

HEALTH-ENHANCING PHYSICAL ACTIVITY  
AND EUDAIMONIC WELL-BEING

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By

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ABSTRACT

Numerous studies have investigated the relationship between physical activity and physiological health (e.g., Burke et al., 2006; Irwin, 2004). Less attention has been paid to the contribution of physical activity on psychological well-being (Fox et al., 2000), and more specifically eudaimonic well-being, which reflects optimal psychological functioning and development at one's maximum potential (Ryff, 1989, 1995). This study investigated the role that health-enhancing physical activity (HEPA; any form of physical activity that benefits health and functional capacity; Miilunpalo et al., 2000) plays in eudaimonic well-being, which Ryff conceptualizes in terms of six dimensions: (1) Autonomy (i.e., being self-determined and independent); (2) Environmental Mastery (i.e., having a sense of mastery and competence in managing the environment); (3) Personal Growth (i.e., having a feeling of continued development); (4) Positive Relations with Others (i.e., having warm, satisfying, and trusting relationships with others); (5) Purpose in Life (i.e., having goals and a sense of direction in life); and, (6) Self-acceptance (i.e., possessing a positive attitude toward the self).

Employing Ryff's (1989, 1995) perspective of eudaimonic well-being, this study explored whether or not experiencing eudaimonia during HEPA moderates the relationship between HEPA and eudaimonic well-being. Additionally, it explored whether or not the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being is mediated by basic need satisfaction. Undergraduate university students ( $N = 524$ ;  $M_{\text{age}} = 20.7$  years) completed an online survey including the Scales of Psychological Well-Being (Ryff & Keyes, 1995), the Short Questionnaire to Assess Health-enhancing Physical Activity (Wendel-Vos et al., 2003), the Hedonic and Eudaimonic Motives for Activity scale (Huta & Ryan, 2008),

and the Psychological Need Satisfaction in Exercise Scale (Wilson, Rogers, et al., 2006). While level of HEPA was not significantly related to eudaimonic well-being ( $r = .05, p = .24$ ), experiencing hedonia during HEPA (i.e., enjoying oneself, experiencing pleasure;  $r = .40, p < .01$ ), experiencing eudaimonia during HEPA ( $r = .37, p < .01$ ), and basic need satisfaction ( $r = .46, p < .01$ ) were significantly related to eudaimonic well-being. Although experiencing eudaimonia during HEPA did not moderate the relationship between HEPA and eudaimonic well-being, experiencing eudaimonia during HEPA accounted for a significant 2.2% unique variance in eudaimonic well-being beyond HEPA and experiencing hedonia during HEPA (the full model accounted for a significant 18.2% of the variance in eudaimonic well-being).

Furthermore, the data were consistent with a model of partial mediation in that basic need satisfaction partially accounted for the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being, supporting the proposition put forth by Ryan et al. (2008) that positive psychological well-being is a result of eudaimonic living that facilitates the satisfaction of our basic psychological needs. Findings from this study suggest that what appears to be significant in the relationship between HEPA and eudaimonic well-being is not the *level* of activity, but rather what is *experienced* during the activity. Future research may explore the directionality of the relationship by examining the extent to which eudaimonic well-being influences what is experienced during activity.

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LIST OF ABBREVIATIONS

Abbreviation

BRFSS	Behavior Risk Factor Surveillance System
GLTEQ	Godin Leisure Time Exercise Questionnaire
HEMA	Hedonic and Eudaimonic Motives for Activity scale
HEPA	Health-Enhancing Physical Activity
MET	Metabolic Equivalent of Task
PANAS	Positive and Negative Affect Scale
PNSE	Psychological Need Satisfaction in Exercise scale
SDT	Self-Determination Theory
SPWB	Scales of Psychological Well-Being
SQUASH	Short Questionnaire to Assess Health-Enhancing Physical Activity
SWLS	Satisfaction With Life Scale
U of S	University of Saskatchewan

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DEFINITIONS<sup>1</sup>

**Health-enhancing physical activity (HEPA):** Any form of physical activity that benefits health and functional capacity (Miilunpalo, Nupponen, Laitakari, Marttila, & Paronen, 2000).

**Hedonic well-being:** A conceptualization of positive psychological well-being that is primarily concerned with maximizing subjective happiness and experiencing pleasure (Ryan & Deci, 2001).

**Eudaimonic well-being:** A conceptualization of positive psychological well-being that includes six health-promoting dimensions that reflect optimal psychological functioning and development at one's true and highest potential (i.e., autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, self-acceptance; Ryff 1989, 1995).

**Experiencing eudaimonia during HEPA:** Experiencing elements of eudaimonic well-being while engaging in HEPA (e.g., developing a skill, learning, or gaining insight into something; Huta & Ryan, 2008).

**Experiencing hedonia during HEPA:** Experiencing elements of hedonic well-being while engaging in HEPA (e.g., experiencing pleasure; Huta & Ryan, 2008).

**Basic psychological needs:** Three fundamental and universal psychological needs that when satisfied nourish well-being, including competence (i.e., the sense of efficacy one has with respect to his/her environments), autonomy (i.e., the sense of choice and volition in the regulation of behaviour), and relatedness (i.e., feeling a meaningful connection with and being cared about by others; Deci & Ryan, 2002).

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<sup>1</sup> The order of definitions is consistent with the order in which the terms appear in the thesis.

## CHAPTER 1

### 1.1 INTRODUCTION

The significance of positive psychological health is evident in that anything less than flourishing mental health (i.e., experiencing high levels of emotional, psychological, and social well-being; Keyes & Lopez, 2002) is associated with increased impairment and disability (Keyes, 2007). Individuals who are not psychologically flourishing are therefore at risk of psychological harm. Given that adults who are diagnosed as completely mentally healthy function superior to all others in terms of the fewest workdays missed, the lowest level of health limitations of activities of daily living, the lowest health care utilization, the lowest level of perceived helplessness, and the highest level of intimacy (Keyes), it is important for research to focus on positive psychological well-being.

My research investigated the role that physical activity plays in positive psychological well-being, and more specifically the role of health-enhancing physical activity (HEPA), which is any form of physical activity that benefits health and functional capacity (Miilunpalo, Nupponen, Laitakari, Marttila, & Paronen, 2000). Research that has investigated the relationship between physical activity and positive psychological health has primarily used markers of hedonic well-being (e.g., satisfaction with life, quality of life, positive and negative affect) to measure positive psychological health (Ryan & Deci, 2001). As assessments of positive psychological health, hedonic well-being indices focus largely on maximizing happiness through

the presence of positive affect and the absence of negative affect (Ryan & Deci). In contrast, Ryff (1989, 1995) emphasizes eudaimonic well-being – to be fully functioning psychologically at one’s true and highest potential – as a more inclusive understanding of positive psychological health. Ryff’s perspective of eudaimonic well-being includes six health-promoting dimensions (i.e., autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance), which reflect optimal psychological functioning and development (Ryan & Deci).

This study explored the relationship between HEPA and eudaimonic well-being. Specifically, this study explored whether or not the data were consistent with a model of moderation whereby the relationship between HEPA and eudaimonic well-being was moderated by experiencing eudaimonia during HEPA. It also explored whether or not the data were consistent with a model of mediation whereby basic need satisfaction mediates the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being. Research questions of interest included: Is HEPA related to eudaimonic well-being? If eudaimonia is experienced during HEPA, does it strengthen the relationship between HEPA and eudaimonic well-being? Does HEPA satisfy our basic psychological needs and, if so, does basic need satisfaction play a role in the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being? By addressing these questions, insight will be gained concerning how HEPA might contribute to eudaimonic well-being.

Investigating the relationship between HEPA and eudaimonic well-being has a number of potentially important practical implications for health-care practitioners as well as the general public. Many common treatments for mental illness (e.g., prescription drugs, cognitive behavioural therapy) can be expensive and in short supply (Mutrie, 2000). Understanding the

relationship between HEPA and eudaimonic well-being is an important step towards potentially promoting HEPA as a new strategy in mental health care that is cost-effective and reaches a broader audience (including those who may not have access to more expensive health-care strategies). Ultimately, if future research establishes a causal relationship between HEPA and eudaimonic well-being, health-care practitioners will be able to promote physical activity for the psychological benefits in addition to the well-known physiological benefits (e.g., lower blood pressure, decreased risk of heart disease; Public Health Agency of Canada, 2003).

### 1.2 REVIEW OF THE LITERATURE

#### 1.2.1 Health-Enhancing Physical Activity

The World Health Organization (WHO, 2002) has stated that sedentary lifestyles are among the leading causes of death and disability in the world, with physical inactivity estimated to contribute to two million deaths worldwide annually (WHO, 2008). Sedentary lifestyles not only increase all causes of mortality, they also double the risk of cardiovascular disease and obesity, increase the risk of osteoporosis, and are associated with approximately 10-22% of breast cancer, colon cancer, diabetes, and heart disease (WHO, 2002, 2008). Alternatively, physical activity has been shown to be an important element of healthy living. Past research has revealed significant health-related physiological benefits that accrue from engaging in physical activity such as improved strength, reduced fatigue, increased healthy weight, reduced back injuries, and improved cardiorespiratory fitness (Burke, Carron, & Eys, 2006; Irwin, 2004; Sylvia-Bobiak & Caldwell, 2006). Reduced risk of coronary heart disease, stroke, high blood pressure, breast cancer, and diabetes are also the long-term benefits associated with a physically active lifestyle (Hall & Fong, 2003; Irwin; Sylvia-Bobiak & Caldwell; WHO, 2008). Less

attention has been paid to the contribution of physical activity on mental well-being (Fox, Boutcher, Faulkner, & Biddle, 2000).

Conceptualizing physical activity in terms of health-enhancing physical activity (HEPA) acknowledges the multifaceted nature of physical activity in that it is not limited to structured forms of exercise (Miilunpalo et al., 2000). HEPA includes any form of physical activity that benefits health and functional capacity (Miilunpalo et al.). However, previous research that has investigated the relationship between physical activity and psychological health has predominantly defined physical activity as structured exercise (e.g., sports, fitness classes; Acevedo & Ekkekakis, 2006; Griffin, 1997). In order to gain a comprehensive understanding of what types of activities may play important roles in positive psychological health, it is important to examine the function of various types of physical activity. The types of activities considered to be health-enhancing are not limited to structured exercises. Although structured exercise and sport are included, other forms of physical activity such as running errands on foot are also incorporated. Specifically, occupational activities (e.g., physical activity at work), lifestyle activities (e.g., commuting by bicycle), recreational activities (e.g., hiking), fitness activities (e.g., jogging), and sport activities (e.g., sports training) are all considered to be health-enhancing (Wendel-Vos, Schuit, Saris, & Kromhout, 2003).

### 1.2.2 University Students' Physical Activity and Psychological Well-being

Although the physiological benefits related to physical activity are widely recognized (US Department of Health and Human Services, 1996), many people remain inactive. University students are one population that is of concern. A review by Irwin (2004) examined universities from 27 countries including Australia, China, the United States, Canada, and numerous European countries and found that on average more than half of university students are not active. The

inactivity amongst this population indicates that they are not acquiring the benefits of physical activity and face a number of consequences as a result of being sedentary (e.g., shorter life expectancy, higher risk of developing heart disease and certain cancers; Irwin). Specifically, the transition from high school to the freshmen year of university presents risks regarding physical activity participation and has been associated with negative changes in physical activity patterns and psychological well-being (Irwin). The dreaded “freshmen 15” refers to the typical weight gain many first-year students experience and suggests a lack of physical activity during this stage in life (Caspersen, Pereira, & Curran, 2000).

University students are not only largely inactive, they are also at risk of psychological harm due to stressors such as changes in social support, living on their own, and changes in sleeping and eating habits (Allgower, Wardle, & Steptoe, 2001). Given that there has been a shift in major depression to younger ages of onset, increased prevalence of depression in younger age periods (Burke, Burke, Rae, & Regier, 1991), and 30% to 40% of university students experience elevated psychological distress (Adlaf, Gliksman, Demers, & Newton-Taylor, 2001), university students represent a unique target for the promotion of positive health aspects such as physical activity and psychological well-being. It is therefore important for research pertaining to physical activity and psychological health to incorporate university students as this is a stage in life where lifelong physical activity habits and behaviours may be positively influenced (Leslie, Fotheringham, Owen, & Bauman, 2001) and psychological well-being can be targeted. Additionally, the vast majority of research that has investigated the relationship between physical activity and mental well-being has done so with middle-aged and older populations (Penedo & Dahn, 2005). This further justifies investigating the physical activity-psychological health relationship amongst university students.

### 1.2.3 Hedonic Well-being vs. Eudaimonic Well-being

A literature search on psychological health returns a plethora of research concerning depression, anxiety, cognitive impairments, psychological distress, mood disorders, stigma, loneliness, intellectual disabilities, and numerous other psychological maladies. Psychological health literature has typically focused on the negative side of psychological functioning (Ryff & Keyes, 1995). That is, previous research concerning psychological health has insinuated that people are mentally healthy if they do not suffer from negative psychological symptoms (Ryff, 1995). The definition of psychological health, however, should not be limited to the absence of psychological maladies. Psychological health is not merely the lack of psychopathology; it includes the presence of an array of positive aspects such as positive affect, purpose in life, and social contribution (Cowen, 1991; Keyes, 2007; Ryan, Huta, & Deci, 2008). In conjunction with this belief, transition into a modern phase of research with a focus on studying *positive* psychological health has occurred (Ryan et al.).

Much research on positive psychological health to date has conceptualized it in terms of *hedonic well-being*. The hedonic approach to positive psychological health reflects the view that well-being consists of maximizing subjective happiness and experiencing pleasure (Ryan & Deci, 2001). Hence, in order to maximize hedonic well-being, people should do what makes them happy. Measures of hedonic well-being almost always center on the distinction between positive and negative affect, and evaluations of life satisfaction (Ryff, 1989). However, many of the well-known and commonly used hedonic well-being measures believed to assess positive psychological health (e.g., Life Satisfaction Index; Neugarten, Havighurst, & Tobin, 1961) were not originally developed to do so (Ryff). Rather than define the basic structure of psychological well-being, measures assessing life satisfaction were intended to differentiate between

individuals who were aging successfully from those who were not (Ryff). Similarly, measures of positive and negative affect were first developed to assess social change (Ryff). Regardless, measures of hedonic well-being have reigned as the primary markers of positive psychological health during the past decade and a half (Ryan & Deci).

Research that has looked specifically at the relationship between physical activity and psychological health has used predominantly hedonic well-being indices to assess psychological health (e.g., Fuzhong et al., 2001; Long & Van Stavel, 1995; Penedo & Dahn, 2005; Stubbe, de Moor, Boomsma, & de Geus, 2007; Yeung & Hemsley, 1997; Zuosong & Liu, 2006). For example, Fuzhong et al. attempted to increase the psychological well-being in elderly individuals through tai chi exercise and measured psychological well-being via life satisfaction, positive and negative affect, depression, and psychological distress. Similarly, Stubbe et al. examined the association between well-being and leisure time exercise in twins aged 18-65 years using life satisfaction and subjective happiness to assess well-being. These examples demonstrate that researchers continue to conceptualize positive psychological health in terms of hedonic well-being. Ryff (1989) has explained, however, that many of the common hedonic well-being measures were not originally intended to assess positive psychological health and therefore neglect important aspects of positive psychological health.

