity

Outcome expectations are defined as perceptions of positive and negative outcomes that result from participating in a specific behaviour (Bandura, 1997). Regarding physical activity, a cardiac patient would be said to have high outcome expectations if they agreed that physical activity could improve their overall health. In SET, outcome expectations are postulated to have a direct influence on physical activity behaviour; however, a debate exists in the literature regarding the extent to which outcome expectations impact this behaviour (Williams, Anderson, & Winett, 2005). While some researchers have demonstrated a relationship between outcome expectations and physical activity (Resnick & Nigg, 2003; Schwarzer, 2001; Williams et al., 2005; Williams & Bond, 2002), others have not (Carlson et al., 2001; Rovniak, Anderson, Winett, & Stephens, 2002). Furthermore, a recent study revealed that outcome expectations at baseline were not significantly associated with either physical activity adoption or maintenance (Wilcox, Castro, & King, 2006), while another found outcome expectations was strongly related to physical activity at 12 months but not at 6 months (Williams et al., 2008). Unfortunately, there is no clear indication whether outcome expectations directly influences physical activity. However, Williams and colleagues (2005) have suggested that in a physical activity context, outcome expectations may play a larger role in predicting self-efficacy rather than physical activity. Specifically, these authors suggest that the expected positive outcomes of physical activity can outweigh the negative ones which increase individuals' perception in their ability to perform the behaviour (i.e., higher self-efficacy). This debate between the relationship of

outcome expectation and self-efficacy is still ongoing (Williams, 2010) and this dissertation is aimed at shedding light on the existing debate.

Even though SET has received a great amount of support in the physical activity domain, it is believed that it may not be the single best theory to explain physical activity. As mentioned previously, Tulloch et al. (2008) tested a SET model for physical activity adoption and maintenance in a large sample of cardiac patients. Based on a seminal paper on health behaviour change maintenance (Rothman, 2000; Rothman, Baldwin, & Hertel, 2004), Tulloch and colleagues concluded that integrating another theory such as Self-Determination Theory would be crucial to gain a better understanding of physical activity. In addition, recent SDT researchers have recommended that SDT be integrated with other prominent theories (Hagger & Chatzisarantis, 2008; Wilson et al., 2008). Since motivation is multidimensional, looking at the strengths of one's beliefs (i.e., self-efficacy) and the reasons why to engage in physical activity (i.e., self-determination theory) could allow for a greater understanding of physical activity that may not be present when only testing one theory.

Self-Determination Theory

Self-Determination Theory (SDT; Deci & Ryan, 1985; 2002) is a motivation theory based on a humanistic perspective which acknowledges that every human being has an innate tendency towards growth, integration and well-being. SDT explains this process with the tenet that humans have to satisfy three basic psychological needs of autonomy, competence, and relatedness. SDT presents itself through four main mini-theories: Cognitive Evaluation Theory; Organismic Integration Theory, Causality Orientation Theory and Basic Needs Theory. For the purpose of this dissertation Cognitive Evaluation Theory and Organismic Integration Theory are presented since the main premise of these mini-theories and their constructs are the most

pertinent to help explain the physical activity behaviour change process. In brief, these two mini-theories were used to investigate the sequence proposed by SDT (see figure 2).

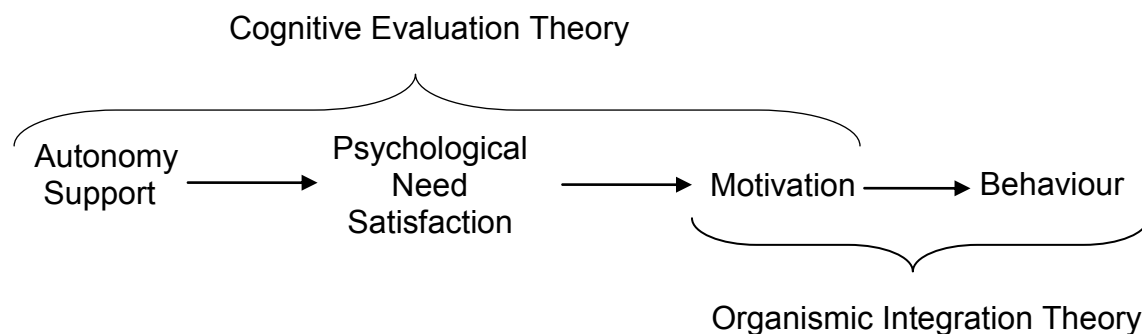


Figure 2. Visual representation of constructs that both two mini theories of SDT explain

Cognitive Evaluation Theory

Cognitive evaluation theory focuses on the socio-contextual variables that influence motivation. Specifically, this mini-theory proposes a multi-dimensional approach to understanding the underpinnings of motivation. It is multidimensional since one's social environment has an influence on motivation, through the satisfaction of three psychological needs (Ryan & Deci, 2007). The following sections will describe in more detail the influence of the social context and psychological need satisfaction onto motivation.

Social context: Autonomy support. Autonomy support is the main avenue through which the social context is assessed to determine its influence on the psychological needs and motivation. Specifically, autonomy support consists of three main facets:

"The first, the person in the 'one-up' position (whether a coach, teacher, parent, or counsellor) should try to take and acknowledge the perspective and world-view of the person being motivated....[the second is] providing as much choice as possible within the limits of the context....[and third] to provide a meaningful rationale in those instances where choice cannot be provided" (Vansteenkiste & Sheldon, 2006, p.75).

Other facets of autonomy support has also been discussed where the person in the “one-up” position would also provide non-controlling competence feedback, avoid guilt inducing criticisms and allow opportunities to take initiatives (Mageau & Vallerand, 2003). Therefore, how one perceives his/her social context regarding physical activity, whether it is perceived as autonomy supportive or not, will influence one’s needs and in turn one’s physical activity motivation.

Basic Psychological Needs. As mentioned previously, SDT proposes three psychological needs - autonomy, competence, and relatedness - that lead to self-determined motivation and subsequently optimal growth and well-being. Autonomy "refers to being the perceived origin or source of one's own behaviour" (Deci & Ryan, 2002, p. 8). For example, if a cardiac patient feels that he/she has a choice of the type of physical activity to engage in (e.g., walking on a treadmill instead of cycling on a stationary bike), then it can be said that his/her sense of autonomy would be higher. Competence refers to “feeling effective in one's ongoing interactions with the social environment and experiencing opportunities to exercise and express one's capacities" (Deci & Ryan, 2002, p.7). In a physical activity context, a cardiac patient feels competent if he/she feels capable of achieving a personally challenging exercise. Relatedness "refers to the desire to feel connected to others" (Deci & Ryan, 2000) and to have a sense of belonging (Ryan & Deci, 2007). Again, a cardiac patient who walks on the treadmill at the cardiac rehabilitation clinic and feels connected with the staff and other patients at the clinic would exemplify a high feeling of relatedness. Theoretically, the fulfillment of these three needs in an exercise context should increase the likelihood that the individual will be motivated for self-determined reasons (e.g., for the value, health benefits and/or pleasure and satisfaction of the activity) to sustain their physical activity levels (Ryan & Deci, 2007).

Since these needs have only been recently investigated in a physical activity context with adult populations, little research has tested the sequence between autonomy support, psychological needs and motivation. However, some studies have shown a positive relationships between the basic psychological needs and self-determined types of motivation (Barbeau, Sweet, & Fortier, 2009; Edmunds, Ntoumanis, & Duda, 2006; Edmunds, Ntoumanis, & Duda, 2007; Wilson & Rodgers, 2008; Wilson, Rodgers, Blanchard, & Gessell, 2003). Fewer studies have tested the relationship between autonomy support and the psychological needs, although autonomy supportive interventions have revealed that those in the intervention group had greater levels of self-determined motivation (Fortier, Sweet et al., 2007; Williams et al., 2006). Only recently has the autonomy support, psychological needs and motivation sequence been tested in a physical activity context. Of note, Edmunds, Ntoumanis and Duda (2006) showed a positive relationship between autonomy support and psychological needs in an exercise class setting. Recently, Markland and Tobin (2010) tested the mediating role of the psychological needs on the autonomy/need support and motivation relationship. This study found that autonomy/need support positively predicted all psychological needs. In turn, the needs of autonomy and competence were positively related to self-determined types of motivation. Relatedness had an expected relationship to all regulations except for intrinsic regulation but no relationship was found. Therefore, empirical evidence supports the autonomy support, psychological needs and motivation sequence, but more research is needed to test the entire sequence. To date, no studies, to our knowledge, have tested the entire sequence with a chronically-ill population.

Organismic Integration Theory

Organismic Integration theory is a second mini-theory of SDT and illustrates motivation through a continuum of three main types of motivation: amotivation, extrinsic regulation, and intrinsic regulation.

The Self-Determination Continuum. The continuum is presented through a series of six different types of motivational regulation. Extrinsic motivation consists of four types of regulation while amotivation and intrinsic motivation are represented by one type each¹ (Deci & Ryan, 2002). On the continuum, amotivation is the least self-determined motive as it represents a lack in the motivation to act or to act passively. For example, a cardiac patient who does not understand the reason behind why he/she should be physically active would be considered to be amotivated. Next, external regulation, the least self-determined extrinsic motivation, represents individuals partaking in a behaviour for the rewards or an external demand. For example, a cardiac patient who adopts physical activity only because his/her family physician advised them to do so would be motivated by external regulation. Next, introjected regulation is exemplified when an individual engages in an activity or behaviour to avoid feelings of guilt/shame or to attain ego type feelings such as pride. If a cardiac patient participates in physical activity because he/she wants to avoid feeling guilty from not participating in physical activity, he/she will be considered to be motivated for introjected reasons. The next two extrinsic regulations are self-determined in nature, meaning that the reasons for engaging in behaviour are more internally focused than the other two types of regulation. Identified regulation occurs when one values the behaviour they engage in and understands the importance of that behaviour. If a cardiac individual chooses to participate in physical activity to improve his/her health, identified

¹ Although different types of intrinsic motivation exists, namely intrinsic motivation to know, for accomplishment, to experience stimulation (Pelletier et al., 1995; Vallerand et al., 1992). Since the measure of intrinsic motivation used in this dissertation does not capture these different types, they are not discussed further.

regulation is the motive. The last extrinsic regulation, integrated, has the most internal focus. It is closest to the intrinsic level since individuals have integrated the values and importance of the behaviour into the “self” and the behaviour is now congruent with the individuals’ life goals and values. It is not intrinsic because the individual’s motive to partake in the behaviour does not lie in the activity itself. Therefore, integrated regulation is exemplified by a cardiac patient who values the benefits of physical activity and considers physical activity to be part of who they are. To be intrinsically motivated is to actively engaged in "tasks that people find interesting and that, in turn, promote growth" (Deci & Ryan, 2000, p.233). Therefore, if a cardiac patient participates in physical activity for the pure enjoyment and satisfaction they derive from the activity they would be considered to be intrinsically motivated. In addition, the three more internal forms of motivation (i.e. identified, integrated, and intrinsic) have been combined to create a self-determined motivation construct. Non self-determined motivation is the opposite of self-determined motivation and comprised of external and introjected types of regulation (Deci & Ryan, 2008).

Internalization. The process of internalization is to move from a more extrinsically oriented regulation to more self-determined forms of motivation. Essentially, it is hypothesized that one would expect to adopt more self-determined forms of regulation (i.e., identified, integrated and intrinsic) as the behaviour is adopted and maintained. In an academic setting, Ratelle, Guay, Larose and Senécal (2004) demonstrated that academic intrinsic motivation increased over a two year period while amotivation decreased in that same time period. In a physical activity context, Rodgers, Hall, Duncan, Pearson and Milne (2010) found that patterns of internalization changed over time as explained in SDT. Specifically, identified and intrinsic regulations increased in physical activity initiators over an eight week period, while no changes

were found for more non self-determined forms of motivation. Therefore, research has supported the internalization process highlighted in SDT.

Consequences. An assumption of Organismic Integration Theory is that individuals who are more self-determined experience more positive consequences, while non self-determined motivations lead to negative consequences/outcomes. The consequences from the various types of regulations have been demonstrated in a variety of domains (Ryan & Deci, 2000), including health and physical activity. For example, self-determined motivation had an impact on persistence in swimming (Pelletier, Fortier, Vallerand, & Brière, 2001), gymnastics athletes' well-being (Gagné, Ryan, & Bargmann, 2003), weight loss (Edmunds, Ntoumanis, & Duda, 2007; Teixeira, Going, Houtkooper, Cussler, Metcalfe et al., 2006a), improvements in multiple risk behaviours (i.e., smoking, diet and physical activity) (G. C. Williams, Gagne, Mushlin, & Deci, 2005), and flow (Kowal & Fortier, 2000; Kowal & Fortier, 1999). Specific to the physical activity context, self-determined motivation has been demonstrated to be positively related to physical activity intentions (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003; Wilson & Rodgers, 2004) and behaviour (Barbeau et al., 2009; Buckworth, Lee, Regan, Schneider, & DiClemente, 2007; Chatzisarantis & Hagger, 2009; Daley & Duda, 2006; Duncan, Hall, Wilson, & Jenny, 2010; Ingledeew, Markland, & Ferguson, 2009; Ingledeew & Markland, 2008; Wilson, Rodgers, Blanchard, & Gessell, 2003). Conversely, non self-determined forms of motivation can lead to athlete burnout (Lemyre, Roberts, & Stray-Gundersen, 2007) and even relapse or maladaptive levels of physical activity (Fortier & Farrell, 2009).

SDT-based interventions have also supported the relationship between self-determined motivation and physical activity. In one randomized control trial, self-determined motivation was found to be significantly higher in the intervention group than in the control group. Within this

same article, the path analysis revealed that self-determined motivation at six weeks (mid-intervention) predicted physical activity at three months (end of intervention; Fortier, Sweet, O'Sullivan, & Williams, 2007). This relationship was found only in the intervention group. A second intervention tested SDT-based teaching style intervention in exercise classes and found that those in an autonomy supportive class reported greater increase in relatedness, competence and better attendance to exercise classes, but no differences on the motivational regulations. Furthermore, autonomy need satisfaction predicted identified, integrated and intrinsic regulation over time (Edmunds, Ntoumanis, & Duda, 2008). Finally, the Promotion of Health and Exercise in Obesity trial was also based on SDT and revealed that the intervention lead to significant difference in perceived competence, self-determined motivation and exercise levels (Silva, Vieira et al., 2010). The SDT sequence was also supported in this trial where autonomy/need support predicted need satisfaction which influenced self-determined types of motivation and in turn impacted physical activity behaviour (Silva et al., 2010). Therefore, associational and intervention studies have supported the self-determined motivation and physical activity link.

Recently, the focus has been to investigate the role of self-determination in physical activity in chronic populations. Studies have supported the relationship between self-determined motivation and physical activity in chronically ill samples, such as adults with diabetes (Fortier et al., 2010; Sweet et al., 2009), and cancer survivors (Milne, Wallman, Guilfoyle, Gordon, & Courneya, 2008; Peddle, Plotnikoff, Wild, Au, & Courneya, 2008; Wilson, Blanchard, Nehl, & Baker, 2006). However, few studies have investigated SDT constructs in adults with cardiovascular disease. A recent review on the correlates of physical activity of cardiac patients enrolled in cardiac rehabilitation included SDT in their search criteria, however no SDT based research was found in their search (Petter et al., 2009). Despite this finding, one such study of

adults enrolled in a tertiary-care cardiac centre, revealed that increased self-determination predicted one's intention and plans to be physically active (Slovinec D'Angelo, Reid, & Pelletier, 2007). Further, Russell and Bray (2009; 2010) tested self-determined motivation for physical activity in cardiac rehabilitation and found that self-determined motivation was related to physical activity outcomes. Since few SDT-based studies have been conducted with a cardiac population, studies from this dissertation added to this literature as well as helped increase the generalizability of SDT. In addition, testing the complete autonomy support → psychological need → motivation → physical activity sequence in this dissertation filled a gap, given the limited number of studies that have investigated the entire SDT sequence in the physical activity context.

Combining SDT and SET

As presented earlier, both theories rely on the meta-theoretical concept of agency. Seeing humans as an agent for action therefore puts these theories in the same conceptual realm, and thus facilitates their integration. Due to the strong theoretical backgrounds of these theories, researchers have begun examining constructs from both theories in the same investigations across a variety of domains such as mathematic performance (Stevens, Olivarez, Lan, & Tallent-Runnels, 2004), career decisions (Guay, Senecal, Gauthier, & Fernet, 2003) and cognitive engagement in academic setting (Walker, Greene, & Mansell, 2006). In the health context, these constructs have been used to predict a wide range of health-related outcomes such as physical activity behaviour and weight loss. For instance, intrinsic motivation and self-efficacy were found to positively predict weight loss over 4 months in obese/overweight women (Palmeira et al., 2007; Teixeira, Going, Houtkooper, Cussler, Metcalfe et al., 2006b).

With regards to physical activity, Thogerson-Ntoumani & Ntoumanis (2006) revealed that barrier self-efficacy was related to introjected, identified, and intrinsic types of regulations, but also acknowledged the possibility of the inverse occurring, due to the cross-sectional nature of their investigation. In another study on adolescent physical activity, intrinsic motivation was found to be related to barrier self-efficacy which in turn linked to walking and moderate and vigorous physical activity (Wilson et al., 2005). Dyrland and Wininger (2006) investigated if barrier self-efficacy, the need for autonomy, competence and relatedness as well as intrinsic motivation predicted attendance to physical activity. Competence and relatedness were found to significantly predict attendance, explaining 6% of the variance each. These variables were slightly better than self-efficacy as it explained 2% of the variance in attendance (Dyrland & Wininger, 2006). In a socio-ecological model, variables from the social and physical environment along with individual level variables (i.e., intrinsic and extrinsic motivation, and barrier self-efficacy) were hypothesized to predict walking, and moderate and vigorous physical activity (McNeill, Wyrwich, Brownson, Clark, & Kreuter, 2006). Within the structural equation model, barrier self-efficacy mediated the relationship between intrinsic motivation and physical activity for all three types of physical activity. Furthermore, extrinsic motivation was found to be negatively related to barrier self-efficacy. Overall, variables from SDT and SET appear to work well together within healthy adult populations.

Studies with chronically ill individuals have also incorporated SDT and SET. First, Senécal and colleagues (2000) found that self-determined motivation and self-efficacy predicted both dietary self-care adherence and life satisfaction, where self-efficacy was a stronger predictor of adherence, and self-determined motivation stronger for life satisfaction. Another study with adults with type 2 diabetes demonstrated that self-determined motivation mediated the

relationship between barrier self-efficacy and long-term physical activity (Sweet, Fortier, Guérin, Tulloch, Sigal, & Kenny, 2009). Third, Slovenic D'Angelo (2004) tested a physical activity model in adults with coronary artery disease and included a variety of motivational constructs such as self-determined motivation, perceived competence, self-efficacy, and planning. Overall, self-determined motivation was found to directly influence physical activity behaviour at 6 months. Self-efficacy also predicted physical activity but was mediated through planning. In a recent cardiac study, self-determined motivation and self-efficacy were revealed to be important predictors of physical activity changes after cardiac rehabilitation (Mildestvedt, Meland, & Eide, 2008). Therefore, these studies showed that for a cardiac population self-determined motivation and self-efficacy directly and indirectly influenced physical activity.

In summary, research has combined concepts between SET and SDT to increase our understanding of physical activity. As the above studies illustrated, constructs from both theories appear to be complimentary and compatible. Based on these studies, the correlation between self-efficacy and self-determined types of motivation ranged from .27 to .58 (mean = .41; of five of the eight above studies that provided correlation tables), demonstrating a moderately strong relationship between these variables. Nevertheless, all of these aforementioned studies have the common limitation of only incorporating a few constructs from each theory rather than testing entire theories. To better understand the influence of the constructs from each of these theories, proper steps need to be followed which include testing entire theories (Noar & Zimmerman, 2005). Therefore, this dissertation followed these recommended steps.

Theory comparison and integration

Theory comparison and integration has recently been recommended, especially in health behaviour research (Nigg, Allegrante, & Ory, 2002; Noar & Zimmerman, 2005), and those

integrating motivational correlates of health (Brug, Oenema, & Ferreira, 2005). These authors argue that integrative research is a necessary next step in order to clearly establish the pathways that determine behaviour change. The goal of theoretical integration is not to test one theory versus another but to incorporate constructs from two or more theories with the goal of better understanding the underpinnings of behaviour. Theory comparison and integration is thus beneficial as its goal is not to declare one theory a “winner”, but rather to resolve some issues regarding similar constructs across theories and to improve the model (Biddle, Hagger, Chatzisarantis, & Lippke, 2007; Weinstein, 2007). There appears to be a “lack of consensus regarding what to call certain constructs [which] has resulted in a fragmented literature that could be integrated if a common set of terminology was agreed upon” (Noar & Zimmerman, 2005). This lack of consensus has then resulted in “producing ‘mini-literatures’” (p.277) as research is conducted on separate theories. Theory comparison and integration is therefore purported to help us come to a better understanding of the behaviour change processes by joining theories (Nigg et al., 2002; Noar & Zimmerman, 2005; Rothman et al., 2004). However, few studies have properly integrated theories as outlined by Noar and Zimmerman (2005). In a literature review conducted by these researchers, only 19 studies were found to have compared entire theories, and even fewer have integrated them. From these 19 theoretical comparison studies, Noar and Zimmerman (2005) recommended that new research comparing theories should incorporate some methodological and conceptual strategies to strengthen the study design, which include: 1) comparing full/entire theories, and using 2) multiple populations, 3) non-college samples, 4) Structural Equation Modeling techniques (at least path analysis) and 5) longitudinal designs. These recommendations were implemented in this dissertation.

As highlighted above, it is important to test the entire theories first. Therefore, testing these entire theories separately to determine the influence of the theoretical models and then comparing their results is an essential first step. Finally, one would create an integrated model based on the results of the comparison as well as theoretical tenets. Furthermore, Weinstein and Rothman (2005) support these steps to theory integration as they argue that combining constructs from theories A and B and determining if the integrated model would explain more variance than the individual theories would be more beneficial for research and practice. Comparing and integrating theories can therefore further our understanding of the underpinnings of specific health behaviours and create more effective interventions.

This method of theory integration has been conducted in a very limited number of studies. Noar and Zimmerman (2005) only found two articles by Wulfert and colleagues who have properly integrated theories (Wulfert & Wan, 1995; Wulfert, Wan, & Backus, 1996). Not many studies have followed the Noar and Zimmerman strategy, and to our knowledge, none in the physical activity arena. Therefore, by following the methodological and analytical suggestions for theory comparison and integration outlined by Noar and Zimmerman (2005) this dissertation tested and integrated SDT and SET in a physical activity context. Specifically, the first article of this dissertation followed all the steps for theory integration across three cross-sectional samples, including cardiac individuals. The second article then tested the integrated model found in the first article with a longitudinal sample of cardiac rehabilitation participants. All models were tested with a path analysis with a Structural Equation Software and thus answering Noar and Zimmerman's recommendations.

Physical Activity Behaviour Change

While it is important to investigate theoretical correlates of physical activity, it is equally crucial to explore how physical activity changes. As Nagin (1999) states “Charting and understanding developmental trajectories [i.e., patterns over time] are among the most fundamental and empirically important research topics in the social and behavioural sciences...”(p.1). Since individuals vary in their adoption of physical activity (e.g. some have an abrupt increase whereas others gradually increase their levels) and also have different adherence patterns (some will lapse and re-adopt or others will stop), it is safe to assume that physical activity is a dynamic process. Therefore, investigating trajectories is essential as physical activity can change in linear and non-linear patterns and that individual differences exist in physical activity patterns (Resnicow & Vaughan, 2006).

A hypothetical example is outlined next to illustrate potential differences in physical activity patterns between individuals. Within a specific sample of patients enrolled in a cardiac rehabilitation program who are assessed over a 24 month period, researchers may encounter some patients who enter the program with moderate levels of physical activity and maintain those levels throughout the rehabilitation program (i.e. no change), other patients may gradually increase their physical activity levels over the rehabilitation and post-rehabilitation period (i.e. linear change), while another group of patients may increase their levels during the rehabilitation program but revert back to baseline levels post- rehabilitation (i.e. quadratic change). Traditional mean-based analyses would not capture these differences within a sample and would show no significant change in physical activity when in fact changes exist. Second, the majority of statistical analyses used to analyze change are based on the assumption that change follows a homogeneous pattern for all individuals (with variation in the quantity of change rather than

direction of change; Resnicow & Vaughn, 2006). Therefore, Baranowski (2006) advocates that more advanced statistical analyses are needed to accommodate change and to test our theories more accurately. One such analysis is latent class growth modeling (Nagin, 1999). With latent class growth modeling, the sample is empirically divided into different sub-groups of patterns. These sub-groups are determined by combining the similar individual trajectories together. Furthermore, it is possible to capture the non-linear change of each sub-group. Investigating linear and/or non-linear physical activity trajectories within sub-groups of the same sample paints a more realistic picture of the physical activity behaviour change process.

Recent studies have used latent class growth modeling and demonstrated its benefit over traditional mean-based linear analyses. Louvet, Gaudreau, Menaut, Genty and Deneuve (2007) investigated whether soccer players changed their coping styles over the course of three competitions. No change in coping style was found when the data was analyzed with traditional mean-based methods. However, when latent class growth modeling was used, changes in three different patterns of coping strategy emerged. Most individuals would maintain their coping strategy but others increased or decreased their use of a specific strategy across the three competitions. Some of these trajectories were also found to be quadratic in nature rather than linear. This study revealed that latent class growth modeling can uncover meaningful patterns that would not usually be found in traditional methods.

Other studies in an academic setting have used latent class growth modeling to demonstrate fluctuations in self-determination and self-efficacy. With regards to self-efficacy, Larose, Ratelle, Guay, Sénécal, and Harvey (2006) measured students' levels of self-efficacy for science from the end of high school to the end of second year in college. Using latent class growth modeling, the authors revealed that half of the sample maintained their level of science

self-efficacy while 20% of the sample increased their science self-efficacy and 30% decreased their degree of self-efficacy. As highlighted by the authors, this variation in degree of science self-efficacy between sub-groups of participants would have been neglected in traditional mean-based statistical approaches. Similarly, Ratelle, Guay, Larose, and Senécal (2004) investigated the trajectories of self-determined regulations in an academic setting. The different types of regulations were found to fluctuate over different academic settings (end of high school to the end of second year college). Mean-based analysis found that the motivation regulations were quite stable over time, while latent class growth modeling revealed that amotivation, identified regulation, and intrinsic motivation were more prone to fluctuate over time. For instance, a group of individuals maintained, some decreased, and others increased their level of intrinsic motivation over time. To further understand the reasons behind the differences in levels of motivation, the researchers tested the influence of additional factors on the specific sub-groups. In fact, parent involvement and autonomy support were found to be higher in individuals who had higher levels of identified and intrinsic motivation, while those who had low scores or showed decreases in these levels of motivation also had low scores on parental involvement and autonomy support. These supplementary analyses helped the researchers understand some of the underlying mechanisms that influence these motivational regulations patterns.

A recent study by Barnett, Gauvin, Craig and Katzmarzyk (2008) investigated the trajectories of physical activity of Canadians over the past 22 years. With the use of latent class growth modeling, four distinctive trajectories emerged where 56% remained inactive, 25% increased their physical activity, 7% decreased and 12% remained active. Based on the importance of within-person change and empirical evidence suggesting different physical activity patterns, this dissertation investigated, in the third article, the existence of sub-groups of

physical activity patterns over the entire cardiac rehabilitation program and post-rehabilitation to best illustrate the behaviour change process.

As Resnicow and Vaughn (2006) highlighted, physical activity change is a complicated process that involves multiple events/factors which interact to change behaviour in linear or non-linear ways. In this case, multiple factors, such as different motivational variables, could interact to influence the physical activity change process. For this dissertation, the key factors were the SDT and SET variables presented earlier. As a result, it is essential to investigate the patterns of these variables to determine if different patterns of change emerge from the sample and to examine the presence of linear or non-linear change. Using latent class growth modeling, the same procedure used in determining the physical activity patterns was used to analyze the motivational patterns. Supplementary analyses were then conducted to determine if the probability of belonging to one physical activity pattern is contingent on being in a specific motivational pattern. This second analysis provided another test of the relationship of the motivational variables with physical activity and thus extends the findings of theory testing and integration.

These analyses increase our understanding of the mechanisms behind physical activity and could lead to interventions to increase the effectiveness of the physical activity component of the cardiac rehabilitation program. Therefore, combining results from this trajectory analysis with those from theory testing and integration gives a more complete account of the behaviour change process.

Present Study

Purposes

To recap, the overall objective of this dissertation was to better understand motivation and physical activity of cardiac patients enrolled in cardiac rehabilitation. Specifically, theory-based motivational variables were studied as correlates of physical activity. To accomplish this objective, a two-purpose research approach was taken.

Heeding recent recommendations (Rothman et al., 2004; Tulloch et al., 2008), the first purpose tested and integrated concepts from two strong motivational theories: Self-Efficacy Theory (SET; Bandura, 1997) and Self-Determination Theory (SDT; Deci & Ryan, 1985; 2002) into one comprehensive physical activity model using the novel and rigorous approach of Noar and Zimmerman (2005). This first purpose was examined via two articles.

Article 1. A first objective of this article was to test and integrate the aforementioned theories using a cross-sectional sample of cardiac patients. Specifically, each theory was analysed separately (SDT & SET) and then integrated into one comprehensive model for cardiac patients. In term of hypothesis, *a priori* models for each theoretical model and the integrative models were designed based on the theoretical assumptions of each theory as well as past research. As a second objective, theory testing and integration was also conducted across two other populations, namely a student and primary care sample, to determine if the cross-sectional models found in cardiac patient can be replicated in these populations. This article determined if the theoretical and integrated models differed between the cardiac and the two other samples. Since SDT and SET are theorized to remain constant across different population (Bandura, 1997; Deci & Ryan, 2002), it was hypothesized that the individual theoretical models and the

integrative model were also constant across all three populations. More detailed hypothesized models are elaborated in Article 1.

Article 2. This second article tested if the integrated cross-sectional model found for cardiac patients in article-1 can be replicated with longitudinal data. These cardiac patients followed a 4-month cardiac rehabilitation program with data collected at three time-points – baseline, 2-month and 4-month. Testing this longitudinal model with cardiac patients added to the cross-sectional study by examining the temporal sequence of the constructs in predicting physical activity adoption. This article further enhanced our understanding of the theoretical underpinnings of cardiac patient's physical activity as they progress through a cardiac rehabilitation program. We hypothesized that the SDT-SET integration models found in the cross-sectional study would be retained in this prospective investigation.

The second purpose of this dissertation was to extend the findings from purpose 1 by investigating physical activity patterns over a 24-month period in cardiac patients. Furthermore, this second purpose empirically divided the sample into groups of patients who share similar motivational and physical activity trajectories and tested the probability of sharing physical activity and motivational patterns. One article presented the findings related to this overall purpose.

Article 3. Three main objectives were explored in this article. First, the goal was to investigate the existence of different physical activity patterns among groups of cardiac patients enrolled in cardiac rehabilitation to best account for individual differences and non-linear trends in the physical activity behaviour change process, as recently recommended by Resnicow and Vaughan (2006). We hypothesized that different patterns of physical activity would emerge within the sample as demonstrated by Barnett, Gauvin, Craig and Katzmarzyk (2008) with a

large sample of healthy adults. Similar to the first objective, the second aim investigated different patterns for selected SDT and SET variables. Although no other study, to our knowledge, had examined for differential motivational patterns in cardiac individuals, we hypothesized that different patterns of SDT and SET variables would emerge from the sample as demonstrated in other research domains of SDT (Ratelle, Guay, Larose, and Senécal, 2004) and SET (Guay, Ratelle, Senécal, Larose, & Deschênes, 2006; Larose, Ratelle, Guay, Senécal, and Harvey, 2006). For the third objective, we investigated how the different motivational patterns related to the different physical activity trajectories. Due to exploratory nature of this study, it was difficult to accurately predict how the different motivational patterns will relate to the different physical activity trajectories. However, it was expected that the relationships would support the theoretical assumptions (i.e., individuals within patterns representing higher levels of self-determined motivation, barrier self-efficacy and outcome expectations have a greater probability of belonging to patterns of higher physical activity levels).

Organization of the remainder of the dissertation

This dissertation is divided into four additional chapters. Chapter 2 is represented by article-1 which is entitled “Testing and integrating Self-Determination Theory and Self-Efficacy Theory across three populations”. Article-2 is then presented in Chapter 3 and is entitled “How does Self-Efficacy Theory and Self-Determination work together to predict physical activity after cardiac rehabilitation?” Next, Chapter 4 included article-3 entitled “Patterns of motivation and ongoing exercise activity in cardiac rehabilitation settings. A 24-month exploration from the TEACH study”. Articles 1 and 3 have been submitted for publication and therefore formatted according to the journal’s specification. Article 2 is formatted in APA format. Chapter 5

discussed the overall findings across all three articles. Finally, the appendices include the questionnaires employed in all three studies.