An alternative way to conceptualize positive psychological health that advances our understanding of psychological well-being is *eudaimonic well-being*, which reflects optimal psychological functioning at one's highest potential (Ryan & Deci, 2001; Ryff, 1989, 1995). Eudaimonic well-being is more than the absence of psychological maladies. There is also more to eudaimonic well-being than experiencing positive affect or satisfaction with one's life. After all, individuals who report that they are happy are not necessarily psychologically well (Deci &

Ryan, 2008). Eudaimonia, as Aristotle first wrote about in his *Nicomachian Ethics*, reflects living the good life via the realization of one's daimon, or true potential (Ryff, 1989). Put another way, eudaimonic well-being reflects optimal functioning and development at one's true and highest potential (Ryff, 1989, 1995). Therefore, eudaimonia occurs when individuals pursue their excellences and live in accordance with their daimon (Ryan & Deci). Unlike the typical short-term feeling of happiness experienced with hedonia, eudaimonia is a description of character, an adjective describing an exemplary life that extends into the future (Huta & Ryan, 2008; Ryan et al., 2008). Whereas hedonia reflects affective states and is subsequently state-like, eudaimonia appears to include both state-like (i.e., temporary and brief) and trait-like (i.e., propensity towards more stable patterns of behaviour and thoughts) tendencies (Schmutte & Ryff, 1997). While maintaining a degree of fluctuation and being responsive to life circumstances like its hedonic counterpart, eudaimonic well-being also possesses more enduring qualities and is not as fleeting as affect (Schmutte & Ryff). Thus, eudaimonia appears to fall between states (e.g., affect) and traits (e.g., personality; Schmutte & Ryff).

Ryff (1989, 1995), a leading researcher on eudaimonic well-being, challenges the hedonistic view of well-being and depicts eudaimonic well-being as distinct from hedonic happiness. Her conception of eudaimonic well-being has been informed by the work of developmental, clinical, and humanistic psychologists (e.g., Erikson, Maslow, Rogers, Jung, Jahoda), and reflects optimal psychological functioning at one's highest potential. Specifically, Ryff conceptualizes eudaimonic well-being as a multidimensional construct that taps six separate aspects of positive psychological health; (1) autonomy, (2) environmental mastery, (3) personal growth, (4) positive relations with others, (5) purpose in life, and (6) self-acceptance. The dimensions of eudaimonic well-being represent a valuable guide to a more complete and

meaningful life and are explicitly concerned with individuals' development and self-realization (Ryan et al., 2008).

Most researchers agree that eudaimonic well-being and hedonic well-being are not completely independent constructs (e.g., Deci & Ryan, 2008; Huta & Ryan, 2008; Keyes, Shmotkin, & Ryff, 2002; Waterman, Schwartz, & Conti, 2008). Both forms of well-being are positive mental health constructs that are related but distinct entities. Waterman et al. found relatively strong associations between a measure of hedonic well-being (i.e., enjoyment) and a measure of eudaimonic well-being (i.e., personal expressiveness;  $r_s = .83 - .87, p < .01$ ). Ryff (1989) found weaker, albeit significant, relations between the Scales of Psychological Well-Being (SPWB; Ryff & Keyes, 1995), a measure she constructed to reflect her conceptualization of eudaimonic well-being, and hedonic well-being measures (i.e., life satisfaction, positive affect;  $r_s = .25 - .73; p < .01$ ). Oster et al. (2008) found similar relations between the SPWB and measures of hedonic well-being (i.e., satisfaction with life, positive affect;  $r_s = .27 - .74$ ), as did Ryff and Keyes (i.e., with hedonic well-being measures of happiness, life satisfaction;  $r_s = .08 - .42, p < .05$ ). The apparent overlap between hedonic and eudaimonic well-being, as indicated by the significant relations between measures of hedonic and eudaimonic well-being, suggests that psychological well-being is likely best conceived of as including elements of both hedonia and eudaimonia (Huta & Ryan).

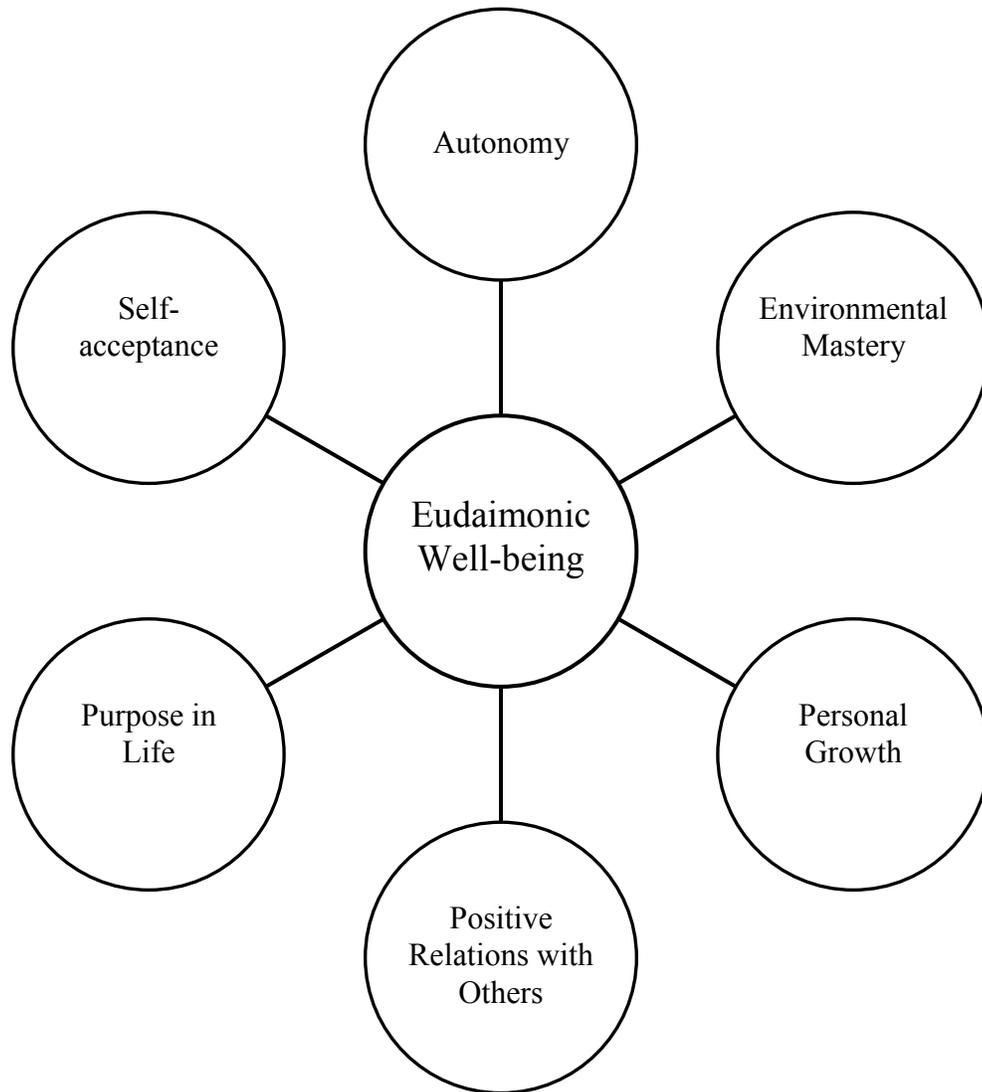
Although significant relations have been found between hedonic well-being and the SPWB (e.g., Oster et al., 2008; Ryff & Keyes, 1995), there are significant points of divergence between hedonic well-being and Ryff's perspective of eudaimonic well-being (Deci & Ryan, 2008). The strongly existential aspects of eudaimonic well-being (e.g., purpose in life, personal growth) are most distinct from markers of hedonic well-being (Keyes et al., 2002). Furthermore,

measures of hedonic well-being cannot by themselves be true indicators of well-being because hedonic well-being (i.e., happiness) can be so variously produced (Ryan et al., 2008). For example, happiness and positive affect are often associated with things such as selfishness and materialism (Ryan et al.). However, happiness that arises as a result of selfish acts cannot be indicative of optimal well-being (Ryan et al.). Therefore, it is important to go beyond the concepts most often measured in the past and assess positive psychological health more broadly (Huta & Ryan, 2008). Eudaimonic well-being expands our understanding of positive psychological health and encompasses the essential features that promote optimal psychological functioning and growth.

A brief overview of the six dimensions of eudaimonic well-being, as discussed by Ryff and Keyes (1995), demonstrates that this multidimensional approach to positive psychological health provides an important perspective in our understanding of well-being (see Figure 1.1). Autonomy refers to self-determination and independence. Rather than succumbing to social pressures or looking to others for approval, autonomous individuals regulate their behaviour and thoughts from within as well as evaluate themselves by their own standards. Environmental mastery reflects having the capacity to effectively manage one's surroundings, including having a sense of control over complex external activities and the ability to choose/create contexts suitable to personal needs and values. Individuals with a feeling of continued growth and development possess personal growth. This includes being open to new experiences as well as realizing one's potential and seeing improvements in one's self. Positive relatedness involves possessing quality relations with others and being concerned about the welfare of others. Individuals who lack this attribute have few close and trusting relationships and find it difficult to be warm and open with others. Having goals, a sense of direction in life, and feeling that life is

Figure 1.1

*The six dimensions of Ryff's (1989) conceptualization of eudaimonic well-being*



meaningful reflects purpose in life. Individuals who have no outlooks or beliefs that give life meaning lack purpose in life. Lastly, self-acceptance reflects having a positive attitude towards oneself, as well as acknowledging and accepting multiple aspects of the self (including both good and bad qualities). Individuals with low self-acceptance are often disappointed with themselves and wish they were different than who they are. To assess her conceptualization of eudaimonic well-being, Ryff and Keyes developed the SPWB, which contains six subscales representing the six dimensions of eudaimonic well-being. The six dimensions not only reflect positive psychological functioning at one's maximal potential; they also dictate the complexity of positive psychological well-being (Ryff & Keyes).

### 1.2.4 HEPA and Eudaimonic Well-being

What is the relationship between HEPA and eudaimonic well-being? How can HEPA contribute to an individual being eudaimonically-well, if at all? Aristotle acknowledged that certain needs must be met in order to achieve our daimon and be eudaimonically-well (Ryff & Singer, 2008). Specifically, Aristotle recognized that our bodies must be healthy in order to reach our fullest potential. Similarly, Ryff and Singer proposed that eudaimonic well-being might be positively related to active engagement in health behaviours. Results from a related study with university students ( $N = 168$ ), however, are somewhat inconsistent with the proposition that an active/healthy body will contribute to being eudaimonically-well (Oster et al., 2008). Oster et al. found a relatively small pattern of relationships between HEPA and eudaimonic well-being ( $r_s = -.04 - .13$ ). Further investigation is warranted, however, as these findings reflect the basic bivariate relationship between HEPA and eudaimonic well-being. The current study examined the relationship between HEPA and eudaimonic well-being by considering how this relationship

may be influenced by experiencing eudaimonia during HEPA, and having basic psychological needs satisfied by physical activity.

In order for HEPA to be related to eudaimonic well-being, perhaps the dimensions of eudaimonic well-being should be experienced *during* HEPA. Experiencing elements of eudaimonia while engaging in HEPA (i.e., feeling autonomous, having a sense of control over surroundings, continuing to develop, having satisfying relations with others, feeling as though there is meaning to life, and possessing a positive attitude towards the self) is likely to be associated with eudaimonic well-being, as the experience itself would be eudaimonic in nature. In support of the notion that experiencing eudaimonia during HEPA could be related to eudaimonic well-being, Huta and Ryan (2008) had undergraduate students ( $N = 118$ ) record activities from the previous day that had taken up most of their time (e.g., studying) and report the well-being that was experienced during each activity. Huta and Ryan found a significant relationship between experiencing eudaimonia during an activity (i.e., doing something you believe in; developing a skill, learning, or gaining insight into something; pursuing excellence or a personal ideal; developing your potential) and eudaimonic well-being ( $r = .25, p < .05$ ). Significant relations were also found between experiencing eudaimonia during an activity and other indices of eudaimonic well-being such as meaning in life ( $r_s = .25 - .30, p < .01$ ), personal expressiveness ( $r_s = .54 - .57, p < .01$ ), and engagement in life ( $r_s = .33 - .34, p < .01$ ). These results suggest that experiencing eudaimonia during an activity is related to eudaimonic well-being. Experiencing eudaimonia during an activity is suggested to be related to eudaimonic well-being because eudaimonic-activities diversify one's experiences and place activities within a meaningful framework (Huta, 2005).

Extending the findings from Huta and Ryan (2008) to the current study, the basic relationship between HEPA and eudaimonic well-being may vary depending on whether or not eudaimonia is experienced during HEPA. Huta and Ryan found that experiencing eudaimonia during an activity was related to eudaimonic well-being, which suggests that experiencing eudaimonia during HEPA may affect the strength of the relationship between HEPA and eudaimonic well-being. Interactions such as this are typically introduced when there is a surprisingly weak or inconsistent relationship between a predictor variable and a criterion variable (Baron & Kenny, 1986), such as the weak association between HEPA and eudaimonic well-being found by Oster et al. (2008). Taking into account the possible influence of experiencing eudaimonia while engaged in HEPA advances previous research which has looked at the relationship between *level* of physical activity and psychological well-being (e.g., Penedo & Dahn, 2005; Stubbe et al., 2007), but has not considered what is experienced during physical activity. Based on findings by Huta and Ryan, experiencing eudaimonia during HEPA may present a stronger relationship between HEPA and eudaimonic well-being than not experiencing eudaimonia during HEPA.

Although Huta and Ryan (2008) provided support for the relationship between experiencing eudaimonia during an activity and eudaimonic well-being, it is also important to consider if other variables may be contributing to this relationship. Ryan et al. (2008) proposed that the satisfaction of our basic psychological needs may play an important role in the relationship between eudaimonic activities and eudaimonic well-being. Three basic psychological needs, as described by Deci and Ryan (2002), are competence (i.e., the sense of efficacy one has with respect to his/her environments), autonomy (i.e., the sense of choice and volition in the regulation of behaviour), and relatedness (i.e., feeling a meaningful connection

with and being cared about by others). Deci and Ryan contended that the satisfaction of these basic needs represents essential conditions that nourish well-being. That is, need-satisfying experiences and activities have positive effects on our psychological health. Environments or activities that promote basic need satisfaction support well-being, whereas contexts that hinder basic need satisfaction inhibit well-being (Wilson, Rogers, Rodgers, & Wild, 2006). The premise put forth by Ryan et al. that positive psychological health is a result of eudaimonic activities that satisfy our basic psychological needs suggests that basic need satisfaction may be the mechanism through which experiencing eudaimonia during an activity and eudaimonic well-being are related. That is, eudaimonic well-being may occur as a result of behaving in ways that satisfy our basic psychological needs. Although previous research has examined the extent to which *exercise* satisfies our basic psychological needs and contributes to our well-being (e.g., Wilson, Longley, Muon, Rodgers, & Murray, 2006; Wilson, Rogers, et al.), to date no research has investigated the degree to which *physical activity* influences basic need satisfaction and therefore is related to psychological well-being (P. Wilson, personal communication, March 12, 2008).

In contrast to experiencing eudaimonia during an activity, Waterman et al. (2008) found that activities leading to eudaimonic well-being were a subset of those that included hedonic enjoyment. With a sample of 637 undergraduate students, 81.4-88.4% of activities rated as high on eudaimonic well-being received similarly high ratings on hedonic enjoyment. This suggests that in order for an activity to be associated with eudaimonic well-being, hedonia should also be experienced. Alternatively, only 60.9-67.9% of the activities rated as high on hedonic enjoyment received comparable ratings on eudaimonic well-being. This led Waterman et al. to conclude that there are two broad categories of activities associated with positive psychological well-being – those giving rise to both hedonia and eudaimonia, and those giving rise to hedonia alone.

Although there are many activities that a person can participate in that stimulate hedonia, only a subset of these activities will also give rise to eudaimonic well-being. That is, not all hedonia leads to eudaimonic well-being (Deci & Ryan, 2008). Activities that give rise to eudaimonic well-being will be those that contribute to achieving human potential, such as an elite athlete navigating a difficult down-hill ski run (Waterman et al.) or volunteering to help the less fortunate (Steger, Kashdan, & Oishi, 2008). Alternatively, there are many things that a person can do that provide enjoyment – such as enjoying a work of art (Huta & Ryan, 2008) or a nice glass of wine (Waterman et al.) – yet bear no relationship to achieving human potential. The results from Waterman et al. suggest that if a person is eudaimonically-well, he/she will necessarily also experience hedonia. This reasoning can be extended to the current study: In order for HEPA to be associated with eudaimonic well-being, HEPA should also be associated with hedonic enjoyment. Theoretically, hedonia should be experienced during HEPA in order for HEPA to be related to eudaimonic well-being.

### 1.3 STATEMENT OF PURPOSE AND HYPOTHESES

The purpose of this study was twofold. First, it explored whether or not experiencing eudaimonia during HEPA moderated the relationship between HEPA and eudaimonic well-being. Second, it explored whether or not the data were consistent with a model of mediation whereby basic need satisfaction accounted for the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being. Although Waterman et al. (2008) provided evidence that hedonia should be experienced during activities in order for them to be associated with eudaimonic well-being, Huta and Ryan (2008) have also found that eudaimonia should be experienced during activities in order for them to be related to eudaimonic well-being. Both arguments can be applied to the current study with HEPA as the activity. In this case, HEPA

should be related to eudaimonic well-being when either hedonia or eudaimonia are experienced during HEPA. Including more than one independent variable in the prediction of eudaimonic well-being may be beneficial as this often increases the accuracy of prediction (Thomas, Nelson, & Silverman, 2005). Experiencing eudaimonia during HEPA will likely predict unique variance in eudaimonic well-being beyond experiencing hedonia during HEPA, as the activity itself will include elements of eudaimonia and thus be reflective of the dimensions of eudaimonic well-being. Beyond this, however, basic need satisfaction may nurture and promote eudaimonic well-being and therefore play an important role in the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being. Specifically, it was hypothesized that:

1. Experiencing eudaimonia during HEPA would moderate the relationship between HEPA and eudaimonic well-being, such that when experiencing eudaimonia during HEPA was high there would be a stronger positive relationship between HEPA and eudaimonic well-being than when experiencing eudaimonia during HEPA was low.
2. a) Experiencing eudaimonia during HEPA would predict unique variance in eudaimonic well-being beyond HEPA and experiencing hedonia during HEPA.  
b) Basic need satisfaction would mediate the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being<sup>2</sup>.

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<sup>2</sup> Since direct testing for causal mediation was inappropriate due to the limitations of cross-sectional designs (e.g., lack of a longitudinal design, cause-effect pathway, and temporal order of the variables; Baron & Kenny, 1986; Bauman, Sallis, Dzewaltowski, & Owen, 2002; Mathieu & Taylor, 2006), rather than claiming causal mediation, my analysis explored the concept of mediation in a cross-sectional design. Although this analysis did not designate basic need satisfaction as a true mediator in the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being, it assessed the extent to which the data were consistent with a model of mediation. The analysis provides particularly useful information for researchers to consider when constructing longitudinal designs in the future.

## CHAPTER 2

### 2.1 METHOD

#### 2.1.1 Overview of Design

The current study followed a cross-sectional design, meaning that participants were assessed at one time point on all variables. At the basic level, cross-sectional designs provide information regarding relationships among variables (Brown, Cozby, Kee, & Worden, 1999). Although there are some noted drawbacks to cross-sectional designs (e.g., cannot establish cause-effect pathway; Bauman et al., 2002), such designs have both practical and theoretical value. As a result of conducting research that follows a cross-sectional design, researchers generate hypotheses about possible causal relationships, identify potential mediators, and test theory which can eventually lead to theory modifications (Bauman et al.).

#### 2.1.2 Participants

Participants were 524 (men,  $n = 175$ ; women,  $n = 349$ ) undergraduate students who were enrolled in a first or second year course at the University of Saskatchewan (U of S). Age, height, and weight information, as well as year of university is summarized in Table 2.1. Information regarding college enrollment, marital status, and sociocultural background is presented in Table 2.2. Demographics revealed that a typical undergraduate student who participated in this study was a single, white, woman, approximately 20 years old, with a normal body mass index of 23.8 (height = 165.4 cm, weight = 65.2 kg), and enrolled in the College of Arts and Science.

Table 2.1

*Participant age, height, weight, and year of university*

	<i>N</i>	Reported Range	<i>M</i>	<i>SD</i>
Age	524	17-61 years	20.7 years	4.1 years
Men	175	17-51 years	20.9 years	3.7 years
Women	349	17-61 years	20.6 years	4.2 years
Did not report	0			
Height	524	149.9-200.7 cm	167.4 cm	9.1 cm
Men	175	154.9-195.6 cm	171.7 cm	11.2 cm
Women	349	149.9-200.7 cm	165.4 cm	6.6 cm
Did not report	0			
Weight	521	43.1-166.9 kg	70.4 kg	16.6 kg
Men	174	43.1-166.9 kg	80.7 kg	16.6 kg
Women	347	43.1-136.1 kg	65.2 kg	14.0 kg
Did not report	3			
Year of university	508	1-9 years	2.4 years	1.3 years
Men	169	1-9 years	2.4 years	1.5 years
Women	339	1-6 years	2.4 years	1.2 years
Did not report	16			

*Note.* Demographic data were self-reported.

Table 2.2

*Participant college enrollment, marital status, and sociocultural information*

	<i>n</i>	%
<b>College</b>		
Agriculture and Bioresources	11	2.1
Arts and Science	222	42.3
Commerce	68	13.0
Education	65	12.4
Engineering	38	7.3
Kinesiology	84	16.0
Pharmacy and Nutrition	3	0.6
Unknown/undeclared	21	4.0
Did not report	12	2.3
<b>Marital Status</b>		
Married/Common Law	40	7.6
Separated/Divorced	3	0.5
Single	474	90.5
Widowed	2	0.4
Did not report	5	1.0
<b>Sociocultural Information</b>		
Aboriginal	28	5.2
Black	2	0.4
Caucasian	471	86.9
Chinese	16	2.9
Filipino	1	0.2
Korean	1	0.2
South Asian	7	1.3
Southeast Asian	6	1.1
Did not report	10	1.8

*Note.* Participants could identify as belonging to more than one sociocultural category.

Participation in the study was voluntary. However, due to the length of the questionnaire package – and subsequent time commitment – participants were entered to win one of two \$100.00 gift certificates to the U of S bookstore. Participants were informed about the draw in the consent form, prior to making the decision to participate in the study. The compensation was intended to thank participants for their commitment to the study. The winners were randomly selected and notified via email.

### 2.1.3 Measures

#### 2.1.3.1 Demographics

In order to obtain general information about the sample, participants completed a short demographics questionnaire (see Appendix A). Participants self-reported age, gender, year in university, college, height, weight, sociocultural information, and marital status.

#### 2.1.3.2 Physical Activity

Participants' HEPA was measured using the Short Questionnaire to Assess Health-Enhancing Physical Activity (SQUASH; Wendel-Vos et al., 2003; see Appendix B). The SQUASH is a self-report measure consisting of questions that assess commuting activities, leisure time activities, household activities, and activities at work/school. The activities that are included in the SQUASH are based on their intensity (i.e., activities are  $\geq 4$  metabolic equivalent of task; MET) except for light household and work/school activities. Participants reported the frequency, duration, and intensity of physical activities engaged in a typical week. For example, participants indicated how many days per week they engaged in bicycling to/from work/school, the average time per day, and the effort expended during the activity.

The SQUASH was scored by calculating an activity score for each question in order to obtain a total activity score. Each activity was allocated into one of three intensity categories –

light, moderate, or vigorous – and given an intensity score (ranging from one to twelve) based on Ainsworth et al.'s (2000) allocation of MET intensities to various physical activities. For example, commuting by bicycle received an intensity score of three, four, or five depending on reported effort being slow, moderate, or fast. Total minutes of activity were calculated for each activity by multiplying frequency (number of days per week) by duration (number of minutes per day). An activity score for each question was then calculated by multiplying total minutes of activity by the intensity score. The sum of the activity scores from each question provided the total SQUASH score.

Research has demonstrated support for the validity and reliability of the SQUASH. To assess the construct validity of the SQUASH, Wendel-Vos et al. (2003) provided convergent validity evidence between it and more objective measures of physical activity. Reported activity levels from the SQUASH were found to be significantly related to readings from an activity accelerometer over a two-week period ( $r = .45, p < .005$ ). Wendel-Vos et al. also found the five-week test-retest reliability of the items on the SQUASH to range from .44 ( $p < .01$ ) to .96 ( $p < .01$ ), with intense household activities being the least reliable and commuting by bicycle the most reliable. As for the total activity score (i.e., composite), Spearman's reliability coefficient was .58 ( $p < .01$ ) over the five-week time-span. The SQUASH has been used to assess HEPA in various populations including overweight individuals (van Wier et al., 2006), patients with type 2 diabetes (Welschen et al., 2007), and general practice patients (van Sluijs et al., 2005). The SQUASH has also been used in "healthy" populations with individuals aged 15-30 years (Hosper, Klazinga, & Stronks, 2007).

### 2.1.3.3 Eudaimonic Well-being

The Scales of Psychological Well-Being (SPWB; Ryff & Keyes, 1995; see Appendix C) was used to assess participants' eudaimonic well-being. This 84-item, self-report instrument is comprised of six subscales, with each 14-item subscale assessing unique dimensions of eudaimonic well-being: Autonomy (e.g., "Being happy with myself is more important to me than having others approve of me"); Environmental Mastery (e.g., "I am good at juggling my time so that I can fit everything in that needs to get done"); Personal Growth (e.g., "With time, I have gained a lot of insight about life that has made me a stronger, more capable person"); Positive Relations with Others (e.g., "My friends and I sympathize with each other's problems"); Purpose in Life (e.g., "I am an active person in carrying out the plans I set for myself"); and Self-acceptance (e.g., "For the most part, I am proud of who I am and the life I lead"). Each subscale included an equal number of positively and negatively phrased items. Participants responded to each item using a six-point Likert scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Social desirability is not considered to be a major confound in literature on psychological well-being (Ryff, 1989). Responses to negatively-worded items were reversed for scoring procedures so that high scores indicated high self-ratings on the dimension assessed (e.g., a response of 2 *disagree somewhat* becomes 5 *agree somewhat*). Separate subscale scores were compiled, as well as a single composite score by taking the mean across all subscales. Scores on the scale, as well as the separate subscales, could have ranged from 1 to 6.

The development of the SPWB was guided by the construct-oriented approach to personality assessment (Ryff & Singer, 2008). High and low scorers were first defined for each dimension, with multiple independent writers composing descriptive items that fit with the definitions. Initial items were then scrutinized for face validity (e.g., redundancy of items, lack of distinctiveness, whether all aspects of the definitions were covered) and unacceptable items were

removed. The construct-oriented approach requires that each item correlates more highly with its own subscale than another subscale (Ryff & Singer). Items failing to meet this requirement were eliminated. This process was iterative (i.e., after an item was deleted from a subscale, the entire process was repeated given that each deleted item reconfigured the subscale) and ceased when each subscale was reduced to 20 items.

In the majority of her research, Ryff employs a shortened version of the scale consisting of 14-item subscales (e.g., Ryff & Essex, 1992; Ryff, Lee, Essex, & Schmutte, 1994; Ryff, Singer, & Love, 2004). Each 14-item subscale correlates strongly with its 20-item parent subscale (autonomy  $r = .97$ , environmental mastery  $r = .98$ , personal growth  $r = .97$ , positive relations with others  $r = .98$ , purpose in life  $r = .98$ , self-acceptance  $r = .99$ ; Ryff & Essex), and internal consistency coefficients for the 14-item subscales range from .83 to .91 (autonomy  $\alpha = .83$ , environmental mastery  $\alpha = .86$ , personal growth  $\alpha = .85$ , positive relations with others  $\alpha = .88$ , purpose in life  $\alpha = .88$ , self-acceptance  $\alpha = .91$ ; C. D. Ryff, personal communication, November 7, 2007). The scale has been validated in numerous samples including young, middle-aged, and older adults (Ryff, 1989); Japanese university students (Kitamura & Kishida, 2004); South Korean middle-aged adults (Keyes & Ryff, 2003); aging women who have experienced a community relocation (Kling, Ryff, & Essex, 1997); and American undergraduate students (Nave, Sherman, & Funder, 2007);

Past research has examined the factorial validity of the scale using confirmatory factor analysis (e.g., Cheng & Chan, 2005; Ryff & Keyes, 1995). In addition to examining the six-factor theoretical model, Ryff and Keyes assessed several other models that may provide a more parsimonious and straightforward explanation for the structure of the scale items (e.g., a model suggesting that individuals agree/disagree to the items to portray a positive image). Ryff and

Keyes found that the best-fitting model is the theory-guided six factor model. Another model which proposed that the six factors are caused by another latent construct (i.e., well-being) also fit the data well. This “superfactor model” provides support for the composite scale in that the subscales appear to be a function of a greater conceptual domain, psychological well-being (Ryff & Keyes).

Further validation of the SPWB comes from psychosocial correlates, such as identity status (Helson & Srivastava, 2001), social comparison processes (Heidrich & Ryff, 1993), and personality traits (Schmutte & Ryff, 1997). The subscales of the SPWB have also correlated with various biological markers such as neuroendocrine regulation (personal growth  $r_s = .21 - .29, p < .05$ ; purpose in life  $r = .29, p < .05$ ), HDL cholesterol (personal growth  $r = .17, p < .05$ ; purpose in life  $r = .22, p < .05$ ), and reduced levels of glycosylated hemoglobin (environmental mastery  $r = -.20, p < .05$ ; positive relations with others  $r = -.21, p < .01$ ; self-acceptance  $r = -.19, p < .05$ ; Ryff & Singer, 2008). Biological correlates are significant in that if eudaimonic well-being truly is the right way to live, presumably it will benefit neurobiological processes that underlie growth and development (Ryff & Singer).

### 2.1.3.4 Experiencing Hedonia and Eudaimonia during HEPA

Huta and Ryan’s (2008) Hedonic and Eudaimonic Motives for Activities scale (HEMA; see Appendix D) was used to assess the amount of hedonia and eudaimonia that participants experienced during HEPA. The HEMA scale is an eight-item, self-report measure that assesses the degree to which each form of well-being is experienced during an activity. An example item for experiencing eudaimonia is “Through your HEPA, how much are you doing something you believe in?” An example item for experiencing hedonia is “Through your HEPA, how much are you experiencing pleasure?” The measure is rated along a seven-point Likert scale ranging from

1 (*not at all*) to 7 (*very much*). Experiencing hedonia is captured with items 1, 3, 5, and 8, while experiencing eudaimonia is reflected in items 2, 4, 6, and 7. Separate scores for each form of well-being were obtained by taking the mean of the four hedonic items to produce a hedonic activity score and the mean of the four eudaimonic items to generate a eudaimonic activity score. Scores on each scale may range from 1 to 7, with high scores representing high levels of experiencing that form of well-being during HEPA<sup>3</sup>.