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CHAPTER 2

TESTING AND INTEGRATING SELF-DETERMINATION THEORY AND SELF-EFFICACY THEORY ACROSS THREE POPULATIONS

Running Head: SDT & SET integration

Testing and integrating Self-Determination Theory and
Self-Efficacy Theory across three populations

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Abstract

Objectives. The present article reports results from three studies aimed at individually testing and integrating Self-Determination Theory (SDT) and Self-Efficacy Theory (SET) to predict physical activity across three populations.

Design. All three studies employed a cross-sectional design. Study-1 (N =107) tested the models with cardiac individuals, Study-2 (N =108) with primary care patients, and Study-3 (N =225) with university students.

Methods. Participants completed validated questionnaires measuring SDT, SET and physical activity. Data were analyzed using path analysis in AMOS and models were compared with standardized beta coefficients, explained variance and model fit indices.

Results. Overall, results of this article supported theory testing and integration across three populations. All three studies revealed similar results regarding the SET models. Study-3 found a slightly different SDT model than the other two samples, where the need for competence was predicted by self-determined motivation and related to physical activity. Across all three studies, the integration models were supported and generally preferred over the individual theoretical models. However, differences did exist between the models of all three samples.

Conclusions. Findings partially supported our hypothesis as the integrated models were supported, but variation did exist. Results showed that this article was able to successfully integrate two key motivational theories in physical activity research. More studies should integrate theories in order to enhance our understanding of physical activity.

Testing and integrating Self-Determination Theory and Self-Efficacy Theory across three populations

Introduction

Theoretical frameworks are crucial to use in health behaviour research as they help understand the behaviour change process and guide interventions (Baranowski, Anderson, & Carmack, 1998; Baranowski, Cullen, Nicklas, & Thompson, 2003; Improved Clinical Effectiveness through Behavioural Research Group, 2006). Unfortunately, only 36% of reviewed health behaviour articles are theoretically driven (Painter, Borba, Hynes, Mays, & Glanz, 2008). Consequently, the application and testing of theories needs to increase in health behaviour research (Painter et al., 2008), including physical activity. In addition to the need for theory testing, theory integration has been recently urged to advance the health behaviour literature as integration will help reduce redundancy between theories and utilize each theory's strengths (Noar & Zimmerman, 2005). Motivational variables continue to consistently hold a strong link with physical activity (Pan et al., 2009; Petter, Blanchard, Kemp, Mazoff, & Ferrier, 2009; Trost, Owen, Bauman, Sallis, & Brown, 2002), Self-Efficacy Theory (SET; Bandura, 1997) and Self-Determination Theory (SDT; Deci & Ryan, 1985; Deci & Ryan, 2002) are two strong motivational theories. Therefore, this article purports to answer the current call for theory testing and integration using these aforementioned theories in the context of physical activity.

Self-Efficacy Theory

Self-Efficacy Theory has emerged as a reliable theory in the physical activity literature. Its main construct, self-efficacy, has been shown to be a strong and consistent predictor of physical activity (Petter et al., 2009; Trost et al., 2002). Self-efficacy is task specific, meaning that various forms of self-efficacy such as task, barrier, and scheduling can exist for any given behaviour.

Task self-efficacy refers to one's confidence to participate in physical activity, while barrier self-efficacy is defined by one's confidence to participate in physical activity when faced with specific physical activity related barriers. Scheduling self-efficacy relates to one's confidence to organize their time and responsibilities around physical activity. The relationship between task (Blanchard et al., 2007; Millen & Bray, 2008; Strachan, Woodgate, Brawley, & Tse, 2005; Von Ah, Ebert, Ngamvitroj, Park, & Kang, 2004), barrier (Blanchard, Rodgers, Courneya, Daub, & Knapik, 2002; Blanchard et al., 2007; Blanchard, Reid et al., 2007; Millen & Bray, 2008; Strachan et al., 2005; Sylvia-Bobek & Caldwell, 2006) and scheduling (Strachan et al., 2005; Woodgate, Brawley, & Weston, 2005; Woodgate & Brawley, 2008) self-efficacy and physical activity has been demonstrated across a variety populations, including cardiac patients (Blanchard et al., 2002; Blanchard, Reid et al., 2007; Millen & Bray, 2008; Von Ah et al., 2004).

Outcome expectation, a second construct within SET, is described as the perceptions of positive and negative outcomes that result from participating in physical activity (Bandura, 1997). The relationship between outcome expectations and physical activity is mixed in the physical activity literature (Williams, Anderson, & Winett, 2005). Some researchers have demonstrated an association between outcome expectations and physical activity (Resnick & Nigg, 2003; Schwarzer, 2001; Williams et al., 2005; Williams & Bond, 2002), while others have not (Carlson et al., 2001; Rovniak, Anderson, Winett, & Stephens, 2002). To clarify these mixed findings, this article tested two different sequences to determine which may be best for the physical activity domain: 1) the self-efficacy-outcome expectation-physical activity 2) outcome expectation-self-efficacy-physical activity.

Self-Determination Theory

Self-Determination Theory (SDT; Deci & Ryan, 1985; Deci & Ryan, 2002) has received increased attention in the physical activity domain and is encouraged for physical activity research (Biddle & Nigg, 2000; Wilson, Mack, & Grattan, 2008). In SDT, multiple components explain the physical activity behaviour change process (Ryan & Deci, 2007). Autonomy support refers to one's perception of his/her social environment in the extent to which it provides choices and options, acknowledges one's opinion and provides rationale when suggesting choices. Higher levels of autonomy support will help fulfill one's psychological needs for autonomy, competence and relatedness. Autonomy "refers to being the perceived origin or source of one's own behaviour" (Deci & Ryan, 2002, p. 8). Competence is defined as "feeling effective in one's ongoing interactions with the social environment and experiencing opportunities to exercise and express one's capacities" (Deci & Ryan, 2002, p.7) and relatedness as the desire to feel connected to others (Ryan & Deci, 2007). Satisfaction of these three psychological needs influences motivation and specifically increases self-determined motivation.

Three main types of motivation are found within SDT - amotivation, extrinsic, and intrinsic. These types are represented by different regulations and are placed on a continuum ranging from amotivation to intrinsic motivation. Extrinsic motivation consists of four types of regulation – external, introjected, identified and integrated (Deci & Ryan, 2002). The two former types of regulations are aggregated to create non self-determined motivation while the two latter forms represent self-determined motivation (Barbeau, Sweet, & Fortier, 2009; Deci & Ryan, 2008). When self-determined, individuals partake in physical activity because they value the activity and/or do it out of choice or for the pleasure and satisfaction derived from the activity. Non self-determined motivation is expressed when individuals participate in physical activity to gain

rewards or to avoid negative consequences or feeling guilty. Amotivation is defined by the lack of intention or willingness to engage in physical activity. Finally, high levels of self-determined motivation result in greater physical activity and this relationship has been well documented across a variety of populations including healthy adults (Edmunds, Ntoumanis, & Duda, 2006), adults with type 2 diabetes (Fortier, Sweet, Tulloch, Blanchard, Sigal, Kenny & Reid, 2010), primary care patients (Fortier, Sweet, O'Sullivan, & Williams, 2007), and patients in cardiac rehabilitation (Russell & Bray, 2009). However, few studies have tested the entire SDT sequence (Edmunds et al., 2006). In addition, SDT experts have recommended that this theory should be integrated with others strong theories to further explain physical activity (Hagger & Chatzisarantis, 2008).

SDT & SET

Studies integrating theories related to health behaviours such as physical activity have been called for (Hagger, 2009; Nigg, Allegrante, & Ory, 2002; Noar & Zimmerman, 2005), especially those examining motivational variables (Brug, Oenema, & Ferreira, 2005). The goal of theoretical integration is not to pin one theory against another but to incorporate constructs from two or more theories with the goal of better understanding the underlying mechanisms of behaviour change (Biddle, Hagger, Chatzisarantis, & Lippke, 2007).

SDT and SET are based on the ideology that humans are agents of their actions. In short, agency, specifically regarding an internalist view, refers to the fact that humans possess complex internal structures that allow them to make choices regarding their actions (Sugarman & Sokol, in press). Although SDT and SET have this same meta-theoretical ideology, both theories have different views of agency. In SET, individuals act when they feel capable and able to attain the goal (i.e., self-efficacy drives the agent). Although SDT entertains the idea that feelings of

capability/competence are important, the theorists believe that autonomy plays a larger role. If one feels autonomous in their actions, the likelihood of behaviour enactment and sustainability is greater. Therefore, self-determined motivation becomes the main element of the agent.

Since both theories are based on the same overarching framework, their integration is therefore possible. In addition to this theoretical argument, recent studies have begun combining constructs from SDT and SET and have revealed strong relationships between concepts from both theories. In one study, barrier self-efficacy was predicted by introjected, identified, and intrinsic types of regulations (Thogersen-Ntoumani & Ntoumanis, 2006). In another study, McNeill and colleagues (McNeill, Wyrwich, Brownson, Clark, & Kreuter, 2006) showed that barrier self-efficacy mediated the relationship between intrinsic motivation and physical activity for all three physical activity intensities. Finally, a study with adults with type 2 diabetes demonstrated that self-determined motivation mediated the relationship between barrier self-efficacy and 12-month physical activity (Sweet et al., 2009).

Although these studies have demonstrated that constructs from both theories can work together in predicting physical activity, they have the common limitation of only testing one or two constructs from each theory rather than the entire theories, and thus not heeding contemporary recommendations (Noar & Zimmerman, 2005). To integrate theories and to better understand the influence of the constructs, proper procedures need to be followed which include testing entire theories prior to their integration (Noar & Zimmerman, 2005).

Present Article

By following the methodological and analytical suggestions for theory comparison and integration outlined by Noar and Zimmerman (2005), the overall purpose of this article was to integrate SDT and SET into one comprehensive model. Specifically, each theory was analysed

separately (SDT & SET) and then integrated into one model. This overall purpose was examined in a sample of cardiac individuals and retested across two other populations - primary care patients, and university students - to determine if the theoretical and integrative models would be the same or differ between the three samples. *A priori* models were designed for each theory and integrated models which were based on the theoretical assumptions of each theory as well as past research. Since SDT and SET are theorized to remain constant across different population (Bandura, 1997; Deci & Ryan, 2002), it was hypothesized that the theoretical and integrative models would remain constant across all three populations.

Hypothesized SDT models. Overall, two individual SDT models were evaluated to determine the best model. In the SDT literature, two models have been tested - a theoretical model and a process model. The main difference between these two models is the placement of competence. In the theoretical model, autonomy support was expected to predict the psychological needs of autonomy, relatedness and competence which in turn predicted the types of motivation. As for the process model, autonomy support was set to predict the psychological needs, however competence was also hypothesized to be predicted by self-determined motivation. In addition, both self-determined motivation and competence were set to have a direct relationship with the outcome. This process model has been tested and supported in the health behaviour literature (Fortier et al., 2007; Williams, McGregor et al., 2006). The reason for self-determined motivation to predict competence is explained by Williams and colleagues (2006) who claim that "...when people are more autonomously motivated they feel more competent to attain relevant health outcomes [and]...This is consistent with SDT because autonomy concerns the experience of initiating behaviours that prompt people to feel more competent in attaining outcomes" (p.91-92). For both models, self-determined motivation is

expected to significantly and positively predict physical activity, while non self-determined motivation is hypothesized to have a negative link with physical activity, as highlighted by SDT.

Hypothesized SET models. Two models for SET were also tested. The first model was the theoretical model which saw self-efficacy having a direct and indirect effect, through outcome expectations, on physical activity. As for the second SET model, previous research (Williams et al., 2005) has demonstrated that outcome expectation may not have a direct link to physical activity, but rather an indirect one through self-efficacy. This second SET model was labelled the empirical model and tested the outcome expectations – self-efficacy – physical activity relationship.

Hypothesized SDT-SET models. The next step involved combining the key variables from each model to create a more comprehensive model. The concepts of self-efficacy and perceived competence have been hypothesized to be similar (Williams et al., 2006); as they both assess an individual's perception of his/her ability/capacity to attain a goal and/or conduct a behaviour. A strong correlation (.50) between competence and self-efficacy has been documented (Fortier et al., 2007). Therefore, a factor analysis was conducted to determine if these concepts were similar or different. In addition, since non self-determined motivation has failed to predict physical activity (Barbeau et al., 2009) it is not expected to be in the integrated models. However, if the results indicated a meaningful relationship (standardized coefficient above/below $\pm .10$) between non self-determined motivation and physical activity, we hypothesized that the construct will be at the same level as self-determined motivation.

The integrated model was based on the theoretical tenets of both theories as well as past research. Two different hypothesized integrated models were tested. The links that remain constant across both integrated models are explained first, followed by the rationales for

differences between the first and second integration model. First, autonomy support is hypothesized to predict autonomy, relatedness, and competence/self-efficacy as postulated by SDT. Second and also in line with SDT, autonomy and relatedness are expected to be related to self-determined motivation. Third, the results of the SDT models (see above) determined the direction of the relationship between competence/self-efficacy and self-determined motivation. Fourth, the relationship between outcome expectations and competence/self-efficacy is also determined by the results of the aforementioned SET models. Self-determined motivation is then expected to have a positive significant relationship with physical activity. Considering the tenets of SET as well as results of some SDT research (Fortier et al., 2007), competence/self-efficacy is also expected to have a positive relationship with physical activity.

The difference between the two models lies in the relationship between the needs of autonomy and relatedness with competence/self-efficacy. In the first integrated model, competence/self-efficacy takes on the role hypothesized in SDT. In this instance, competence/self-efficacy is hypothesized to be a precursor to motivation and therefore was at the same level as the other psychological needs. Therefore, autonomy, relatedness and competence/self-efficacy are expected to positively relate with self-determined motivation.

In the second model, competency/self-efficacy takes on the agency role as depicted in SET. Due to this agency role, the need for autonomy and relatedness are hypothesized to be antecedents to competence/self-efficacy. Some support does exist in the SDT literature for this relationship in the second hypothesized integration model. As presented earlier, Williams et al. (2006) stated that autonomy prompts people to feel competent, supporting the proposed autonomy – competence relationship. In addition, Deci and Ryan (2000) mentioned that autonomy has a crucial role in forming self-determined behaviour. Specifically, they state that

“autonomy occupies a unique position in the set of three needs: being able to satisfy the needs for competence... may be enough for controlled behavior, but being able to satisfy the need for autonomy is essential for the goal-directed behavior to be self-determined...” (p.242). Therefore, the need for autonomy could be a precursor to the need of competence. Finally, autonomy and relatedness have also been hypothesized to come before competence/self-efficacy in the intervention model of the Physical Activity Counselling Trial (Fortier, Hogg et al., 2007). The rationale for this relationship is that having greater autonomy and relatedness eventually will help to bolster one’s sense of competence/self-efficacy. Therefore, the proposed relationship between the needs of autonomy and relatedness with competence/self-efficacy has some theoretical support, and, therefore, is the premise for this second hypothesized model.

Study 1: Cardiac Participants

This first study sought to test the individual models for SDT and SET in a sample of cardiac individuals. Following the individual models, the integrative models were examined based on the hypotheses just outlined.

Methods

Participants and procedure. Cardiac patients (n=107; mean age: 62.48 ± 9.68 years) responded to a paper-pencil questionnaire after joining a local cardiac rehabilitation program. Recruitment was conducted at two centre-based cardiac rehabilitation sites. All participants enrolled in the cardiac rehabilitation program were eligible, which included participants who suffered a cardiac related event or were at high risk (i.e., diagnosed with hypertension). Eighty eight percent of participants (107/121) that were approached accepted to be in the study and, thus, completed the consent form and responded to the measures listed below within two weeks from the start of the program. The participants were predominantly Caucasian (96%),

Francophone (67%), and retired (67%). All procedures were approved by the appropriate Research Ethics Board.

Measures.

Physical Activity. The Godin Leisure Time Exercise Questionnaire was used to evaluate self-reported physical activity (Godin & Shepard, 1985). Participants reported the number of days in a typical week that they engaged in physical activity for more than 20 minutes for light, moderate and strenuous intensities. The frequencies were multiplied by three, five, and nine for each intensity, respectively, and then summed to produce the total weekly leisure activity score. This questionnaire has compared favourably with other common self-report measures of physical activity (Jacobs, Ainsworth, Hartman, & Leon, 1993) and objective measures such as activity monitor and fitness tests (Kriska & Caspersen, 1997).

Autonomy support. Participants responded to six items of the Important Other Climate Questionnaire (Williams et al., 2006). Each item (e.g., "My exercise important other listened to how I would like to do things regarding my physical activity") was anchored on a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7). A mean of the six items was calculated. Cronbach alphas' for this measure and all others are reported in the result section.

Basic Psychological Needs. The Psychological Need Satisfaction in Exercise Scale was used to assess the satisfaction of the psychological needs for physical activity (Wilson, Rogers, Rodgers, & Wild, 2006). On a 6-point Likert scale ranging from 1 (false) to 6 (true), participants responded to 18 items reflecting how they might feel when physically active. A mean was calculated for autonomy (6 items; "I feel free to exercise in my own way"), competence (6 items; "I feel that I am able to complete exercises that are personally challenging"), and relatedness (6 items; "I feel close to my exercise companions who appreciate how difficult exercise can be").

Motivation. Behavioral Regulation Exercise Questionnaire-2 (BREQ-2) was used to assess participants' motivation for physical activity (Markland & Tobin, 2004). Participants responded to 19 items, on a 5 point Likert scale ranging from 0 (not true for me) to 4 (very true for me), covering the types of motivational regulations on the self-determination continuum: amotivation (4 items, e.g. "I think participating in physical activity is a waste of time"), external regulation (4 items; e.g. "I take part in physical activity because my friends/family/partner say I should."), introjected regulation (3 items; e.g. "I feel guilty when I don't participate in physical activity."), identified regulation (4 items; e.g. "It's important to me to participate in physical activity") and intrinsic regulation (4 items; e.g. "I get pleasure and satisfaction from participating in physical activity"). Wilson, Rodgers, Loitz, and Scime (2006) also constructed four items to represent integrated regulation, which is currently missing from the BREQ-2 scale. The integrated items proposed by Wilson and associates were included in the scale (4 items; e.g. "I consider exercise consistent with my values"). The mean score of each motivational regulation was calculated. As explained in the data analysis section, the regulations were subjected to a factor analysis to determine if they can be combined into two commonly used SDT constructs, namely self-determined and non self-determined motivation.

Task self-efficacy. Task self-efficacy was measured according to recommendations put forth by Bandura (1997). Specifically, participants rated their confidence to engage in physical activity for more than 20 minutes during their free time for at least 1, 2, 3 up to 7 days per week. Answers were rated on a scale from 0% (not at all confident) to 100% (completely confident) and a mean percentage was calculated.

Barrier self-efficacy. The barrier self-efficacy scale was developed and validated by Blanchard and colleagues (2002) for individuals in cardiac rehabilitation. Participants rated the

degree of confidence to overcome nine different barriers (e.g. fear of having a cardiac incident, bad weather, do not have time) on a scale ranging from 0 (not at all confident) to 100% (completely confident). A mean of the nine items was calculated.

Scheduling self-efficacy. A measure developed and validated by DuCharme and Brawley (1995) was used to assess participants' scheduling self-efficacy. This measure has been previously used in cardiac rehabilitation research and asks individuals to rate confidence levels in their ability to self-regulate various organization and scheduling tasks with respect to the exercise component of the cardiac rehabilitation program. Participants reported their confidence levels on a scale from 0 to 100% to carry out nine scheduling tasks (e.g., organize time around each cardiac rehabilitation exercise session during the next 2 months) and the mean of the items was calculated. A factor analysis was also conducted on all three types of self-efficacy to determine if they differed, as barrier and scheduling self-efficacy have often been combined (Strachan et al., 2004).

Outcome Expectations. All seventeen items (Rogers et al., 2004) were used to measure outcome expectations. The items consist of various outcomes/benefits of physical activity (e.g.; less depressed, improve health/reduce disease risk). Participants rated their agreement with the impact of physical activity on each of these outcomes/benefits using a 5 point Likert scale (1 = strongly agree to 5 = strongly agree). A mean of the 17 items was calculated to create the score for outcome expectations.

Data analysis. The data screening process followed recommendation and procedures outlined in Tabachnick and Fidell (2007). Specifically, univariate and multivariate outliers, missing data, and normality of the variables were examined with SPSS v. 18 (IBM Corporation, 2010). Factor analysis was conducted to determine whether the motivational regulations from

SDT emerged as different factors. Similarly, the self-efficacy measures were also verified with a factor analysis. Based on the results of these factor analyses, variables were combined as necessary.

For each model, five goodness of fit indices: the chi-square goodness-of-fit, the comparative fit index (CFI), the root mean square error of approximation (RMSEA), the standardized root mean residual (SRMR) and the Akaike Information Criterion (AIC) were examined. Good model fit is indicated by a non-significant chi-square, a CFI of greater or equal to .90, an RMSEA of at least below .08, and an SRMR below .10 (preferably below .05; Kline, 2005). In addition, the smallest AIC between the models points to the better fitting model (Kline, 2005). Next, paths that are non-meaningful (standard path coefficient $< .10$) and/or non-significant were removed from the respective models and the modified model was recalculated. Modification indices were also considered. Amos v. 18 (IBM Corporation, 2010) was used to test each model.

Individual SDT & SET models. As outlined in the introduction, two SDT and two SET were tested. For SDT, a theoretical and process model was tested. Similarly, a theoretical and empirical model was tested for SET.

Theoretical integration – SDT-SET models. As explained earlier, two hypothesized integrated models were examined. The integrated models were based on the hypothesized links, but also from the results from the individual theoretical models just tested. Specifically, non-meaningful relationships (i.e., standardized beta coefficients $< .10$) in individual theory models were not included in the integrated model. Each hypothesized integrated model was further modified, where non-meaningful paths (i.e., standardized beta coefficients $< .10$) were removed and modification indices were considered. The best fitting model from each hypothesized

integrated model was compared to the individual theoretical models by looking at the variance explained in the motivational and physical activity variables and the number of supported hypothesized paths. Of note, the same data analyses were conducted for Study-2 and Study-3.

Results and discussion

Preliminary results. Two univariate outliers were found for physical activity and scheduling self-efficacy and were reduced to one unit higher than the next highest score. A total of 3 multivariate outliers were found and removed, leaving the final sample at 104. A t-test revealed no difference between cardiac rehabilitation sites on the outcome variable of physical activity ($t(102) = 0.41, p = .68$).

SDT models. The results of the factor analysis with varimax rotation revealed two factors (Factor 1: eigenvalue = 2.99, 49.77% of variance; Factor 2: eigenvalue = 1.35, 22.56% of variance) for the motivational variables, one comprising self-determined motivation (i.e., identified, integrated and intrinsic) while the second represented non self-determined motivation (i.e., external and introjected). As seen in previous research (Barbeau et al., 2009), amotivation negatively loaded on the self-determined motivation factor and thus was removed from future analyses. Acceptable to strong Cronbach alphas were found for autonomy support (.81), autonomy (.87), competence (.89), relatedness (.89), and self-determined (.90) and non self-determined motivation (.73).

The models were trimmed by removing non-meaningful and non-significant links and correlating the errors on the psychological needs, on the one hand, and the motivations, on the other hand. Comparing both SDT models, the theoretical model had slightly better fit (chi-square = 8.79, $df = 9, p = .49$; CFI = 1.00; RMSEA = .00; SRMR = .05; AIC = 60.80) than the process model (chi-square = 9.86, $df = 8, p = .28$; CFI = .99; RMSEA = .05; SRMR = .05; AIC = 63.86).

Competence did not have a meaningful link with physical activity (standardized beta = $-.07$) in the process model, furthering the support of the theoretical model. As illustrated in panel 1 of figure 1, self-determined motivation was significantly and positively related to physical activity, while non-self-determined motivation had a near significant negative relationship. Therefore, both types of motivation were kept for the integrated models.

SET models. All variables had good internal consistency (scheduling self-efficacy = $.88$; barrier self-efficacy = $.91$; task self-efficacy = $.93$; outcome expectations = $.82$). Only one factor emerged (Eigen value = 1.81 , 60.45% variance) from the factor analysis, resulting in the aggregation of all three self-efficacies. Two SET models were compared – a theoretical and empirical model. Results from this study demonstrated that self-efficacy significantly predicted physical activity (see panel 2 of figure 1), while outcome expectation did not (beta = $.04$, $p = .68$), supporting the empirical model.

SDT – SET integration models. Results from the factor analysis revealed that only one factor emerged (Eigen value = 2.05 , 51.40% of variance) between the different types of self-efficacy and perceived competence. A standardized mean of the three types of self-efficacy and perceived competence was created and this new variable was labelled confidence (Cronbach's alpha = $.92$). This confidence variables therefore consists of one's overall feeling of his/her ability to perform physical activity. This confidence term replaced the competence/self-efficacy term of the hypothesized model explained in the introduction.

When compared to the first hypothesized integrated model (chi-square = 29.20 , $df = 14$, $p = .10$; CFI = $.93$; RMSEA = $.10$; SRMR = $.08$; AIC = 89.20), the second integrated model had the best fit (chi-square = 19.38 , $df = 13$, $p = .11$; CFI = $.97$; RMSEA = $.07$; SRMR = $.06$; AIC = 81.38). As illustrated in panel 3 of figure 1, autonomy support predicted autonomy and

relatedness and confidence. Outcome expectations significantly predicting confidence which in turn predicted self-determined motivation. Finally, confidence, self-determined motivation and non self-determined motivation all had small effects on physical activity, but the relationships were not significant. Illustrated in Table 4 are the hypothesized relationships that were present in both the individual SDT and SET models and integrated model. For the cardiac population, the number of confirmed hypothesized links in both the individual SDT and SET models and the integrated model was similar. The difference lies on the relationship between self-determined motivation and confidence with physical activity. In the individual models, these relationships are significant but become non-significant in the integrated models. Therefore, these two variables are competing and thus reducing the size of their influence on physical activity. However, a larger sample size could help to see significant results between these variables and physical activity. In the integrated model, more variance was explained in confidence and self-determined motivation compared to the individual models. Finally, a slight increase in the explained variance of physical activity may indicate the importance of having these variables predicting the behaviour; however no test exists to determine if this increase was significant. Overall, the integrated model appeared as a better model as the number of hypothesized links remained relatively constant across the integrated and individual models, slightly more variance was explained for in the key variables and the integrated model held excellent model fit. Next, we were interested in whether this theory testing and integration would hold up across two other samples.

Study 2: Primary Care Participants

With the successful theoretical integration of SDT and SET in a cardiac sample, this second study also sought to test and integrate SDT and SET, but with a primary care sample.

Therefore, the same hypothesized individual SDT and SET models as well as the integrative models were tested. These models were examined to see if they were the same as those of the cardiac population.

Methods

Participants and procedures. Primary care patients (n= 108; mean age: 55.72 ± 10.92 years, 58.70% female) responded to a paper-pencil questionnaire after health education group sessions provided by a local medical clinic. The educational group sessions addressed health topics such as nutrition, hypertension, weight loss and cholesterol management. All participants were not sufficiently at risk for cardiac rehabilitation referral. All participants in the group sessions were eligible for the study. After each group session, a research assistant described the research project and asked for participants to volunteer and immediately answer the questionnaire package. Those who accepted remained in the room and upon filling out a consent form, were given the questionnaire package [58% response rate (108/186)]. The participants were predominantly Caucasian (99%), Francophone (63.90%), and employed full-time (59.2%).

Measures. The physical activity, motivation, basic psychological needs, perceived autonomy support, outcome expectation and task self-efficacy measures were the same as the cardiac sample. Only the barrier and schedule self-efficacy measures were different, as those in the previous study were designed for a cardiac population.

Barrier self-efficacy. Participants indicated the degree (0% to 100%) to which they were confident at overcoming 12 common barriers to physical activity (i.e., bad weather, did not have time). This scale was based on McAuley (1992) and Blanchard and colleagues (Blanchard et al., 2002). A mean of the 12 items was calculated.

Scheduling self-efficacy. On a scale of 0% to 100%, participant indicated the degree to which they were confident in their abilities to schedule physical activity in their daily lives across five items (e.g., you will develop a plan to reach your exercise goals). Specific items for this scale were borrowed from past research assessing self-regulatory self-efficacy among a similar population (Strachan, Brawley, Spink, & Jung, 2009) which were in accordance with recommendations for measuring exercise-related self-efficacy (McAuley & Mihalko, 1998).

Results and Discussion

Preliminary results. No univariate outliers were found across all variables and these variables were normally distributed. Missing data were present on five variables and all were below 5% and, therefore, missing data patterns were not tested. Missing data were imputed using maximization estimation procedure with 25 iterations. One multivariate outlier was found, but the participant was not removed as the scores did not differ enough to warrant removal.

SDT models. As in Study-1, the results of the factor analysis with varimax rotation revealed two factors (Factor 1: eigenvalue = 2.85, 47.52% of variance; Factor 2: eigenvalue = 1.33, 22.13% of variance): one comprising self-determined motivation (i.e., identified, integrated and intrinsic) and a second representing non self-determined motivation (i.e., external and introjected). Amotivation negatively loaded on the self-determined motivation factor and thus was removed from future analyses, as in the previous study. Autonomy support (.90), autonomy (.90), competence (.90), relatedness (.94) and self-determined (.93) and non self-determined motivation (.73) were found to be reliable. Both SDT models had very similar fit and supported five hypothesized links. The theoretical model (chi-square = 8.82, df = 9, p = .36; CFI = .99; RMSEA = .03; SRMR = .04; AIC = 62.82) was selected over the process model (chi-square = 8.77, df = 8, p = .36; CFI = .99; RMSEA = .03; SRMR = .04; AIC = 62.77), in order to remain

consistent with the theoretical assumptions of SDT. Therefore the theoretical model is illustrated in panel 1 of figure 2. Only self-determined motivation had a significant positive link with physical activity and therefore, non self-determined motivation was not kept for the integration model.

SET models. Task, barrier and scheduling self-efficacy as well as outcome expectation were found to have good internal consistencies (.93, .91, .95, .83, respectively). Only one factor emerged (eigen value = 2.18, 72.74% of variance) from the factor analysis conducted on the self-efficacy measures, resulting in the aggregation of all three types of self-efficacies. Results from this study demonstrated that self-efficacy had a significant link with physical activity (see panel 2 of figure 2), while outcome expectation did not (beta = .06, $p = .50$), supporting the empirical model and results found in Study-1.

SDT – SET integration models. As in the cardiac sample, only one factor emerged (Eigen value = 2.05, 51.40% of variance) from the three types of self-efficacy and competence and subsequently named confidence (Cronbach's alpha = .94). Both hypothesized integrated model had similar fit (Model 1: chi-square = 9.64, $df = 8$, $p = .29$; CFI = .99; RMSEA = .04; SRMR = .05; AIC = 63.64). Due to the similarity between models, the second hypothesized integrated model (chi-square = 11.62, $df = 9$, $p = .24$; CFI = .98; RMSEA = .05; SRMR = .05; AIC = 63.62) was illustrated in panel 3 of figure 2 in order to remain visually similar to the cardiac model. Since no differences were found between the integrated models, it can be assumed that confidence can play different roles with this population. However, caution needs to be taken when interpreting these results as the data were cross-sectional. Both integrated models are compared to the individual theoretical models. In both models, autonomy support significantly predicted relatedness and had a positive relationship with autonomy, albeit not

significant. Contrary to expectations and the SDT model, the need of relatedness was not significant associated with self-determined motivation. Confidence had a very strong relationship with self-determined motivation while, outcome expectations did not significantly predict confidence. As for the first integrated model, autonomy support was significantly related with confidence, and in the second integrated model, autonomy and relatedness had strong relationships with confidence, as hypothesized. In both models, self-determined motivation had a significant relationship with physical activity while confidence had a small non-significant association with on physical activity. Although the model fit and variance explained in physical activity in both integrated models were similar to SDT model, the integrated model was favoured since integrating the SET concepts allowed for a more comprehensive description of the factors involved in physical activity. As illustrated in Table 4, only three hypothesized links in the integrated model were supported when compared to the individual SDT and SET models. The most notable differences were that confidence (self-efficacy in SET model) lost its significance with physical activity when self-determined motivation. Similarly, outcome expectations were not significantly related with confidence in the integrated model. Therefore it appears that self-determination theory variables play a larger role in this population. The integrated models had good model fit and more variance was explained in confidence, self-determined motivation and physical activity. However, fewer hypothesized link were found as significant in the integrated model. As explained, these non significant links were the result of self-determination theory variables having a stronger relationship with confidence and physical activity. Overall, the integrated model still demonstrated some support for the theory integration. Next, the hypothesised models were tested with a younger healthier population.

Study 3: University Students

This third study was intended to also test the hypothesized individual and integrated SDT and SET models, as conducted in Study-1 and -2. Using a university sample, the same hypothesized individual models for SDT and SET and integrative models were investigated.