To provide support for the psychometric structure of the HEMA scale, Huta and Ryan (2008) performed exploratory principal components analysis. This analysis found a two-factor solution, with each item loading highest on the factor it was designed to represent. The results of the factor analysis provided convergent validity evidence between the items on the scale and each latent variable (i.e., hedonia and eudaimonia). Huta and Ryan have also provided support for the validity and reliability of the scale. With a sample of undergraduate students ( $N = 117$ ), internal consistency coefficients for the scale were  $\alpha = .85$  for eudaimonic items and  $\alpha = .89$  for hedonic items. Hedonic activity scores were significantly associated with positive affect ( $r = .86$ ,  $p < .01$ ), which lends support to the traditional hedonic nature of the hedonic items in the scale (i.e., hedonic well-being traditionally assesses positive affect). In contrast, eudaimonic activity scores were not associated with positive affect ( $r = .12$ ), providing discriminant validity between hedonic activity scores and eudaimonic activity scores. The eudaimonic items in the scale were,

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<sup>3</sup> Although the name of the measure includes the term *motives*, I believe that the scale assesses the extent to which eudaimonia and hedonia are *experienced* during activities. The original scale instructed participants to report what they were feeling during various activities (see Huta, 2005). Huta considers eudaimonia and hedonia to be motives and believes that the motives underlying actions are more important than the actions themselves (V. Huta, personal communication, April 21, 2008). To reflect this, Huta modified the scale instructions in later studies to refer to eudaimonia and hedonia as motives for doing an activity (i.e., “To what degree do you typically approach your activities with each of the following intentions”; Huta & Ryan, 2008). To clarify the instructions on the HEMA scale, (i.e., do they refer to “motives” or “experience”), a pilot study was conducted where participants ( $N = 37$ ) indicated what they were thinking about when completing the HEMA scale. Based on the findings, the HEMA scale will be interpreted as referring to what participants were experiencing during HEPA, while bearing in mind that a small proportion of participants might be reporting what they were motivated to do (see Appendix E).

however, strongly correlated with meaning in life ( $r = .43, p < .05$ ). Divergent evidence between eudaimonic and hedonic items on the scale was provided by non-significant within-person correlations ( $r_s = .05 - .10$ ), suggesting that eudaimonia and hedonia are independent at a given moment in time (Huta & Ryan).

#### 2.1.3.5 Hedonic Well-being

Participants completed the Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffen, 1985; see Appendix F), which is a five-item, self-report instrument designed to measure subjective evaluations of one's life. Using a seven-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), participants responded to statements addressing the satisfaction they have with their life (e.g., "So far I have gotten the important things I want in life"). The range of possible scores is from *minimal satisfaction with life* (5) to *very high satisfaction with life* (35). Diener et al. conducted a series of validation studies and demonstrated that the SWLS is a single factor, multi-item assessment of global life satisfaction that is appropriate for a variety of age groups, including university undergraduate students. Pavot, Diener, Colvin, and Sandvik (1991) found the scale to have good internal consistency with  $\alpha$  coefficients ranging from .63 to .77. Diener et al. provided convergent validity evidence for the SWLS by assessing the scales relationship with other measures of well-being such as the Delighted-Terrible Scale ( $r_s = .62 - .68$ ; Andrews & Withey, 1976) and the Gurin Scale ( $r_s = .59 - .62$ ; Gurin, Veroff, & Feld, 1960). Further convergent validity evidence for the SWLS has been found with external criteria, including a memory measure of satisfaction ( $r = .42$ ) and peer-reported life satisfaction ( $r = .54$ ; Pavot et al.).

The short form of the Positive and Negative Affect scale (PANAS; Watson, Clark, & Tellegen, 1988; see Appendix G) provided a second assessment of hedonic well-being. The

PANAS is a 20-item, self-report measure that assesses the intensity associated with one's positive and negative affect. The scale consists of two subscales; the positive affect subscale is comprised of 10 items that assess positive affect, and the negative affect scale includes 10 items that assess negative affect. Using a five-point Likert scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*), participants indicated the extent to which they generally experienced 20 different feelings and emotions (e.g., "inspired"). Separate scores were compiled for each subscale by summing the appropriate responses. Scores for each subscale may range from 0 to 50. High positive affect scores and low negative affect scores indicate high energy, full concentration, and engagement (Watson et al.). Principal factor analysis has shown that each item on the PANAS is an indicator of either positive affect or negative affect; that is, each item has a substantial loading on one factor (i.e., .40 or greater) but a near-zero loading on the other (i.e., less than .25; Watson et al.). The inter-correlation between the positive affect subscale and the negative affect subscale has been shown to be both negative and low ( $r = -.17, p < .05$ ; Watson et al.). Further validation of the PANAS stems from relationships between the positive affect subscale and other self-report measures of positive affect ( $r_s = .50 - .90, p < .05$ ), as well as associations between the negative affect subscale and other self-report measures of negative affect ( $r_s = .51 - .92, p < .05$ ). With a sample of 633 undergraduate students, Watson et al. found good internal consistency coefficients for both the positive affect subscale ( $\alpha = .88$ ) and the negative affect subscale ( $\alpha = .87$ ). Over an eight-week retest period, Watson et al. found the test-retest reliability to be .68 for the positive affect subscale and .71 for the negative affect subscale.

### 2.1.3.6 Psychological Needs in Physical Activity

The Psychological Need Satisfaction in Exercise scale (PNSE; Wilson, Rogers, et al., 2006; see Appendix H) was used to assess the extent to which participants' psychological needs

were satisfied by physical activity. Recognizing that there had been no attempt to measure the degree to which exercise contexts satisfy our three basic psychological needs, Wilson, Rogers, et al. designed the PNSE scale as a multidimensional instrument intended to measure perceived psychological need satisfaction in exercise. The PNSE scale consists of three subscales that address basic psychological needs: Competence (e.g., “I feel like I am capable of doing even the most challenging exercises”), Autonomy (e.g., “I feel like I have a say in choosing the exercises that I do”), and Relatedness (e.g., “I feel connected to the people who I interact with while we exercise together”). Each subscale consists of six items, for a total of 18-items. The 18 items were randomly ordered to reduce the potential for response set bias. Participants responded to each item using a six-point Likert scale ranging from 1 (*false*) to 6 (*true*). Separate subscale scores were compiled by averaging the items on each subscale, as well as a single composite score by taking the mean across all subscales. The composite score was used in the current study during hypothesis testing as this highlights the complementary nature of the three basic psychological needs (Hagger, Chatzisarantis, & Harris, 2006), and reflects the theoretical framework proposed by Ryan et al. (2008) as including all three basic psychological needs. Scores for the composite as well as the separate subscales can range from 1 to 6, which reflect the extent to which exercise satisfies competence, autonomy, and relatedness with higher scores representing greater satisfaction and lower scores signifying less satisfaction. Although basic need satisfaction has primarily been examined in exercise contexts, some research has explored basic need satisfaction in physical activity contexts and simply modified the wording on the PNSE scale to refer to the specific activity (e.g., dragon boat paddlers; McDonough, 2007). In a similar vein, the current study slightly modified the wording of the PNSE scale to refer to physical activity rather than structured exercise. For example, participants responded to the

phrase “I feel free to choose which physical activities I participate in” as opposed to “I feel free to choose which exercises I participate in”.

Wilson, Rogers, et al. (2006) developed the PNSE scale in two stages. Initially, personal accounts of need satisfying experiences were provided by a sample of 239 exercisers. Their responses were used in conjunction with self-determination theory (SDT; Deci & Ryan, 1985, 2002) to create a set of items for the scale. Next, 40 experts (i.e., self-determination theorists, exercise psychologists, and exercise instructors) rated the items for content relevance and representation, with adjustments made to the items based on the experts’ comments. As a result, the 18-item PNSE scale incorporates the need-satisfying experiences of exercisers with expert opinion regarding SDT and psychological need satisfaction.

The psychometric properties of the PNSE scale have been assessed, and the instrument has been rendered useful for examining psychological need satisfaction in exercise contexts (Wilson, Rogers, et al., 2006). Through use of exploratory factor analysis, Wilson, Rogers, et al. provided support for the three-factor model of the scale (i.e., competence, autonomy, relatedness). Wilson, Rogers, et al. found that competence accounts for 33.6% of the total variance and reflects the capability of meeting personally challenging exercises. Autonomy accounts for 19.3% of the total variance, with items loading on this factor reflecting volition, choice, and self-determining behaviour. Relatedness contains items representing feeling connected with others and accounts for 10.4% of the total variance. Wilson, Rogers, et al. found low to moderate correlations among the three factors ( $r_{\text{competence.autonomy}} = .46$ ,  $r_{\text{competence.relatedness}} = .18$ ,  $r_{\text{autonomy.relatedness}} = .09$ ), suggesting that the factors represent three distinct entities. Wilson, Rogers, et al. also found high internal consistency coefficients for all three PNSE subscales (competence  $\alpha = .91$ , autonomy  $\alpha = .91$ , relatedness  $\alpha = .90$ ).

With a sample of 581 undergraduate students, Wilson, Rogers, et al. (2006) provided evidence for the validity of the PNSE scale by correlating the subscales with three proxy measures. Correlations among all six measures showed that competence scores on the PNSE scale were most strongly associated with the Intrinsic Motivation Inventory's Perceived Competence subscale ( $r = .65$ ; Ryan, 1982); autonomy scores correlated most strongly with the Intrinsic Motivation Inventory's Perceived Choice subscale ( $r = .32$ ); and, relatedness scores were most strongly related with the Affiliation subscale of the Exercise Motivation Inventory-2 ( $r = .48$ ; Markland & Ingledew, 1997). These results reveal convergent validity between the PNSE subscales and conceptually similar assessments of need satisfaction.

#### 2.1.4 Procedure

After obtaining approval from the Behavioural Research Ethics Board (see Appendix I), as well as approval from course professors at the U of S, I visited classes to invite undergraduate students to participate in my study. Participants were informed about the purpose and procedures of the study, provided with an opportunity to ask questions, and invited to complete an online web-based questionnaire package consisting of an informed consent form (see Appendix J), the demographics questionnaire, the SQUASH, the SPWB, the HEMA scale, measures of hedonic well-being, and the PNSE scale<sup>4</sup>.

Potential participants provided me with their U of S email address in order for an email to be sent that contained a secure link to the online web-based survey. The online web-based

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<sup>4</sup> The current study belonged to a larger study, funded by the Social Sciences and Humanities Research Council of Canada, entitled *Health-Enhancing Physical Activity: A Means to Eudaimonic Well-being?* (principal investigator D. Mack). The larger study longitudinally tracked cohort-based changes in HEPA and eudaimonic well-being among university students at three different institutions (U of S, Brock University, and University of British Columbia) at three time periods over a period of 12 months. Participants at the U of S were recruited through first- and second-year courses in an attempt to ensure that participants were university students at all three periods of data collection. Although participants were asked to provide their U of S email address in the questionnaire package, this was only used as a means to contact them for additional periods of data collection within the larger study. After participants had been contacted for the larger study, all email addresses were removed from the data file.

questionnaire package, taking an average of 31 minutes and 50 seconds to complete, could be completed at a computer and location of the participants' choosing. Participant recruitment and survey completion occurred over a 5-week time period, spanning the last week of September 2008 to the end of October 2008. Participation was voluntary, and participants were informed that participation in the study would have no effect on their academic standing. It was made clear that participants could withdraw at any time without penalty by closing their web-browser. Personal responses were kept confidential, as results were reported in aggregate form so it was not possible to identify individuals. Although not expected or reported, participants were provided with contact information for the U of S Student Counseling Services in the event that participants wanted to further discuss their feelings regarding issues presented in the study.

### 2.1.5 Data Analyses

Pearson correlation was used to examine the bivariate relationships among all of the variables in the study (i.e., HEPA, eudaimonic well-being, experiencing eudaimonia during HEPA, experiencing hedonia during HEPA, basic need satisfaction, and the indices of hedonic well-being). Various relationships were explored to address previous claims in the literature (e.g., relationship between health behaviours and eudaimonic well-being; Ryff & Singer, 2008), to compare findings from the current study with previous research findings (e.g., relations between eudaimonic well-being, hedonic well-being, experiencing eudaimonia during HEPA, and experience hedonia during HEPA), as well as to expand on previous research findings (e.g., relations between well-being and basic need satisfaction). Internal consistency of the measures was examined using Cronbach's alpha.

To test the moderating effects of experiencing eudaimonia during HEPA on the relationship between HEPA and eudaimonic well-being (Hypothesis 1), hierarchical regression

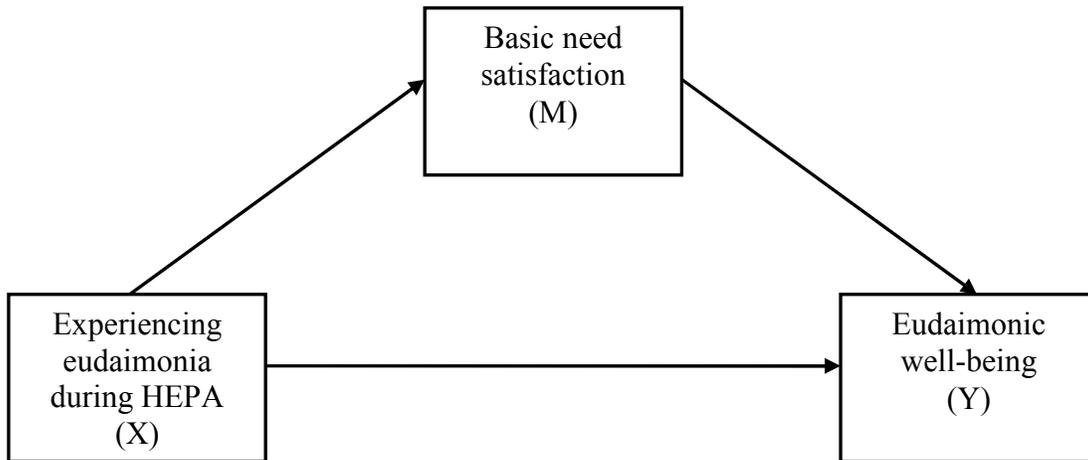
was employed. Examining the interaction effect presents the possibility of finding significant relationships that may otherwise go undetected in simple regression models (Aiken & West, 1991). With eudaimonic well-being as the criterion variable, HEPA and experiencing eudaimonia during HEPA were entered into the regression equation on Step 1, and the interaction between HEPA and experiencing eudaimonia during HEPA was entered on Step 2. This analysis tested to see if the interaction term was a significant predictor of eudaimonic well-being, and subsequently if the relationship between HEPA and eudaimonic well-being changed linearly with respect to the interaction variable (Baron & Kenny, 1986).

Hierarchical regression was also employed to address the hypothesis that experiencing eudaimonia during HEPA would predict unique variance in eudaimonic well-being beyond HEPA and experiencing hedonia during HEPA (Hypothesis 2a). With eudaimonic well-being as the criterion variable, HEPA and experiencing hedonia during HEPA were entered into the regression equation on Step 1, and experiencing eudaimonia during HEPA was entered on Step 2. The regression analysis specified which of the variables were significant predictors of eudaimonic well-being and indicated if experiencing eudaimonia during HEPA explained variance beyond HEPA and experiencing hedonia during HEPA.

To explore the potential mediating role of basic need satisfaction in the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being (Hypothesis 2b), an exploratory test of correlational mediation via hierarchical multiple regression took place (James & Brett, 1984). The predictor variables were entered into the regression equation based on the framework put forth by Ryan et al. (2008) that eudaimonic well-being results from eudaimonic activities that satisfy our basic psychological needs (see Figure 2.1). Experiencing eudaimonia during HEPA (X) was entered into the regression equation at Step 1, basic need satisfaction (M)

Figure 2.1

*Hypothesized mediation model of experiencing eudaimonia during HEPA and eudaimonic well-being as mediated by basic need satisfaction*



was entered at Step 2, and eudaimonic well-being (Y) was the criterion variable. Step 1 determined whether or not experiencing eudaimonia during HEPA (X) was a significant predictor of eudaimonic well-being (Y); that is, if the covariance between Y and X (i.e.,  $R^2_{y \cdot x}$ ) was significant. Step 2 indicated whether or not basic need satisfaction (M) added uniquely to the prediction of Y in relation to X; that is, if  $R^2_{y \cdot mx}$  was significantly greater than  $R^2_{y \cdot x}$ .