Method

Participants and Procedure. Undergraduate students enrolled in a first year psychology course partook in a research participation program. Once registered to the program, they had the option of participating in multiple concurrently running research projects, where this specific study was enlisted. After reading a description of the study, students who selected to participate to this study completed an online consent form and responded to the measures listed below.

These undergraduate university students' (N = 225) age ranged from 18 to 49 (mean = 20.7, sd = 4.58), 65% were female and 51% indicated that English was their mother tongue.

Measures. All measures used for the student sample were the same as the primary care sample. Participants responded to the questionnaire online.

Results and discussion

Preliminary analyses. Three univariate outliers were found for physical activity and they were reduced to one unit higher than the next highest score. A square-root transformation was still necessary as physical activity was slightly skewed (2.04) and kurtotic (4.46). Missing data was found to be missing at random and imputed using Expectation Maximization procedure with 25 iterations. A total of 11 multivariate outliers were found and therefore those participants were removed.

SDT models. As in both studies, a factor analysis for motivation revealed two main factors (Factor 1: eigenvalue = 3.04, 50.70% of variance; Factor 2: eigenvalue = 1.35, 22.57% of

variance), one for self-determined motivation and the other for non self-determined motivation. Amotivation negatively loaded on the self-determined motivation factor and thus was removed from future analyses as demonstrated in Study-1 and -2. Good internal consistencies were found for autonomy support (.85), autonomy (.90), competence (.94), relatedness (.93) and self-determined (.91) and non self-determined motivation (.78). Once the SDT theoretical model was trimmed, the model had good fit (chi-square = 25.22, df = 15, p = .05; CFI = .98; RMSEA = .06; SRMR = .05; AIC = 103.22). However, the SDT process model was the best fitting model (chi-square = 19.78, df = 16, p = .23; CFI = .99; RMSEA = .03; SRMR = .05; AIC = 95.78). The result of the AIC further supports the SDT process model as its value was smaller than the theoretical model. As illustrated in panel 1 of figure 3, the need for competence was associated with self-determined motivation and also had a direct link with physical activity along with self-determined motivation. Since non self-determined motivation did not have a meaningful relationship with physical activity, it was removed from the integrated models.

SET models. All SET variables had acceptable Cronbach's alpha (task self-efficacy = .83; barriers self-efficacy = .76; scheduling self-efficacy = .87; outcome expectations = .86). A factor analysis with all three types of self-efficacies was conducted prior to testing the models and only one factor emerged (Eigen value = 2.48, 61.95% of variance), and thus combined into an overall score. As in Study-1 and -2, outcome expectation did not have a significant relationship with physical activity (beta = .04, p = .56), but did predict self-efficacy. In turn, self-efficacy had a significant and positive relationship with physical activity levels, thus supporting the empirical model (see panel 2 of figure 3).

SDT – SET integration models. Results from the factor analysis reveal that only one factor emerged between the different types of self-efficacy and perceived competence, creating

the construct of confidence (Cronbach's alpha = .92). Similar to that of the cardiac model, the second hypothesized integrated model had the best fit of the data (chi-square = 26.87, df = 7, p = .00; CFI = .95; RMSEA = .11; SRMR = .05; AIC = 82.86), compared to the first integrated model (chi-square = 33.37, df = 7, p = .00; CFI = .94; RMSEA = .13; SRMR = .06; AIC = 89.37). As illustrated in panel 3 of figure 3, autonomy support predicted both the needs for autonomy and relatedness, which, in turn, influenced levels of outcome expectations and self-determined motivation. Autonomy also was related to confidence. Confidence, outcome expectation and self-determined motivation all predicted physical activity. However, both confidence and self-determined motivation had a suppression effect on outcome expectations, explaining the negative relationship between outcome expectations and physical activity. As illustrated in Table 4, eight hypothesized links were supported in the integration model compared to nine across both SDT and SET models. This difference was regarding the relationship between outcome expectations and confidence. In the integrated model, self-determined motivation was directed to influence confidence which predicted nearly 50% of the variance in confidence. Therefore, outcome expectations did not explain any additional variance and thus making its relationship with confidence non-significant. More variance was explained in confidence and self-determined motivation in the integrated model compared to the individual models. Finally, an increase in the explained variance of physical activity may indicate the importance of having these variables predicting the behaviour. Overall, the integrated model appeared as a better model as the number of hypothesized links remained relatively constant, slightly more variance was explained in the key variables and the integrated model held excellent model fit.

General Discussion

The overall purpose of this article was to address the call from Noar and Zimmerman (2005) to test and integrate health behaviour theories. Specifically, we tested and integrated SDT and SET in a physical activity context across three samples. The individual SDT and SET models were supported and partially confirmed our hypotheses. Integration of these theories was also partially supported as the constructs were strongly related, a similar number of hypotheses were confirmed in the integration models compared to the individual models, the integration models had good model fit and the second hypothesized model was supported across the three samples.

A highly innovative aspect of this article is the full test of SET and SDT, and their integration following the approach of Noar and Zimmerman (2005). Testing each theory separately, verifying construct similarity through factor analysis and using the results from the theory testing to guide the integration are all strengths of this article. In addition, these steps were conducted across three different populations, adding to the contributions of this article. Finally, this was the first study to test and integrate both SDT and SET, using the Noar and Zimmerman approach (2005).

SDT Models

The theoretical SDT model was supported for the cardiac and primary care populations while the process model was best for university students. Although these models differed on the placement of competence, they still supported the underlying principles of SDT in that more self-determined motivation predicted physical activity and the central role competence plays in physical activity. Concerning the other SDT concepts, autonomy support was associated with the needs of autonomy and relatedness across all samples as well as the need for competence in the

cardiac and primary care SDT models which is in line with SDT and previous research (Edmunds, Ntoumanis, & Duda, 2007). Finally, relatedness was linked to self-determined motivation in all samples, suggesting that relatedness should be studied more often in this context (Edmunds et al., 2007), as competence and autonomy have been the primary focus of previous research. Overall, SDT was supported across these three studies.

From a theoretical standpoint, this article adds to the current literature that tests the tenets of SDT in a physical activity context. Most research has only studied sections of SDT (i.e. motivational regulations), and only a few studies have tested the autonomy support → psychological needs → motivational regulations → physical activity relationship (Edmunds et al., 2006; Edmunds et al., 2007). Therefore, this study added to the research testing the SDT process. In addition, this article improves the generalizability of SDT as only a handful of studies have tested SDT for physical activity with a cardiac population (Mildestvedt, Meland, & Eide, 2008; Russell & Bray, 2009; Russell & Bray, 2010).

SET Models

Self-efficacy was significantly related to physical activity in all three samples which confirms theory and past research (Bandura, 1997; Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008). Regarding the SET models, results were contrary to the theory and some studies (Resnick & Nigg, 2003; Schwarzer et al., 2007; Williams et al., 2008; Williams & Bond, 2002) as the empirical model was selected over the theoretical model across all three samples. Specifically, outcome expectation was related to self-efficacy but not to physical activity, while only self-efficacy predicted physical activity. This latter finding relates to recent studies in physical activity research (Millen & Bray, 2009; Perkins, Waters, Baum, & Basen-Engquist, 2009; Wilcox, Castro, & King, 2006) and in a review of outcome expectations and

physical activity (Williams et al., 2005). In this review, the authors concluded that “decreasing expected aversive outcomes ... and increasing expected positive outcomes of physical activity would increase self-efficacy for physical activity; therefore, it is possible that for physical activity, outcome expectancy operates to influence self-efficacy (p.73)”. In support of this claim, outcome expectations had a greater impact on self-efficacy than physical activity as demonstrated across these three studies.

This article also advanced SET, as three different types of self-efficacies were used which allowed for a larger breadth of self-efficacy even though only a combined score was created for these three types. This article also answered the call by Williams et al. (2005) who suggested more research is necessary to help resolve the debate regarding the relationship between outcome expectation and self-efficacy in a physical activity context. Finally, this article further adds to the use and importance of self-efficacy in physical activity research.

SDT-SET Integration Models

The second hypothesized integrated model, which had confidence in an agency role, was supported in all three samples. This integrated model was found as the best model in the cardiac and student samples, while no difference was revealed between both integrated models in the primary care sample. However, the models were not fully replicated as only some hypothesized theoretical links were consistently found across all samples. Therefore, these results partially supported our hypothesis. With regards to the specific hypothesized links, autonomy support was associated with relatedness across all samples and related to autonomy in the cardiac and student integrated models, but not in the primary care integrated model. Autonomy support was only found to be linked with confidence in the cardiac integrated model. Conversely, the need for autonomy significantly predicted confidence in the primary care and student integrated models,

but not in the cardiac sample. Therefore, cardiac patients starting a cardiac rehabilitation program may look to their important others for guidance and support rather than relying on their own volition to increase their feeling of confidence.

With regards to self-determined motivation, a consistent and positive relationship was found with confidence in all samples. In both the cardiac and primary care sample, confidence was found to influence self-determined motivation, while the inverse was revealed in the student model. Relatedness was associated with self-determined motivation in the cardiac and university student sample. Autonomy was only found to influence self-determined motivation in the student model. Therefore, it would be important to foster cardiac patients' sense of relatedness as well as build their confidence as these constructs were related to self-determined motivation. As for the relationship with physical activity, self-determined motivation was significantly related to this outcome in the primary care and student models, while confidence only significantly predicted physical activity in the student model. As explained in the results of the cardiac model, the variables predicting physical activity may be competing for the same variance and thus their influence on the behaviour was reduced to non-significant levels in this sample. Moreover, an increase in sample size in the cardiac and primary care samples could have resulted in more support for some of the hypothesized links.

In addition to the non-significant relationships between confidence and self-determined motivation with physical activity in the cardiac sample integrated model, lower levels of the explained variance in physical activity were also found. Due to the complexity of cardiac related illness, cardiac individuals may have many other factors that influence their physical activity levels. Mental health factors such as depression and anxiety have been linked with physical activity in individuals partaking in cardiac rehabilitation (Hunt-Shanks, Blanchard, & Reid,

2009; Petter et al., 2009). Therefore, these variables should be considered, as they could potentially act as moderating variables. Moreover, non self-determined motivation had the largest impact on behaviour over self-determined motivation and confidence in the cardiac sample. Therefore, for cardiac patients, it may be more important to attempt to minimize the influence of external and internal pressures (i.e., non self-determined motivation) towards physical activity as a reduction in this type of motivation appears to result in an increase in physical activity.

Strengths, limitations and future research

As previously mentioned, strong elements of this article were the complete testing and integration of two strong theories and their attempted replication across three populations. Indeed, addressing multiple theories may help to build a more comprehensive intervention by utilizing the strengths of each theory. Findings from all three studies revealed that autonomy support and the psychological needs are important constructs to foster as they were linked to both SET variables and self-determined motivation. Focusing on satisfying the three psychological needs by acting in an autonomy supportive fashion can help increase one's confidence, motivation and perception of positive outcomes related to physical activity. Recent interventions have begun incorporating these elements in their counselling protocol as they provide a guiding style and a theoretical framework behind their intervention and have been shown to be effective (see Fortier, Duda, Guérin, & Teixeira, 2010).

Despite the strengths of this article, limitations do exist. All measures, including physical activity, were self-reported and thus subject to social desirability. Studies using objective data (i.e., accelerometer, pedometer) would greatly enhance these findings. The student sample responded to the questionnaire online, while the cardiac and primary care sample

answered a paper-pencil questionnaire. Therefore, the different mode of delivery could have influenced the results. All three studies are based on cross-sectional data, therefore no causality or temporal relationships can be assumed. Studies that replicate the integrated model with longitudinal data would greatly benefit the literature on physical activity change. While the integrated models were favoured over the individual theory models, such conclusions warrant caution. There are no statistical tests to determine if the percentage of variance found in the integrated model is statistically different from the individual SDT and SET models, especially since the difference in the variance of specific variables between these models was small. In addition, this study tested two integrated models using a meditational approach. Other models with these constructs could therefore be tested. Future research could test different meditational and/or moderational models and attempt to determine which one may be optimal to understand physical activity behaviour. Finally, a study that tests the effectiveness of single (e.g., one SDT based group, one SET based group) versus multiple (e.g., one SDT & SET based group) theory-based physical activity intervention could shed light on the role of independent and integrated theories on physical activity behaviour change.

Overall conclusion

Based on the results of the three studies, self-determined motivation and self-efficacy/confidence have positive relationships with physical activity, especially in the individual theoretical models. These relationships did differ between samples in the integration model. Since physical activity levels remain low, it is therefore imperative that we gain more insight into the mechanisms at play during physical activity behaviour to help reverse the current rates. Consequently, theory integration should be the focus of future studies, especially since this article illustrated that theory integration is feasible.

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Table 1. Means, standard deviations and correlations of SDT and SET variables and physical activity included in the integrated model of the cardiac sample.

Variables	M (SD)	1	2	3	4	5	6	7	8
1. Physical Activity	26.00 (22.13)	-	-.04	-.09	-.02	.17	.15	-.11	.04
2. Autonomy Support	5.70 (1.11)		-	.48*	.33*	.41*	.41*	.20*	.33*
3. Relatedness	4.74 (1.10)			-	.56*	.32*	.47*	.32*	.48*
4. Autonomy	5.16 (0.91)				-	.36*	.32*	.22*	.44*
5. Confidence	0.00 (0.71)					-	.56*	.10	.46*
6. Self-determined motivation	3.11 (0.76)						-	.29*	.56*
7. Non self-Determined Motivation	1.50 (0.86)							-	.26*
8. Outcome Expectations	4.08 (0.54)								-

Note. * $p < .05$

Table 2. Means, standard deviations and correlations of SDT and SET variables and physical activity included in the integrated model of the primary care sample.

Variables	M (SD)	1	2	3	4	5	6	7
1. Physical Activity	27.94 (20.79)	-	.02	.01	.16	.32*	.44*	.06
2. Autonomy Support	4.96 (1.46)		-	.53*	.16	.34*	.31*	.29*
3. Relatedness	4.50 (1.28)			-	.38*	.46*	.37*	.45*
4. Autonomy	5.25 (0.74)				-	.38*	.33*	.23*
5. Confidence	0.00 (0.78)					-	.53*	.35*
6. Self-determined motivation	2.76 (0.83)						-	.28*
7. Outcome Expectations	4.06 (0.55)							-

Note. *p < .05

Table 3. Means, standard deviations and correlations of SDT and SET variables and physical activity included in the integrated model of the student sample.

Variables	M (SD)	1	2	3	4	5	6	7
1. Physical Activity	69.73 (54.69)	-	.14*	.16*	.27*	.40*	.35*	.04
2. Autonomy Support	4.89 (1.05)		-	.35*	.30*	.26*	.35*	.39*
3. Relatedness	4.34 (1.12)			-	.18*	.32*	.41*	.57*
4. Autonomy	5.18 (0.77)				-	.50*	.43*	.28*
5. Confidence	0.00 (0.78)					-	.64*	.37*
6. Self-determined motivation	2.93 (0.77)						-	.47*
7. Outcome Expectations	3.85 (0.57)							-

Note. Correlation between physical activity and the variables are with the square root transformation of physical activity. * $p < .05$

Table 4. Comparing the hypothesized theoretical links that are tested and represented in both the individual (SDT & SET) and integrated models.

Theory	Links	Cardiac		Primary Care		Student	
		Theory Models	Integrated Models	Theory Models	Integrated Models	Theory Models	Integrated Models
SDT	AS → A	Y	Y	N	N	Y	Y
	AS → R	Y	Y	Y	Y	Y	Y
	AS → C/CD	Y	Y	Y	N	N	N
	A → SD	N	N	N	N	Y	Y
	C/CD → SD	Y	Y	Y	Y	-	-
	SD → C/CD	-	-	-	-	Y	Y
	R → SD	Y	Y	Y	N	Y	Y
	A → NSD	N	N	-	-	-	-
	C/CD → NSD	N	N	-	-	-	-
	R → NSD	N	N	-	-	-	-
	SD → PA	Y	N	Y	Y	Y	Y
	NSD → PA	N	N	-	-	-	-
	C/CD → PA	-	-	-	-	Y	Y
	Total supported for SDT		6/11	5/11	5/7	3/7	7/8
SET	OE → SE/CD	Y	Y	Y	N	Y	N
	SE/CD → PA	Y	N	Y	N	Y	Y
Total supported for SET		2/2	1/2	2/2	0/2	2/2	1/2

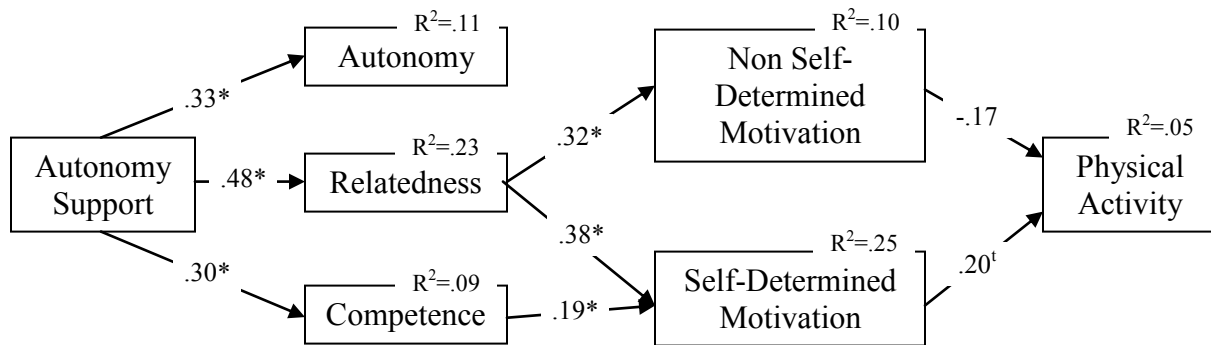
Note. Y = Hypothesis supported; N = Hypothesis not supported; “-” = Not present in both the individual and integrated models; AS = autonomy support; A = autonomy; C = competence; R = relatedness; SD = self-determined motivation; NSD = non self-determined motivation; OE = outcome expectations; SE = self-efficacy; CD = confidence; PA = physical activity

Figure captions.

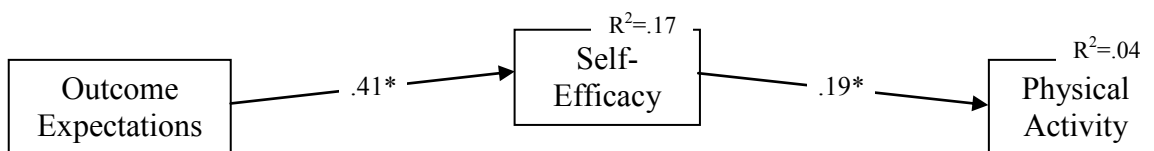
Figure 1. Final Models for SDT, SET and Integration with a cardiac sample

Figure 2. Final Models for SDT, SET and Integration with a primary care sample

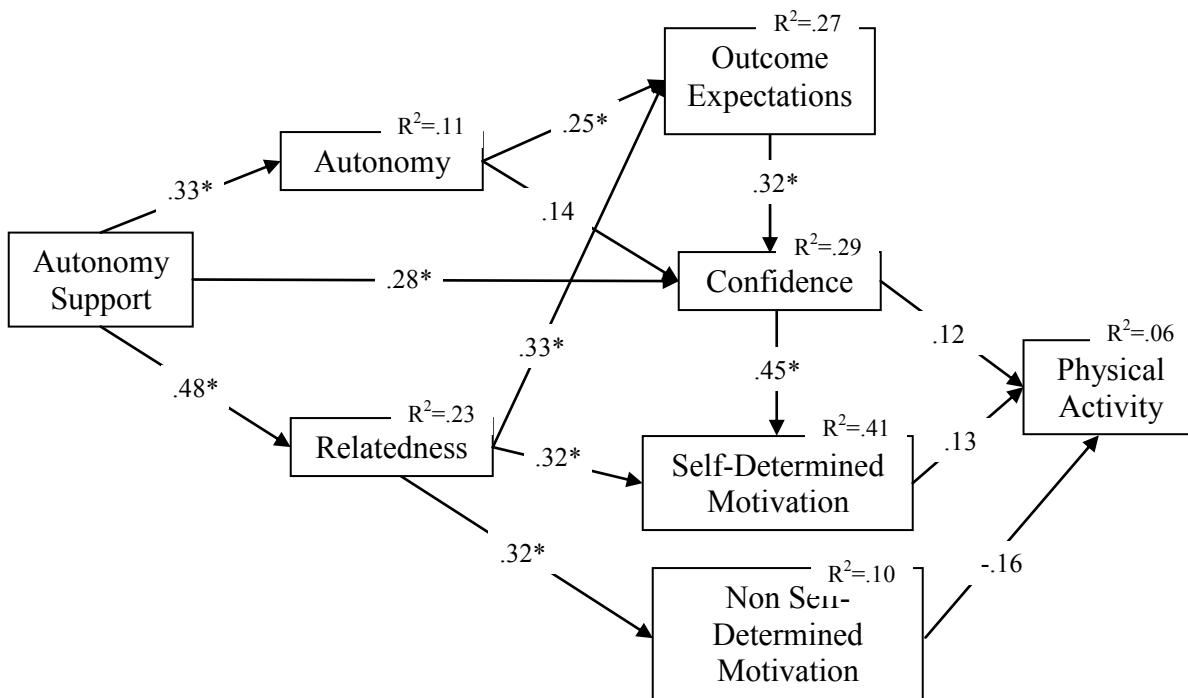
Figure 3. Final Models for SDT, SET and Integration with a university student sample



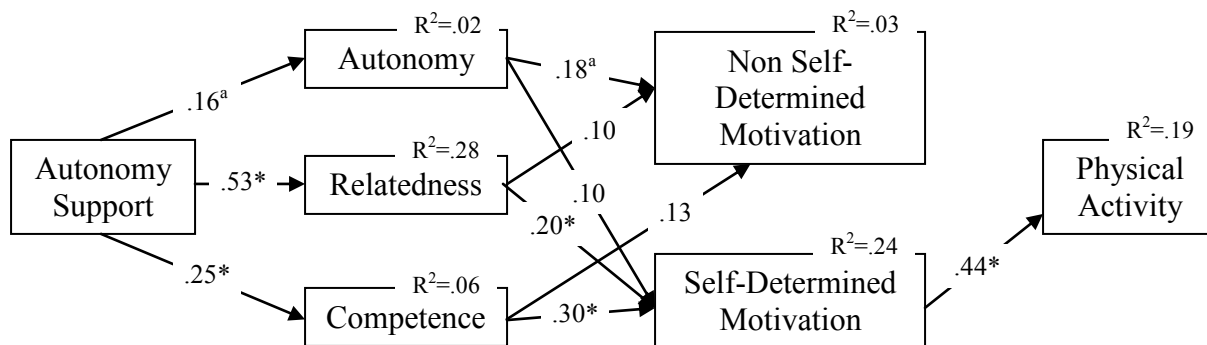
Panel 1 - SDT Model. Standard coefficients; ^tp = .05, * p < .05



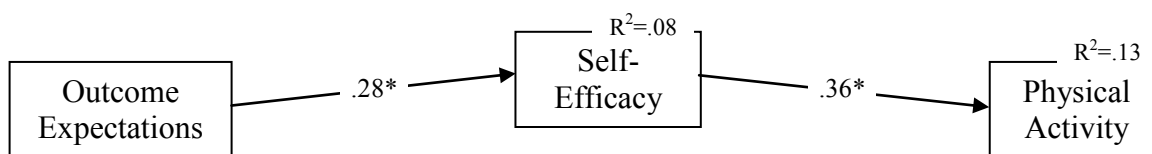
Panel 2 - SET Model. Standard coefficients; * p < .05



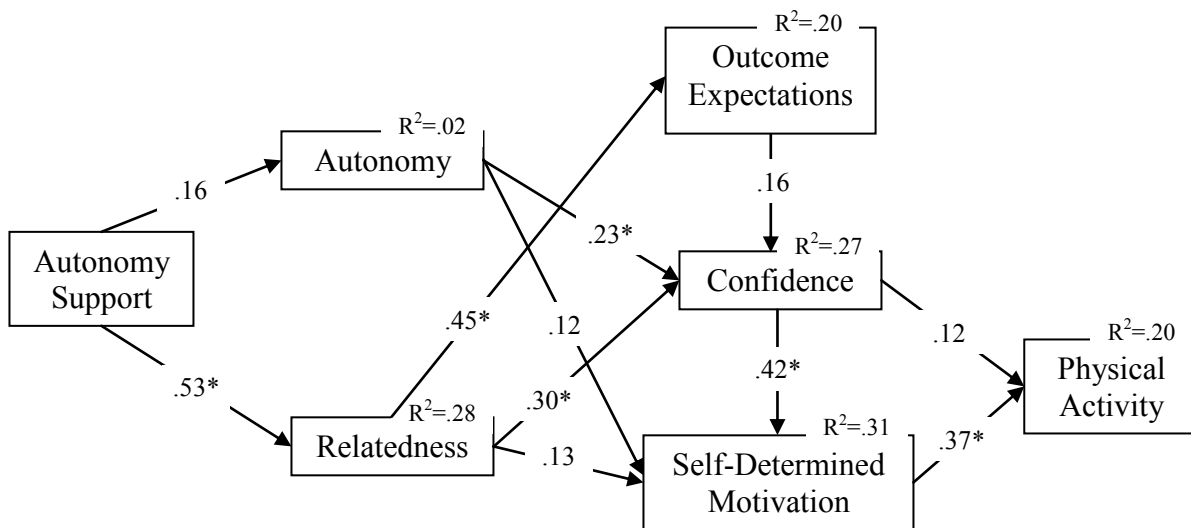
Panel 3 – SDT-SET Model. Standard coefficients; * p < .05



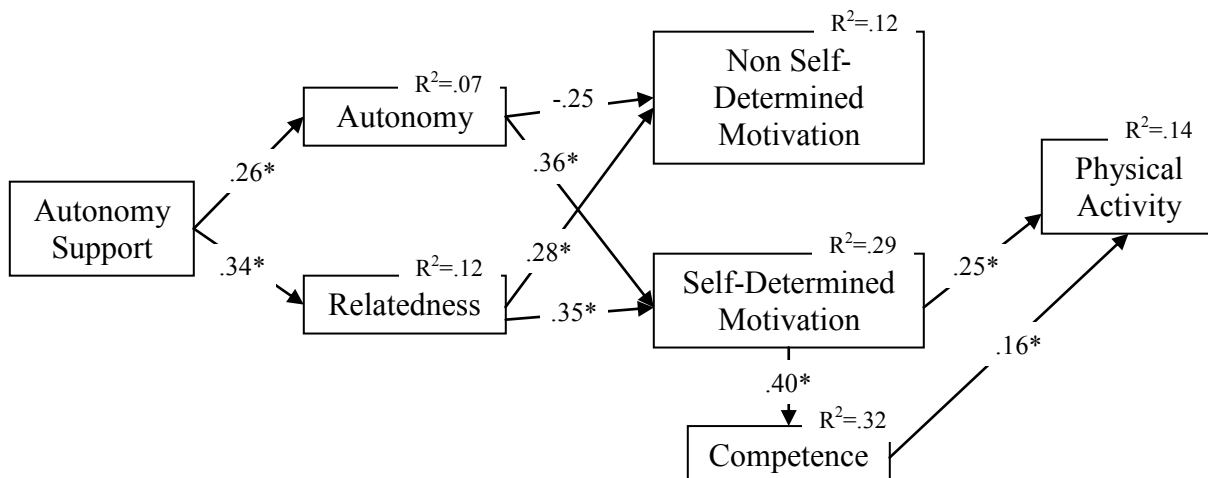
Panel 1 - SDT Model. Standard coefficients; ^a p < .10; * p < .05



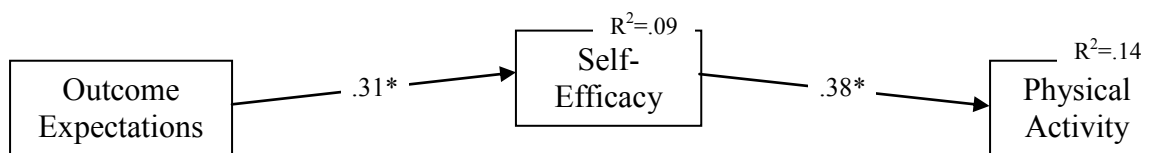
Panel 2 – SET Model. Standard coefficients; * p < .05



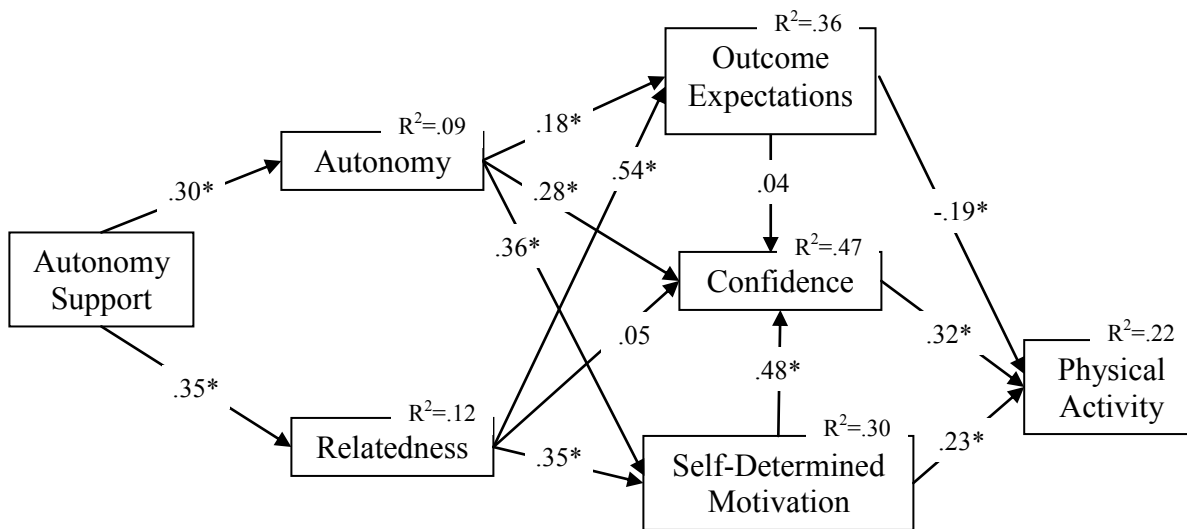
Panel 3 – SDT-SET Model. Standard coefficients; * p < .05



Panel 1 – SDT Model. Standard coefficients; * p < .05



Panel 2 – SET Model. Standard coefficients; * p < .05



Panel 3 – SDT-SET Model. Standard coefficients; * p < .05

CHAPTER 3

**HOW DOES SELF-EFFICACY THEORY AND SELF-DETERMINATION
WORK TOGETHER TO PREDICT PHYSICAL ACTIVITY
AT THE END OF CARDIAC REHABILITATION?**

Running head: SDT & SET IN CARDIAC REHABILITATION

How does Self-Efficacy Theory and Self-Determination work together
to predict physical activity at the end of cardiac rehabilitation?

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Abstract

Self-Determination Theory and Self-Efficacy Theory are prominent theories in the physical activity literature, and studies have begun integrating their concepts. In fact, Sweet, Fortier, Strachan and Blanchard (2010) have integrated these two theories in a cross-sectional study with a sample of cardiac patients. Therefore, this study sought to test a longitudinal integrated model to predict physical activity at the end of a 4-month cardiac rehabilitation program. Participants from two cardiac rehabilitation programs (N = 109) answered validated self-report questionnaires for self-determination and self-efficacy theory variables at baseline and two-month as well as for physical activity at four months. Data were analyzed using AMOS to assess the path analysis and model fit. Prior to integration, perceived competence and self-efficacy were combined, and labelled as confidence, as one factor emerged from a factor analysis. After controlling for 2-month physical activity and cardiac rehabilitation site, no variables significantly predicted residual change in 4-month physical activity. Although confidence did not predict residual change in 4-month physical activity, it had a strong positive relationship with 2-month physical activity (beta= .34, $p < .001$). The overall model retained good fit indices. In conclusion, results diverged from theoretical predictions of physical activity, but SDT and SET were still partially supported. Since the model had good fit, this study demonstrated that theoretical integration is feasible.

How does Self-Efficacy Theory and Self-Determination work together
to predict physical activity at the end of cardiac rehabilitation?

Introduction

Physical activity has been linked to a multitude of physical and psychological health benefits (Penedo & Dahn, 2005), and as a protective factor for coronary heart disease (Popkin, Kim, Rusev, Du, & Zizza, 2006). As such, physical activity is a central component of cardiac rehabilitation. In this context, physical activity has been found to prevent cardiac mortality, all-cause mortality. It also reduces levels of total cholesterol, levels of triglyceride and systolic blood pressure (Taylor et al., 2004) and can even reverse the disease process (Warburton, Whitney Nicol, & Bredin, 2006). Even though the benefits of physical activity are clear, physical activity still remains low in cardiac patients (Wofford, Grennlund, Croft, & Labarthe, 2007; Zhao, Ford, Li, & Mokdad, 2008). Therefore, enhancing our understanding of the factors that help increase cardiac individuals' physical activity is an important research priority.