Due to the cross-sectional design of this study, and exploratory nature of Hypothesis 2b, a second analysis was carried out to further explore the potential mediating role of basic need satisfaction. As the first analysis was correlational in nature, a formal mediation analysis was carried out – albeit with cross-sectional data – to see if the data were consistent with a model of mediation following a proper mediation analysis. This additional analysis was intended to provide further evidence as to whether or not the data were consistent with a model of mediation, and thus, more confidence as to whether or not basic need satisfaction may act as a potential mediator. Both mediation analyses assessed the extent to which the data were consistent with a model of mediation; neither were intended to infer direct support for causal mediation. The second analysis consisted of multiple regression used in conjunction with Baron and Kenny's (1986) guidelines for testing mediation. Baron and Kenny outlined four steps that must be met in order for a mediation hypothesis to be supported. In Step 1, X is entered as the predictor variable in the regression equation and Y is entered as the criterion variable. Step 1 tests whether or not X is correlated with Y to establish that there is an effect to be mediated. In Step 2, X is entered as the predictor variable in the regression equation and M is entered as the criterion variable. In Step 3, X and M are entered into the regression equation as predictor variables and Y is entered as the criterion variable. This step tests the effect of M on Y while controlling for X. Step 4 aims to establish that M completely mediates the X-Y relationship, if the unstandardized Beta

coefficient of X is zero when M is controlled (note that Step 3 and Step 4 are estimated in the same regression equation). Partial mediation can also occur, whereby the unstandardized Beta coefficient of X in Step 4 is reduced in size, but is still different from zero when M is controlled (Frazier, Tix, & Barron, 2004)<sup>5</sup>.

In addition to the abovementioned hypothesis testing, an exploratory analysis was conducted whereby all of the hypotheses were re-analyzed using each dimension of eudaimonic well-being as the criterion variable. In addition to using the composite of eudaimonic well-being, Ryff has used the separate subscales to compare how each dimension is associated with different measures of well-being (e.g., positive affect, depression; Ryff, 1989), to assess age differences for each dimension (Ryff & Keyes, 1995), and to examine the biological correlates of each dimension (e.g., neuroendocrine, immune; Ryff et al., 2004). The hypotheses were re-analyzed in the current study with each dimension of eudaimonic well-being to see if the results varied by dimension.

Prior to interpreting the regression analyses, the variables were examined to test the assumptions of normality, linearity, multicollinearity, and homoscedasticity of residuals. Normality was assessed by examining the distribution of the variables and the histograms of the standardized residuals (Tabachnick & Fidell, 2001; Stevens, 1992). Standardized residuals  $> 3$  and leverage values  $> 3(p)/n$  indicated potential outliers and subsequent problems with normality (Stevens). Linearity and homoscedasticity were examined through the scatterplots of the residuals. Significance was set at  $p < .05$  for all analyses.

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<sup>5</sup> Unstandardized Beta coefficients are reported for the formal mediation analysis, whereas standardized Beta coefficients are reported for the correlational mediation analysis.

## CHAPTER 3

## 3.1 RESULTS

The purpose of this study was to explore the potential moderating role of experiencing eudaimonia during HEPA in the relationship between HEPA and eudaimonic well-being. Additionally, this study explored whether or not the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being was mediated by basic need satisfaction.

## 3.1.1 Scale Reliabilities and Descriptive Statistics

Descriptive statistics and internal consistency scale reliabilities for the SQUASH, SPWB, HEMA scale, and PNSE scale are reported in Table 3.1 (measures of hedonic well-being are also included). The majority of scales and subscales had acceptable internal consistency, with Cronbach's alpha values ranging from  $\alpha = .74$  to  $.94$ . Although the SQUASH had lower internal consistency as reflected by Cronbach's alpha ( $\alpha = .58$ ), Spearman's reliability coefficient for the total activity score ( $r_{\text{Spearman}} = 0.62$ ) mirrors that of previous research ( $r_{\text{Spearman}} = 0.58$ ; Wendel-Vos et al., 2003).

## 3.1.2 Missing Data and Evaluation of Assumptions

Prior to statistical analysis, the data were cleaned and examined for missing data points. Participants with more than two missing data points were deleted from the data set ( $n = 44$ ). Additionally, participants who were missing two data points that were from the same subscale

Table 3.1

*Descriptive statistics and scale reliabilities for HEPA (SQUASH), eudaimonic well-being (SPWB), experiencing hedonia and eudaimonia during HEPA (HEMA), and basic need satisfaction (PNSE)*

Variable	# Items	Scale Range <sup>a</sup>	Mean	SD	Reliability $\alpha$
HEPA (SQUASH) <sup>b</sup>	14		7208.65	10100.29	.58
Eudaimonic well-being (SPWB)	84	1-6	4.68	0.57	.87
Autonomy	14	1-6	4.35	0.77	.85
Environmental mastery	14	1-6	4.38	0.74	.85
Personal growth	14	1-6	5.04	0.56	.81
Positive relations with others	14	1-6	4.77	0.81	.87
Purpose in life	14	1-6	4.88	0.71	.87
Self-acceptance	14	1-6	4.66	0.84	.90
Experiencing hedonia and eudaimonia during HEPA (HEMA)					
Experiencing eudaimonia during HEPA	4	1-7	5.00	1.24	.86
Experiencing hedonia during HEPA	4	1-7	4.98	1.05	.78
Basic need satisfaction (PNSE)	18	1-6	4.83	0.83	.74
Autonomy	6	1-6	5.27	0.77	.91
Competence	6	1-6	4.69	1.01	.94
Relatedness	6	1-6	4.51	1.16	.93
Hedonic well-being					
SWLS	5	1-35	25.28	5.94	.87
PANAS positive subscale	10	0-50	35.27	6.08	.84
PANAS negative subscale	10	0-50	19.78	6.04	.83

*Note.* <sup>a</sup>Scale Range refers to the lowest and highest possible score on each scale. <sup>b</sup>There is no standard scale range for the SQUASH as scores vary depending on intensity and time per day. *HEPA* refers to Health-Enhancing Physical Activity. *SQUASH* refers to the Short Questionnaire to Assess Health-Enhancing Physical Activity. *SPWB* refers to the Scales of Psychological Well-Being. *HEMA* refers to the Hedonic and Eudaimonic Motives for Activities Scale. *PNSE* refers to the Psychological Need Satisfaction in Exercise Scale. *SWLS* refers to the Satisfaction With Life Scale. *PANAS* refers to the Positive and Negative Affect Scale.

were deleted from the data set ( $n = 4$ ). This resulted in the elimination of 48 participants, resulting in a final sample size of 524 participants. Participants with one or two missing data points (multiple missing data points were not from the same subscale) were retained and within-person mean substitution was used to estimate the missing value (Tabachnick & Fidell, 2001). Mean substitution is a conservative procedure, as the mean for the distribution as a whole does not change (Tabachnick & Fidell). Among my sample, 111 participants were missing one data point and 16 participants were missing two data points that were not from the same subscale. Within-person subscale means were calculated from available data and used to replace missing values prior to data analysis. The SPWB had 47 data points mean replaced, the HEMA scale had 7 data points mean replaced, the PNSE scale had 49 data points mean replaced, the SWLS had 3 data points mean replaced, and the PANAS had 37 data points mean replaced.

Prior to statistical analysis, the data were examined for violations of normality on each scale and subscale distribution. Only the SPWB autonomy subscale distribution was normally distributed (see Table 3.2). The majority of non-parametric distributions were negatively skewed (i.e., 14 distributions) and two distributions were positively skewed. Additionally, six distributions were leptokurtic. The SQUASH distribution had substantial violations of normality, displaying both large positive skewness and large positive kurtosis. As recommended by Tabachnick and Fidell (2001), the distributions of the non-parametric scales and subscales were normalized using square root, logarithmic, and inverse transformations. When compared to the results without data transformations, the appropriate data transformations did not substantially change the results of data analysis or any conclusions that were made. Therefore, all results are reported with the original scale distributions.

Table 3.2

*Skewness and kurtosis information for all scales and subscales*

Variable	$Z_{\text{skewness}}$ <i>Std. error = 0.107</i>	$Z_{\text{kurtosis}}$ <i>Std. error = 0.213</i>
HEPA (SQUASH)	37.80*	102.57*
Eudaimonic well-being (SPWB)	-4.83*	1.32
Autonomy	-1.51	0.54
Environmental mastery	-4.30*	1.79
Personal growth	-5.93*	0.66
Positive relations with others	-7.06*	1.03
Purpose in life	-7.11*	1.51
Self-acceptance	-6.94*	1.52
Experiencing hedonia and eudaimonia during HEPA (HEMA)		
Experiencing eudaimonia during HEPA	-4.00*	-1.18
Experiencing hedonia during HEPA	-3.89*	-1.32
Basic need satisfaction (PNSE)	-8.44*	3.71*
Autonomy	-13.08*	12.38*
Competence	-8.85*	3.07*
Relatedness	-8.79*	2.77*
Hedonic well-being		
SWLS	-7.88*	1.76
PANAS positive subscale	-2.66*	-0.85
PANAS negative subscale	7.35*	4.03*

*Note.* Skewness and kurtosis values were divided by their standard error to obtain a z-value, as recommended by Tabachnick and Fidell (2001). Resulting values of +/-1.96 are determined as being significantly skewed or kurtotic and are marked by asterisks. *HEPA* refers to Health-Enhancing Physical Activity. *SQUASH* refers to the Short Questionnaire to Assess Health-Enhancing Physical Activity. *SPWB* refers to the Scales of Psychological Well-Being. *HEMA* refers to the Hedonic and Eudaimonic Motives for Activities Scale. *PNSE* refers to the Psychological Need Satisfaction in Exercise Scale. *SWLS* refers to the Satisfaction With Life Scale. *PANAS* refers to the Positive and Negative Affect Scale.

Adhering to the recommendations of Tabachnick and Fidell (2001), outliers were identified in the data set as a standard score greater than  $\pm 3.29$  standard deviations above or below the mean on any of the scales and subscales. There were 27 outliers in the data set. After outliers were identified, they were truncated at  $\pm 3.29$  standard deviations above or below the mean on each scale and subscale. As multiple regression is robust against substantial departures of normality (Vincent, 2005), the adjusted outliers did not significantly change the results of data analysis (when compared to the results without outliers adjusted). Therefore, all results are reported with no adjustment to outliers.

The data were also screened for multicollinearity prior to interpreting the regression analyses. Collinearity statistics indicated that multicollinearity was not an issue as tolerance values were greater than 0.100 and variance inflation factors were less than 10.000 (Stevens, 1992; Vincent, 2005).

### 3.1.3 Correlations

The correlations among HEPA, eudaimonic well-being, experiencing hedonia during HEPA, experiencing eudaimonia during HEPA, and basic need satisfaction are presented in Table 3.3 (measures of hedonic well-being are also included). While HEPA and eudaimonic well-being did not exhibit a significant relationship ( $r = .05, p = .24$ ), experiencing eudaimonia during HEPA ( $r = .37, p < .01$ ), experiencing hedonia during HEPA ( $r = .40, p < .01$ ), and basic need satisfaction ( $r = .46, p < .01$ ) were positively related to eudaimonic well-being. Eudaimonic well-being was also positively related to two of the hedonic well-being measures (SWLS  $r = .71, p < .01$ ; PANAS positive subscale  $r = .66, p < .01$ ), and negatively related to one of the hedonic well-being measures (PANAS negative subscale  $r = -.62, p < .01$ ). All three measures of hedonic well-being were related to experiencing hedonia during HEPA (SWLS  $r = .39, p < .01$ ; PANAS

Table 3.3

*Pearson product moment correlations for HEPA, eudaimonic well-being, experiencing eudaimonia during HEPA, experiencing hedonia during HEPA, basic need satisfaction, and hedonic well-being*

Variable	1.	2a.	2b.	2c.	2d.	2e.	2f.	2g.	3a.	3b.	4a.	4b.	4c.	4d.	5a.	5b.	5c.
1. HEPA (SQUASH)	---																
2a. Eudaimonic well-being (SPWB)	.05	---															
2b. Autonomy	.04	.64**	---														
2c. Environmental mastery	.03	.84**	.45**	---													
2d. Personal growth	.06	.72**	.40**	.50**	---												
2e. Positive relations with others	.06	.73**	.29**	.54**	.44**	---											
2f. Purpose in life	.01	.84**	.38**	.69**	.59**	.49**	---										
2g. Self-acceptance	.04	.89**	.45**	.72**	.56**	.61**	.76**	---									
Experiencing hedonia and eudaimonia during HEPA (HEMA)																	
3a. Experiencing eudaimonia during HEPA	.22**	.37**	.14**	.30**	.32**	.20**	.38**	.41**	---								
3b. Experiencing hedonia during HEPA	.14**	.40**	.20**	.38**	.27**	.26**	.32**	.42**	.66**	---							
4a. Basic need satisfaction (PNSE)	.24**	.46**	.22**	.42**	.37**	.31**	.39**	.43**	.57**	.50**	---						
4b. Autonomy	.10*	.46**	.31**	.40**	.38**	.30**	.39**	.40**	.35**	.38**	.73**	---					
4c. Competence	.26**	.38**	.20**	.38**	.32**	.17**	.33**	.36**	.52**	.42**	.87**	.55**	---				
4d. Relatedness	.20**	.31**	.07	.28**	.23**	.30**	.26**	.32**	.49**	.41**	.83**	.38**	.56**	---			
Hedonic well-being																	
5a. SWLS	.05	.71**	.27**	.63**	.41**	.53**	.63**	.79**	.37**	.39**	.38**	.33**	.29**	.32**	---		
5b. PANAS positive subscale	.14**	.66**	.34**	.57**	.48**	.47**	.61**	.62**	.49**	.46**	.50**	.42**	.46**	.35**	.56**	---	
5c. PANAS negative subscale	.07	-.62**	-.45**	-.59**	-.38**	-.39**	-.46**	-.58**	-.08	-.17**	-.23**	-.24**	-.20**	-.14**	-.43**	-.29**	---

Table 3.3 continued

*Note.* \*  $p < .05$ . \*\*  $p < .01$ . *HEPA* refers to Health-Enhancing Physical Activity. *SQUASH* refers to the Short Questionnaire to Assess Health-Enhancing Physical Activity. *SPWB* refers to the Scales of Psychological Well-Being. *HEMA* refers to the Hedonic and Eudaimonic Motives for Activities Scale. *PNSE* refers to the Psychological Need Satisfaction in Exercise Scale. *SWLS* refers to the Satisfaction With Life Scale. *PANAS* refers to the Positive and Negative Affect Scale.

positive subscale  $r = .46, p < .01$ ; PANAS negative subscale  $r = -.17, p < .01$ ); and two measures of hedonic well-being were related to experiencing eudaimonia during HEPA (SWLS  $r = .37, p < .01$ ; PANAS positive subscale  $r = .49, p < .01$ ). Experiencing hedonia during HEPA was positively related to experiencing eudaimonia during HEPA ( $r = .66, p < .01$ ).