Motivational variables have been found to be the strongest and most consistent predictors of physical activity in both healthy (Pan et al., 2009; Trost, Owen, Bauman, Sallis, & Brown, 2002) and cardiac individuals (Petter, Blanchard, Kemp, Mazoff, & Ferrier, 2009). Since these motivational variables are modifiable and frequently have a theoretical base, they have been deemed crucial to investigate (Baranowski, Cullen, Nicklas, & Thompson, 2003). Indeed, using theoretical frameworks to guide research helps to further understand the behaviour change process (Improved Clinical Effectiveness through Behavioural Research Group, 2006). While many theoretical explanations for physical activity exists, Self-Efficacy Theory (SET; Bandura, 1997) and Self-Determination Theory (SDT; Deci & Ryan, 1985; Deci & Ryan, 2002) have emerged as strong theories in the physical activity domain and are encouraged for physical

activity research (Hagger & Chatzisarantis, 2008; Petter et al., 2009; Trost et al., 2002; Wilson, Mack, & Grattan, 2008).

Recently, experts have urged that such theories be integrated to build on their strengths and thus gain more insight on the behaviour change process (Nigg, Allegrante, & Ory, 2002; Noar & Zimmerman, 2005). Moreover, SDT researchers (Hagger & Chatzisarantis, 2008; Wilson et al., 2008) have recently recommended the integration of SDT with other theories to improve our understanding of physical activity. Therefore, the purpose of this study was to replicate Sweet, Fortier, Strachan and Blanchard (2010) integrated SDT and SET model while using longitudinal data. To contextualize the integration of SET and SDT, the respective theories are described in the following sections, followed by recent integration studies which lead up to the purpose of the present study.

Self-Efficacy Theory

Within SET, behaviour is influenced by both self-efficacy and outcome expectations, where outcome expectation mediates the self-efficacy-behaviour relationship. Three common forms of self-efficacy are task, barrier and scheduling self-efficacy. Task self-efficacy refers to the general confidence in one's ability to perform a task (Bandura, 1997) and in this case to participate in physical activity. Barrier self-efficacy is defined by how confident an individual is to participate in physical activity when faced with specific barriers associated with physical activity (i.e., scared of having a cardiac event; Blanchard, Rodgers, Courneya, Daub, & Knapik, 2002). Finally, scheduling self-efficacy examines one's confidence to organize their time and responsibilities around physical activity (DuCharme & Brawley, 1995; Woodgate, Brawley, & Weston, 2005).

Overall, self-efficacy has been strongly linked with physical activity for both healthy adults (Trost et al., 2002) and cardiac patients (Petter et al., 2009). Within a cardiac population, Millen and Bray (2008) recently demonstrated that barrier self-efficacy predicted cardiac rehabilitation attendance during the program as well as physical activity at 6 weeks post-program, while task self-efficacy influenced physical activity at 12 weeks post-program. Other studies supported the relationship between task and barrier self-efficacy on physical activity in cardiac individuals (Blanchard et al., 2002; Evon & Burns, 2004). Scheduling self-efficacy has also been found to predict physical activity in a cardiac population (Woodgate et al., 2005). Not many studies have tested this type of self-efficacy in predicting physical activity in a cardiac population, but its use is strongly recommended (Millen & Bray, 2008; Woodgate & Brawley, 2008). Of note, in Sweet et al. (2010) the three types of self-efficacies were merged along with competence from SDT and labelled confidence, which is therefore a unitary construct defined as one's overall feeling of ability and capability to participate in physical activity. This same construct was used in this study.

The other SET construct, outcome expectations, is defined as perceptions of positive and negative outcomes that result from participating in physical activity (Bandura, 1997). Theoretically, outcome expectations is set to predict the behaviour, however this link is not clearly established in physical activity research (Williams, Anderson, & Winett, 2005). As suggested by Williams and colleagues, outcome expectation may have a more important role in predicting self-efficacy than physical activity. Indeed, a recent study confirmed this relationship in a cross-sectional analysis of SET across three populations, including cardiac patients (Sweet, Fortier, Strachan, & Blanchard, 2010). Therefore, outcome expectation was set to predict self-efficacy rather than physical activity in the present study.

Self-Determination Theory

As described in SDT, the sequence toward behaviour change is explained by the relationships between: autonomy support → psychological needs → self-determined motivation → behaviour (physical activity). Autonomy support is at its highest when an individual perceives that his/her social context provides choices and options, acknowledges their feelings and perspectives and provides rational when choices cannot be given (Vansteenkiste & Sheldon, 2006). In SDT, higher levels of perception of autonomy support are purported to lead to greater satisfaction of the three psychological needs. The satisfaction of the needs of autonomy (i.e., feeling one has volition and is the source of his/her own actions), competence (i.e., feeling able and capable of experiencing opportunities), and relatedness (i.e., feeling connected with others) are then hypothesized to translate to self-determined forms of motivation.

In SDT, there are two broad types of motivation, namely self-determined motivation and non self-determined motivation (Deci & Ryan, 2008). On the one hand, self-determined motivation is characterized by one valuing the benefits of physical activity and/or deriving pleasure and satisfaction in its participation. On the other hand, non self-determined motivation is explained by external (e.g., following the doctor's orders) and/or internal pressures (e.g., feeling of guilt) for engaging in physical activity. These more self-determined forms of motivation then lead to more positive consequences such as physical activity as explained next.

The influence of self-determined motivation is well documented across a variety of sport and physical activity related outcomes such as persistence in sports (Gagné, Ryan, & Bargmann, 2003; Pelletier, Fortier, Vallerand, & Brière, 2001), weight loss (Edmunds, Ntoumanis, & Duda, 2007; Silva et al., 2010), flow (Kowal & Fortier, 2000; Kowal & Fortier, 1999), and stages of change (Buckworth, Lee, Regan, Schneider, & DiClemente, 2007; Daley & Duda, 2006).

Specific to physical activity, self-determined motivation has been found to predict physical activity adoption (Fortier, Sweet, O'Sullivan, & Williams, 2007) and maintenance (Mildestvedt, Meland, & Eide, 2008). A limited number of studies have however investigated SDT constructs in adults with cardiovascular disease. A recent review on the correlates of physical activity of cardiac patients enrolled in cardiac rehabilitation found no SDT-based research with this population (Petter et al., 2009). However, recent studies in the context of cardiac rehabilitation have demonstrated a significant and positive relationship between self-determined motivation and physical activity (Mildestvedt et al., 2008; Russell & Bray, 2009; Russell & Bray, 2010; Sweet et al., 2010). As mentioned previously, the Sweet et al. study was conducted with cross-sectional data and thus a longitudinal investigation is warranted to test the temporal validity of SDT variables in this context.

SDT and SET

Since SDT and SET stem from the same meta-theoretical concept of agency, where humans are seen as active contributors of their behaviours, it is possible to integrate these theories. In addition, SDT and SET have received extensive support in physical activity research where some researchers have begun integrating concepts from both theories. For instance, barriers self-efficacy mediated the relationship between intrinsic motivation and physical activity in a community sample (McNeill, Wyrwich, Brownson, Clark, & Kreuter, 2006). In adults with type 2 diabetes, Sweet, Fortier, Guérin, Tulloch, Sigal and Kenny (2009) demonstrated that self-determined motivation mediated the relationship between barrier self-efficacy and long-term physical activity. In cardiac individuals, self-determined motivation and self-efficacy were revealed to be important predictors of physical activity changes after cardiac rehabilitation (Mildestvedt et al., 2008). In summary, these studies as well as others (Dyrlund & Wininger,

2006; Slovenic D'Angelo, 2004) have demonstrated that the integration of SDT and SET concepts is a fruitful approach to predicting physical activity. However, these integration studies have mostly used specific concepts from each theory rather than testing entire theories. As outlined by Noar and Zimmerman (2005), it is best to test and integrate entire theories. This procedure was recently conducted by Sweet and colleagues (2010) with cross-sectional data from three different populations, including a cardiac population. Specifically, each theory was tested separately and then integrated into one comprehensive model. This study revealed that for the cardiac population a similar amount of hypothesized relationships were found between the integrated model and the individual SDT and SET models. In addition, the integrated SDT-SET model accounted for more variance in physical activity, self-determined motivation and confidence than the individual theories and held well together in a path analytical model. Since the Sweet and colleagues (2010) study used cross-sectional data from cardiac rehabilitation participants and that theoretical integration is at its infancy, it is imperative that a longitudinal investigation be conducted on this integration model, hence the purpose of this study.

Present Study

The main objective of this study was to test a Self-Determination Theory and Self-Efficacy Theory integrated longitudinal model to predict physical activity at 4 month (end of cardiac rehabilitation program). Since a previous integrated model was found in cross-sectional data of cardiac individuals (Sweet et al., 2010), the goal was to replicate this integrated model using longitudinal data. Based on the cross-sectional model and theoretical tenets, the hypothesized longitudinal integration model is illustrated in Figure 1. Of particular note, confidence is set later in the model (at 2 months) and is predicted by autonomy and relatedness since it holds the SET assumption that it is a key process regarding human agency and therefore

can drive behaviour. Under this principle, the psychological needs of autonomy and relatedness are expected to predict confidence.

Method

Procedures

All participants were referred by their physician to a centre-based cardiac rehabilitation program. Participants were approached during their first week at one of two 16-week centre-based cardiac rehabilitation programs. Upon signing a consent form, a meeting was scheduled within the first two weeks for participants to answer the baseline questionnaire onsite [89% response rate (109/123)]. Everyone enrolled in the cardiac rehabilitation program was eligible, which included participants who had suffered a cardiac related event or were at high risk for cardiovascular disease. Questionnaires were answered at baseline, 2 months (mid-program) and 4 months (end of program). All steps were approved by the appropriate Research Ethics Board.

Participants

Study participants (N = 109) enrolled in one of two cardiac rehabilitation programs were predominantly male (67.9%), francophone (67.9%), Caucasian (96.3%) and retired (64.0%) with a mean age of 62.28 years (SD =9.64). The majority of participants enrolled in the cardiac rehabilitation suffered a cardiac-related event (88.1%) while others were at high risk.

Measures

Physical activity. Using the Godin Leisure Time Exercise Questionnaire (GLTEQ; Godin & Shepard, 1985), participants reported the number of days in a typical week in the past two months that they engaged in physical activity for more than 20 minutes for light, moderate and strenuous intensities. The frequencies were multiplied by three, five, and nine for each intensity, respectively, and then summed to produce the total weekly leisure activity score. This

questionnaire has been demonstrated as being valid and reliable (Jacobs, Ainsworth, Hartman, & Leon, 1993; Kriska & Caspersen, 1997).

SDT variables.

Autonomy support. The Important Other Climate Questionnaire (Williams et al., 2006) was used to assess participants' perception of autonomy support. Each of the six items (e.g., "My exercise important other listened to how I would like to do things regarding my physical activity") was anchored on a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7). A mean of the six items was calculated. The alpha for this study was within acceptable range (alpha = .81).

Psychological Needs. On a 6-point Likert scale ranging from 1 (false) to 6 (true), participants responded to 18 items from The Psychological Need Satisfaction in Exercise Scale (Wilson, Rogers, Rodgers, & Wild, 2006). Each item reflected how participants might feel when they are physically active. For example, an item for autonomy (6 items) was "I feel free to exercise in my own way", for competence (6 items) "I feel that I am able to complete exercises that are personally challenging" and for relatedness (6 items) "I feel close to my exercise companions who appreciate how difficult exercise can be". A mean was calculated for each psychological need. For this study, high Cronbach's alpha were found for autonomy (.87), relatedness (.90) and competence (alpha = .90).

Motivations. Participants responded to the Behavioral Regulation Exercise Questionnaire-2 (BREQ-2) to measure their motivation for physical activity (Markland & Tobin, 2004). On 5-point Likert scale ranging from 0 (not true for me) to 4 (very true for me), 19 items measured the types of motivational regulations on the self-determination continuum: amotivation (4 items, e.g. "I think participating in physical activity is a waste of time"), external regulation (4

items; e.g. “I take part in physical activity because my friends/family/partner say I should.”), introjected regulation (3 items; e.g. “I feel guilty when I don’t participate in physical activity.”), identified regulation (4 items; e.g. “It’s important to me to participate in physical activity”) and intrinsic regulation (4 items; e.g. “I get pleasure and satisfaction from participating in physical activity”). The BREQ-2 scale does not contain items measuring integrated regulation and thus four items from Wilson, Rodgers, Loitz, and Scime (2006) were included to assess this type of regulation (e.g. “I consider exercise consistent with my values”). The mean score of each motivational regulation was calculated. To replicate findings from Sweet and colleagues (2010) and in line with previous research and SDT (Barbeau, Sweet, Fortier, 2009; Deci & Ryan, 2008), identified, integrated and intrinsic regulations were combined to create self-determined motivation ($\alpha = .89$) while external and introjected regulation were aggregated for non self-determined motivation ($\alpha = .72$).

SET variables.

Task self-efficacy. Participants rated their confidence to engage in physical activity for more than 20 minutes during their free time for at least 1, 2, 3 up to 7 days per week over the next two months using a 0% (not at all confident) to 100% (completely confident) scale. This follows the graded approach recommended by Bandura (1997). A mean percentage was calculated. In this study, this scale was reliable (Cronbach’s $\alpha = .88$).

Barrier self-efficacy. Using Blanchard and colleagues’ (2002) barrier self-efficacy scale for individuals in cardiac rehabilitation, participants rated the degree of confidence to overcome nine different barriers over the next two months (e.g. fear of having a cardiac incident, bad weather, do not have time). Each item was rated on a scale ranging from 0 (not at all confident)

to 100% (completely confident) and a mean of the nine items was calculated. This questionnaire was found to have good internal consistency (Cronbach's alpha = .89).

Scheduling self-efficacy. This seven-item measure was previously used in cardiac rehabilitation research to assess participants' scheduling self-efficacy (DuCharme & Brawley, 1995). Participants reported their confidence levels on a scale from 0 to 100% to all items for the next two months (e.g., organize time around each cardiac rehabilitation exercise session). The mean of the nine items was calculated. Good internal consistency was found for this scale (alpha = .88). To replicate the integration model from Sweet and colleagues (2010), the need for competence and all three self-efficacies at 2-months were standardized and combined to create the concept of confidence (alpha =.92).

Outcome expectations. A 17 item validated scale assessed participants' outcome expectations (Rogers et al., 2004). This scale consisted of various outcomes/benefits of physical activity (e.g.; less depressed, improve health/reduce disease risk). Participants rated their agreement of the impact of physical activity on each of these outcomes using a 5 point Likert scale (1 = strongly disagree to 5 = strongly agree). A mean of the 17 items was calculated to create the score for outcome expectations. The internal consistency of this scale was good (alpha =.82).

Data analysis

Preliminary analyses. Following Tabachnick and Fidell's (2007) data cleaning procedure, univariate and multivariate outliers, missing data, and normality of the variables were examined with SPSS v. 18 (IBM Corporation, 2010). Since recruitment and data collection were conducted at two different cardiac rehabilitation sites, a t-test was performed to determine if the outcome variable, physical activity at 4 months, differed between the two sites.

Main analyses. As previously mentioned, the integrated SDT-SET model is based on the model found in Sweet and colleagues (2010) and theoretical tenets (see Figure 1). Using AMOS v. 18, the model was replicated and further modified, if necessary, by removing non-meaningful paths and considering suggestions from the modification indices. Five goodness of fit indices: the chi-square goodness-of-fit, the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean residual (SRMR) were examined. Good model fit is indicated by a non-significant chi-square, a CFI of greater or equal to .90, a RMSEA of at least below .08, and a SRMR below .10 (preferably below .05; Kline, 2005).

Results

Preliminary Results

Two univariate outliers were reduced to one unit larger than the next highest value for the needs of autonomy at baseline and 2-month self-determined motivation and three univariate outliers were reduced for scheduling self-efficacy at 2 months. Differences in physical activity at 4 months were found by cardiac rehabilitation site, $t = 3.52$, $p < .01$. Therefore, a cardiac rehabilitation variable was entered in the model to control for this difference. Missing data ranged from 4.6% to 22.9% (Mean = 15%; 97% completed baseline, 82% two months; 77% 4 months) and were found to be missing not at random. Specifically, those who were missing on physical activity had lower levels of confidence. Due to this result, the multiple imputation technique was conducted as it does not make assumptions about missing data pattern and is the most respectable method of dealing with this type of missing data (Tabachnick & Fidell, 2007). This imputation technique resulted in the creation of five different datasets. The results of these datasets were combined by averaging the corresponding regression coefficients, r-squared, standard errors and model fit indices. The model of the imputed data was then compared to that

of the original data (with missing values) to determine if the models differed. Once data were imputed, all variables were found to be normally distributed. One multivariate outlier was found which had a low autonomy support score with high levels of autonomy and low levels of relatedness. Since this combination is theoretically possible, the multivariate outlier was retained for the analyses.

Main analyses

Table 1 provides the means and correlations between study variables pooled across all five imputed datasets. The standardized beta coefficients, r-squares and model fit of all five datasets are in Table 2, while the averages of the standardized betas and r-squares are found on Figure 2. This figure illustrates the final SDT-SET integration model where non-meaningful links (standardized beta below $\pm .10$) are removed and modification indices were considered. Upon averaging the model fit indices of the five datasets, the final model was found to have good fit (chi-square (29) = 38.00, $p = .13$; CFI = .95; RMSEA = .05, SRMR = .08). Overall, the results from the multiple imputation and original data compare favourably as most coefficients are similar aside from the relationship between baseline autonomy and 2-month non self-determined motivation and 2-month self-determined motivation and 4-month physical activity which were not significant for the imputation method but significant for the original data set with missing values². In line with the hypothesized model, autonomy support predicted the needs of autonomy and relatedness and outcome expectation was related to confidence. In addition, the need of autonomy was a positive, although not significant, predictor of self-determined motivation. Confidence was significantly related to self-determined motivation. Contrary to the hypothesized model, the need of relatedness did not have a meaningful relationship with self-determined

² The imputation model was referred as the main model throughout the manuscript, as this imputation technique has been found to be more reliable than listwise deletion (Schlomer, Bauman, & Card, 2010).

motivation, confidence and outcome expectations. Similarly, 2-month confidence was a predictor of 2-month physical activity rather than residual change in 4-month physical activity as highlighted by the modification indices. Two-month self-determined motivation was not significantly related to residual change in 4-month physical activity, and non self-determined motivation did not have a meaningful relationship with physical activity³.

Discussion

This study aimed to test a longitudinal integrated Self-Determination Theory – Self-Efficacy Theory model to predict physical activity at the end of a 4-month cardiac rehabilitation program. Therefore, this longitudinal integration model extends the previous Sweet and colleagues' (2010) study which was conducted with cross-sectional data. To our knowledge, the current study was the first to test a fully integrated model of SDT and SET in a physical activity context while using longitudinal data. Previous longitudinal studies combining these theories only tested specific concepts from each theory rather than all theoretical constructs from SDT and SET (Mildestvedt et al., 2008; Slovenic D'Angelo, 2004; Sweet et al., 2009). In addition, this research answered the call from SDT researchers (Hagger & Chatzisarantis, 2008; Wilson et al., 2008) for integrating SDT with other prominent theories as well as added to the general literature on theory integration (Noar & Zimmerman, 2005).

The overall findings partially supported the hypothesized model. Specifically, the longitudinal model had good fit supporting the integration of the constructs from both theories in one integrated model and therefore supported Sweet and colleagues (2010). Starting with autonomy support, it was found to predict the psychological needs of autonomy and relatedness

³ Since 2-month physical activity accounted for a large amount of variance in 4-month physical activity, a regression analysis revealed a non-significant relationship (unstandardized beta = -3.54, $t = -1.11$, $p > .05$) between 2-month self-determined motivation and 4-month physical activity (not controlling for 2-month physical activity).

which is in line with our hypotheses which were based on Sweet and colleagues (2010). In addition, this relationship corroborated past research (Markland & Tobin, 2010; Silva et al., 2010) along with SDT. Therefore, health care professionals should be autonomy supportive by acting in a warm and caring way (relatedness), expressing empathy (relatedness), minimizing pressure and control (autonomy), maximizing patients' choice while providing a rationale for suggestions (autonomy) in order to increase satisfaction of these psychological needs. Next, the path between the need of autonomy and self-determined motivation was not significant, but in the right direction and, thus, in line with SDT, Sweet and colleagues (2010), and past research that has demonstrated a positive link between autonomy and self-determined motivation (Barbeau, Sweet, & Fortier, 2009; Peddle, Plotnikoff, Wild, Au, & Courneya, 2008). Relatedness was not linked with self-determined motivation which is contrary to our hypotheses and SDT. Confidence, which is comprised of competence from SDT, significantly predicted self-determined motivation which is congruent with Sweet et al. (2010), previous research (Edmunds, Ntoumanis, & Duda, 2006; Wilson, Rodgers, Blanchard, & Gessell, 2003) and theory (Ryan & Deci, 2007). Although not all the needs predicted self-determined motivation, few studies have tested the psychological needs in a cardiac setting (Russell & Bray, 2009; Russell & Bray, 2010) and thus more research is needed to fill this gap.

Moreover, outcome expectation was found to be a strong predictor of confidence, which is contrary to SET, but supports findings from Sweet and colleagues (2010) and suggestions by Williams and colleagues (2005). Therefore, it appears that outcome expectation plays a role in predicting self-efficacy in a physical activity context. Based on these findings, interventions could therefore focus on fostering positive outcome expectations in order to build confidence.

With regards to physical activity at four months, this longitudinal model revealed that neither self-determined motivation nor confidence at two months significantly predicted residual change in physical activity at four months. First, the relationship between 2-month self-determined motivation and residual change in 4-month physical activity is contrary to SDT and previous physical activity research (Barbeau et al., 2009; McDonough & Crocker, 2007), including studies with a cardiac sample (Russell & Bray, 2009; Russell & Bray, 2010). However, Sweet and colleagues (2010) also did not find a significant relationship between these two constructs. A longitudinal study also reported a non-significant link between self-determined motivation and physical activity change (Fortier, Kowal, Lemyre, & Orpana, 2009). One explanation for this non-significant result is that self-determined motivation may be more important in the long-term. Indeed, self-determined motivation has been hypothesized as playing a larger role in maintaining health behaviours such as physical activity (Rothman, Baldwin, & Hertel, 2004). In support of this premise, a recent study demonstrated that regular exercisers have stronger self-determined motivation compared to exercise initiates (Rodgers, Hall, Duncan, Pearson, & Milne, 2010). Specific to cardiac individuals, self-determined motivation was shown to be an important predictor of physical activity maintenance after cardiac rehabilitation (Mildestvedt et al., 2008). Therefore, self-determined motivation may in fact play out in the later phases of behaviour change. Future research should test an integrated SDT and SET model to predict long-term physical activity (i.e., 12 months).

Second, 2-month confidence had a significant relationship with 2-month physical activity rather than residual change at 4-month. This result is not consistent with our hypothesis, theory (Bandura, 1997) and past research (Millen & Bray, 2008; Schwarzer, Luszczynska et al., 2008). However, a recent study by Hays, Pressler, Damush, Rawl & Clark (2010) revealed no

longitudinal significant link between self-efficacy and outcome expectation at baseline with 8-week physical activity attendance in women at risk for cardiovascular disease. Similarly to self-determined motivation, it is possible that confidence may also have a greater impact for long-term physical activity. In fact, Williams, Lewis, Dunsiger, Whiteley, Papandonatos, Napolitano, et al. (2008) revealed that self-efficacy did not significantly predict physical activity at 6 months, but did predict physical activity at 12 months supporting the hypothesis that confidence/self-efficacy may be more influential in the long-term. In line with this hypothesis, recent studies in the physical activity domain have theorized that different types of self-efficacy have larger impacts at specific phases of the behaviour change process (Scholz, Sniehotta, & Schwarzer, 2005; Schwarzer et al., 2007). As such, task self-efficacy is viewed as playing an important role in physical activity intentions and adoption, while self-regulatory self-efficacies (i.e., barrier and scheduling) are seen as better predictors of sustained physical activity levels (Rodgers & Sullivan, 2001; Rodgers, Hall, Blanchard, McAuley, & Munroe, 2002). Therefore, future research could tease out these types of self-efficacy and test the phase-specific hypothesis.

Another explanation for the non-significant relationship between the motivational variables of confidence and self-determined motivation and physical activity could be the presence of other mediating/indirect factors such as intentions and planning. Since self-determined motivation and physical activity did not have a significant relationship, we cannot talk about mediating effect as described by Baron and Kenny (1986). However, recent statistical advances allow us to talk about indirect effects, even if the relationship between the independent and dependent variables is not statistically significant (Hayes, 2009). Hayes claims that one should use bootstrapping methods to establish if indirect effects are present. Therefore, future

studies could test if these intentions and planning variables explain the self-determined motivation and physical activity relationship, by using methods outlined in Hayes.

The literature supported these indirect effects as self-determined motivation was found to have an indirect relationship with physical activity through intentions (Fortier et al., 2009), while another study with a cardiac population revealed that self-determined motivation had a stronger relationship with planning than with intentions (Slovinec D'Angelo, Reid, & Pelletier, 2007). In addition, Slovenic D'Angelo (2004) revealed the self-efficacy had an indirect relationship with 6-month physical activity through planning. Other studies with cardiac rehabilitation participants have highlighted the role planning has played in predicting physical activity (Sniehotta, Scholz, & Schwarzer, 2006; Sniehotta, Scholz, & Schwarzer, 2005). Furthermore, a recent review of physical activity interventions demonstrated that self-regulations variables (such as planning) had the most support for their mediating effect on the intervention-physical activity relationship (Rhodes & Pfaeffli, 2010). Therefore, a more in depth investigation of the processes between motivational variables of self-determined motivation and confidence with physical activity is warranted.

Finally, past physical activity was found to be the sole significant predictor of physical activity at four months. This finding is consistent with previous research (Weinstein, 2007) and SET (Bandura, 1997). It is important to include past physical activity as past studies often omitted this variable from their model despite being a consistent predictors of future behaviour (Weinstein, 2007).

Strengths, limitation and future research

The use of theory in predicting health behaviours such as physical activity is an added strength of this study as theories have been underutilized in health behaviour research (Michie et

al., 2005; Painter, Borba, Hynes, Mays, & Glanz, 2008). As previously mentioned, testing the integration model was a clear strength of this study due to the recent calls for theory integration (Nigg et al., 2002; Noar & Zimmerman, 2005). Although Sweet and colleagues (2010) integrated SDT and SET, they used a cross-sectional sample. Therefore, using longitudinal data in this study adds to the cross-sectional integration model and therefore hinting at the sequencing between constructs. In addition, using a longitudinal design fills a gap in the cardiac literature, since most studies with a cardiac population are cross-sectional in nature (Petter et al., 2009).

The use of objective physical activity data would be needed in future research as the current investigation was based on a self-report physical activity questionnaire. This study had a small sample size which limited the analyses. With a larger and more diverse sample, future studies could retest this integrated model using structural equation modeling. Furthermore, a larger sample would allow future studies to test the longitudinal integrated model using an autoregressive/cross lagged model. This type of analysis would be of great benefit as it could determine what the best sequence is between all variables over the entire length of the 4-month program. In addition, using non mean-based within-person analyses would allow for an investigation of the entire behaviour change process. Specifically, investigating development trajectories over the course of the cardiac rehabilitation program and post-program could reveal interesting results. Using an analytical approach such as Latent Class Growth Modeling (Nagin, 1999), one could identify if different physical activity patterns emerge within a sample. This type of analysis would therefore account for individual differences in the patterns of change and allow to link motivational variables with these different patterns. Therefore, large samples would allow us to use more advanced statistical technique in order to paint a more accurate picture of the physical activity behaviour change process. Finally, this study was limited to four months and

therefore future studies could focus on longer-term physical activity, especially post-cardiac rehabilitation program, in order to determine if the same or different constructs influences physical activity behaviour.

Overall conclusion

Although the motivational constructs did not predict residual change in 4-month physical activity, the integrated model still had good model fit, suggesting that combining SDT and SET can hold together in one model. This integrative insight is especially important when looking at the broader social problem of physical inactivity. Instead of accumulating “mini-literatures” for each specific theory, as indicated by Noar and Zimmerman (2005), we may gain more insight and knowledge on the physical activity behaviour change process if we begin to “join theoretical forces”. Although this integration did not succeed at predicting the outcome, future research testing an integrative model is still needed to augment our understanding of the constructs leading to increased physical activity.

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Table 1. Means and correlations of SDT and SET variables and physical activity included in the integrated model for the five pooled multiple imputation datasets.

Variables	M	1	2	3	4	5	6	7	8	9	10
1. Autonomy Support (Baseline)	5.66	-	.51*	.30*	.14	.23*	.10	.11	-.03	-.16	.05
2. Relatedness (Baseline)	4.75		-	.51*	.12	.20	.04	.19	.04	-.14	.14
3. Autonomy (Baseline)	5.14			-	.19	.25*	-.10	.26*	.03	.02	.09
4. Confidence (2months)	0.00				-	.34*	.15	.38*	.29*	.11	.01
5. Self-determined motivation (2months)	3.07					-	.22	.33*	.07	-.11	.19
6. Non self-Determined Motivation (2months)	1.50						-	.02	.01	.01	.01
7. Outcome Expectations (2months)	4.07							-	.03	-.17	.24*
8. Physical Activity (2months)	34.45								-	.47*	-.10
9. Physical Activity (4months)	34.52									-	-.24*
10. Cardiac Rehabilitation site	-										-

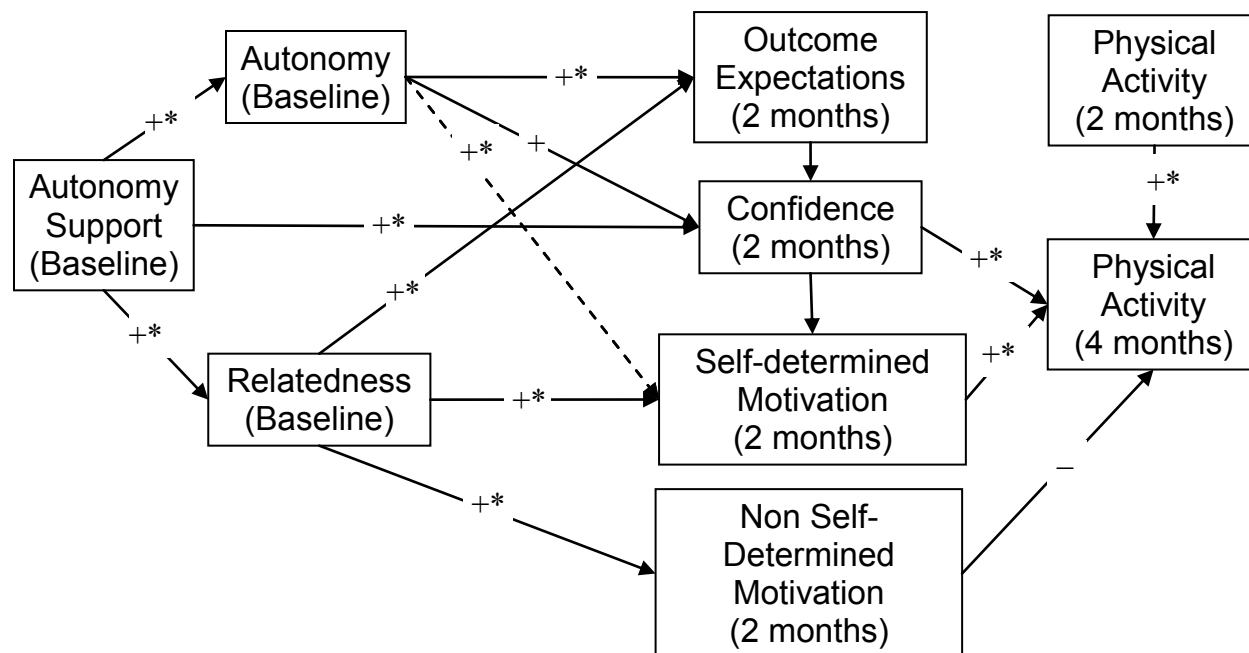
Note. *p < .05

Table 2. Standardized coefficients and model fit indices for the five imputed datasets.

	MI 1	MI 2	MI 3	MI 4	MI 5
Paths					
Autonomy support → Autonomy	.29*	.27*	.29*	.31*	.32*
Autonomy support → Relatedness	.56*	.53*	.54*	.47*	.45*
Autonomy → Outcome Expectations	.18	.33*	.21*	.29*	.18
Autonomy → Self- Determined Motivation	.04	.17	.22*	.08	.22*
Autonomy → Non Self- Determined Motivation	-.24*	-.20	-.18	.13	-.08
Relatedness → Self- Determined Motivation	.20	-.02	.06	.06	.04
Relatedness → Non Self- Determined Motivation	.16	.21	.15	.25	-.10
Outcome Expectations → Confidence	.48*	.37*	.34*	.34*	.30*
Confidence → Self- Determined Motivation	.27*	.22*	.32*	.40*	.28*
Confidence → Physical Activity (2 months)	.25*	.30*	.32*	.33*	.28*
Self-Determined Motivation → Physical Activity (4 months)	-.12	-.13	-.08	-.18*	-.09
Physical Activity (2 months) → Physical Activity (4 months)	.46*	.48*	.45*	.49*	.47*
Cardiac Rehabilitation → Physical Activity (4 months)	-.19*	-.15	-.20*	-.16	-.18*
Cardiac Rehabilitation → Self-Determined Motivation	.08	.26**	.15	.11	.11
Cardiac Rehabilitation → Outcome Satisfaction	.26*	.19*	.21*	.24*	.18
Model Fit Indices					
Chi-square (df)	34.66 (29)	41.25 (29)	40.47 (29)	35.36 (29)	38.25 (29)
CFI	.97	.93	.94	.96	.93
SRMR	.07	.09	.08	.08	.08
RMSEA	.04	.06	.06	.05	.05

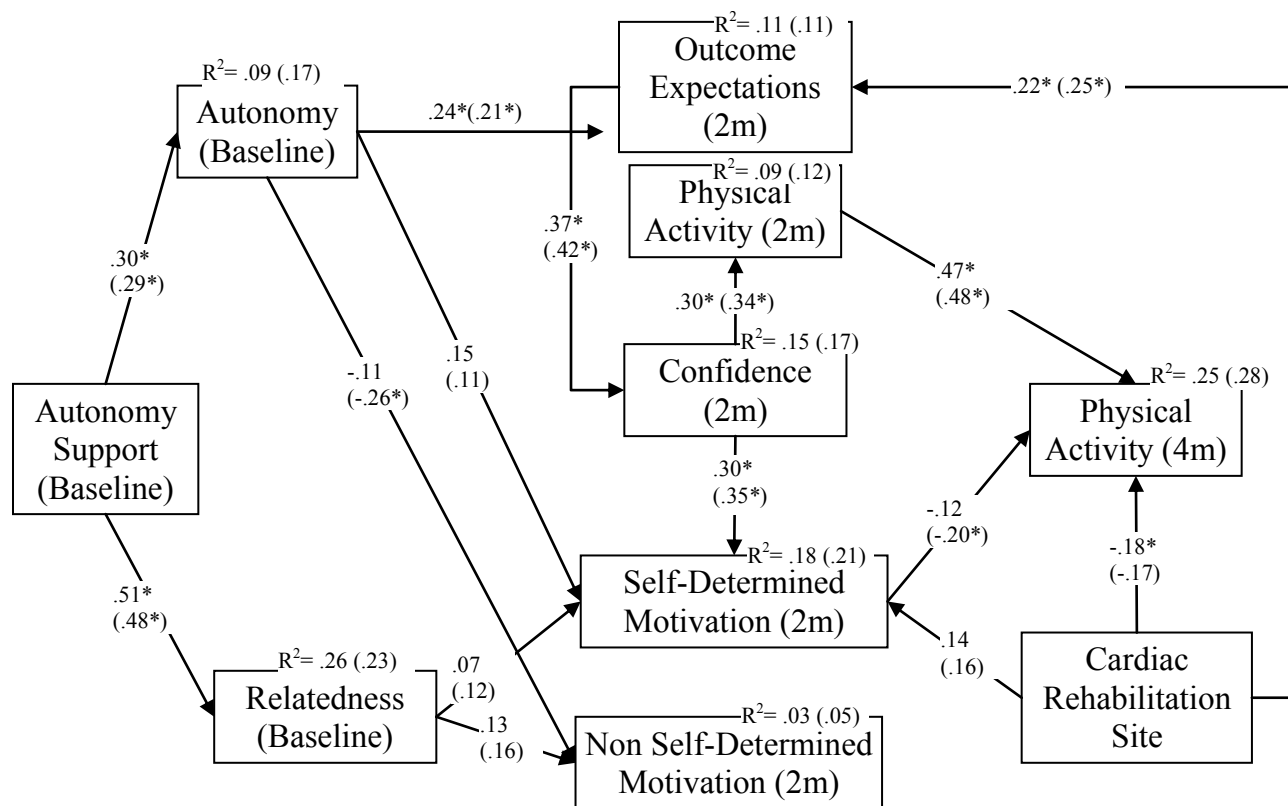
Note. MI = Multiple Imputation, CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardized root mean residual. * $p < .05$

Figure 1. Hypothesized SDT-SET models



Note: +* = positive significant relationship; + = positive non-significant relationship; - = negative non-significant relationship; \longrightarrow = path based on cross-sectional model; $- - - \blacktriangleright$ = theoretical hypothesized path, not found in cross-sectional model

Figure 2. Final SDT-SET integrated model



Note: Numbers in parentheses are derived from the dataset that included missing values.

* $p < .05$

CHAPTER 4
PATTERNS OF MOTIVATION AND ONGOING EXERCISE ACTIVITY
IN CARDIAC REHABILITATION SETTINGS.
A 24-MONTH EXPLORATION FROM THE TEACH STUDY

Running Head: Exercise and motivational patterns

Patterns of motivation and ongoing exercise activity in cardiac rehabilitation settings. A 24-month exploration from the TEACH study

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Abstract

Background Few studies have explored exercise and motivational patterns of cardiac rehabilitation (CR) patients in the long term.

Purpose We explored differential patterns of exercise and motivation in CR patients over a 24-month period and examined the relationship between these emerging patterns.

Methods Patients (n=251) completed an exercise, barrier self-efficacy, outcome expectations and self-determined motivation questionnaire. Latent class growth modeling was used to classify patients in different exercise and motivational patterns.

Results Three exercise patterns emerged: inactive, non-maintainers and maintainers (16%; 67% and 17% of sample per pattern, respectively). Multiple trajectories were found for barrier self-efficacy, outcome expectations, and self-determined motivation (3, 5, and 4, respectively). Patients in high barrier self-efficacy, outcome expectation, and self-determined groups had greater probability of being in the maintainer exercise group.

Conclusions Identifying a patient's exercise and motivational profile could help CR programs tailor their intervention to optimize the potential for continued exercise activity.

Keywords: cardiac rehabilitation, exercise, motivation, self-efficacy, coronary disease

Patterns of motivation and ongoing exercise activity in cardiac rehabilitation settings. A 24-month exploration from the TEACH study

Introduction

Cardiovascular disease is the leading cause of death in developed countries (1). To help reduce future progression of disease or mortality of patients with cardiovascular disease, cardiac rehabilitation programs have been shown to be an effective approach to the reduction of cardiovascular risks (2, 3). Although exercise adoption during cardiac rehabilitation is well documented (4), longer-term participation in exercise post-cardiac rehabilitation has seldom been investigated. Most studies follow cardiac rehabilitation participants for up to 12 months from baseline (5, 6). Exercise behaviour is often examined as an outcome rather than a behavioural process. Further research is needed to understand how exercise behaviour patterns evolve over time as individuals rarely continue to exercise at the same rate or frequency. Identifying distinctive patterns of exercise adoption or extinction can provide further insight regarding factors influencing these patterns of exercise behaviour (7).

Motivational variables have been established as consistent determinants of exercise (8). Variables derived from two motivation theories, Self-Efficacy Theory (9) and Self-Determination Theory (10), have demonstrated this ability to influence exercise. Self-efficacy Theory is a sub-theory of Social Cognitive Theory (9), which explains behaviour through the triad of (i) behaviour (e.g. physical activity), (ii) internal personal factors which include all cognitive (e.g., self-efficacy), affective and biological events, and (iii) environment (e.g. social and physical environment). The relationship between two components of the triad (e.g., the internal personal factor - behaviour relationship) can be studied separately in order to get to a more in depth understanding of that section, hence the reason for Self-Efficacy Theory (9).

According to Self-Efficacy Theory, behaviour is explained by two variables, namely self-efficacy (i.e., confidence in one's ability to participate in exercise despite obstacles) and outcome expectations (i.e., perceptions of outcomes that result from participating in exercise). In a physical activity context, self-efficacy has been demonstrated to be a strong and consistent predictor of behaviour across a variety of populations including older adults (11), adults with diabetes (12), and cardiac patients (13). Although outcome expectations have been investigated sparingly in physical activity research (14), studies have demonstrated a relationship with physical activity maintenance (15).

Self-Determination Theory is a motivation theory based on a humanistic perspective which acknowledges that every human being has an innate tendency towards growth, integration and well-being. As explained in this theory, motivation lies on a continuum from 'extrinsic' to 'intrinsic' (10). If the reasons behind exercising are more internal (i.e., for health benefits and/or the pleasure and satisfaction) one is said to be on the intrinsic end of the continuum and thus self-determined. Non self-determined motivation is characterized by externally focused reasons (i.e., following doctor's advice) and lies on the extrinsic end of the continuum. Self-determined motivation has been shown to be related to exercise in primary-care and other clinical populations (16, 17) and is the principal Self-Determination Theory variable assessed in this study. Understanding how these motivational variables affect exercise behaviour change could help inform the ongoing development and delivery of cardiac rehabilitation programs.

The first objective of this study was to investigate the existence of differing patterns of exercise over a 24-month period among patients enrolled in a cardiac rehabilitation program. Previous research with an adult population has demonstrated that differing patterns of exercise would emerge (18). The second objective was to test the hypothesis that varying patterns of Self-

Determination Theory and Self-Efficacy Theory variables existed, as demonstrated in self-determination and self-efficacy studies from other domains (19, 20). Finally, we investigated how varying motivational patterns might relate to the differing exercise trajectories; we hypothesized that the relationships would support the theoretical assumptions (i.e., higher levels of the motivational variables would be related to higher levels of exercise).

Method

Participants

The current study examined 251 individuals who participated in supervised cardiac rehabilitation programs and enrolled in the Tracking Exercise After Cardiac Hospitalization study (TEACH) (6). These participants were initially hospitalized at one of three tertiary care hospitals: two located in Ottawa, Canada and one in Kingston, Canada. By 12 months, 98% of the sample had participated in a cardiac rehabilitation program. The study population was predominantly Caucasian/White (94%) and male (79%) with a mean age of 61.40 (SD= 9.64) years, and a mean level of education of 13.65 (SD = 3.52) years. Seventy seven percent were married, 52% were retired, 71% had an income greater than CDN\$40 000 per annum and 77.7% were overweight/obese. Acute myocardial infarction (AMI), Percutaneous transluminal coronary angioplasty (PTCA) and coronary artery bypass graft surgery (CABG) were the main reasons for hospitalizations which represented approximately 35.5%, 24.7% and 39.8% of the sample, respectively. Other medical conditions represented in the sample included angina/chest pain (39%), shortness of breath (36.7%), diabetes (18.3%), and arthritis (37.8%).

Procedure

Eligible participants (20 to 85 years of age, hospitalized for myocardial infarction, a percutaneous coronary intervention, or coronary artery bypass grafting, and having no

contraindications to exercise) were recruited in hospital by a study coordinator and answered a questionnaire at hospital discharge (baseline). All participants were subsequently enrolled in a cardiac rehabilitation program. At all subsequent time points, a questionnaire, a return envelope and a letter requesting the return of the completed questionnaire one week from its reception were mailed to every participant. Exercise was assessed at baseline, six, 12 and 24 months. Self-efficacy and outcome expectations were assessed at baseline, two and six months, while self-determined motivation were measured at two, six and 12 months.

Measures

Exercise. The Godin Leisure Time Exercise Questionnaire (21) was used to assess participants' exercise. Participants indicated the number of times per week they participated in strenuous, moderate and mild exercise. Frequency of strenuous and moderate exercise intensity was multiplied by nine and five, respectively, and summed to calculate exercise units. Exercise unit scores for strenuous and moderate intensity of 24 or higher are consistent with exercise recommendation for cardiac patients (see (6)). This self-report measure of exercise has been demonstrated to be reliable and valid (22).

Barrier self-efficacy. Twelve items assessed participants' confidence in their ability to do regular exercise when presented with various obstacles (e.g., feeling depressed, bad weather). Participants answered each item on a seven-point scale ranging from "not at all confident" [1] to "completely confident" [7]. Responses were averaged across items to yield a mean score. This barrier self-efficacy scale has been previously demonstrated as being valid and reliable (23). The internal consistency of measurements obtained in our study was excellent (Table 1).

Outcome expectations. Steinhardt and Dishman's (24) previously validated scale (10 items), and one additional item specific to expectations of cardiac problems was used to assess

outcome expectations. Participants stated the degree to which they agreed with possible outcomes of exercise behaviour (e.g., maintain or lose weight) on a 7-point scale ranging from 1 = “do not agree at all” to 7 = “completely agree”. The average of all items was calculated. Pilot study results showed this measure to be internally valid when administered to cardiac patients ($\alpha = .93$). A similar Cronbach’s alpha score was noted in our investigation (Table 2).

Self-determined motivation. The Physical Activity Regulation Scale was used to assess self-determined motivation. This measure includes the regulation subscales of the Behavioral Regulation Exercise Questionnaire (25) and the addition of the integrated regulation and amotivation subscales. Participants responded to three items representing each regulation (a total of 18 items) on a scale anchored from 1 (do not agree at all) to 7 (completely agree). In line with Self-Determination Theory, self-determined motivation was created by summing the values for the identified, integrated and intrinsic subscales. The psychometric properties of this measure have been confirmed elsewhere (26). For this study, reliability estimates can be seen in Table 1.

Data Analysis

The analysis employed in this study, Latent Class Growth Modeling (7), creates objective and distinct patterns of each of the constructs, enabling a clearer representation of the data. Using such an analytical technique is ideal when the longitudinal variables of interest would not be described adequately when only applying a single set of parameters (i.e., a single mean and slope). Instead, allowing patterns (or trajectories) with their own set of parameters to emerge permits multiple patterns to develop and more accurately describe the data. In this study, an increasing number of developmental trajectories (e.g., exercise patterns) were tested to determine the optimal number of patterns (27). In order to determine this optimal number of patterns, the Bayesian Information Criterion (BIC) of the lower and higher number of patterns (e.g., 3 versus

4 patterns) were compared using the log Bayes factor ($2 \cdot \Delta\text{BIC}$) (28). If the log Bayes factor resulted in a score of 2 or below, the previous model had better fit. Posterior probabilities, which indicate the degree to which participants belong to a specific trajectory, were used to assess model fit. A posterior probability above 70% suggests acceptable homogeneity of the trajectory. All trajectories were set to have a quadratic function (i.e. including time and time² in the equation) in the initial models. Non-significant quadratic trends were reduced to linear trends and non-significant linear slopes were kept in the model as these suggest that the individuals did not change over time. This process was conducted for both exercise and each of the Self-Determination Theory and Self-Efficacy Theory variables in order to determine the appropriate number of patterns.

The dual trajectory analysis capabilities of Latent Class Growth Modeling allowed us to investigate how each motivational variable and exercise varied together over time. In short, this analysis allowed us to reveal the probabilities of belonging to a specific motivational and exercise pattern.

Results

Preliminary analyses

Data were available for 100%, 96%, 94%, 94% and 87% of participants at baseline, two, six, 12 and 24 months, respectively. Missing data were found to be random (i.e., the probability of missing a particular data point was not related to the dependent variable); and thus imputed using an expectation maximization algorithm (29). No univariate or multivariate outliers were found and all variables were normally distributed. Means and standard deviations for all variables across all time points are reported in Table 1.

Main analyses

Exercise patterns. Based on the Bayesian information criterion for determining the number of exercise patterns, three exercise patterns emerged. Posterior probabilities were above the necessary cut-off for each trajectory (87%, 91%, and 87%, respectively). All patterns were found to have a significant quadratic trend (see Table 2). The patterns 1, 2, and 3 were respectively labeled inactive, non-maintainers, and maintainers; they represented 16%; 67% and 17% of the sample (Figure 1). Since a score of 24 on the exercise measure is equivalent, as noted previously, to meeting the physical activity recommendations, pattern-1 is labelled inactive as they are below this score over the course of the 24 months. Pattern-2 is named as the non-maintainer group as the pattern's exercise score surpassed 24 at 12-months but regressed below it at 24 months. Finally, the maintainer pattern represents pattern-3 as exercise levels consistently remained above the 24 score cut-off. Analysis of the intercepts and slopes of each trajectory revealed significant differences between the intercepts of patterns 1 and 2 (chi-square = 12.57, $P < .001$), and patterns 1 and 3 (chi-square = 24.03, $P < .001$), and patterns 2 and 3 (chi-square = 10.89, $P < .001$), indicating that participants in each exercise pattern started with slightly higher levels of exercise. The quadratic trend of pattern 3 is significantly steeper than the quadratic trend of slope 2 (chi-square = 19.31, $P < .001$).

Motivational Patterns.

Barrier self-efficacy. Three barrier self-efficacy patterns emerged: low stable, moderate-starter increasers, and high-starter increasers (see Figure 2). Posterior probabilities also supported each trajectory (89%, 86%, and 91%, respectively). Each pattern represented approximately 12%, 46% and 42% of the sample, respectively. The first pattern remained stable

as no linear relationships were found, a significant quadratic and linear trend was found for patterns two and three (Table 2).

Outcome expectations. Five outcome expectations patterns emerged: moderate stable, moderate starter small decrease, low starter decrease, moderate starter decrease, and high stable (see Figure 3). Posterior probability met the criteria for each of the patterns (87%, 84%, 93%, 83%, and 95%, respectively). Each pattern represented approximately 19%, 45%, 5%, 12%, and 19% of the sample, respectively. Non-significant linear trends were found for moderate stable (pattern-1) and high stable (pattern-5), and significant quadratic trends were found for the remaining patterns (Table 2).

Self-determined motivation. Four self-determined patterns emerged: low stable, moderately self-determined-1, moderately self-determined-2, and highly self-determined (see Figure 4). Posterior probability supported the four trajectories (97%, 90%, 84%, 92%, respectively). Each pattern represented approximately 9%, 18%, 32%, and 41% of the sample, respectively. Slopes for low stable (pattern-1) and moderately self-determined-1 (pattern-2) trajectories were not significant while a small but significant decrease was found for patterns three and four (Table 2).

Probability of belonging to specific motivational and exercise patterns.

Barrier self-efficacy and exercise. Individuals in the low-stable barrier self-efficacy group (pattern 1 of figure 2) have a high probability (97.18%) of belonging to the inactive exercise group (pattern-1 of figure 1) especially compared to those in the high starter increaser barrier self-efficacy group (0.00%, pattern-3 of figure 2; Table 3). In contrast, the high starter increaser barrier self-efficacy group has a probability of 25% to be in the maintainer group (pattern-2 and -3 of figure 1) compared to 3% and 5% for the inactive and non-maintainer

exercise patterns, respectively. Therefore, those who have low levels of barrier self-efficacy at the beginning of a cardiac rehabilitation program are less likely to maintain their exercise levels.

Outcome expectation and exercise. The low starter decreaser and moderate starter decreaser patterns (3 and 4 of figure 3) have no chance (0%) of belonging to a maintainer trajectory (see Table 3). However, the moderate starter small decreasers (pattern-2) and high stable (pattern-5) outcome expectation trajectories have the greatest probability of belonging to the maintainer pattern compared to the other outcome expectation trajectories (Table 3). These results indicated that those who decreased their expectations of the influence of exercise on various outcomes are more likely not to remain active over the two year period.

Self-determined motivation and exercise. Participants in the low stable self-determined motivation (pattern-1 of figure 4) group have a greater probability of following the inactive exercise pattern (75%). However, the probability of those in the highly self-determined group (pattern-4 of figure 4) to be part of the maintainer exerciser group is 29% (see Table 3). In essence, individuals with higher levels of self-determined motivation have a greater probability of being in the higher exercise level patterns.

Discussion

Exercise patterns

We identified the development of three distinct exercise patterns (i.e., inactive, non-maintainers and maintainers) among cardiac patients completing a cardiac rehabilitation program. This is the first study to conduct this type of analysis in a cardiac rehabilitation setting; there are no previous studies with which to compare. These findings, however, are similar to those of Barnett and colleagues (18) who described distinctive exercise patterns in an adult population.

In the current study, increases in exercise from baseline to 12 months were found in both the non-maintainer and maintainer exercise patterns. Disappointingly, only a small percent (17%) of the individuals maintained their exercise levels over the two year period; the majority reverted to baseline levels. Of note, the exercise level of the non-maintainer exercise pattern was above the recommended levels of exercise at six and 12 months, but the decrease in exercise at 24 months reveals the difficulty of maintaining exercise at these recommended levels. Cardiac rehabilitation is effective at increasing exercise in the short-term but does not appear to help participants sustain the initial increases in exercise behaviour. These findings corroborate past research regarding long-term exercise post-cardiac rehabilitation (30). The implications of these findings are discussed below in association with the examination of the motivational patterns and their relationships with the exercise patterns.

Motivational patterns and exercise

Multiple patterns were found for each motivational variable, thus supporting our hypothesis and past research in other domains (19, 20). Although studies in other research areas have demonstrated the emergence of unique motivational trajectories, this is the first study, to our knowledge, that has investigated this phenomenon in an exercise setting. While different patterns emerged in the sample for barrier self-efficacy and self-determined motivation, large fluctuations within each specific pattern were not found (e.g., no pattern demonstrated sharp increases or decreases over time). The decline of some of the outcome expectation trajectories indicates that at the time of clinical interventions, practitioners may need to clearly articulate realistic outcomes in order to avoid the creation of unrealistically high expectations which, predictably will lead to disappointment and as shown in this study decreases in exercise. Based

on their findings, Sears and colleagues (31) have indicated that it is crucial to identify individuals with unrealistic expectations in order to provide them with more accurate information.

In assessing the relationship between the motivational and exercise patterns, it seems that individuals who had higher and stable levels of barrier self-efficacy, outcome expectations and self-determined motivation had a greater probability of increasing and maintaining their exercise levels throughout the 24-month period. In contrast, those with lower levels of barrier self-efficacy, self-determined motivation and decreasing levels of outcome expectations were unlikely to increase and maintain levels of exercise. Although no other studies have examined the relationship between motivational variables and exercise using this type of analysis, previous longitudinal research does support these links. Specifically, more self-determined motivation has been demonstrated to be related to exercise participation in both the short and long-term (32-34). Similar findings have also linked higher levels of Self-Efficacy Theory variables to higher levels of exercise (23, 35, 36). From a theoretical perspective, these findings support the tenets of both Self-Efficacy Theory and Self-Determination Theory by demonstrating their relationship with exercise participation in a population of cardiac patients.

Taken together, these results suggest the importance of assessing these motivational variables at the beginning of a cardiac rehabilitation program and monitoring them for the first few months to ascertain the patient's probable exercise trajectory. If a patient's initially low efficacy beliefs and self-determined motivation are not improving, then it may be appropriate to adopt a more intensive intervention protocol targeting these variables. However, if a patient is showing high levels of self-efficacy and self-determined motivation throughout, then there can be more confidence that exercise behaviours will be maintained; suggesting that less intensive protocol may be needed for this patient. Collecting motivational information throughout the

process could benefit health care practitioners (e.g. exercise specialists, health educators) by identifying those patients who may benefit from additional motivational tools and strategies to ensure sustained exercise levels.

Incorporating intervention strategies throughout the cardiac rehabilitation program such as collaborative problem solving, action and coping planning, self-monitoring and enjoyment-enhancing strategies might be useful in increasing the motivational variables and the likelihood of maintaining exercise over the long-term (37, 38). Previous interventions utilizing such approaches have demonstrated that self-efficacy (39, 40) and self-determined motivation (41, 42) can be positively influenced. As highlighted in this investigation, individuals with higher levels of self-determined motivation and barrier self-efficacy were more likely to maintain exercise. Therefore, these strategies could be applied throughout the cardiac rehabilitation process to help participants feel more prepared to overcome exercise related obstacles (i.e., increase levels of barrier self-efficacy) and internalize the reasons to exercise (i.e., enhance self-determined motivation), subsequently leading to exercise maintenance.

With regards to outcome expectations, our findings suggests that future interventions within cardiac rehabilitation programs should focus on maintaining high, stable levels of outcome expectations as a decline in this variable appears to be related to low exercise levels. As noted earlier, it may be important to ensure that patients have realistic expectations in order to help sustain their outcome expectations and subsequent exercise behaviour. Unrealistic expectations have been found to be related to lower exercise levels particularly when a patient is not satisfied with the exercise related outcomes (14). Specifically, individuals who had high expectations at the onset but perceived low beneficial outcomes of exercise at 12 months were found to have lower exercise scores compared to those that had average expectations and

perceived average benefits. In summary, supplementing current cardiac rehabilitation programs with strategies aimed at increasing barrier self-efficacy, self-determined motivation and stabilizing outcome expectations would be beneficial.

Strengths, limitations and future studies

Theories are currently underutilized in health behaviour research and therefore the use of Self-Determination Theory and Self-Efficacy Theory variables is a strength of this investigation (43). Theoretical approaches should be considered in the design of studies aimed at understanding exercise behaviour. Another principal strength of this investigation is length of the evaluation of exercise behaviour in patients completing a cardiac rehabilitation program. A novel aspect of the study is the nature of the analysis applied to objectively identify differing patterns of exercise and motivation and to determine the probability of an association between these variables. This study is the first to employ this approach to exercise research in cardiac rehabilitation. Future investigators might consider applying these methods to the identification of distinctive patterns of other cardiac-related health behaviours such as smoking, nutrition or even compliance with medication. Behaviour change is always challenging; practitioners would benefit from a greater understanding of the factors likely to be most productive in stimulating and supporting long term behavioural change in a cardiac rehabilitation setting.

There are limitations to our study. Exercise behaviour was assessed by means of a self-report questionnaire; more objective measures (e.g. accelerometers) would allow for a more precise quantification of exercise. There are some limitations regarding the study sample which must be acknowledged; our participants were typically more educated and generally more active than populations encountered in other settings. In addition, the motivational constructs were not assessed over the entire time period (baseline to 24 months), which prevented us from

investigating the variability between the motivation constructs and exercise patterns over the entire 24-month period. Future investigations using objective measures of physical activity, involving a more representative population, and assessing the motivational variables over the entire period of study may help to paint a clearer picture of the behaviour change processes in this clinically important population.

Conclusion

This study examined long term exercise patterns in a population of cardiac rehabilitation patients and permitted the identification of distinctive patterns of exercise and motivation among this population. Although ongoing exercise participation post-cardiac rehabilitation was seen to wane, it would seem important to ensure that the information and strategies provided to patients are designed to foster greater self-efficacy and self-determined motivation while creating more realistic outcome expectations. Applying such strategies throughout any program, while monitoring these levels over time, could help to increase patient satisfaction, facilitate exercise adoption and maintenance among cardiac rehabilitation participants and, ultimately, increase the effectiveness of cardiac rehabilitation programs.

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Table 1. Descriptive information for each variable over time.

Variables	Baseline		2 months		6 months		12 months		24 months	
	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α
Exercise	16.47 (15.94)	-	-	-	28.70 (19.69)	-	31.35 (22.72)	-	21.81 (20.59)	-
Barrier self- efficacy	4.45 (1.25)	.94	5.21 (1.18)	.95	5.25 (1.24)	.96	-	-	-	-
Outcome Expectations	5.51 (1.03)	.89	5.71 (1.01)	.90	5.01 (1.26)	.95	-	-	-	-
Self- Determined Motivation	-	-	17.04 (3.28)	.85	16.98 (3.26)	.86	16.37 (3.40)	.86	-	-

Table 2. Coefficients and significance for patterns of each variable

Patterns	Slope	Coefficients	T test	P value
Exercise Patterns				
1	Linear	1.70	1.89	.06
	Quadratic	-0.08	-2.23	.02
2	Linear	2.47	7.55	< .01
	Quadratic	-0.10	-7.94	< .01
3	Linear	4.83	7.43	< .01
	Quadratic	-0.16	-6.45	< .01
Barrier Self-Efficacy Patterns				
1	Linear	.01	0.17	.87
2	Linear	.62	7.41	< .01
	Quadratic	-.07	-5.57	< .01
3	Linear	.46	5.44	< .01
	Quadratic	-.06	-4.69	< .01
Outcome Expectation Patterns				
1	Linear	.03	0.94	.35
2	Linear	.24	3.48	< .01
	Quadratic	-.05	-4.59	< .01
3	Linear	.27	1.22	.22
	Quadratic	-.09	-2.41	.02
4	Linear	.17	1.13	.26
	Quadratic	-.10	-4.01	< .01
5	Linear	-.02	-0.75	.46
Self-Determined Motivation Patterns				
1	Linear	-.10	-1.91	.06
2	Linear	-.04	-1.01	.31
3	Linear	-.10	-3.28	< .01
4	Linear	-.05	-2.20	.03

Table 3. Dual trajectory probability (%) of exercise group k conditional on motivational variable group j.

	Exercise Patterns		
	1. Inactive	2. Non-Maintainers	3. Maintainers
Barrier Self-Efficacy Patterns			
1. Low stable	97.18	0.00	2.82
2. Moderate starter increasers	39.92	54.95	5.13
3. High starter increasers	0.00	75.23	24.77
Outcome Expectation Patterns			
1. Moderate stable	31.99	60.72	7.29
2. Moderate starter small decreasers	17.29	63.95	18.19
3. Low starter decreasers	64.42	35.58	0.00
4. Moderate starter decreasers	67.09	32.91	0.00
5. High Stable	3.57	74.19	22.24
Self-Determined Motivation Patterns			
1. Low stable	75.52	23.48	0.0
2. Moderately Self-Determined-1	41.55	58.45	0.0
3. Moderately Self-Determined-2	34.31	62.97	2.94
4. Highly Self-Determined	1.94	69.08	28.98

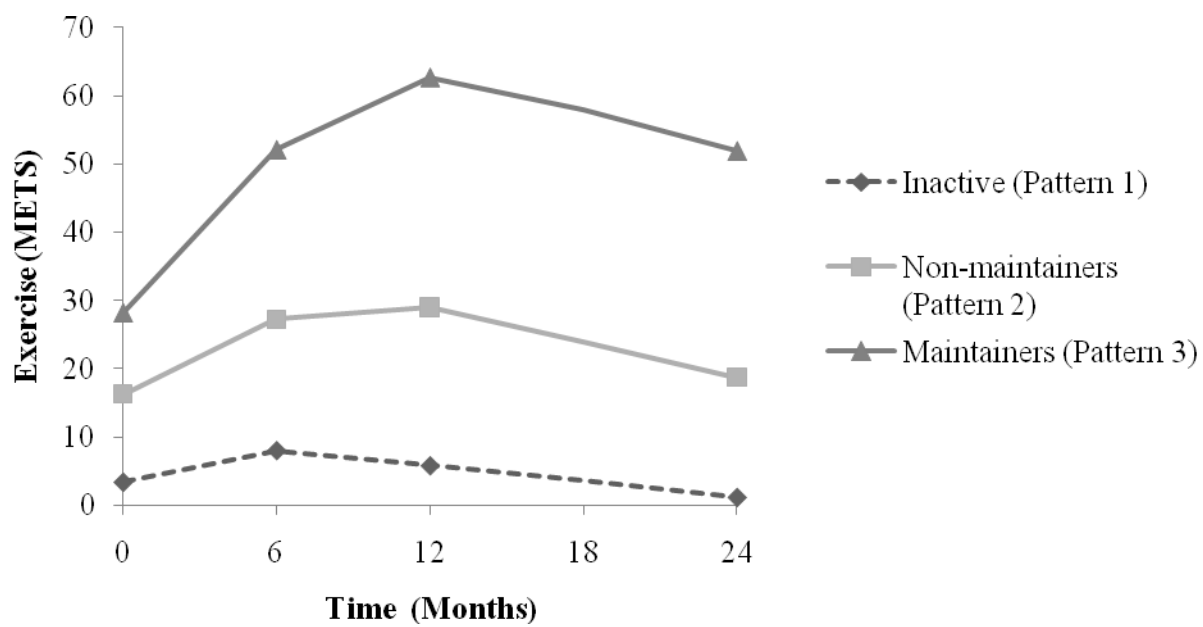
Figure Captions

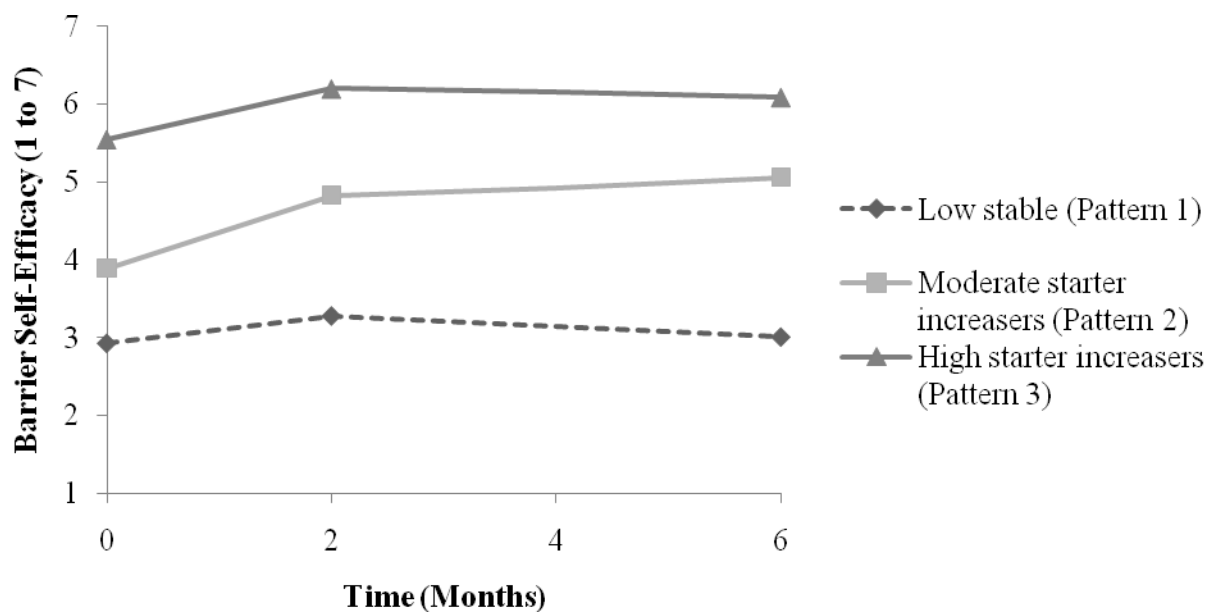
Figure 1. Exercise patterns from baseline to 24 months. Markers (e.g., ■, ▲, ◆) on the lines indicate the time points were assessments were made.