### 3.1.4 Tests of Hypotheses<sup>6</sup>

#### 3.1.4.1 Hypothesis 1 – Moderation/Interaction effects of experiencing eudaimonia during HEPA

The first hypothesis predicted that experiencing eudaimonia during HEPA would moderate the relationship between HEPA and eudaimonic well-being. A hierarchical regression analysis did not provide support for this hypothesis. On Step 1, HEPA was not a significant predictor of eudaimonic well-being, while experiencing eudaimonia during HEPA was a significant predictor ( $\beta = .38, p < .01$ ). The interaction term (i.e., the interaction between HEPA and experiencing eudaimonia during HEPA) was not a significant predictor on Step 2. That is,

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<sup>6</sup> In addition to the reported hypothesis testing, an exploratory analysis was also conducted whereby the hypotheses were re-analyzed separately for men and women – using each dimension of eudaimonic well-being as the criterion variable. The gender analyses were conducted on the basis that men tend to have greater participation in physical activity than women (Anderssen et al., 1996; Caspersen et al., 2000; Trost et al., 2002). Thus, gender analyses explored if the typically different physical activity levels between men and women influenced the results of the current study. Little differences were anticipated between genders as previous research has found that men and women tend to differ on only two of the six dimensions of eudaimonic well-being (i.e., positive relatedness and personal growth; Ryff, 1989; Ryff & Keyes, 1995). Although there were significant differences between men and women on many of the variables in this study (see Table 3.4), there were no structural changes in hypothesis testing as, in general, hypothesis testing for men did not differ from hypothesis testing for women. Hypothesis 1 was not supported when analyzed separately for men and women. Hypothesis 2a was supported when analyzed separately for men and women. Results showed that for men, experiencing eudaimonia during HEPA explained between 2.1% and 8.8% unique variance in eudaimonic well-being and three dimensions of eudaimonic well-being (i.e., personal growth, purpose in life, self-acceptance), with the full models accounting for between 16.7% and 25.0% of the variance. For women, experiencing eudaimonia during HEPA accounted for between 2.1% and 3.7% unique variance in eudaimonic well-being and the same three dimensions of eudaimonic well-being, with the full models accounting for between 9.0% and 21.0% of the variance. Experiencing eudaimonia during HEPA did not predict unique variance in autonomy, environmental mastery, and positive relations with others for both men and women. Support was provided for Hypothesis 2b when analyzed separately for men and women; the data were consistent with a model of partial mediation with five dimensions of eudaimonic well-being for men (i.e., the data did not satisfy all conditions of mediation when autonomy was applied as the criterion variable) and all six dimensions for women.

Table 3.4

*Analysis of mean differences between men and women for HEPA, eudaimonic well-being, experiencing eudaimonia during HEPA, experiencing hedonia during HEPA, basic need satisfaction, and hedonic well-being*

	Men ( <i>n</i> = 175)		Women ( <i>n</i> = 349)		<i>t</i>
	M	SD	M	SD	
HEPA (SQUASH)	8706.51	11280.32	6457.57	9380.84	2.27*
Eudaimonic well-being (SPWB)	4.66	0.61	4.69	0.56	-0.60
Autonomy	4.45	0.78	4.30	0.76	2.04*
Environmental mastery	4.43	0.78	4.35	0.72	1.17
Personal growth	5.01	0.61	5.05	0.54	-0.74
Positive relations with others	4.65	0.86	4.84	0.78	-2.41*
Purpose in life	4.77	0.77	4.94	0.67	-2.52*
Self-acceptance	4.65	0.90	4.67	0.82	-0.33
Experiencing hedonia and eudaimonia during HEPA (HEMA)					
Experiencing eudaimonia during HEPA	5.18	1.26	4.90	1.23	2.46*
Experiencing hedonia during HEPA	5.24	1.06	4.85	1.02	4.09**
Basic need satisfaction (PNSE)	5.00	0.80	4.74	0.83	3.38**
Hedonic well-being					
SWLS	24.79	6.36	25.52	5.72	-1.33
PANAS positive subscale	35.71	5.80	35.05	6.21	1.18
PANAS negative subscale	19.26	6.07	20.04	6.03	-1.40

*Note.* \*  $p < .05$ . \*\*  $p < .01$ . HEPA refers to Health-Enhancing Physical Activity. SQUASH refers to the Short Questionnaire to Assess Health-Enhancing Physical Activity. SPWB refers to the Scales of Psychological Well-Being. HEMA refers to the Hedonic and Eudaimonic Motives for Activities Scale. PNSE refers to the Psychological Need Satisfaction in Exercise Scale. SWLS refers to the Satisfaction With Life Scale. PANAS refers to the Positive and Negative Affect Scale.

there was not a significant  $\Delta R^2$  on Step 2 when the interaction term was included. Therefore, the relationship between HEPA and eudaimonic well-being was not moderated by experiencing eudaimonia during HEPA (see Table 3.5). This hypothesis was also not supported when each individual dimension of eudaimonic well-being was applied as the criterion variable (i.e., exploratory analyses)<sup>7</sup>. A summary of these analyses is presented in Table 3.6.

#### 3.1.4.2 Hypothesis 2.a. – Unique variance accounted for by experiencing eudaimonia during HEPA

Experiencing eudaimonia during HEPA was expected to predict unique variance in eudaimonic well-being beyond HEPA and experiencing hedonia during HEPA. A hierarchical regression analysis supported this hypothesis. Experiencing eudaimonia during HEPA explained 2.2% variance beyond HEPA and experiencing hedonia during HEPA, with the full model accounting for 18.2% of the variance (see Table 3.7).

Similar results were found when predicting three of the six dimensions of eudaimonic well-being (i.e., personal growth, purpose in life, and self-acceptance). The full models for these three dimensions accounted for between 10.6% and 21.5% of the variance. Experiencing eudaimonia during HEPA explained an additional 3.3% to 5.4% variance beyond HEPA and experiencing hedonia during HEPA for models in which there was a significant  $\Delta R^2$  in Step 2.

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<sup>7</sup> There is a debate in the literature as to whether or not predictor variables should be mean-centered prior to running an analysis for a moderator effect (i.e., variables are transformed into deviation units by subtracting their sample means to produce revised sample means of zero; see Gatignon & Vosgerau, 2005; Jaccard, Wan, & Turrissi, 1990; Kromrey & Foster-Johnson, 1998). Some researchers advocate for mean-centering, as it reduces the multicollinearity among the variables in the regression equation (Frazier et al., 2004; Jaccard et al.). Other researchers argue that mean-centering does not affect the statistical tests for moderator effects, that the results obtained with centered and raw data are equivalent, and thus conclude that mean-centering is not necessary (Gatignon & Vosgerau; Kromrey & Foster-Johnson). To explore if the results from my moderator analysis differed with mean-centered variables, I re-ran the moderator analysis after mean-centering the predictor variables. The standardized Beta coefficient for the interaction term decreased in the mean-centered analysis. However, for both the mean-centered analysis and the raw data analysis,  $R = .376$ ,  $R^2 = .141$ ,  $\Delta R^2 = .001$ ,  $B = 2.29$  (unstandardized Beta coefficient for interaction term),  $t = .932$  (for interaction term), and  $p = .35$ . The interaction term was not a significant predictor and there was not a significant  $\Delta R^2$  when the interaction term was included on Step 2. Thus, the moderator hypothesis was not supported when using centered or raw data.

Table 3.5

*Summary of the multiple regression analysis exploring the interaction effect of experiencing eudaimonia during HEPA on the relationship between HEPA and eudaimonic well-being*

Dependent Variable	Predictor Variable	$\beta$	$R^2$	$\Delta R^2$
Eudaimonic well-being (SPWB)	Step 1		.140**	.140**
	HEPA (SQUASH)	-.033		
	Experiencing eudaimonia during HEPA (HEMA)	.380**		
	Step 2		.141	.001
	HEPA(SQUASH)	-.260		
	Experiencing eudaimonia during HEPA (HEMA)	.355**		
	Interaction Term	.238		

*Note.* \*\*  $p < .01$ . *SPWB* refers to the Scales of Psychological Well-Being. *HEPA* refers to Health-Enhancing Physical Activity. *SQUASH* refers to the Short Questionnaire to Assess Health-Enhancing Physical Activity. *HEMA* refers to Hedonic and Eudaimonic Motives for Activities Scale.

Table 3.6

*Summary of the multiple regression analyses exploring the interaction effect of experiencing eudaimonia during HEPA on the relationship between HEPA and each dimension of eudaimonic well-being*

Dependent Variable	Predictor Variable	$\beta$	$R^2$	$\Delta R^2$
Autonomy	Step 1		.021**	.021**
	HEPA (SQUASH)	.007		
	Experiencing eudaimonia during HEPA (HEMA)	.144**		
	Step 2		.021	.000
	HEPA(SQUASH)	-.070		
	Experiencing eudaimonia during HEPA (HEMA) Interaction Term	.135* .080		
Environmental mastery	Step 1		.086**	.086**
	HEPA (SQUASH)	-.038		
	Experiencing eudaimonia during HEPA (HEMA)	.300**		
	Step 2		.088	.001
	HEPA(SQUASH)	-.242		
	Experiencing eudaimonia during HEPA (HEMA) Interaction Term	.277** .213		
Personal growth	Step 1		.099**	.099**
	HEPA (SQUASH)	-.010		
	Experiencing eudaimonia during HEPA (HEMA)	.317**		
	Step 2		.101	.001
	HEPA(SQUASH)	-.241		
	Experiencing eudaimonia during HEPA (HEMA) Interaction Term	.291** .241		

Table 3.6 continued

Dependent Variable	Predictor Variable	$\beta$	$R^2$	$\Delta R^2$
Positive relations with others	Step 1		.041**	.041**
	HEPA (SQUASH)	.013		
	Experiencing eudaimonia during HEPA (HEMA)	.199**		
	Step 2		.041	.000
	HEPA(SQUASH)	-.045		
	Experiencing eudaimonia during HEPA (HEMA) Interaction Term	.192** .061		
Purpose in life	Step 1		.151**	.151**
	HEPA (SQUASH)	-.075		
	Experiencing eudaimonia during HEPA (HEMA)	.398**		
	Step 2		.154	.003
	HEPA(SQUASH)	-.403		
	Experiencing eudaimonia during HEPA (HEMA) Interaction Term	.361** .343		
Self-acceptance	Step 1		.173**	.173**
	HEPA (SQUASH)	-.050		
	Experiencing eudaimonia during HEPA (HEMA)	.425**		
	Step 2		.175	.001
	HEPA(SQUASH)	-.246		
	Experiencing eudaimonia during HEPA (HEMA) Interaction Term	.403** .204		

Table 3.6 continued

*Note.* \*  $p < .05$ . \*\*  $p < .01$ . Applying each eudaimonic well-being dimension as the criterion variable were exploratory analyses. *SPWB* refers to the Scales of Psychological Well-Being. *HEPA* refers to Health-Enhancing Physical Activity. *SQUASH* refers to the Short Questionnaire to Assess Health-Enhancing Physical Activity. *HEMA* refers to the Hedonic and Eudaimonic Motives for Activities Scale.

Table 3.7

*Summary of the hierarchical regression analysis exploring the influence of experiencing eudaimonia during HEPA beyond HEPA and experiencing hedonia during HEPA on eudaimonic well-being*

Criterion Variable	Predictor Variable	$\beta$	$R^2$	$\Delta R^2$
Eudaimonic well-being (SPWB)	Step 1		.160**	.160**
	HEPA (SQUASH)	-.003		
	Experiencing hedonia during HEPA (HEMA)	.401**		
	Step 2		.182**	.022**
	HEPA(SQUASH)	-.030		
	Experiencing hedonia during HEPA (HEMA)	.273**		
	Experiencing eudaimonia during HEPA (HEMA)	.200**		

*Note.* \*\*  $p < .01$ . *SPWB* refers to the Scales of Psychological Well-Being. *HEPA* refers to Health-Enhancing Physical Activity. *SQUASH* refers to the Short Questionnaire to Assess Health-Enhancing Physical Activity. *HEMA* refers to Hedonic and Eudaimonic Motives for Activities Scale.

Although experiencing hedonia during HEPA was a significant predictor of autonomy, environmental mastery, and positive relations with others; experiencing eudaimonia during HEPA did not predict unique variance beyond HEPA and experiencing hedonia during HEPA in these models. A summary of these analyses is presented in Table 3.8.

#### 3.1.4.3 Hypothesis 2.b. – Potential mediating role of basic need satisfaction

It was expected that the data would be consistent with a model in which basic need satisfaction mediates the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being. An exploratory test of correlational mediation via hierarchical multiple regression (James & Brett, 1984) provided support for this hypothesis. Step 1 showed that experiencing eudaimonia during HEPA was a significant predictor of eudaimonic well-being ( $\beta = .37, p < .01$ ). Hence, the covariance between experiencing eudaimonia during HEPA and eudaimonic well-being was significant ( $R^2_{y \cdot x} = .14, p < .01$ ). Step 2 showed that basic need satisfaction added uniquely to the prediction of eudaimonic well-being ( $\beta = .36, \Delta R^2 = .09, p < .01$ ) in relation to experiencing eudaimonia during HEPA, and the covariance at Step 2 ( $R^2_{y \cdot mx} = .23, p < .01$ ) was greater than the covariance at Step 1. Therefore, the results support a correlational form of mediation (James & Brett; see Table 3.9). Similar results were obtained when each dimension of eudaimonic well-being was entered as the criterion variable. The covariance at Step 2 ( $R^2_{y \cdot mx's} = .05 - .43, p < .01$ ) was greater than the covariance at Step 1 ( $R^2_{y \cdot x's} = .02 - .17, p < .01$ ). Table 3.10 provides a summary of the exploratory tests of correlational mediation for each dimension of eudaimonic well-being.

The second analysis that was carried out to further explore the mediating role of basic need satisfaction provided partial support for Hypothesis 2b. Adhering to the four-step mediation

Table 3.8

*Summary of the hierarchical regression analyses exploring the influence of experiencing eudaimonia during HEPA beyond HEPA and experiencing hedonia during HEPA on each dimension of eudaimonic well-being*

Criterion Variable	Predictor Variable	$\beta$	$R^2$	$\Delta R^2$
Autonomy	Step 1		.038**	.038**
	HEPA (SQUASH)	.012		
	Experiencing hedonia during HEPA (HEMA)	.193**		
	Step 2		.039	.000
	HEPA(SQUASH)	.009		
	Experiencing hedonia during HEPA (HEMA)	.175**		
	Experiencing eudaimonia during HEPA (HEMA)	.028		
Environmental mastery	Step 1		.144**	.144**
	HEPA (SQUASH)	-.023		
	Experiencing hedonia during HEPA (HEMA)	.382**		
	Step 2		.148	.004
	HEPA(SQUASH)	-.035		
	Experiencing hedonia during HEPA (HEMA)	.328**		
	Experiencing eudaimonia during HEPA (HEMA)	.084		
Personal growth	Step 1		.073**	.073**
	HEPA (SQUASH)	.024		
	Experiencing hedonia during HEPA (HEMA)	.266**		
	Step 2		.106**	.033**
	HEPA(SQUASH)	-.009		
	Experiencing hedonia during HEPA (HEMA)	.109*		
	Experiencing eudaimonia during HEPA (HEMA)	.245**		

Table 3.8 continued

Criterion Variable	Predictor Variable	$\beta$	$R^2$	$\Delta R^2$
Positive relations with others	Step 1		.069**	.069**
	HEPA (SQUASH)	.022		
	Experiencing hedonia during HEPA (HEMA)	.258**		
	Step 2		.070	.001
	HEPA(SQUASH)	.015		
	Experiencing hedonia during HEPA (HEMA)	.227**		
	Experiencing eudaimonia during HEPA (HEMA)	.049		
Purpose in life	Step 1		.106**	.106**
	HEPA (SQUASH)	-.032		
	Experiencing hedonia during HEPA (HEMA)	.329**		
	Step 2		.160**	.054**
	HEPA(SQUASH)	-.074		
	Experiencing hedonia during HEPA (HEMA)	.129*		
	Experiencing eudaimonia during HEPA (HEMA)	.313**		
Self-acceptance	Step 1		.182**	.182**
	HEPA (SQUASH)	-.015		
	Experiencing hedonia during HEPA (HEMA)	.428**		
	Step 2		.215**	.033**
	HEPA(SQUASH)	-.048		
	Experiencing hedonia during HEPA (HEMA)	.271**		
	Experiencing eudaimonia during HEPA (HEMA)	.246**		

Table 3.8 continued

*Note.* \*  $p < .05$ . \*\*  $p < .01$ . Applying each eudaimonic well-being dimension as the criterion variable were exploratory analyses. *SPWB* refers to the Scales of Psychological Well-Being. *HEPA* refers to Health-Enhancing Physical Activity. *SQUASH* refers to the Short Questionnaire to Assess Health-Enhancing Physical Activity. *HEMA* refers to Hedonic and Eudaimonic Motives for Activities Scale.