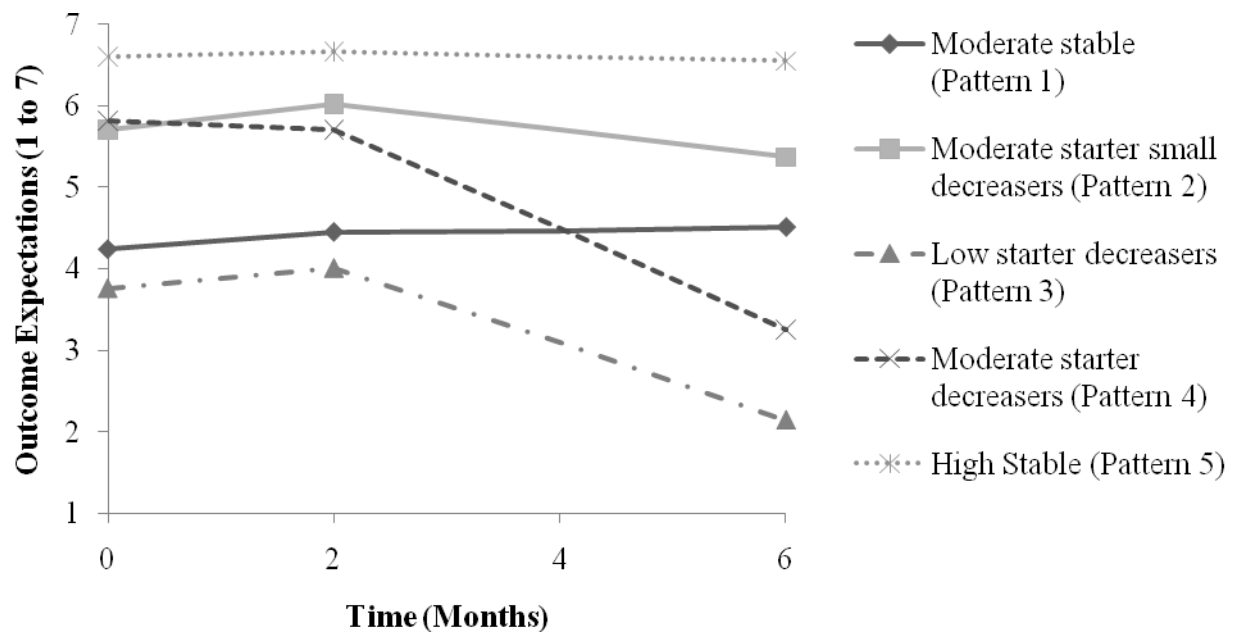
Figure 2. Barrier self-efficacy patterns from baseline to 6 months. Markers (e.g., ■, ▲, ◆) on the lines indicate the time points were assessments were made.

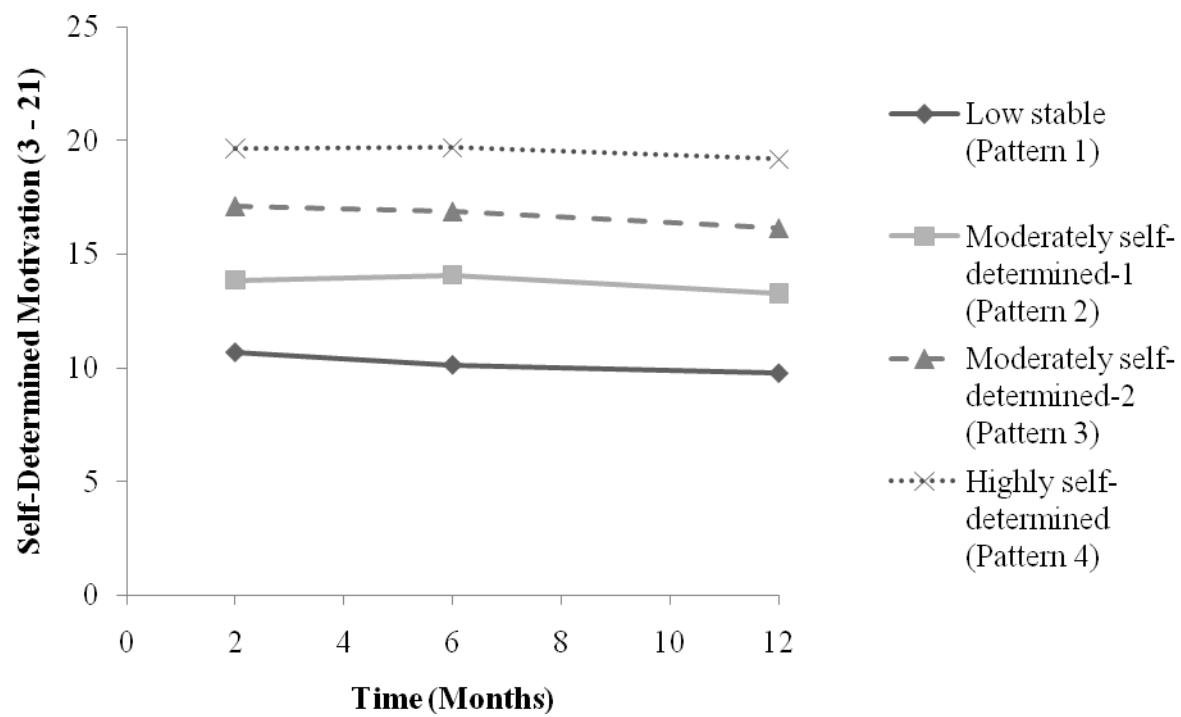
Figure 3. Outcome expectations patterns from baseline to 6 months. Markers (e.g., ■, ▲, ◆) on the lines indicate the time points were assessments were made.

Figure 4. Self-determined motivation patterns from 2 months to 12 months. Markers (e.g., ■, ▲, ◆) on the lines indicate the time points were assessments were made.









CHAPTER 5
GENERAL DISCUSSION

GENERAL DISCUSSION

The overall objective of this dissertation was to gain a greater understanding of motivation and physical activity of individuals partaking in cardiac rehabilitation. This overall objective was divided into two purposes. The first purpose was to test and integrate two strong theories, namely Self-Determination Theory (SDT; Deci & Ryan, 1985; Deci & Ryan, 2002) and Self-Efficacy Theory (SET; Bandura, 1997), into one comprehensive physical activity model. Two articles addressed this purpose where the first was carried out across a cross-sectional sample of cardiac patients and two other samples. The second article utilized longitudinal data of cardiac patients who participated in a cardiac rehabilitation program. The second purpose of this dissertation extended the findings from the first purpose by investigating cardiac patients' physical activity and motivational patterns over a 24-month period. Furthermore, these patterns were examined concurrently to determine the probability of sharing physical activity and motivational patterns. These results were presented in Article-3.

Summary

Addressing purpose-1, Article-1 first tested and integrated SDT and SET with a sample of cardiac patients. As illustrated in the article, the integrated model had excellent model fit. Autonomy support predicted the psychological needs which then influenced the motivational/expectancy variables. In turn, the motivational variables were related to physical activity, albeit not significantly. In addition, more variance was explained in physical activity, self-determined motivation and confidence in the integration models compared to the individual theory-based models. Therefore, these results supported the integration of SDT and SET in a sample of cardiac patients. These findings were also tested with a sample of primary care adults and university students. Good model fit and greater variance explained in the variables were also

found. Despite differences between some paths across the three samples, it was concluded that these three studies lend support to the integration of SDT and SET.

Based on the findings and recommendations of the first article with a cardiac sample, a longitudinal test of the integration model was warranted to investigate the temporal sequence for this population. Thus, Article-2 examined the SDT-SET integrated model from Article-1 with a longitudinal sample of cardiac rehabilitation patients following a 4-month cardiac rehabilitation program. Briefly, the first part of the model supported our hypothesis showing that the social context significantly influenced the psychological needs (baseline) which was then positively related to the motivational/expectancy variables (two months), albeit not significant. However, the 2-month motivational variables of self-determined motivation and confidence (i.e., aggregated measure of competence and task, barrier, and scheduling self-efficacy) did not predict the residual change of physical activity at four months (i.e., end of cardiac rehabilitation). Despite these findings, the integrated model held well when using longitudinal data. The discussion of these results is presented in the theoretical implication section and a more in depth explanations on the role of other physical activity correlates are elaborated in the limitations and future research section. Overall, purpose-1 of this dissertation was partially supported as theory integration was upheld across three samples in Article-1 and longitudinal data in Article-2. To our knowledge these are the only studies that have integrated these two theories with cross-sectional and longitudinal data in the physical activity context. Therefore, more studies need to be conducted before firm conclusions can be made.

Specific to the cardiac population, purpose-1 (Article-1 and -2) was limited to the cardiac rehabilitation program and focused on predicting physical activity at one specific time point (e.g., 4-months). Since physical activity is a dynamic process, it is important to test how this

behaviour can fluctuate over time. In addition, assessing how various factors such as motivational variables interacted with physical activity over time is also necessary (Reniscow & Vaughan, 2006). Therefore, the second purpose sought to investigate physical activity and motivational change across a sample of cardiac patients over 24 months. Specifically, Article-3 aimed to determine if different patterns emerged for these variables as well as what were the probabilities of belonging to specific motivational and physical activity patterns. Results from this article revealed three different physical activity trajectories: inactive, non-maintainers and maintainers. Distinct motivational/expectancy patterns also emerged. In addition, individuals in the higher patterns of self-determined motivation and barrier self-efficacy were more likely to be in the maintainer physical activity group compared to the other motivational patterns. Moreover, those who saw decreases in outcome expectations had higher probability of belonging to the inactive physical activity pattern. Therefore, these results extended findings from purpose 1 as SDT and SET variables were demonstrated to have a relationship with physical activity in a cardiac population. To our knowledge, this type of analysis was the first to be attempted with individuals partaking in a cardiac rehabilitation setting. Overall, this dissertation demonstrated that SDT and SET can be integrated into one comprehensive model (Article-1 and -2) and are related to physical activity adoption (Article-1) and maintenance (Article-3). In the next sections, the strengths of the studies, post-hoc analyses of Article-2, theoretical and practical implications of these findings, study limitations and suggestions for future research are discussed.

Strengths

This dissertation had several strengths. First, the use of theory was important as theoretical frameworks help guide research to further understand the behaviour change process (Improved Clinical Effectiveness through Behavioural Research Group, 2006; Painter, Borba,

Hynes, Mays, & Glanz, 2008). Despite the advantages of theories, they are currently underutilized in health behaviour research (Painter et al., 2008). Therefore, this dissertation addressed this gap as it used two strong theoretical frameworks, namely SDT and SET. Second, the use of more than one theory was a strong point of this dissertation as Michie and colleagues (Michie et al., 2005) claim that one theory often is not encompassing enough to capture a number of the elements related to behaviour change. Therefore, choosing two theories allowed us to investigate multiple domains of behaviour change. In fact, Michie and colleagues identified 12 overarching domains for health behaviour change and suggested that more than one domain should be tested in order to have a broader view of the change process. These domains combine similar theoretical variables into specific categories. Within this dissertation, concepts from both motivational theories covered five of the 12 domains highlighted by Michie et al. Specifically, self-efficacy and competence were set under the “Beliefs about capabilities” domain; outcome expectations under “Beliefs about consequences”; past behaviour under “Nature of the behaviours”; self-determined motivation under “Motivations and Goals”; and autonomy support under “Social influences”. Therefore, this demonstrates the advantages of using more than one theory.

Third, theory integration was one of the main strengths of this dissertation. Previous research has combined specific constructs from SDT and SET (McNeill, Wyrwich, Brownson, Clark, & Kreuter, 2006; Mildestvedt, Meland, & Eide, 2008; Slovenic D'Angelo, 2004; Sweet et al., 2009) and demonstrated that variables from these theories work well together in a physical activity context. For instance, Sweet and colleagues (2009) showed that self-determined motivation mediated the barrier self-efficacy – physical activity relationship in adults with type 2 diabetes. In a study with cardiac patients, Mildestvedt and colleagues (2008) revealed that both

self-efficacy and self-determined motivation were related to physical activity. However, Noar & Zimmerman (2005) stressed that simply combining specific constructs from different theories is not the most rigorous approach to theory integration. As such, complete theories should be tested separately and then integrated based on those findings. In response to this claim, article-1 was the first study, to our knowledge, that tested entire theories (i.e., SDT and SET) which then informed the hypothesized integrated models. Likewise, Article-2 was the first study to test an integrated model with longitudinal data. In this dissertation, integrating theories to understand physical activity helped to reduce the mini-literatures and capitalized on the strengths of both theories. This procedure allowed us to enhance our understanding of the processes and mechanisms that predict motivation and, in turn, physical activity.

Specific to theory integration, this dissertation responded to a number of Noar & Zimmerman's (2005) recommendations for proper theory integration. Notably, article-1 and -2 tested a path analysis with a structural equation modeling software, allowing tests of model fit. In addition, Article-1 conducted this integration across three different samples, and two of these samples were not from a convenience sample of university students. Finally, article-2 assessed the integrated model with longitudinal data. Therefore, this dissertation followed suggestions made by Noar and Zimmerman for proper theory integration.

Fourth, two of the three articles in this dissertation employed longitudinal data. Longitudinal investigations have been called for in physical activity (Marcus et al., 2000), and in cardiac research as most of the previous studies have employed cross-sectional designs (Petter, Blanchard, Kemp, Mazoff, & Ferrier, 2009). Using longitudinal data in this dissertation (Articles-2 and -3) added to the cross-sectional integration models (Article-1) as time-lagged data hints at the causal sequencing between constructs, at least more so than cross-sectional

models. Article-2 looked at the integrated model over the span of a 4-month cardiac rehabilitation program to examine the effect of SDT and SET on physical activity at the end of the program.

Article-3 investigated cardiac individuals' physical activity and motivational changes over a 24-month period. While a growing number of studies examine physical activity maintenance, the extant research is limited in that few studies have investigated maintenance post cardiac rehabilitation (Woodgate & Brawley, 2008). Therefore, this article extended Article-2 by 20 months and included the post-cardiac rehabilitation phase. Looking at this phase is important as individuals partaking in cardiac rehabilitation are usually successful at increasing their physical activity behaviour during the cardiac rehabilitation program (Wofford, Grenlund, Croft, & Labarthe, 2007), but fail to maintain post-cardiac rehabilitation (Leung, Ceccato, Steward, & Grace, 2007; Reid et al., 2006). Therefore, this dissertation contributed to the research investigating the longitudinal relationships between physical activity and the motivational variables and examined the post-cardiac rehabilitation phase.

Fifth, in addition to the strong analyses used in Article-1 and Article-2 (i.e., path analysis), the statistical analysis employed in Article-3 was innovative. The use of this analysis also responded to a recent call to use advanced statistical analyses to investigate behaviour change (Baranowski, 2006). Rather than testing longitudinal data with regression-based analyses and focusing on explaining behaviour at one specific time point (e.g. 4-month physical activity), Article-3 was able to look at the entire behaviour change process. The use of within-person analyses facilitates the investigation of longitudinal data and behaviour change. However, within-person analyses that are mean-based do not allow different clusters of individuals to emerge from the data (Nagin, 2005). By using latent class growth modeling (Nagin, 1999; Nagin,

2005), Article-3 demonstrated that different developmental trajectories emerged for physical activity and the motivational variables. This analysis allowed for a look at the dynamic process of behaviour change. In addition, the dual trajectory capabilities of Latent Class Growth Model were utilized in order to investigate the probability of individuals belonging to a motivational and physical activity pattern. This was the first study, to our knowledge, that used this type of analysis in the cardiac rehabilitation domain, thus a strong contribution to the literature.

Sixth, this dissertation also added to the individual theories. For SDT, only a limited number of studies using SDT have been conducted with cardiac patients (Mildestvedt et al., 2008; Russell & Bray, 2009; Russell & Bray, 2010; Slovenic D'Angelo, 2004). Therefore, the current dissertation added to the generalizability of this theory. In addition, research has mostly concentrated on sections of SDT (i.e. motivational regulations), but a few recent studies have tested the autonomy support → psychological needs → motivational regulations → physical activity relationship (Edmunds, Ntoumanis, & Duda, 2006; Silva et al., 2010). This dissertation therefore added to the literature by testing the SDT sequence. Using a validated measure of Psychological Needs in Exercise (Wilson, Rogers, Rodgers, & Wild, 2006) and the newly designed integrated items for the Behavioural Regulation Exercise Questionnaire (Wilson, Rodgers, Loitz, & Scime, 2006) aided in the full test of SDT.

With respect to self-efficacy, few studies have incorporated more than one or two types of self-efficacies (Woodgate, Brawley, & Weston, 2005). Incorporating three types of self-efficacy in Article-1 and -2 addressed this gap. In addition, this dissertation addressed the mixed findings on the sequence between outcome expectations, self-efficacy and physical activity as pointed out by Williams and colleagues (D. M. Williams, Anderson, & Winett, 2005).

Finally, this dissertation is in line with Orleans' (2000) call for research on health behaviour change in special populations, since cardiac patients partaking in cardiac rehabilitation were the main population of interest. In addition, a predominantly Francophone population was studied in Article-1 (Study 1 and 3) and Article-2. This population is especially important to target, within Canada, as Francophones have a higher rate of cardiovascular disease than Anglophones as well as lower levels of healthy habits, such as lower rates of physical activity (Programme de recherche, éducation et développement en santé publique et l'Institut franco-ontarien, 2005). Therefore, this dissertation addressed this current gap in the literature by investigating these specific understudied and at risk populations.

Post-hoc analyses of Article-2

Due to the unexpected results regarding the relationship between the motivational variables of self-determined motivation and confidence and physical activity, post-hoc analyses, not presented in Article-2, were conducted and are reported here. Specifically, the integration model was retested with different physical activity related outcomes. First, moderate-vigorous physical activity (i.e., composed of the moderate and vigorous items from the Godin Leisure Time Exercise Questionnaire) was used since this type of physical activity is recommended for cardiac patients (Reid et al., 2006). The results of the integrated model did not differ to the ones presented in Article-2, as self-determined motivation and confidence remained unrelated to moderate-vigorous physical activity at 4-months. Second, the model was analyzed with cardiac rehabilitation exercise attendance, as this outcome is often assessed in the cardiac rehabilitation context (Bray & Cowan, 2004; Hays, Pressler, Damush, Rawl, & Clark, 2010). Similarly, the motivational variables did not predict this outcome. In sum, motivational variables were not found to predict these other physical activity related outcomes. Therefore, additional post-hoc

analyses were conducted by separating the aggregated measures of self-determined motivation and self-efficacy.

Since the self-determined motivation was an aggregated measure, correlations were conducted to determine if specific 2-month motivational regulations from SDT (i.e., external, introjected, identified, integrated and intrinsic) had a relationship with physical activity at four months. The rationale for this post-hoc analysis was that past research has called for further investigation to untangle the different nuances in the regulations and that specific regulations were demonstrated as significant predictors of physical activity (Brickell & Chatzisarantis, 2007; Edmunds et al., 2006; Wilson, Mack, & Grattan, 2008). However, none of the regulations at 2-months were significantly correlated with physical activity at 4-months in Article-2. Therefore, these post-hoc analyses did not reveal new insights.

Finally, post-hoc analyses were conducted for self-efficacy. Since experts in the health behaviour domain are suggesting that different correlates are important at different times of the behaviour change process (Marlatt, Baer, & Quigley, 1995; Rothman, Baldwin, & Hertel, 2004), meaning that they are phase-specific. This phase specific hypothesis has been elaborated in the self-efficacy literature (Scholz, Sniehotta, & Schwarzer, 2005; Schwarzer et al., 2007). Therefore, we separated the different types of self-efficacies to test this phase specific hypothesis. Specifically, task self-efficacy is viewed as playing an important role in physical activity intentions and adoption, while self-regulatory self-efficacies (e.g., barrier and scheduling) are seen as better predictors of sustained physical activity levels (Rodgers & Sullivan, 2001; Rodgers, Hall, Blanchard, McAuley, & Munroe, 2002). Accordingly, correlations were conducted between the different types of self-efficacies at two months and physical activity at four months. Only 2-month task self-efficacy was correlated with physical

activity at four months ($r = .214, p = .031$). Therefore, task self-efficacy may play a larger role compared to the other types of self-efficacies in physical activity adoption.

Theoretical implications

From a theoretical standpoint, this dissertation tested the tenets of SDT and SET in a physical activity context. As described in the general introduction, SDT is composed of two mini-theories that explain the entire process towards behaviour change, namely Cognitive Evaluation Theory and Organismic Integration Theory (Deci & Ryan, 2002). In Cognitive Evaluation Theory, autonomy support is said to predict the psychological needs of autonomy, competence and relatedness which are then positively related to self-determined motivation (Deci & Ryan, 2002). As demonstrated in Article-1 and Article-2, the link between autonomy support and the needs of autonomy and relatedness were confirmed across all studies and with competence in the primary care and cardiac SDT models of Article 1. These findings support past research (Edmunds, Ntoumanis, & Duda, 2008; Silva et al., 2010) and the first section of Cognitive Evaluation Theory. The next step in the process was the influence of the psychological needs onto motivation. Relatedness and self-determined motivation had a positive and significant relationship across all three SDT models in Article-1, but this relationship was not meaningful in Article-2. Although no association was found between the need for autonomy and self-determined motivation for the cardiac sample in Article-1, a significant positive relationship was found in the student sample, and positive, non significant, link in the primary care model and in Article-2. Collectively, these results support Cognitive Evaluation Theory as well as past research (Barbeau, Sweet, & Fortier, 2009; Markland & Tobin, 2010; Wilson, Rodgers, Blanchard, & Gessell, 2003) as these psychological needs were generally associated with self-determined motivation.

The most consistent relationship was that of competence/confidence and self-determined motivation. In all models of article-1 and -2 the concept of competence in SDT models and confidence in the integrated models were significantly and positively related to self-determined motivation, showing that when individuals feel competent they are more self-determined towards physical activity. This consistent link between competence and self-determined motivation mimics results from past research (Brunet & Sabiston, 2009; Edmunds et al., 2006; Wilson & Rodgers, 2008). Interestingly, competence/confidence predicted self-determined motivation in all of Article-1 and Article-2, except for the student sample in Article-1 where self-determined motivation was found to predict competence. This finding is noteworthy as competence is theorized to predict motivation in Cognitive Evaluation Theory (Deci & Ryan, 2002), but a SDT process model has found that competence can be predicted by self-determined motivation (Fortier, Sweet, O'Sullivan, & Williams, 2007; G. C. Williams et al., 2006). Findings from this dissertation lean towards supporting the theoretical predictions of Cognitive Evaluation Theory (i.e., competence predicts motivation) given that three of four sets of results supported that sequence.

The second mini-theory, Organismic Integration Theory, hypothesizes that more self-determined motivation leads to more positive consequences, in this case, greater physical activity levels (Deci & Ryan, 2002). In all three SDT models of Article-1, self-determined motivation was a consistent, positive and significant predictor of physical activity, as hypothesized by Organismic Integration Theory. This relationship also corroborated past research (Barbeau et al., 2009; Duncan, Hall, Wilson, & Jenny, 2010; Ingledeew, Markland, & Ferguson, 2009). However, the self-determined motivation – physical activity link lost its significance in the integrated model of the cross-sectional sample of cardiac patients. Similarly, self-determined motivation at

two months did not significantly predict physical activity at four months in Article 2. These latter findings were surprising as they were contrary to Organismic Integration Theory and past research (Barbeau et al., 2009; McDonough & Crocker, 2007; Russell & Bray, 2009; Russell & Bray, 2010). As mentioned earlier, post-hoc correlations on the motivational regulations and physical activity were conducted to determine if specific regulations had an influence, but revealed no significant relationship between these variables.

One explanation might be that self-determined motivation has been hypothesized as playing a larger role in the physical activity maintenance phase (Rothman et al., 2004). Article-3 of this dissertation revealed that individuals in higher patterns of self-determined motivation were more likely to belong to the maintainer physical activity trajectory. Indeed, these results are in line with recent studies that demonstrated that self-determined motivation predicted physical activity maintenance in adults with type-2 diabetes (Sweet et al., 2009) and, of interest, cardiac patients (Mildestvedt et al., 2008). Stage of change and SDT research has also shown that individuals in the higher stages of change for physical activity (i.e., action and maintenance) had higher levels of self-determined motivation (Buckworth, Lee, Regan, Schneider, & DiClemente, 2007; Daley & Duda, 2006; Fortier et al., 2010; Landry & Solmon, 2004). Therefore, the results from Article-3 supported this maintenance phase hypothesis as well as Organismic Integration Theory. Overall, self-determined motivation may play a larger role in the later phases of the physical activity behaviour change process.

With regards to SET, the relationship between self-efficacy and outcome expectation is not clear in the literature (D. M. Williams, 2010). While SET suggests that outcome expectations acts as a partial mediator between self-efficacy and physical activity (Bandura, 1997), Williams and colleagues (D. M. Williams et al., 2005) have found mixed support for the outcome

expectations – physical activity relationship. These authors suggested that, in the physical activity domain, outcome expectations may play a larger role in predicting self-efficacy rather than physical activity. As a result, this dissertation investigated both hypotheses across three samples in Article-1. Across all three samples, outcome expectations were found to be a better predictor of self-efficacy than physical activity. In addition, outcome expectations were not found to be a predictor of 4-month physical activity in Article-2, but a predictor of confidence at two months. Across these studies, outcome expectations appear to be a better predictor of self-efficacy than physical activity in this context, as hypothesized Williams and colleagues (2005). Therefore, as outlined by Williams (2010), Self-Efficacy Theory may need to adapt the operational definition of its constructs to allow for the sequence between outcome expectations and self-efficacy to reflect empirical findings.

Looking at the relationship between self-efficacy and physical activity, a positive link was found across all three articles. This finding is consistent with previous reviews (Pan et al., 2009; Petter et al., 2009; Trost, Owen, Bauman, Sallis, & Brown, 2002), and research (Blanchard et al., 2007; Blanchard, Reid et al., 2007; Woodgate & Brawley, 2008). In addition, these results are in line with SET that outlines self-efficacy as a main predictor of behaviour. However, in Article-2, confidence was not a predictor of physical activity at four months, but related to physical activity at two months. One explanation for this non-significant longitudinal relationship could lie in the phase specific hypothesis explained earlier. As previously highlighted, only 2-month task self-efficacy was correlated to physical activity at 4 months. Moreover, higher levels of barrier self-efficacy were found to be important for physical activity maintenance in Article-3. Therefore, the phase specific hypothesis appears to hold true.

Although outcome expectations were not found to predict physical activity in the short-term (Article-1 and -2), this construct has been found to play a role in physical activity maintenance in past research (Tulloch et al., 2008; D. M. Williams et al., 2008). Similarly in Article-3, individuals who had higher levels of outcome expectations had a larger probability to be in a higher physical activity pattern. In addition, those who decreased their outcome expectations were more likely to remain inactive over 24 months. Although outcome expectations do not appear to have a strong relationship with self-efficacy in the short term, its role may be more prominent in physical activity maintenance. Future research should investigate this in order to clarify the implications for SET.

Prior physical activity has also been outlined, in SET, as a key predictor of future physical activity but has often been omitted from various studies (Weinstein, 2007). Results from Article-2 support this hypothesis as 2-month physical activity was found to predict 4-month physical activity, thus supporting SET. Therefore, past behaviour continues to be a consistent predictor of future behaviour and should continue to be investigated as outlined in SET.

In line with theoretical integration, redundancy between similar constructs was accounted for. Specifically, the three types of self-efficacy and competence were combined into one variable as indicated by a factors analysis. This combination is also in line with Michie and colleagues' (2005) health behaviour change domains as these variables are combined in one domain. This result demonstrated one of the strengths of theory integration.

When observing the integration models, variables from SDT and SET were interrelated. These relationships demonstrated connections between these two theories that would not have been discovered without proper theory integration. Specifically, the psychological needs of autonomy and relatedness were positively related to outcome expectations in Article-1 and -2.

SDT would support this finding as satisfaction of the psychological needs is theorized to be a precursor for motivation as well as other outcomes such as well-being (see Basic Needs Theory within SDT; Deci & Ryan, 2002). As such, it makes theoretical sense that if one's psychological needs are satisfied, then he/she would also have greater positive expectations of the outcomes related to physical activity. Overall, these findings imply that these two theories can work together and help to establish new relationships that could further inform the respective theories as well as interventions. Finally, this theoretical integration was also valid on a meta-theoretical level as both theories are based on the concept of agency and further supported empirically by following Noar and Zimmerman's (2005) recommendations.

Limitations and future research

Study limitations merit discussion. One limitation of this dissertation was that the specific motivational regulations of SDT were not investigated. A recent trend of studies has shown that some regulations are better at predicting physical activity than others (Wilson et al., 2003; Wilson & Rodgers, 2004). Unfortunately, the current dissertation did not have a sufficiently large sample size to incorporate these regulations when testing the individual theory and theory integration models. Therefore, future research needs to test the individual motivational regulations in order to fully understand their impact on physical activity adoption and maintenance.

Similarly, the three types of self-efficacies were not teased apart in Article -1 and Article-2. As presented earlier, correlations were conducted with the specific types of self-efficacies in Article-2 and revealed that task self-efficacy was correlated with physical activity at four months. In addition, Article-3 showed the importance of barrier self-efficacy in physical activity maintenance. Therefore, other studies with larger sample sizes need to be conducted in order to

determine if the different types of self-efficacies do in fact differ from each other and if the phase specific hypothesis holds true. Identifying which types of self-efficacies to intervene on and at what time of the behaviour change process would be important from a practical application standpoint.

As described in Article 1, two integrated models were hypothesized and tested. However, additional models could be evaluated, especially when considering potential interactions between variables. Therefore, future studies could test other mediating and moderating models to help gain a better understanding of how these variables interact when predicting physical activity. In addition, the results of the models presented in Article-1 and -2 focused on the theorized direct relationships. Future research testing indirect relationships and establishing mediating effects could reveal interesting results and suggestions for future interventions.

As highlighted earlier, the motivational variables of confidence and self-determined motivation did not have the largest impact on physical activity in the integrated cardiac models of Article-1 and in Article-2. Therefore, other variables could be included in this model in order to increase the prediction of physical activity. As such, experts are urging that studies look at the influence of outcome value and satisfaction in addition to outcome expectations (Rothman, 2000; D. M. Williams et al., 2005). Outcome value refers to the importance one attributes to the expected outcome. It is hypothesized that those who value the outcome will have greater improvement in physical activity levels than those who don't value the expected outcome. Past research demonstrated strong support for its relationship with physical activity (Rodgers & Brawley, 1996). In addition, Williams et al., (2005) suggested in their review that outcome value could in fact moderate the relationship between outcome expectations and physical activity. Therefore, future studies need to investigate this potential relationship.

With regards to outcome satisfaction, it is defined by how one is satisfied with the impact of physical activity has on a variety of physical activity related consequences. Rothman (2000) hypothesized that those who maintain a health behaviour will have higher level of satisfaction with the outcomes of the behaviour than those who do not maintain that behaviour. Wilcox et al. (Wilcox, Castro, & King, 2006) sought out to discover if combining participants' outcome expectation at baseline and their perceived satisfaction with the outcomes at 6 months would predict physical activity at 12 months. On the one hand, individuals who had high expectations and perceived low beneficial outcomes of physical activity had lower physical activity scores. On the other hand, individuals who had low expectations and perceived high benefits, and individuals who had average expectations and perceived average benefits, were found to have the highest levels of physical activity. In another study, outcome satisfaction was found to be a better predictor of physical activity maintenance than adoption (D. M. Williams et al., 2008). Since a limited number of studies have investigated these variables concurrently, further research is warranted to test the interplay between outcome expectations, value and satisfaction on physical activity adoption and maintenance.

As presented in Article-2, intention and planning should be considered as potential mediators between the motivational variables and physical activity. Indeed, intention and planning have been found to mediate (and partially mediate) the relationship between self-efficacy and self-determined motivation and physical activity in past research (D'Angelo, Reid, & Pelletier, 2007; Fortier, Kowal, Lemyre, & Orpana, 2009). In a recent review of physical activity interventions, self-regulation variables, such as planning, were found to have the most support in the intervention-physical activity link (Rhodes & Pfaeffli, 2010). Since these variables

are integral to the Health Action Process Approach (HAPA; Schwarzer, 2008) model, it would appear to be valuable to investigate this model along with SET and SDT.

The HAPA model explains behaviour change through two main phases. The first phase, the motivational phase, illustrates how action self-efficacy (i.e., similar to task self-efficacy), outcome expectation, and risk perception lead to intention. Once this intention is formed, it is then important to put it into action. Therefore, the volitional phase explains how intentions translate to behaviour. People need to specify their intentions (when, where and how - action planning) and anticipate barriers and describe how to overcome them (coping planning). In addition, maintenance self-efficacy (i.e., similar to barrier self-efficacy) also plays a crucial role in predicting planning as well as behaviour. The HAPA model has been supported in non cardiac individuals (Schwarzer et al., 2007) and in a cardiac rehabilitation setting (Sniehotta, Scholz, & Schwarzer, 2006; Sniehotta, Scholz, & Schwarzer, 2005). In addition, Schwarzer and colleagues (Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008) supported the HAPA model as action and recovery (i.e., confidence to get back on track) self-efficacy, outcome expectations, intentions, and planning held well in one overall model. Since self-efficacy and outcome expectations are already integrated within the current dissertation, it could be valuable to add intention and planning variables to determine if more variance is accounted for in cardiac patients' physical activity behaviour. Furthermore, it would be interesting to determine where SDT variables would fit in this model. One hypothesis is that self-determined motivation would interact with planning to predict physical activity as demonstrated in the implementation intention literature (Chatzisarantis, Hagger, & Thøgersen-Ntoumani, 2008). However, future research needs to further test this hypothesis as well as where the other SDT variables would play into the HAPA model.

In addition, it may be essential to investigate other psychological variables. Due to the complexity of cardiac related illness, cardiac individuals may have many other intrapersonal factors that influence their physical activity levels. Mental health factors such as depression and anxiety have been demonstrated to be linked with physical activity in individuals partaking in cardiac rehabilitation (Hunt-Shanks, Blanchard, & Reid, 2009; Petter et al., 2009). In addition, gender, socio-economic status and cardiac condition have also been found to be related to physical activity levels in cardiac populations (Leung et al., 2007, Reid et al, 2006). Therefore, these variables should be examined or at least controlled for as they may have a central role in physical activity for cardiac patients.

Although there is large support for the influence of individual level variables such as motivation on physical activity in the general (Pan et al., 2009) and cardiac populations (Petter et al., 2009), these two reviews also stress the need to move beyond the individual. Therefore, one limitation of this dissertation was its focus on intrapersonal motivational variables. In their review of socio-ecological models of physical activity for cardiac individuals, Petter and colleagues (2009) revealed that social support and cardiac rehabilitation accessibility and proximity were associated with greater attendance. As highlighted by the authors, research that utilizes a socio-ecological approach is needed as few studies have explored more than one level of the socio-ecological model and therefore “exploring interactions [between the levels of the socio-ecological model] is extremely important and timely” (p.523). Future research using an ecological model to assess physical activity is needed in order to demonstrate how these variables interact with SDT and SET variables.

Another limitation pertains to sample size. The sample size was small for the cardiac and primary care samples of Article-1 and Article-2. Larger sample sizes could have allowed us the

use of more advanced statistical analyses, such as structural equation modeling. Although a strength of this study was the use of a francophone population, it also limited the generalizability of our results. Finally, physical activity was assessed via a self-report questionnaire across all articles. Therefore, using more objective measures of physical activity could provide interesting results. Physical activity was also limited to leisure time physical activity. Future studies looking at other facets of physical activity (i.e., occupational, transportation, housework/house maintenance) could reveal different results.

Practical applications

The results of this dissertation highlighted numerous practical applications for future interventions and cardiac rehabilitation programs. Since lack of motivation has been documented as a primary barrier for physical activity (Canadian Fitness and Lifestyle Research Institute, 2007; Casey, De Civita, & Dasgupta, 2010; Cerin, Leslie, Sugiyama, & Owen, 2010), it is important to understand the factors that can generate motivation, in this case self-determined motivation and confidence. As illustrated earlier, autonomy support was central in predicting the psychological needs of relatedness and autonomy which were then found to be positively related to self-determined motivation and outcome expectations. In turn, outcome expectations predicted confidence, which was a strong and consistent predictor of self-determined motivation. Based on these findings, interventionists should act in an autonomy supportive fashion, by providing choices, giving constructive positive feedback and respecting participants' feelings and opinions, in order to satisfy patients' psychological needs and to facilitate the internalization of their motivation towards physical activity. In addition, interventionists should help individuals develop more realistic and positive expectations of the outcomes of physical activity as these translate to increases in confidence and subsequent elevations of self-determined motivation.

Therefore, results from this dissertation have outlined a theoretically valid pathway to which interventions could follow to increase levels of confidence and self-determined motivation.

In addition to acting in an autonomy supportive way and creating realistic outcome expectations, other evidence-based interventions strategies such as collaborative problem solving, action and coping planning, self-monitoring, and enjoyment enhancing strategies could be integrated to further help translate the increased motivation to sustained physical activity (Elley, Kerse, Arroll, & Robinson, 2003; Fortier et al., 2007; Kahn et al., 2002). In fact, past interventions utilizing such interventions strategies have demonstrated that self-efficacy (Blanchard et al., 2007; Lewis et al., 2006; Woodgate & Brawley, 2008) and self-determined motivation (Fortier et al., 2007; Silva, Vieira et al., 2010) can be influenced and subsequently lead to greater physical activity levels. In addition, a recent cardiac intervention review demonstrated that self-monitoring and action and coping planning are effective techniques at changing physical activity in cardiac patients (Ferrier, Blanchard, Vallis, & Giacomantonio, in press). As a result, these strategies should be implemented to cardiac rehabilitation programs in order to increase the levels of these motivational variables and subsequently influence physical activity behaviour.

Such strategies would be effective to utilize throughout a cardiac rehabilitation program but could also be implemented later in the process, such as during “booster sessions”. Given that cardiac rehabilitation was not found to be effective at increasing and maintaining physical activity in the long-term (i.e., Article-3), having “booster sessions” one year from enrolment could help maintain physical activity levels. Recent studies have demonstrated that individuals who receive additional scheduled sessions are more likely to continue to participate in physical activity after completing an intensive cardiac rehabilitation program (Arrigo, Brunner-LaRocca,

Leftovits, Pfisterer, & Hoffman, 2008; Squires, Montero-Gomez, Allison, & Thomas, 2008). Berent and colleagues (Berent, von Duvillard, Auer, Sinzinger, & Schmid, in press) have recommended that additional post-cardiac rehabilitation visits should be scheduled with the physician or rehabilitation team to assist the patient to maintain physical activity. In addition, a recent meta-analysis revealed that interventions with more face to face contact were more successful at sustaining physical activity levels (Conn, Hafdahl, Moore, Nielsen, & Brown, 2009). Therefore, cardiac rehabilitation programs might consider incorporating such “booster sessions” and intervention components to increase their effectiveness in stimulating long-term physical activity.

Conclusion

Theoretical testing, comparison and integration have become a key issue in research but few studies have followed the proper steps (Noar & Zimmerman, 2005). A first purpose of this dissertation was to follow these steps in order to gain a greater understanding of the processes leading to increased motivation and physical activity. Taking the results from the two first studies, theory integration was determined to be feasible as both theories held well in one comprehensive model. Therefore, future studies need to retest this integration in the cardiac context, but also attempt to replicate in other settings. A second purpose of this dissertation was to follow cardiac patients over time which was accomplished in the last article. This article identified different physical activity and motivational patterns. In addition, higher levels of each the motivational/expectancy variables were related to higher levels of physical activity. Therefore, future research should be integrating multiple theories as well as following the participants over the long-term (i.e., 24 months and greater) to ascertain the mechanisms at play for physical activity adoption and maintenance. Subsequently, interventionists should act in an

autonomy supportive fashion and adopt motivational and self-regulatory strategies to foster increased motivation in cardiac patients in order to help them sustain long-term physical activity behaviour change.

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**APPENDICES -
MEASURES**

Article 1 and 2: Cardiac patient measures

Patient Demographics

Last Name : _____ First Name : _____ DOB : ____/____/____
 Day/Month/Year

Address : _____ female male

City : _____ Postal Code: _____ e-mail : _____

Tel. (Home) : (____) _____ (Work) : (____) _____ Tel. (Fax
 Cell Pager) : (____) _____

Marital Status: single married separated common-law divorced other _____

Ethnic group : Caucasian Asian Indo-Asian Hispanic African First Nation French Canadian
 European other _____

Spoken/written language : french english other _____

Preferred language: french english other _____

Religion : _____

Employment : _____ full time part time unemployed retired homemaker
 disability other _____

Renseignements démographiques

Nom : _____ Prénom : _____ DDN : ____/____/____
 jr mm aa

Adresse : _____ femme homme

Ville : _____ Code postal : _____ Courriel : _____

Tél. (maison) : (____) _____ (travail) : (____) _____ Tél. (Fax
 Cell Pager) : (____) _____

Statut marital : célibataire marié(e) séparé(e) conjoint de fait divorcé(e) autre _____

Ethnie : caucasien asiatique indoasiatique hispanique africain première nation
 canadien français européen autre _____

Langue parlée/écrite : français anglais autre _____

Langue préférée : français anglais autre _____

Religion : _____

Occupation : _____ temps plein temps partiel sans emploi retiré ménagère
 invalidité autre _____

Cardiovascular Health
QUESTIONNAIRE – PHYSICAL ACTIVITY
Baseline

Note: Throughout the questionnaire, “**recommended physical activities**” refers to all physical activities that the cardiovascular health clinic (i.e. exercise specialist) has advised you to participate in, including those at the clinic as well as the activities you participate in outside the clinic.

Physical Activity (Answer each question in 1, 2 and 3)

1) STRENUOUS/VIGOROUS PHYSICAL ACTIVITY (HEART BEATS RAPIDLY)

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

A) Considering A TYPICAL WEEK in the past 2 months, how many times on average have you done strenuous/vigorous physical activity for more than 20 minutes during your free time (**write the appropriate number of times per week in the circle**).

times
a week

2) MODERATE PHYSICAL ACTIVITY (NOT EXHAUSTING)

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

A) Considering A TYPICAL WEEK in the past 2 months, how many times on average have you done moderate physical activity for more than 20 minutes during your free time (**write the appropriate number of times per week in the circle**).

times
a week

3) MILD PHYSICAL ACTIVITY (MINIMAL EFFORT)

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

A) Considering A TYPICAL WEEK in the past 2 months, how many times on average have you done mild physical activity for more than 20 minutes during your free time (**write the appropriate number of times per week in the circle**).

times
a week

Confidence

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

Not at all confident

Moderately confident

Completely confident

1. Please use the above scale to write a percentage on the line provided for below.

Over the next 2 months, how CONFIDENT are you (i.e. feeling able) to follow the recommended physical activities?	_____ %
---	---------

2. Please use the above scale to write a percentage on EACH line provided for questions A through G.

Over the next 2 months, how **CONFIDENT** are you (i.e. feeling able) to participate in physical activity for more than 20 minutes during your free time for at least...

(PLEASE PROVIDE AN ANSWER FOR EACH LINE)

A) 1 day per week	_____ %
B) 2 days per week	_____ %
C) 3 days per week	_____ %
D) 4 days per week	_____ %
E) 5 days per week	_____ %
F) 6 days per week	_____ %
G) 7 days per week	_____ %

Reasons to participate in physical activity

We are interested in the reasons underlying peoples' decisions to engage, or not to engage in physical activity. Using the scale below, please indicate to what extent each of the following items is true for you. **Please circle the number that best describes your reasons for questions 1 through 23.**

Not true for me		Sometimes true for me		Very true for me
0	1	2	3	4

WHY DO YOU ENGAGE IN THE RECOMMENDED PHYSICAL ACTIVITIES?

1. I participate in the recommended physical activities because other people say I should.	0	1	2	3	4
2. I feel guilty when I don't participate in the recommended physical activities.	0	1	2	3	4
3. I value the benefits of participating in the recommended physical activities.	0	1	2	3	4
4. I participate in the recommended physical activities because it's fun.	0	1	2	3	4
5. I consider physical activity consistent with my values.	0	1	2	3	4
6. I take part in the recommended physical activities because my friends/family/partner say I should.	0	1	2	3	4
7. I feel ashamed when I miss a physical activity session.	0	1	2	3	4
8. It's important to me to participate in the recommended physical activities.	0	1	2	3	4
9. I can't see why I should bother participating in the recommended physical activities.	0	1	2	3	4
10. I enjoy my physical activity sessions.	0	1	2	3	4
11. I consider physical activity a fundamental part of who I am.	0	1	2	3	4
12. I don't see the point in participating in the recommended physical activities.	0	1	2	3	4
13. I feel like a failure when I haven't participated in the recommended physical activities.	0	1	2	3	4
14. I think it is important to make the effort to participate in the recommended physical activities.	0	1	2	3	4
15. I participate in physical activity because it is consistent with my life goals.	0	1	2	3	4
16. I feel under pressure from my friends/family to participate in the recommended physical activities.	0	1	2	3	4
17. I consider physical activity to be part of my identity.	0	1	2	3	4
18. I get pleasure and satisfaction from participating in the recommended physical activities.	0	1	2	3	4

19. I think participating in the recommended physical activities is a waste of time.	0	1	2	3	4
20. I find physical activity a pleasurable activity.	0	1	2	3	4
21. I get restless if I don't participate in the recommended physical activities.	0	1	2	3	4
22. I participate in the recommended physical activities because others will not be pleased with me if I don't.	0	1	2	3	4
23. I don't see why I should have to participate in the recommended physical activities.	0	1	2	3	4

Confidence to overcome barriers to physical activity

The following items reflect situations that are listed as common reasons for preventing individuals from participating in physical activity sessions or, in some cases, stopping their participation in physical activity. Using the scale below please indicate how confident you are to participate in the recommended physical activities IN THE EVENT that any of the following circumstances were to occur. Select the response that most closely matches your own.

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

Not at all confident

Moderately confident

Very

Using the scale above, please write a percentage on the lines provided for question 1 through 10.

“How confident are you that you can participate in the recommended physical activities in the next two months when/if . . .”

1. You are scared of having a cardiac event.	_____ %
2. You have back pain.	_____ %
3. You are experiencing side effects of medication.	_____ %
4. The weather is very bad (hot, humid, rainy, cold).	_____ %
5. You have too much work to do/ Your schedule conflicts with your physical activity session.	_____ %
6. You do not have enough time.	_____ %
7. You have angina/chest pain.	_____ %
8. You are experiencing health problems/ You are feeling under the weather.	_____ %
9. It costs too much.	_____ %
10. It becomes difficult to get to the location where you participate in physical activity.	_____ %

Scheduling self-efficacy

Please indicate how confident you are that you can engage in your recommended physical activities over the next 2 months using the scale below.

Place the appropriate number from the scale (0 – 100) on the line following the statement.

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

Not at all confident

Moderately confident

Very

I am confident that I can ...

1. Attend the physical activity sessions at the clinic at least two times per week for the next 2 months no matter what. _____ %
2. Participate in at least one physical activity session per week outside the clinic (e.g., at home) for the next 2 months no matter what. _____ %
3. Organize my responsibilities around each physical activity session during the next 2 months no matter what. _____ %
4. Plan for the attendance of my physical activity sessions in my daily activities. _____ %
5. Arrange my schedule to participate in the recommended physical activities no matter what over the next 2 months. _____ %
6. Maintain a definite plan to restart to participate in physical activity if I should miss several sessions or weeks of sessions during the next 2 months. _____ %
7. Make up times when I missed my regular physical activity session. _____ %
8. Make sure that I do not miss more than one week of physical activity due to other obligations during the next 2 months. _____ %
9. Organize time around each physical activity session during the next 2 months no matter what. _____ %

Important other autonomy support

This questionnaire contains items that are related to your past interaction with an important other regarding physical activity.

An **important other** could be a family member (spouse, parent, sibling), a close friend or coworker, as long as the person you select is important to you when discussing physical activity. Therefore, we would like to know more about how you feel during your recent encounters with your important other.

Please circle a number for questions 1 through 6.

Strongly disagree	Moderately disagree	Disagree	Neutral	Agree	Moderately Agree	Strongly Agree
1	2	3	4	5	6	7

1. I feel that my important other provides me with choices and options about physical activity (including not being regularly active).	1	2	3	4	5	6	7
2. I feel my important other understands how I see things with respect to my physical activity.	1	2	3	4	5	6	7
3. My important other conveys confidence in my ability to make changes regarding my physical activity.	1	2	3	4	5	6	7
4. My important other listens to how I would like to do things regarding my physical activity.	1	2	3	4	5	6	7
5. My important other encourages me to ask questions about physical activity.	1	2	3	4	5	6	7
6. My important other tries to understand how I see my physical activity before suggesting a new way to do things.	1	2	3	4	5	6	7

Psychological needs for physical activity

The following statements represent different feelings people have when they participate in physical activity. Please answer the following questions by considering **how you typically feel while you are participating in the recommended physical activities.**

False	Mostly False	More false than true	More true than false	Mostly true	True
1	2	3	4	5	6

1. I feel like I share a common bond with people who are important to me when we exercise together.	1	2	3	4	5	6
2. I feel free to exercise my own way.	1	2	3	4	5	6
3. I feel confident in my ability to perform exercises that personally challenge me.	1	2	3	4	5	6
4. I feel like I have a say in choosing the exercises that I do.	1	2	3	4	5	6

False	Mostly False	More false than true	More true than false	Mostly true	True
1	2	3	4	5	6

5. I feel that I am able to complete exercises that are personally challenging.	1	2	3	4	5	6
6. I feel attached to my exercise companions because they accept me for who I am.	1	2	3	4	5	6
7. I feel confident I can do even the most challenging exercises.	1	2	3	4	5	6
8. I feel free to choose which exercises I participate in.	1	2	3	4	5	6
9. I feel like I am the one who decides what exercises I do.	1	2	3	4	5	6
10. I feel capable of completing exercises that are challenging me.	1	2	3	4	5	6
11. I feel free to make my own exercise program decisions.	1	2	3	4	5	6
12. I feel like I am in charge of my exercise program decisions.	1	2	3	4	5	6
13. I feel like I am capable of doing even the most challenging exercises.	1	2	3	4	5	6
14. I feel good about the way I am able to complete challenging exercises.	1	2	3	4	5	6
15. I feel a sense of camaraderie with my exercise companions because we exercise for the same reasons.	1	2	3	4	5	6
16. I feel close to my exercise companions who appreciate how difficult exercise can be.	1	2	3	4	5	6
17. I feel connected to the people who I interact with while we exercise together.	1	2	3	4	5	6
18. I feel like I get along well with other people who I interact with while we exercise together.	1	2	3	4	5	6

Outcomes related to physical activity

Using the following scale, indicate to what extent you **agree** with each of the **17 different outcomes** associated with participating in physical activity.

Strongly disagree	Disagree	Somewhat agree	Agree	Strongly Agree
1	2	3	4	5

Please **circle** the appropriate number that best describes your opinion for each of the **17 outcomes**.

How strongly do you agree that participating in the recommended physical activities will result in...?

1. improving your mood.	1	2	3	4	5
2. feeling less bored.	1	2	3	4	5
3. improving your self esteem.	1	2	3	4	5
4. feeling less stressed.	1	2	3	4	5
5. feeling more attractive.	1	2	3	4	5
6. improving your state of mind.	1	2	3	4	5
7. improving your social network.	1	2	3	4	5
8. improving your job performance.	1	2	3	4	5
9. losing weight.	1	2	3	4	5
10. building muscle strength.	1	2	3	4	5
11. improving your health/reducing your risk of disease.	1	2	3	4	5
12. improving your heart/lungs.	1	2	3	4	5
13. feeling less tired.	1	2	3	4	5
14. feeling less nausea.	1	2	3	4	5
15. injury.	1	2	3	4	5
16. increased joint pain.	1	2	3	4	5
17. increased muscle aches.	1	2	3	4	5

Education

Please indicate the highest degree/certificate you obtained (**Check ONE**).

<input type="checkbox"/>	No diploma or certificate
<input type="checkbox"/>	High school degree
<input type="checkbox"/>	Apprenticeship or trades certificate
<input type="checkbox"/>	College or CEGEP degree (1 year or less)
<input type="checkbox"/>	College or CEGEP degree (1 year or more)
<input type="checkbox"/>	Some university studies (minimum of 1 year)
<input type="checkbox"/>	Bachelor's degree
<input type="checkbox"/>	Master's degree
<input type="checkbox"/>	Degree in medicine, dentistry, veterinary medicine or optometry
<input type="checkbox"/>	Doctorate degree

Santé cardiovasculaire
QUESTIONNAIRE - ACTIVITÉ PHYSIQUE
Initial

SVP Notez : Le terme « **activités physiques recommandées** » fait référence à toutes activités physiques que la clinique de santé cardiovasculaire (i.e. spécialiste d'exercice) vous a avisé de faire, incluant les activités physiques à la clinique de santé cardiovasculaire en plus des activités physiques auxquelles vous participez à l'extérieur de la clinique.

Activité physique (Répondez aux questions 1, 2 et 3)

1) ACTIVITÉ PHYSIQUE EXTÉNUANTE/ÉLEVÉE (FRÉQUENCE CARDIAQUE ÉLEVÉE)
(exemple : jogging ou course à pied, ski de fond, nage intensive, bicycle intensif sur une longue distance)

En vous référant à UNE SEMAINE TYPIQUE durant les 2 derniers mois, combien de fois, en moyenne, vous adonnez-vous à de l'activité physique exténuante/élevée pendant plus de 20 minutes durant vos temps libres? **(inscrivez le nombre de fois par semaine dans le cercle).**

Fois par semaine

2) ACTIVITÉ PHYSIQUE MODÉRÉE/MOYENNE (SANS ÊTRE EXTÉNUANTE)
(exemple : marche rapide, tennis, badminton, golf, motoneige, danse, volley-ball, bicycle de promenade, ...)

En vous référant à UNE SEMAINE TYPIQUE durant les 2 derniers mois, combien de fois, en moyenne, vous adonnez-vous à de l'activité physique modérée/moyenne pendant plus de 20 minutes durant vos temps libres? **(inscrivez le nombre de fois par semaine dans le cercle).**

Fois par semaine

3) ACTIVITÉ PHYSIQUE LÉGÈRE (EFFORT MINIMAL)
(exemple : marche lente, quilles, golf, curling)

En vous référant à UNE SEMAINE TYPIQUE durant les 2 derniers mois, combien de fois, en moyenne, vous adonnez-vous à de l'activité physique légère pendant plus de 20 minutes durant vos temps libres? **(inscrivez le nombre de fois par semaine dans le cercle).**

Fois par semaine

Confiance

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

Pas confiant(e) du tout

Moyennement confiant(e)

Complètement confiant(e)

1. En utilisant l'échelle ci-dessus, s.v.p. indiquez un pourcentage sur la ligne désignée.

En pensant aux 2 prochains mois, quel est votre degré de CONFIANCE pour effectuer les activités physiques recommandées (i.e. à quel point vous vous sentez capable)?	_____ %
---	---------

2. En utilisant l'échelle ci-dessus, s.v.p. indiquez un pourcentage sur CHAQUE ligne désignée pour les questions A à G.

En pensant aux 2 prochains mois, quel est votre degré de **CONFIANCE** pour faire de l'activité physique (i.e. à quel point vous vous sentez capable) pendant plus de 20 minutes durant vos temps libres, au moins :

(S.V.P. RÉPONDRE SUR CHAQUE LIGNE)

A) 1 journée par semaine	_____ %
B) 2 journées par semaine	_____ %
C) 3 journées par semaine	_____ %
D) 4 journées par semaine	_____ %
E) 5 journées par semaine	_____ %
F) 6 journées par semaine	_____ %
G) 7 journées par semaine	_____ %

Raisons pour participer à des activités physiques

Nous aimerions connaître les raisons qui incitent les gens à pratiquer ou à ne pas pratiquer des activités physiques. En vous servant de l'échelle ci-dessous, veuillez indiquer jusqu'à quel point chacun des énoncés suivants est vrai pour vous.

Veuillez encercler le nombre qui décrit le mieux chaque raison pour les questions 1 à 23.

Absolument pas vrai pour moi		Assez vrai pour moi		Très vrai pour moi
0	1	2	3	4

POURQUOI PARTICIPEZ-VOUS AUX ACTIVITÉS PHYSIQUES RECOMMANDÉES?

1. Je pratique les activités physiques recommandées parce que les autres me disent que je dois le faire.	0	1	2	3	4
2. Je me sens coupable lorsque je ne fais pas les activités physiques recommandées.	0	1	2	3	4
3. J'apprécie les avantages que je retire d'une participation aux activités physiques recommandées.	0	1	2	3	4
4. Je pratique les activités physiques recommandées parce que c'est amusant.	0	1	2	3	4
5. Je crois que l'activité physique fait partie de mes valeurs.	0	1	2	3	4
6. Je fais les activités physiques recommandées parce que mes amis/ma famille/mon conjoint/ma conjointe disent que je dois en faire.	0	1	2	3	4
7. Je me sens coupable lorsque je rate une séance d'activité physique.	0	1	2	3	4
8. C'est important pour moi de participer aux activités physiques recommandées.	0	1	2	3	4
9. Je ne vois pas pourquoi je dois me soucier de faire les activités physiques recommandées.	0	1	2	3	4
10. J'aime mes séances d'activité physique.	0	1	2	3	4
11. Je considère que l'activité physique fait partie de moi.	0	1	2	3	4
12. Je ne vois pas ce que ça me donne de faire les activités physiques recommandées.	0	1	2	3	4
13. Je me sens comme un(e) perdant(e) quand je ne fais pas les activités physiques recommandées.	0	1	2	3	4
14. Je crois que c'est important de s'efforcer à faire les activités physiques recommandées.	0	1	2	3	4
15. Je fais de l'activité physique parce que c'est en accord avec mes objectifs de vie.	0	1	2	3	4

16. Je me sens forcé(e) par mes amis/ma famille à faire les activités physiques recommandées.	0	1	2	3	4
17. Je considère l'activité physique comme étant une partie fondamentale de ma personne.	0	1	2	3	4
18. J'éprouve du plaisir et de la satisfaction à faire les activités physiques recommandées.	0	1	2	3	4
19. Je crois que faire les activités physiques recommandées est une perte de temps.	0	1	2	3	4
20. Je trouve ça agréable de faire de l'activité physique.	0	1	2	3	4
21. Je suis agité(e) lorsque je ne fais pas les activités physiques recommandées.	0	1	2	3	4
22. Je fais les activités physiques recommandées parce que les autres ne seront pas contents si je ne le fais pas.	0	1	2	3	4
23. Je ne vois pas pourquoi je dois faire les activités physiques recommandées.	0	1	2	3	4

Confiance pour surmonter les barrières à l'activité physique

Les items suivants présentent des raisons populaires que les gens mentionnent pour ne pas faire de l'activité physique et/ou pour abandonner leur programme d'activité. En utilisant l'échelle ci-dessous, indiquez votre degré de confiance à faire des activités physiques recommandées SI les situations suivantes devaient survenir. **Utilisez la réponse qui correspond le mieux à votre opinion.**

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

Pas du tout confiant(e)

Moyennement confiant(e)

En utilisant l'échelle ci-haut, veuillez inscrire un pourcentage sur chacune des lignes pour les questions 1 à 10 inclusivement.

“ Quel est votre degré de confiance de pouvoir participer aux activités physiques recommandées durant les 2 prochains mois si ...

1. Vous craignez avoir un malaise cardiaque.	_____ %
2. Vous avez mal au dos.	_____ %
3. Vous souffrez des effets secondaires reliés à vos médicaments (prescriptions).	_____ %
4. La température est mauvaise (chaud, humide, pluvieux, froid).	_____ %
5. Vous avez trop de choses à faire/Votre horaire est en conflit avec votre activité physique.	_____ %
6. Vous n'avez pas le temps.	_____ %

- | | |
|---|---------|
| 7. Vous souffrez d'angine ou de douleurs à la poitrine. | _____ % |
| 8. Vous avez des problèmes de santé/Vous ne vous sentez pas bien. | _____ % |
| 9. Les coûts associés à l'activité physique sont trop élevés. | _____ % |
| 10. Vous avez de la difficulté à vous rendre à l'endroit où vous faites de l'activité physique. | _____ % |

Sentiment d'auto-efficacité relié à la gestion du temps

Pour chacun des énoncés suivants, veuillez indiquer votre réponse sur le tiret en vous basant sur l'échelle suivante (0-100).

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

Pas du tout confiant(e)

Moyennement confiant(e)

Très confiant(e)

Veuillez indiquer votre degré de confiance pour gérer votre temps par rapport aux activités physiques recommandées pour les 2 prochains mois en utilisant l'échelle ici-bas.

Je suis confiant(e) que je peux...

- | | |
|---|---------|
| 1. Me présenter à la clinique pour au moins deux sessions d'activités physiques par semaine, pour les 2 prochains mois, peu importe les circonstances. | _____ % |
| 2. Participer à au moins une session d'activité physique par semaine à l'extérieur de la clinique (ex., à la maison), pour les 2 prochains mois, peu importe les circonstances. | _____ % |
| 3. Gérer mes responsabilités en fonction de chaque session d'activités physiques au cours des 2 prochains mois, peu importe les circonstances. | _____ % |
| 4. Prévoir mes séances d'activités physiques dans mon horaire quotidien. | _____ % |
| 5. Organiser mon horaire pour assurer ma participation aux activités physiques recommandées au cours des 2 prochains mois. | _____ % |
| 6. Établir un plan qui va me permettre de recommencer si je manque plusieurs sessions ou semaines d'activités physiques. | _____ % |
| 7. Reprendre les sessions d'activité physique que j'aurais manquées. | _____ % |
| 8. M'assurer de ne pas manquer plus d'une semaine d'activités physiques, au cours des 2 prochains mois, en raison d'autres engagements/obligations. | _____ % |
| 9. Gérer mon temps en fonction de chaque session d'activités physiques, au cours des 2 prochains mois, peu importe les circonstances. | _____ % |

Support d'autonomie d'une personne proche

Les énoncés de cette échelle concernent vos discussions au sujet de l'activité physique avec l'une de vos personnes proches.