Table 3.9

*Summary of the hierarchical regression analysis assessing the correlational mediating role of basic need satisfaction on the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being*

Criterion Variable	Predictor Variable	$\beta$	$R^2$	$\Delta R^2$
Eudaimonic well-being (SPWB)	Step 1		.139**	.139**
	Experiencing eudaimonia during HEPA (HEMA)	.373**		
	Step 2		.227**	.089**
	Experiencing eudaimonia during HEPA (HEMA) Basic need satisfaction (PNSE)	.169** .361**		

*Note.* \*\*  $p < .01$ . *SPWB* refers to the Scales of Psychological Well-Being. *HEPA* refers to Health-Enhancing Physical Activity. *HEMA* refers to Hedonic and Eudaimonic Motives for Activities Scale. *PNSE* refers to the Psychological Need Satisfaction in Exercise Scale.

Table 3.10

*Summary of the hierarchical regression analysis assessing the correlational mediating role of basic need satisfaction on the relationship between experiencing eudaimonia during HEPA and each dimension of eudaimonic well-being*

Criterion Variable	Predictor Variable	$\beta$	$R^2$	$\Delta R^2$
Autonomy	Step 1		.021**	.021**
	Experiencing eudaimonia during HEPA (HEMA)	.145**		
	Step 2		.049**	.028**
	Experiencing eudaimonia during HEPA (HEMA) Basic need satisfaction (PNSE)	.031 .202**		
Environmental mastery	Step 1		.085**	.085**
	Experiencing eudaimonia during HEPA (HEMA)	.292**		
	Step 2		.182**	.097**
	Experiencing eudaimonia during HEPA (HEMA) Basic need satisfaction (PNSE)	.078 .378**		
Personal growth	Step 1		.099**	.099**
	Experiencing eudaimonia during HEPA (HEMA)	.315**		
	Step 2		.151**	.052**
	Experiencing eudaimonia during HEPA (HEMA) Basic need satisfaction (PNSE)	.159** .276**		

Table 3.10 continued

Criterion Variable	Predictor Variable	$\beta$	$R^2$	$\Delta R^2$
Positive relations with others	Step 1		.041**	.041**
	Experiencing eudaimonia during HEPA (HEMA)	.201**		
	Step 2		.309**	.055**
	Experiencing eudaimonia during HEPA (HEMA)	.041		
	Basic need satisfaction (PNSE)	.283**		
Purpose in life	Step 1		.145**	.145**
	Experiencing eudaimonia during HEPA (HEMA)	.381**		
	Step 2		.434**	.043**
	Experiencing eudaimonia during HEPA (HEMA)	.239**		
	Basic need satisfaction (PNSE)	.252**		
Self-acceptance	Step 1		.171**	.171**
	Experiencing eudaimonia during HEPA (HEMA)	.414**		
	Step 2		.230**	.059**
	Experiencing eudaimonia during HEPA (HEMA)	.247**		
	Basic need satisfaction (PNSE)	.295**		

*Note.* \*\*  $p < .01$ . Applying each eudaimonic well-being dimension as the dependent variable were exploratory analyses. *SPWB* refers to the Scales of Psychological Well-Being. *HEPA* refers to Health-Enhancing Physical Activity. *HEMA* refers to Hedonic and Eudaimonic Motives for Activities Scale. *PNSE* refers to the Psychological Need Satisfaction in Exercise Scale.

analysis outlined by Baron and Kenny (1986), Step 1 demonstrated that experiencing eudaimonia during HEPA was associated with eudaimonic well-being ( $r = .37$ ,  $B = .17$ ,  $p < .01$ ). Step 2 revealed a relationship between experiencing eudaimonia during HEPA and basic need satisfaction ( $r = .57$ ,  $B = .38$ ,  $p < .01$ ). Step 3 and Step 4 showed that the link (i.e., unstandardized beta coefficient) previously found between experiencing eudaimonia during HEPA and eudaimonic well-being was reduced but did not completely disappear ( $B = .08$ ,  $p < .01$ ) with basic need satisfaction having a significant contribution to eudaimonic well-being ( $B = .25$ ,  $p < .01$ ). Thus, it appears that the data are consistent with a model of *partial* mediation, as basic need satisfaction does not appear to completely mediate the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being. A model of partial mediation implies that part of the effect of X on Y is direct, whereas a separate part of the X-Y relationship passes through the mediator (James, Mulaik, & Brett, 2006). Table 3.11 provides a summary of the mediation analysis.

The significance of the reduced effect of experiencing eudaimonia during HEPA on eudaimonic well-being was assessed via two tests of significance. Baron and Kenny (1986) recommend using  $(a)(b) / \sqrt{a^2sb^2 + b^2sa^2 + sa^2sb^2}$ , where  $a$  is the unstandardized beta coefficient for the relationship between the independent variable and the mediator,  $b$  is the unstandardized beta coefficient for the relationship between the mediator and the dependent variable, and  $sa$  and  $sb$  are the corresponding standard errors. The formula developed by Sobel (1982) omits the final  $sa^2sb^2$  term. Both formula's obtained the same  $Z$  statistic ( $z = 7.63$ ) and corresponding significance level ( $p < .01$ ). This provides further support that the data appears to be consistent with a model of partial mediation, whereby basic need satisfaction partially mediated the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being.

Table 3.11

*Summary of the multiple regression analyses exploring the mediating effect of basic need satisfaction on the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being*

Criterion Variable	Predictor Variable	<i>r</i>	B	SE <sub>B</sub>	<i>R</i> <sup>2</sup>
Regression Analysis 1					.139**
Eudaimonic well-being (SPWB)	Experiencing eudaimonia during HEPA (HEMA)	.37**	.172**	.019	
Regression Analysis 2					.320**
Basic need satisfaction (PNSE)	Experiencing eudaimonia during HEPA (HEMA)	.57**	.376**	.024	
Regression Analysis 3					.227**
Eudaimonic well-being (SPWB)	Experiencing eudaimonia during HEPA (HEMA)	.37**	.078**	.022	
	Basic need satisfaction (PNSE)	.46**	.251**	.032	

*Note.* \*\*  $p < .01$ . *SPWB* refers to the Scales of Psychological Well-Being. *HEPA* refers to Health-Enhancing Physical Activity. *HEMA* refers to the Hedonic and Eudaimonic Motives for Activities Scale. *PNSE* refers to the Psychological Need Satisfaction in Exercise Scale.

When each dimension of eudaimonic well-being was entered as the criterion variable, similar results were found for three of the six dimensions (i.e., personal growth, purpose in life, and self-acceptance), with the data being consistent with a model of partial mediation. After multiple regression analyses satisfied Step 1 ( $r_s = .32 - .41$ ,  $B_s = .14 - .28$ ,  $p < .01$ ) and Step 2 ( $r = .57$ ,  $B = .38$ ,  $p < .01$ ), the links (i.e., unstandardized beta coefficients) previously found between experiencing eudaimonia during HEPA and each dimension of eudaimonic well-being were reduced but did not completely disappear ( $B_s = .07 - .17$ ,  $p < .01$ ), with basic need satisfaction having a significant contribution to each dimension ( $B_s = .19 - .30$ ,  $p < .01$ ). The reduced effects were found to be significant by means of a Sobel test (personal growth  $z = 6.01$ ,  $p < .01$ ; purpose in life  $z = 5.28$ ,  $p < .01$ ; self-acceptance  $z = 5.72$ ,  $p < .01$ ). Multiple regression analyses for the remaining three dimensions of eudaimonic well-being (i.e., autonomy, environmental mastery, and positive relations with others) found that the data was consistent a model of complete mediation. The links (i.e., unstandardized beta coefficients) previously found between experiencing eudaimonia during HEPA and each dimension of eudaimonic well-being in Step 1 ( $r_s = .15 - .29$ ,  $B_s = .09 - .17$ ,  $p < .01$ ), were reduced to the point where experiencing eudaimonia during HEPA was no longer a significant predictor ( $B_s = .02 - .05$ ), with basic need satisfaction having a significant contribution to each dimension ( $B_s = .19 - .34$ ,  $p < .01$ ). The reduced effects were significant by means of a Sobel test (autonomy  $z = 3.73$ ,  $p < .01$ ; environmental mastery  $z = 7.76$ ,  $p < .01$ ; positive relations with others  $z = 5.37$ ,  $p < .01$ ). Table 3.12 provides a summary of the second mediation analyses and Table 3.13 provides a complete overview of the mediation analyses for each dimension of eudaimonic well-being.

Table 3.12

*Summary of the reduced effect of experiencing eudaimonia during HEPA on eudaimonic well-being after basic need satisfaction has been controlled for exploring the mediating effect of basic need satisfaction on the relationship between experiencing eudaimonia during HEPA and each dimension of eudaimonic well-being*

Criterion Variable	Regression Analysis 1		Regression Analysis 3		Partial Mediation	Complete Mediation	Sobel Test
	B	SE <sub>B</sub>	B	SE <sub>B</sub>			
Eudaimonic well-being	.172**	.019	.078**	.022	☑	-	7.63**
Autonomy	.090**	.027	.019	.032	-	☑	3.73**
Environmental mastery	.173**	.025	.046	.029	-	☑	7.76**
Personal growth	.142**	.019	.072**	.022	☑	-	6.01**
Positive relations with others	.131**	.028	.027	.033	-	☑	5.37**
Purpose in life	.218**	.023	.137**	.027	☑	-	5.28**
Self-acceptance	.281**	.027	.168**	.032	☑	-	5.72**

*Note.* \*\*  $p < .01$ . Regression Analysis 1 contains the unstandardized Beta coefficient for experiencing eudaimonia during HEPA, and Regression Analysis 3 contains the unstandardized Beta coefficient of experiencing eudaimonia during HEPA when basic need satisfaction is controlled. Applying each eudaimonic well-being dimension as the criterion variable were exploratory analyses.

Table 3.13

*Complete overview of the multiple regression analyses exploring the mediating effect of basic need satisfaction on the relationship between experiencing eudaimonia during HEPA and each dimension of eudaimonic well-being*

Criterion Variable	Predictor Variable	<i>r</i>	B	SE <sub>B</sub>	<i>R</i> <sup>2</sup>
Regression Analysis 1					.021**
Autonomy	Experiencing eudaimonia during HEPA (HEMA)	.15**	.090**	.027	
Regression Analysis 2					.320**
Basic need satisfaction (PNSE)	Experiencing eudaimonia during HEPA (HEMA)	.57**	.376**	.024	
Regression analysis 3					.049**
Autonomy	Experiencing eudaimonia during HEPA (HEMA)	.15**	.019	.032	
	Basic need satisfaction (PNSE)	.22**	.188**	.048	
Regression Analysis 1					.085**
Environmental mastery	Experiencing eudaimonia during HEPA (HEMA)	.29**	.173**	.025	
Regression Analysis 2					.320**
Basic need satisfaction (PNSE)	Experiencing eudaimonia during HEPA (HEMA)	.57**	.376**	.024	
Regression analysis 3					.182**
Environmental mastery	Experiencing eudaimonia during HEPA (HEMA)	.29**	.046	.029	
	Basic need satisfaction (PNSE)	.42**	.337**	.043	

Table 3.13 continued

Criterion Variable	Predictor Variable	<i>r</i>	B	SE <sub>B</sub>	<i>R</i> <sup>2</sup>
Regression Analysis 1					.099**
Personal growth	Experiencing eudaimonia during HEPA (HEMA)	.32**	.142**	.019	
Regression Analysis 2					.320**
Basic need satisfaction (PNSE)]	Experiencing eudaimonia during HEPA (HEMA)	.57**	.376**	.024	
Regression analysis 3					.151**
Personal growth	Experiencing eudaimonia during HEPA (HEMA)	.32**	.072**	.022	
	Basic need satisfaction (PNSE)	.37**	.187**	.033	
Regression Analysis 1					.041**
Positive relations with others	Experiencing eudaimonia during HEPA (HEMA)	.20**	.131**	.028	
Regression Analysis 2					.320**
Basic need satisfaction (PNSE)	Experiencing eudaimonia during HEPA (HEMA)	.57**	.376**	.024	
Regression analysis 3					.095**
Positive relations with others	Experiencing eudaimonia during HEPA (HEMA)	.20**	.027	.033	
	Basic need satisfaction (PNSE)	.31**	.277**	.049	

Table 3.13 continued

Criterion Variable	Predictor Variable	<i>r</i>	B	SE <sub>B</sub>	<i>R</i> <sup>2</sup>
Regression Analysis 1					.145**
Purpose in life	Experiencing eudaimonia during HEPA (HEMA)	.38**	.218**	.023	
Regression Analysis 2					.320**
Basic need satisfaction (PNSE)	Experiencing eudaimonia during HEPA (HEMA)	.57**	.376**	.024	
Regression analysis 3					.188
Purpose in life	Experiencing eudaimonia during HEPA (HEMA)	.38**	.137**	.027	
	Basic need satisfaction (PNSE)	.39**	.216**	.041	
Regression Analysis 1					.171**
Self-acceptance	Experiencing eudaimonia during HEPA (HEMA)	.41**	.281**	.027	
Regression Analysis 2					.320**
Basic need satisfaction (PNSE)	Experiencing eudaimonia during HEPA (HEMA)	.57**	.376**	.024	
Regression analysis 3					.230**
Self-acceptance	Experiencing eudaimonia during HEPA (HEMA)	.41**	.168**	.032	
	Basic need satisfaction (PNSE)	.43**	.301**	.048	

*Note.* \*\*  $p < .01$ . Applying each eudaimonic well-being dimension as the criterion variable were exploratory analyses. *HEPA* refers to Health-Enhancing Physical Activity. *HEMA* refers to the Hedonic and Eudaimonic Motives for Activities Scale. *PNSE* refers to the Psychological Need Satisfaction in Exercise Scale.

### 3.2 DISCUSSION

The purpose of this study was to explore the relationship between HEPA and eudaimonic well-being. More specifically, it explored a possible moderating effect of experiencing eudaimonia during HEPA on the relationship between HEPA and eudaimonic well-being, as well as the potential mediating role of basic need satisfaction on the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being. Regardless of the findings, going beyond the basic bivariate relationship between HEPA and eudaimonic well-being and exploring a potential moderating effect and model of mediation, the current study provided a more refined analysis and subsequent understanding of the variables of interest.

Counter to Aristotle's belief that a healthy body is needed in order to reach our potential (Ryff & Singer, 2008), it was found that HEPA was not significantly related to eudaimonic well-being. This finding was unexpected as it contradicts claims that active engagement in health behaviours should contribute to eudaimonic well-being (Ryff & Singer), and findings that participation in physical activity contributes to – or in the very least, is related to – psychological well-being (e.g., Bray & Kwan, 2006; Brooks & Magnusson, 2007; Penedo & Dahn, 2005; Poon & Fung, 2008). Although the finding that HEPA was not significantly related to eudaimonic well-being opposes previous literature, the conceptualization of both physical activity and psychological well-being in the current study differs from that of previous research. The majority of previous research has defined physical activity as structured exercise (Acevedo & Ekkekakis, 2006; Griffin, 1997) and defined psychological well-being as either hedonic well-being (e.g., happiness) or the absence of psychological distress (e.g., depression, anxiety; Ryff & Keyes, 1995). HEPA and eudaimonic well-being were deliberately chosen for the current study as they are both health-oriented; HEPA includes activities that are directed at improving health,

and eudaimonic well-being includes the essential features of optimal psychological health. Although the non-significant relationship between HEPA and eudaimonic well-being contradicts previous research, it draws attention to the specific relationship – or lack there of – between HEPA and eudaimonic well-being.