Une **personne proche** peut être: un membre de la famille (époux(se), parent(s), frère/sœur), un(e) bon(nne) ami(e) ou un collègue, tout en vous souvenant que vous avez eu des discussion d'activité physique avec cette personne. Nous cherchons à savoir comment vous vous sentez lors de vos interactions avec cette personne. **Encerclez un numéro pour les questions 1 à 6.**

Fortement en désaccord	Assez en désaccord	Légèrement en désaccord	Ni en désaccord, ni en accord	Légèrement En accord	Assez en accord	Fortement en accord
1	2	3	4	5	6	7

- | | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. Je ressens que cette personne me présente des choix et des alternatives par rapport à l'activité physique (incluant être inactif). | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. Je ressens que cette personne comprend comment je perçois mon activité physique. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. J'ai l'impression que cette personne a confiance en mes habiletés à faire des changements par rapport à mon activité physique. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. Cette personne prend en considération la façon dont j'aimerais faire les choses par rapport à mon activité physique. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. Cette personne m'encourage à poser des questions par rapport à l'activité physique. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. Cette personne essaie de comprendre mon point de vue par rapport à l'activité physique avant de proposer une nouvelle façon de faire les choses. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Besoins psychologiques envers l'activité physique

Les énoncés suivants représentent une variété d'opinions que les individus peuvent entretenir par rapport à l'activité physique. Veuillez répondre aux questions suivantes en considérant **comment vous vous sentez en pratiquant les activités physiques recommandées.**

Faux	Généralement faux	Plus faux que vrai	Plus vrai que faux	Généralement vrai	Vrai
1	2	3	4	5	6

- | | | | | | | |
|---|---|---|---|---|---|---|
| 1. Lorsque nous faisons de l'activité physique ensemble, je sens qu'il y a un lien entre moi et les gens que je considère importants. | 1 | 2 | 3 | 4 | 5 | 6 |
| 2. Je me sens libre de faire mes activités physiques à ma manière. | 1 | 2 | 3 | 4 | 5 | 6 |
| 3. J'ai confiance en mon habileté de réussir des activités physiques qui me posent un défi. | 1 | 2 | 3 | 4 | 5 | 6 |

4. Je sens que je peux effectuer des choix par rapport à mes activités physiques.	1	2	3	4	5	6
5. Je sens que je suis capable de compléter des activités physiques que je trouve difficiles.	1	2	3	4	5	6
6. Je sens un attachement pour mes compagnons d'activités physiques car ils/elles m'acceptent pour qui je suis.	1	2	3	4	5	6
7. Je me sens confiant/e d'effectuer les activités physiques les plus difficiles.	1	2	3	4	5	6
8. Je me sens libre de choisir les activités physiques auxquelles je participe.	1	2	3	4	5	6
9. Je sens que je choisies les activités physiques à faire.	1	2	3	4	5	6
10. Je me sens capable de compléter les activités physiques que je trouve difficiles.	1	2	3	4	5	6
11. Je me sens libre de prendre des décisions par rapport à mon programme d'activités physiques.	1	2	3	4	5	6
12. Je sens que je suis responsable des décisions relatives à mon programme d'activités physiques.	1	2	3	4	5	6
13. Je sens que je suis capable de faire les activités physiques les plus difficiles.	1	2	3	4	5	6
14. Je me sens bien à l'idée de pouvoir compléter les activités physiques les plus difficiles.	1	2	3	4	5	6
15. Vu que nous faisons de l'activité physique pour les mêmes raisons, je sens qu'il y a une camaraderie entre moi et mes compagnons d'activités physiques.	1	2	3	4	5	6
16. Je me sens proche de mes compagnons(es) d'activités physiques car ils/elles apprécient comment l'activité physique peut être difficile.	1	2	3	4	5	6
17. Quand nous faisons l'activité physique ensemble, je sens qu'il y a un rapport entre moi et mes compagnons d'activités physiques.	1	2	3	4	5	6
18. Je sens que je m'entends bien avec mes compagnons d'activités physiques.	1	2	3	4	5	6

Conséquence résultant de l'activité physique

En utilisant l'échelle ci-dessous, veuillez indiquer jusqu'à quel point vous êtes **d'accord** avec les **17 différentes conséquences/résultats** de l'activité physique.

Pas du tout d'accord	Pas d'accord	Un peu en accord	En accord	Fortement en accord
1	2	3	4	5

Pour les énoncés **1 à 17 inclusivement**, **SVP encercler le numéro** qui correspond le mieux à vos raisons personnelles.

Jusqu'à quel point êtes-vous d'accord que faire les activités physiques recommandées mène à ...

1. améliorer votre humeur.	1	2	3	4	5
2. réduire l'ennui.	1	2	3	4	5
3. améliorer votre estime de soi.	1	2	3	4	5
4. réduire votre stress.	1	2	3	4	5
5. se sentir plus attrayant(e).	1	2	3	4	5
6. avoir un meilleur état d'esprit.	1	2	3	4	5
7. améliorer votre réseau social.	1	2	3	4	5
8. améliorer votre rendement au travail/bureau.	1	2	3	4	5
9. perdre du poids.	1	2	3	4	5
10. augmenter votre force musculaire.	1	2	3	4	5
11. améliorer votre santé/prévenir des maladies.	1	2	3	4	5
12. améliorer votre capacité pulmonaire et/ou cardiaque.	1	2	3	4	5
13. se sentir moins fatigué(e).	1	2	3	4	5
14. avoir moins de nausées.	1	2	3	4	5
15. des blessures.	1	2	3	4	5
16. augmenter des douleurs aux articulations.	1	2	3	4	5
17. augmenter des douleurs aux muscles.	1	2	3	4	5

Éducation

SVP indiquez le diplôme/certificat le plus élevé qui vous avez reçu. **(Cochez UNE boîte).**

<input type="checkbox"/>	No diploma or certificate
<input type="checkbox"/>	Diplôme d'études secondaires
<input type="checkbox"/>	Certificat d'apprenti ou d'une école de métiers
<input type="checkbox"/>	Diplôme/certificat d'un collège ou d'un CEGEP (programme d'un an ou moins)
<input type="checkbox"/>	Diplôme/certificat d'un collège ou d'un CEGEP (programme de plus d'un an)
<input type="checkbox"/>	Études universitaires partielles (minimum 1 an)
<input type="checkbox"/>	Un baccalauréat
<input type="checkbox"/>	Une maîtrise
<input type="checkbox"/>	Un diplôme en médecine, en art dentaire, médecine vétérinaire ou en optométrie
<input type="checkbox"/>	Un doctorat

Article 1: Student And Primary Care Sample Measures

A. Physical Activity

Please respond to each section of the three categories of physical activity listed below. **Answer each question in 1, 2 and 3.**

1) STRENUOUS/VIGOROUS PHYSICAL ACTIVITY (HEART BEATS RAPIDLY)

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

Considering a typical week in the past 4 weeks, how many times on average have you done strenuous/vigorous physical activity for more than 20 minutes during your free time (**write the appropriate number of times per week in the circle**).

times
a week

2) MODERATE PHYSICAL ACTIVITY (NOT EXHAUSTING)

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

Considering a typical week in the past 4 weeks, how many times on average have you done moderate physical activity for more than 20 minutes during your free time (**write the appropriate number of times per week in the circle**).

times
a week

3) MILD PHYSICAL ACTIVITY (MINIMAL EFFORT)

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

Considering a typical week in the past 4 weeks, how many times on average have you done mild physical activity for more than 20 minutes during your free time (**write the appropriate number of times per week in the circle**).

times
a week

B. Confidence

Not at all confident

Moderately confident

Completely confident

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

Please use the above scale to write a percentage on **EACH** line provided for questions **A through G**.

Over the next four weeks, how **CONFIDENT** are you (i.e. feeling able) to participate in physical activity for more than 20 minutes during your free time for at least...

(PLEASE PROVIDE AN ANSWER FOR EACH LINE)

A) 1 day per week	_____ %
B) 2 days per week	_____ %
C) 3 days per week	_____ %
D) 4 days per week	_____ %
E) 5 days per week	_____ %
F) 6 days per week	_____ %
G) 7 days per week	_____ %

C. Reasons for participating in physical activity

We are interested in the reasons underlying peoples' decisions to engage, or not to engage in physical activity. Using the scale below, please indicate to what extent each of the following items is true for you. **Please circle the number that best describes your reasons for questions 1 through 23**

Not true for me		Sometimes true for me		Very true for me
0	1	2	3	4

USUALLY WHY DO YOU ENGAGE IN PHYSICAL ACTIVITY?

1. I participate in physical activity because other people say I should.	0	1	2	3	4
2. I feel guilty when I don't participate in physical activity.	0	1	2	3	4
3. I value the benefits of participating in physical activity.	0	1	2	3	4
4. I participate in physical activity because it's fun.	0	1	2	3	4
5. I consider exercise consistent with my values.	0	1	2	3	4
6. I take part in physical activity because my friends/family/partner say I should.	0	1	2	3	4
7. I feel ashamed when I miss a physical activity session.	0	1	2	3	4
8. It's important to me to participate in physical activity.	0	1	2	3	4
9. I can't see why I should bother participating in physical activity.	0	1	2	3	4
10. I enjoy my physical activity sessions.	0	1	2	3	4
11. I consider exercise a fundamental part of who I am.	0	1	2	3	4
12. I don't see the point in participating in physical activity.	0	1	2	3	4
13. I feel like a failure when I haven't participated in physical activity.	0	1	2	3	4
14. I think it is important to make the effort to participate in physical activity.	0	1	2	3	4
15. I participate in physical activity because it is consistent with life goals	0	1	2	3	4
16. I feel under pressure from my friends/family to participate in physical activity.	0	1	2	3	4
17. I consider physical activity to be part of my identity.	0	1	2	3	4
18. I get pleasure and satisfaction from participating in physical activity.	0	1	2	3	4

9. It cost too much. _____ %
10. My schedule conflicted with my physical activity session. _____ %
11. I didn't feel like it. _____ %
12. I was under personal stress of some kind. _____ %

E. Scheduling self-efficacy

Please indicate how confident you are that you can engage in physical activity over the next four weeks using the scale below.

Place the appropriate percentage from the scale (0 – 100%) on the line following the statement.

Not at all confident			Moderately confident					Very		
0 %	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Over the next four weeks, how confident are you that...

1. You can make time in your schedule to get in your intended physical activity? _____ %
2. You can plan ahead so that you are sure to get in your intended physical activity? _____ %
3. You will develop a plan to reach your physical activity goals? _____ %
4. You will resume regular physical activity when it is interrupted and you miss your physical activity for a day or two? _____ %
5. You will be able to remain flexible with your time, so as to work in physical activity as other obligations arise? _____ %

F. Important other autonomy support

This questionnaire contains items that are related to your past interaction with an important other regarding physical activity. An *important other* could be a family member (spouse, parent, sibling), a close friend or coworker, as long as the person you select is important to you when discussing physical activity. Therefore, we would like to know more about how you feel during your recent encounters with your important other. **Please circle a number for questions 1 through 7.**

<i>Strongly disagree</i>			<i>Moderately agree</i>			<i>Strongly Agree</i>
1	2	3	4	5	6	7

- | | | | | | | | |
|--|---|---|---|---|---|---|---|
| 1. I feel that my important other has provided me with choices and options about physical activity (including not being regularly active). | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. I feel my important other understands how I see things with respect to my physical activity. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. My important other conveys confidence in my ability to make changes regarding my physical activity. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. My important other listens to how I would like to do things regarding my physical activity. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. My important other encourages me to ask questions about my physical activity. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. My important other tries to understand how I see things in terms of improving physical activity before suggesting any changes. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

G. Psychological needs for physical activity

The following statements represent different feelings people have when they exercise. Please answer the following questions by considering how you typically feel while you are participating in physical activities.

False	Mostly False	More false than true	More true than false	Mostly true	True
1	2	3	4	5	6

1. I feel like I share a common bond with people who are important to me when we exercise together.	1	2	3	4	5	6
2. I feel free to exercise my own way.	1	2	3	4	5	6
3. I feel confident in my ability to perform exercises that personally challenge me.	1	2	3	4	5	6
4. I feel like I have a say in choosing the exercises that I do.	1	2	3	4	5	6
5. I feel that I am able to complete exercises that are personally challenging.	1	2	3	4	5	6
6. I feel attached to my exercise companions because they accept me for who I am	1	2	3	4	5	6
7. I feel confident I can do even the most challenging exercises.	1	2	3	4	5	6
8. I feel free to choose which exercises I participate in.	1	2	3	4	5	6
9. I feel like I am the one who decides what exercises I do.	1	2	3	4	5	6
10. I feel capable of completing exercises that are challenging me.	1	2	3	4	5	6
11. I feel free to make my own exercise program decisions.	1	2	3	4	5	6
12. I feel like I am in charge of my exercise program decisions.	1	2	3	4	5	6
13. I feel like I am capable of doing even the most challenging exercises	1	2	3	4	5	6
14. I feel good about the way I am able to complete challenging exercises.	1	2	3	4	5	6
15. I feel a sense of camaraderie with my exercise companions because we exercise for the same reasons.	1	2	3	4	5	6
16. I feel close to my exercise companions who appreciate how difficult exercise can be.	1	2	3	4	5	6
17. I feel connected to the people who I interact with while we exercise together.	1	2	3	4	5	6
18. I feel like I get along well with other people who I interact with while we exercise together.	1	2	3	4	5	6

H. Outcomes related to physical activity

Using the following scale, indicate to what extent you **agree** with each of the **17 different outcomes** associated with participating in physical activity.

Strongly disagree	Disagree	Somewhat agree	Agree	Strongly Agree
1	2	3	4	5

Please circle the appropriate number that best describes your opinion for each of the **17 outcomes**.

How strongly do you agree that participating in physical activity will result in...?

1. improving your mood.	1	2	3	4	5
2. feeling less bored.	1	2	3	4	5
3. improving your self esteem.	1	2	3	4	5
4. feeling less stressed.	1	2	3	4	5
5. feeling more attractive.	1	2	3	4	5
6. improving your state of mind.	1	2	3	4	5
7. improving your social network.	1	2	3	4	5
8. improving your job performance.	1	2	3	4	5
9. losing weight.	1	2	3	4	5
10. building muscle strength.	1	2	3	4	5
11. improving your health/reducing your risk of disease.	1	2	3	4	5
12. improving your heart/lungs.	1	2	3	4	5
13. feeling less tired.	1	2	3	4	5
14. feeling less nausea.	1	2	3	4	5
15. injury.	1	2	3	4	5
16. increased joint pain.	1	2	3	4	5
17. increased muscle aches.	1	2	3	4	5

I. Education

Please indicate the highest degree/certificate you obtained (**Check ONE**).

<input type="checkbox"/>	No diploma or certificate
<input type="checkbox"/>	High school degree
<input type="checkbox"/>	Apprenticeship or trades certificate
<input type="checkbox"/>	College or CEGEP degree (1 year or less)
<input type="checkbox"/>	College or CEGEP degree (1 year or more)
<input type="checkbox"/>	Some university studies (minimum of 1 year)
<input type="checkbox"/>	Bachelor's degree
<input type="checkbox"/>	Master's degree
<input type="checkbox"/>	Degree in medicine, dentistry, veterinary medicine or optometry
<input type="checkbox"/>	Doctorate degree

QUESTIONNAIRE - ACTIVITÉ PHYSIQUE

A. Activité physique

Veillez indiquer la fréquence à laquelle vous pratiquez chaque niveau d'activité physique mentionné ci-dessous.

- 1) **ACTIVITÉ PHYSIQUE EXTÉNUANTE/ÉLEVÉE (FRÉQUENCE CARDIAQUE ÉLEVÉE)**
(exemple : jogging ou course à pied, ski de fond, nage intensive, bicycle intensif sur une longue distance, ...)

En prenant une semaine typique durant les 4 dernières semaines, combien de fois, en moyenne, vous adonnez-vous aux types d'activités physiques exténuante/élevée pendant plus de 20 minutes durant vos temps libres? (**inscrivez le nombre approprié de fois par semaine dans le cercle**).

fois par
semaine

- 2) **ACTIVITÉ PHYSIQUE MODÉRÉE/MOYENNE (SANS ÊTRE EXTÉNUANTE)**
(exemple : marche rapide, tennis, badminton, golf, motoneige, danse, volley-ball, bicycle de promenade, ...)

En prenant une semaine typique durant les 4 dernières semaines, combien de fois, en moyenne, vous adonnez-vous aux types d'activités physiques modérée/moyenne pendant plus de 20 minutes durant vos temps libres? (**inscrivez le nombre approprié de fois par semaine dans le cercle**).

fois par
semaine

- 3) **ACTIVITÉ PHYSIQUE LÉGÈRE (EFFORT MINIMAL)**
(exemple : marche lente, quilles, golf, curling, ...)

En prenant une semaine typique durant les 4 dernières semaines, combien de fois, en moyenne, vous adonnez-vous aux types d'activités physiques légère pendant plus de 20 minutes durant vos temps libres? (**inscrivez le nombre approprié de fois par semaine dans le cercle**).

fois par
semaine

B. Confiance

Pas confiant(e) du tout **Moyennement confiant(e)** **Complètement confiant(e)**

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

En utilisant l'échelle ci-dessus, s.v.p. indiquez un pourcentage sur CHAQUE ligne désignée pour les questions A à G.

En pensant aux 4 prochaines semaines, quel est votre degré de **CONFIANCE** pour faire de l'activité physique (i.e. à quel point vous vous sentez capable) pendant plus de 20 minutes durant vos temps libres, au moins :

(S.V.P. RÉPONDRE SUR CHAQUE LIGNE)

A) 1 journée par semaine	_____ %
B) 2 journées par semaine	_____ %
C) 3 journées par semaine	_____ %
D) 4 journées par semaine	_____ %
E) 5 journées par semaine	_____ %
F) 6 journées par semaine	_____ %
G) 7 journées par semaine	_____ %

C. Raisons pour participer à l'activité physique

Nous aimerions connaître les raisons qui poussent les gens à pratiquer ou à ne pas pratiquer d'activité physique. En vous servant de l'échelle ci-dessous, veuillez indiquer jusqu'à quel point chacun des énoncés suivants est vrai pour vous. **Veuillez encercler le nombre qui décrit le mieux chaque raison pour les questions 1 à 23.**

Absolument pas vrai pour moi		Assez vrai pour moi		Très vrai pour moi
0	1	2	3	4

HABITUELLEMENT POURQUOI FAITES-VOUS DE L'ACTIVITÉ PHYSIQUE?

1. Je pratique de l'activité physique parce que les autres me disent que je dois le faire.	0	1	2	3	4
2. Je me sens coupable lorsque je ne pratique pas à l'activité physique.	0	1	2	3	4
3. J'apprécie les avantages que je tire d'une participation à l'activité physique.	0	1	2	3	4
4. Je pratique de l'activité physique parce que c'est amusant.	0	1	2	3	4
5. Je crois que l'activité physique est en ligne avec mes valeurs.	0	1	2	3	4
6. Je fais de l'activité physique parce que mes amis/ma famille/mon conjoint/ma conjointe disent que je dois en faire.	0	1	2	3	4
7. Je me sens coupable lorsque je rate une séance d'activité physique.	0	1	2	3	4
8. C'est important pour moi de faire de l'activité physique.	0	1	2	3	4
9. Je ne vois pas pourquoi je dois me soucier de faire de l'activité physique.	0	1	2	3	4
10. J'aime mes séances d'activité physique.	0	1	2	3	4
11. Je considère l'exercice comme une partie de moi.	0	1	2	3	4
12. Je ne vois pas ce que ça me donne de faire de l'activité physique.	0	1	2	3	4
13. Je me sens comme un(e) perdant(e) quand je ne fais pas d'activité physique.	0	1	2	3	4
14. Je crois que c'est important de s'efforcer de faire de l'activité physique.	0	1	2	3	4

Absolument pas vrai pour moi		Assez vrai pour moi		Très vrai pour moi
0	1	2	3	4

15. Je fais de l'activité physique parce que c'est en accord avec mes objectifs de vie.	0	1	2	3	4
16. Je me sens forcé(e) par mes amis/ma famille à faire de l'activité physique.	0	1	2	3	4
17. Je considère l'activité physique comme une part fondamentale de ma personne.	0	1	2	3	4
18. J'éprouve du plaisir et de la satisfaction en faisant de l'activité physique.	0	1	2	3	4
19. Je crois que faire de l'activité physique est une perte de temps	0	1	2	3	4
20. Je trouve ça agréable de faire de l'activité physique.	0	1	2	3	4
21. Je suis agité(e) lorsque je ne fais pas de l'activité physique.	0	1	2	3	4
22. Je fais de l'activité physique parce que les autres ne seront pas contents si je ne le fais pas.	0	1	2	3	4
23. Je ne vois pas pourquoi je dois faire de l'activité physique.	0	1	2	3	4

D. Confiance de pouvoir surmonter les obstacles à l'activité physique

Les points suivants illustrent des situations qui peuvent empêcher les gens de participer à des séances d'activité physique ou, dans certains cas, qui les poussent à abandonner. En utilisant l'échelle ci-dessous, indiquez votre degré de confiance pour participer à de l'activité physique SI une des circonstances suivantes devait se produire.

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

Pas confiant(e) du tout

Moyennement confiant(e)

Complètement confiant(e)

En utilisant l'échelle ci-dessus, veuillez inscrire le pourcentage à l'endroit prévu pour les questions 1 à 12.

Je crois que je pourrais participer aux activités physiques que j'ai l'intention de faire au cours des 4 prochaines semaines même si . . .

1. Le temps est très mauvais (chaud/humide/pluvieux/froid). _____%

2. Je suis en vacances. _____%

3. Je ressens de la douleur ou de l'inconfort lorsque je fais de l'activité physique. _____%

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

**Pas confiant(e) du tout
confiant(e)**

Moyennement confiant(e)

Complètement

4. Je dois faire de l'activité physique seul(e). _____%

5. J'ai de la difficulté à me rendre à l'endroit où je participe à de l'activité physique. _____%

6. Je n'ai pas assez de temps. _____%

7. Je suis trop fatigué(e)/je manque d'énergie. _____%

8. Je ne me sens pas bien. _____%

9. C'est trop dispendieux. _____%

10. J'ai un conflit d'horaire pour ma séance d'activité physique. _____%

11. Je n'en ai pas envie. _____%

12. Je suis en situation de stress. _____%

E. Sentiment d'auto-efficacité relié à la gestion du temps

Veillez indiquer votre degré de confiance pour participer à de l'activité physique pour les prochaines quatre semaines en utilisant l'échelle ci-dessous.

Pour chacun des énoncés suivants, veuillez indiquer votre réponse sur le tiret en vous basant sur l'échelle suivante (0-100%).

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

Au cours des 4 prochaines semaines, à quel point vous sentez-vous confiant d'être capable de...

1. Faire du temps pour l'activité physique à laquelle vous avez l'intention de prendre part ? _____%

2. Planifier en avance afin de vous assurer que vous aurez du temps pour l'activité physique à laquelle vous avez l'intention de participer? _____%

3. Développer un plan afin d'atteindre vos objectifs en activité physique ? _____%

4. Reprendre vos activités physiques régulières si elles sont interrompues et que vous manquez une journée ou deux ? _____%

5. Être flexible avec votre temps pour être dans la mesure d'inclure de l'activité physique même si des obligations surviennent ? _____%

F. Support d'autonomie d'une personne proche

Les énoncés de cette échelle concernent vos discussions au sujet de l'activité physique avec l'un(e) de vos proches. Une *personne proche* peut être: un membre de la famille (époux(se), parent(s), frère/sœur), un(e) bon(nne) ami(e) ou un collègue (au travail ou à l'école) tout en vous souvenant que vous avez eu des discussion d'activité physique avec cette personne. Nous cherchons à savoir comment vous vous sentez lors de vos interactions avec cette personne. **Encerchez un numéro pour les questions 1 à 7.**

Fortement en désaccord	Assez en désaccord	Légèrement en désaccord	Ni en désaccord, ni en accord	Légèrement En accord	Assez en accord	Fortement en accord
1	2	3	4	5	6	7

1. Je ressens que mon/ma proche me présente des choix et des alternatives par rapport à l'activité physique (incluant être inactif). 1 2 3 4 5 6 7

2. Je ressens que mon/ma proche comprend comment je vois mon activité physique. 1 2 3 4 5 6 7

3. J'ai l'impression que mon/ma proche a confiance en mes habiletés à faire des changements par rapport à mon activité physique. 1 2 3 4 5 6 7

4. Mon/ma proche prend en considération la façon dont j'aimerais faire les choses par rapport à mon activité physique. 1 2 3 4 5 6 7

5. Mon/ma proche m'encourage à poser des questions par rapport à l'activité physique. 1 2 3 4 5 6 7

6. Mon/ma proche essaie de comprendre mon point de vue par rapport à l'activité physique avant de proposer une nouvelle façon de faire les choses. 1 2 3 4 5 6 7

G. Besoins psychologiques envers l'activité physique

Les énoncés suivants représentent une variété d'opinions que les individus peuvent entretenir par rapport à l'activité physique. Veuillez répondre aux questions suivantes en considérant comment vous vous sentez en pratiquant l'activité physique.

Faux	Généralement faux	Plus faux que vrai	Plus vrai que faux	Généralement vrai	Vrai
1	2	3	4	5	6

1. Lorsque nous faisons de l'activité physique ensemble, je sens qu'il y a un lien entre moi et les gens que je considère importants.	1	2	3	4	5	6
2. Je me sens libre de faire mes activités physiques à ma manière.	1	2	3	4	5	6
3. J'ai confiance en mon habilité de réussir des activités physiques qui me posent un défi.	1	2	3	4	5	6
4. Je sens que je peux effectuer des choix par rapport à mes activités physiques.	1	2	3	4	5	6
5. Je sens que je suis capable de compléter des activités physiques que je trouve difficiles.	1	2	3	4	5	6
6. Je sens un attachement pour mes compagnons d'activité physique car ils/elles m'acceptent pour qui je suis.	1	2	3	4	5	6
7. Je me sens confiant/e d'effectuer les activités physiques les plus difficiles.	1	2	3	4	5	6
8. Je me sens libre de choisir les activités physiques auxquels je participe.	1	2	3	4	5	6
9. Je sens que je choisis les activités physiques à faire.	1	2	3	4	5	6
10. Je me sens capable de compléter les activités physiques que je trouve difficiles.	1	2	3	4	5	6
11. Je me sens libre de prendre des décisions par rapport à mon programme d'activité physique.	1	2	3	4	5	6
12. Je sens que je suis responsable des décisions relatives à mon programme d'activité physique.	1	2	3	4	5	6
13. Je sens que je suis capable de faire les activités physiques les plus difficiles.	1	2	3	4	5	6
14. Je me sens bien à l'idée de pouvoir compléter les activités physiques les plus difficiles.	1	2	3	4	5	6
15. Vu que nous faisons de l'activité physique pour les mêmes raisons, je sens qu'il y a une camaraderie entre moi et mes compagnons d'activité physique.	1	2	3	4	5	6
16. Je me sens proche de mes compagnons(es) d'activité physique car ils/elles apprécient comment l'activité physique peut être difficile.	1	2	3	4	5	6
17. Quand nous faisons l'activité physique ensemble, je sens qu'il y a un rapport entre moi et mes compagnons	1	2	3	4	5	6

d'activités physiques.

18. Je sens que je m'entends bien avec mes compagnons
d'activité physique. 1 2 3 4 5 6

H. Conséquences résultant de l'activité physique

En utilisant l'échelle ci-dessous, veuillez indiquer jusqu'à quel point vous êtes **d'accord** avec les **17 différentes conséquences/résultats** de l'activité physique.

Pas du tout d'accord	Pas d'accord	Un peu en accord	En accord	Fortement en accord
1	2	3	4	5

Pour les énoncés **1 à 17 inclusivement**, **SVP encrer le numéro** qui correspond le mieux à votre opinion personnelle.

Jusqu'à quel point êtes-vous d'accord que faire l'activité physique mène à ...

1. améliorer votre humeur.	1	2	3	4	5
2. réduire l'ennui.	1	2	3	4	5
3. améliorer votre estime de soi.	1	2	3	4	5
4. réduire votre stress.	1	2	3	4	5
5. se sentir plus attrayant(e).	1	2	3	4	5
6. avoir un meilleur état d'esprit.	1	2	3	4	5
7. améliorer votre réseau social.	1	2	3	4	5
8. améliorer votre rendement au travail/bureau.	1	2	3	4	5
9. perdre du poids.	1	2	3	4	5
10. augmenter votre force musculaire.	1	2	3	4	5
11. améliorer votre santé/prévenir des maladies.	1	2	3	4	5
12. améliorer votre capacité pulmonaire et/ou cardiaque.	1	2	3	4	5
13. se sentir moins fatigué(e).	1	2	3	4	5
14. avoir moins de nausées.	1	2	3	4	5
15. des blessures.	1	2	3	4	5
16. augmenter des douleurs aux articulations.	1	2	3	4	5
17. augmenter des douleurs aux muscles.	1	2	3	4	5

I. Éducation

SVP indiquez le diplôme/certificat le plus élevé qui vous avez reçu. **(Cochez UNE boîte).**

<input type="checkbox"/>	No diploma or certificate
<input type="checkbox"/>	Diplôme d'études secondaires
<input type="checkbox"/>	Certificat d'apprenti ou d'une école de métiers
<input type="checkbox"/>	Diplôme/certificat d'un collège ou d'un CEGEP (programme d'un an ou moins)
<input type="checkbox"/>	Diplôme/certificat d'un collège ou d'un CEGEP (programme de plus d'un an)
<input type="checkbox"/>	Études universitaires partielles (minimum 1 an)
<input type="checkbox"/>	Un baccalauréat
<input type="checkbox"/>	Une maîtrise
<input type="checkbox"/>	Un diplôme en médecine, en art dentaire, médecine vétérinaire ou en optométrie
<input type="checkbox"/>	Un doctorat

ARTICLE 3: MEASURES

Godin Leisure-Time Exercise Questionnaire

Considering a typical week in the last 6-months, how many times on average do you do the following kinds of leisure time exercise for more than 15 minutes during your free time? Please write on each line the appropriate number of times you engaged in the different kinds of leisure time exercise described in the table below. If you have not participated in any leisure time exercise, please indicate this with a 0.

Intensity of Exercise	Times per Week
<p>Mild Exercise → (Minimal effort, no perspiration)</p> <p>Examples: yoga, easy walking, golf, etc.</p>	<p>_____</p>
<p>Moderate Exercise → (not exhausting, light perspiration)</p> <p>Examples: brisk walking, leisure or recreational sports, etc.</p>	<p>_____</p>
<p>Strenuous Exercise → (heart beats rapidly, sweating)</p> <p>Examples: running, jogging, aerobic dance, competitive sports (soccer, basketball, swimming, etc.).</p>	<p>_____</p>

Barrier Self-Efficacy

The following questions ask about your confidence in being physically active under various circumstances. Please indicate how confident you are that you will be able to engage in regular exercise over the next 4 weeks even ...

a. When you have many demands at work or many home duties.

Not at all		Moderately			Completely	
Confident		Confident			Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7

b. When you are feeling depressed?

Not at all		Moderately			Completely	
Confident		Confident			Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7

c. When you are feeling anxious or stressed?

Not at all		Moderately			Completely	
Confident		Confident			Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7

d. When you become bored with the activities?

Not at all		Moderately			Completely	
Confident		Confident			Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7

e. If you cannot notice improvements in your fitness?

Not at all		Moderately			Completely	
Confident		Confident			Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7

f. When you feel a little tired?

Not at all		Moderately			Completely	
Confident		Confident			Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7

g. After recovering from illness (e.g., flu, heart condition) or injury that caused you to stop exercising?

Not at all Confident			Moderately Confident			Completely Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7	

h. When you feel physical discomfort when you exercise?

Not at all Confident			Moderately Confident			Completely Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7	

i. During bad/uncomfortable weather (e.g., rain, snow, humidity)?

Not at all Confident			Moderately Confident			Completely Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7	

j. If you have to do it by yourself?

Not at all Confident			Moderately Confident			Completely Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7	

k. When there are other more interesting things to do?

Not at all Confident			Moderately Confident			Completely Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7	

l. Without support from family or friends?

Not at all Confident			Moderately Confident			Completely Confident	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7	

Outcome Expectations Questionnaire

A major Benefit of Exercise for me is ...

	Do Not Agree at all		Moderately Agree			Completely Agree	
1. Cope with life's pressures.	1○	2○	3○	4○	5○	6○	7○
2. Improved health.	1○	2○	3○	4○	5○	6○	7○
3. Release of tension.	1○	2○	3○	4○	5○	6○	7○
4. Fun and enjoyment.	1○	2○	3○	4○	5○	6○	7○
5. Improved mental alertness.	1○	2○	3○	4○	5○	6○	7○
6. Maintain or lose weight.	1○	2○	3○	4○	5○	6○	7○
7. Positive psychological effect.	1○	2○	3○	4○	5○	6○	7○
8. Time spent with close friends and family members.	1○	2○	3○	4○	5○	6○	7○
9. Sense of accomplishment.	1○	2○	3○	4○	5○	6○	7○
10. Enhancing self-image and appearance.	1○	2○	3○	4○	5○	6○	7○
11. Reduced risk of further heart problems.	1○	2○	3○	4○	5○	6○	7○

Reasons for Being Physically Active

Please indicate the extent to which each of the following reasons for doing physical activity applies to you using the scale below.

I am trying to be physically active (or would start to be) because...

	Not at all True		Somewhat True			Completely True	
	1	2	3	4	5	6	7
1. I enjoy my exercise sessions.	1	2	3	4	5	6	7
2. I feel guilty when I don't exercise	1	2	3	4	5	6	7
3. Other people say I should	1	2	3	4	5	6	7
4. Healthy activity is part of my life goals	1	2	3	4	5	6	7
5. I am not even trying because I feel that I would be wasting my time	1	2	3	4	5	6	7
6. Exercising is fun	1	2	3	4	5	6	7
7. I value the benefits of exercise	1	2	3	4	5	6	7
8. Honestly, I don't know why I bother	1	2	3	4	5	6	7
9. I feel ashamed when I miss an exercise session	1	2	3	4	5	6	7
10. Others will not be pleased with me if I don't	1	2	3	4	5	6	7
11. Regular physical activity is very important for many aspects of my life	1	2	3	4	5	6	7
12. I really don't think about being or becoming physically active	1	2	3	4	5	6	7
13. I feel under pressure from my friends/family to exercise	1	2	3	4	5	6	7
14. It makes sense to me to exercise regularly	1	2	3	4	5	6	7
15. Regular physical activity is part of the way I have chosen to live my life	1	2	3	4	5	6	7
16. I find exercise a pleasurable activity	1	2	3	4	5	6	7
17. I feel bad about myself when I haven't exercised in a while	1	2	3	4	5	6	7
18. It is good way to improve my health	1	2	3	4	5	6	7