As it was found that level of HEPA was not significantly related to eudaimonic well-being, an extension of the current study took place and a qualitative study explored how HEPA might facilitate eudaimonic well-being, if at all (see Appendix K). Ten women ( $M_{\text{age}} = 24.6$  years) participated in one-on-one semi-structured interviews that explored *if* and *how* HEPA contributes to eudaimonic well-being in their lives. Although the women varied in their level of HEPA (five women reported high HEPA; four women reported low HEPA; one woman reported a medium level of HEPA), all expressed support for the role of physical activity towards the fulfillment of their potential, while at the same time acknowledging that this might not be the case for everyone. The women reported that physical activity contributes to their eudaimonic well-being via goal setting/striving, providing bonding experiences, allowing for reflections on the self, and developing a physical and able body. Taken together, these qualitative findings show important ways that actively engaging in health behaviours can contribute to eudaimonic well-being, beyond the quantity of the activity.

Both quantitative and qualitative findings suggest that level of HEPA is not associated with eudaimonic well-being. As *level* of HEPA does not appear to be relevant to achieving human potential, other variables – such as what is experienced during the activity – were considered. What is experienced during HEPA likely plays an important role as both experiencing eudaimonia during HEPA ( $r = .37, p < .01$ ) and experiencing hedonia during HEPA ( $r = .40, p < .01$ ) were significantly related to eudaimonic well-being. This replicates

previous research by Huta and Ryan (2008) who had a sample of undergraduate students indicate the extent to which they experienced hedonia and eudaimonia during various activities and found both the hedonic items ( $r = .26, p < .05$ ) and the eudaimonic items ( $r = .25, p < .05$ ) on the HEMA scale to be related to the SPWB. The significant relationship between experiencing elements of either type of well-being during HEPA and eudaimonic well-being suggests that *level* of HEPA may not be as important to reaching human potential, as what is *experienced* while engaging in HEPA. Since experiencing elements of either type of well-being during HEPA were found to be significant predictors of eudaimonic well-being, it does not seem to matter what type of well-being is experienced during HEPA – as long as elements of well-being exist. However, experiencing eudaimonia during HEPA explained 2.2% unique variance in eudaimonic well-being beyond HEPA and experiencing hedonia during HEPA.

Although statistically significant, it is difficult to determine the meaningfulness of the finding that experiencing eudaimonia during HEPA explained 2.2% unique variance in eudaimonic well-being beyond HEPA and experiencing hedonia during HEPA. Although many resources are available that address the methods of detecting significant predictors within regression analyses (e.g., Pedhazur, 1997; Tabachnick & Fidell 2001), one challenge is that there are no set standards that dictate when a significant result becomes meaningful. As the amount of unique variance accounted for by experiencing eudaimonia during HEPA was quite small, the meaningfulness of this finding is dubious. Due to the negligible amount of unique variance accounted for, experiencing elements of either type of well-being during HEPA will likely have a similar impact on eudaimonic well-being. Whether excellence is pursued or pleasure is experienced, experiencing elements of either type of well-being during HEPA appears to be a significant predictor of eudaimonic well-being.

As experiencing elements of either hedonia or eudaimonia during HEPA appear to be significant predictors of eudaimonic well-being, this conjures up the debate as to how similar the two types of well-being are. The general consensus in the literature is that the two types of well-being are not entirely distinct (e.g., Deci & Ryan, 2008; Huta & Ryan, 2008; Keyes et al., 2002; Waterman et al., 2008). Both hedonic and eudaimonic well-being are positive mental health constructs that are components of psychological health, and can co-occur with one another. Waterman et al. explored what type of well-being was related to various activities and found support for two categories of activities: (1) activities for which both hedonic enjoyment and eudaimonia are present, and (2) activities for which hedonic enjoyment alone is present. Kopperud and Vitterso (2008) provided support for the former category of activities – giving rise to both hedonia and eudaimonia – as they found that leisure activities were associated with similar levels of hedonia and eudaimonia. Rather than being primarily associated with one type of well-being, leisure activities appear to give rise to both pleasure and engagement. Findings from the current study also fall in Waterman et al.'s former category of activities, as it was found that experiencing elements of either type of well-being during HEPA were significant predictors of eudaimonic well-being. Waterman et al. explained that activities that fall in this category are not only enjoyed but also include a willingness to invest effort, are believed to be important, and assist in the development of human potential. It is logical that the two types of well-being can be present at the same time as they seem to naturally fit together. The journey to achieving human potential will likely include periods of happiness, enjoyment, and satisfaction as goals are achieved and growth/development ensues.

The current study provides further support for the similarities between the two types of well-being, as eudaimonic well-being was related to measures of hedonic well-being in expected

ways (SWLS  $r = .71, p < .01$ ; PANAS positive subscale  $r = .66, p < .01$ ; PANAS negative subscale  $r = -.62, p < .01$ ). These associations between eudaimonic and hedonic well-being replicate previous research that has found significant relations between them (e.g., Oster et al., 2008; Ryff, 1989; Waterman et al., 2008). In addition to being significantly related to each other, the two types of well-being displayed similar relations with experiencing hedonia during HEPA (eudaimonic well-being  $r = .40, p < .01$ ; hedonic well-being SWLS  $r = .39, p < .01$ ; PANAS positive subscale  $r = .46, p < .01$ ), experiencing eudaimonia during HEPA (eudaimonic well-being  $r = .37, p < .01$ ; hedonic well-being SWLS  $r = .37, p < .01$ ; PANAS positive subscale  $r = .49, p < .01$ ), and basic need satisfaction (eudaimonic well-being  $r = .46, p < .01$ ; hedonic well-being SWLS  $r = .38, p < .01$ ; PANAS positive subscale  $r = .50, p < .01$ ). The comparable pattern of associations that eudaimonic well-being and hedonic well-being displayed with the other variables in this study provides further evidence that the two types of well-being share many similarities.

Although most researchers agree that hedonic and eudaimonic well-being are similar (e.g., Deci & Ryan, 2008; Huta & Ryan, 2008; Waterman et al., 2008), they do not appear to be synonymous. With a sample of 120 Norwegian jobholders, Kopperud and Vitterso (2008) found that hedonic well-being (i.e., pleasure) was not related to eudaimonic well-being (i.e., engagement). They concluded that the two types of well-being differ because happiness/pleasure leads to coasting, which means that less effort is channeled into achieving human potential. As hedonic well-being reflects subjective happiness and pleasure (Ryan & Deci, 2001), and eudaimonic well-being reflects optimal psychological functioning via the realization of human potential (Ryff, 1989), the two types of well-being reflect different aspects of psychological health that, at times, may oppose each other and occur in isolation. Achieving human potential

will likely include moments where happiness is not simultaneously experienced, but rather moments that are challenging and frustrating. On the other hand, experiencing happiness and pleasure plays an important role in our lives that indicates a level of positive psychological health (Ryff). Kopperud and Vitterso provided evidence that hedonia and eudaimonia do not always co-occur, as they found that coffee breaks were strongly associated with high levels of hedonia (i.e., pleasure) and core work-related activities (i.e., activities directly associated with work type) were associated with high levels of eudaimonia (i.e., engagement). This suggests that while some activities, such as coffee breaks, appear to provide pleasure and relaxation, they contribute little to engagement or achieving human potential. Other activities, such as core work-related activities, may not derive immediate pleasure, but the activity may still be contributing to well-being – eudaimonic well-being. Thus, hedonia and eudaimonia appear to independently contribute to overall psychological well-being.

Further evidence that hedonic and eudaimonic well-being may not necessarily co-occur with each other stems from findings specific to exercise/physical activity contexts, where the activity may not be enjoyed but may still contribute to eudaimonic well-being. Due to the physical environment (e.g., mirrored environment, exercise classes) and social nature of many types of exercise/physical activities (e.g., exercise classes, running/walking groups), there is a high risk that social physique anxiety will be experienced during exercise/physical activity (Crawford & Eklund, 1994; Hart, Leary, & Rejeski, 1989). Social physique anxiety is a type of social anxiety where individuals experience apprehension in response to the presence or prospect of others negatively evaluating their body/physique (Focht & Hausenblas, 2004). When social physique anxiety is experienced, enjoyment and pleasure are likely absent. Although enjoyment and pleasure (i.e., hedonic well-being) may not be experienced when social physique anxiety is

at large, engaging in the health behaviour may still be contributing to certain aspects of eudaimonic well-being (e.g., learning a new skill). That is, eudaimonic well-being may be experienced even though hedonic well-being is not.

Rather than viewing hedonic and eudaimonic well-being as competing aspects of psychological health, optimal psychological wellness is likely best conceived of as including aspects of both hedonia and eudaimonia. The separate functions of hedonia (i.e., happiness) and eudaimonia (i.e., achieving human potential) should be considered as complementary to one another (Huta & Ryan, 2008). Given that exclusive hedonia would become directionless and limit achieving human potential, and exclusive eudaimonia would lead to exhaustion without emotional replenishment, combining both happiness/pleasure and engagement in achieving human potential will lead to optimal fulfillment (Huta & Ryan). Since optimal psychological well-being is likely best conceived of as including aspects of both hedonia and eudaimonia, elements of both types of well-being should be experienced during physical activity in order for the activity to contribute to optimal psychological well-being.

Since experiencing elements of well-being during HEPA was significantly related to eudaimonic well-being – but level of HEPA was not – it could be assumed that experiencing eudaimonia during HEPA may moderate the relationship between HEPA and eudaimonic well-being. The relationship between level of HEPA and eudaimonic well-being may be strengthened by incorporating the influence of experiencing eudaimonia during HEPA, as it will add the key element of experiencing eudaimonia during HEPA to the basic relationship between level of HEPA and eudaimonic well-being. The moderated relationship seems logical as such interactions commonly occur when there is a surprisingly weak or inconsistent relationship between a predictor variable and a criterion variable (Baron & Kenny, 1986), such as the non-significant

relationship between HEPA and eudaimonic well-being in the current study. Contrary to this logic, however, experiencing eudaimonia during HEPA did not moderate the relationship between HEPA and eudaimonic well-being.

The lack of evidence for an interaction effect may stem from the drawbacks that are inherent to cross-sectional designs, which are especially relevant to the analysis of interaction effects. There is often difficulty with detecting interaction effects in non-experimental studies due to (1) measurement error [i.e., unreliable measures; measurement errors for each variable are exacerbated when multiplied together to form the interaction variable], (2) the functional form of the interaction [i.e., the reliance on the traditional multiplicative term in the regression analysis may be misleading if the interaction is not linear], (3) levels of measurement [i.e., the traditional analysis is appropriate for interval data, but may be problematic with ordinal data], and (4) lack of statistical power (Jaccard et al., 1990; McClelland & Judd, 1993). Although it is difficult to identify the extent to which each factor contributes to failing to detect significant interaction effects (Jaccard et al.), these factors may have contributed to the lack of support for the moderation hypothesis in the current study.

In addition to the statistical rationale as to why an interaction effect was not detected, the moderation hypothesis may not have been supported because level of HEPA is simply not related to eudaimonic well-being. Doing more activity (i.e., increasing level of HEPA) while experiencing more elements of eudaimonia during activity did not strengthen the relationship between HEPA and eudaimonic well-being. Whether on its own or combined with a variable that is significantly related to eudaimonic well-being, level of HEPA does not appear to be relevant to eudaimonic well-being. Although somewhat surprising, this conclusion has been supported not only by the non-significant relationship between level of HEPA and eudaimonic well-being, but

also by the lack of support for the moderation hypothesis. When it comes to HEPA and eudaimonic well-being, the important factor seems to be the quality of the activity; that is, elements of well-being should be experienced during HEPA to be significantly related to eudaimonic well-being.

Although the current study found a direct relationship between experiencing elements of well-being during HEPA and eudaimonic well-being, basic need satisfaction may be partially influencing this relationship as the satisfaction of the basic psychological needs of competence, autonomy, and relatedness represent conditions that nourish well-being. It has even been suggested that basic need satisfaction is *essential* for optimal development (Deci & Ryan, 2002), which highlights that basic need satisfaction is relevant to positive psychological well-being. Since competence, autonomy, and relatedness promote and nurture well-being, these basic needs must be satisfied in order to thrive. Following this logic, Ryan et al. (2008) proposed that basic need satisfaction may play an important role in the relationship between eudaimonic activities and eudaimonic well-being. Results from two separate analyses in the current study provide partial support for Ryan et al.'s framework, as the data were consistent with a model of partial mediation whereby basic need satisfaction partially accounted for the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being. Stemming from Ryan et al.'s framework, this finding suggests that experiencing eudaimonia during HEPA may help to satisfy competence, autonomy, and relatedness, which nourishes and promotes eudaimonic well-being. Although exploratory due to the cross-sectional nature of the current study, the finding that the data were consistent with a model of partial mediation contributes to an emerging body of evidence that points to the positive effects stemming from need satisfaction on psychological well-being.

Although experiencing elements of well-being during HEPA was previously identified as the important factor in eudaimonic well-being, it is logical that basic need satisfaction might play an important role in eudaimonic well-being as basic need satisfaction has been identified as essential for obtaining optimal functioning and development (Deci & Ryan, 2002). Conceptually, basic needs correspond with eudaimonic well-being, as both variables are health-oriented; and the former is presumably necessary to acquire the latter. In order to be eudaimonically well and achieve human potential, challenging tasks must be mastered (i.e., competence), personal agency must be felt (i.e., autonomy), and meaningful connections must be made with others (i.e., relatedness). Findings from the current study suggest that experiencing eudaimonia during HEPA might be related to eudaimonic well-being partially because physical activity satisfies basic psychological needs. This conclusion, however, should be interpreted with caution as the cross-sectional nature of the study does not allow for causal claims and renders the mediation finding exploratory.

The natural mesh between basic need satisfaction and eudaimonic well-being becomes problematic and calls into question the meaningfulness of the model of partial mediation when considering the noticeable overlap between two basic needs (i.e., autonomy and relatedness) and two dimensions of eudaimonic well-being (i.e., autonomy and positive relations with others). As one of the steps in the exploratory mediation analysis examined the relationship between basic need satisfaction and eudaimonic well-being, the current study inevitably explored the extent to which autonomy predicts autonomy, and relatedness predicts positive relations with others. In addition to having the same names, these constructs appear to have conceptually similar elements. As a basic need, autonomy reflects having a sense of choice and volition such that behaviour emanates from within (Deci & Ryan, 2002). As a dimension of eudaimonic well-

being, autonomy reflects having the ability to resist social pressures in order to regulate behaviour from within (Ryff, 1989). Both constructs include choosing behaviours that originate from within. As for relatedness and positive relations with others, both constructs incorporate having significant relationships with others, with the former reflecting feeling a meaningful connection with and being cared about by others (Deci & Ryan), and the latter reflecting having warm, satisfying, and trusting relationships with others (Ryff).

Although both autonomy constructs and both relatedness constructs contain the same labeling and appear to be conceptually similar, the function of basic psychological needs differs from the function of the dimensions of eudaimonic well-being. As basic needs, autonomy and relatedness represent conditions that nourish well-being (Ryan et al., 2008). As dimensions of eudaimonic well-being, autonomy and positive relations with others comprise two of the six dimensions that characterize what is essential for psychological well-being (Ryan & Deci, 2001). Basic needs nurture and promote psychological well-being, whereas the dimensions of eudaimonic well-being define psychological well-being. Further evidence for the differences between basic needs and the dimensions of eudaimonia comes from the current study which found that the two autonomy constructs ( $r = .31, p < .01$ ) and the two relatedness constructs ( $r = .30, p < .01$ ) were moderately related to each other. Although significant, these modest relations provide a degree of support that basic needs and eudaimonic well-being are somewhat independent from each other. Furthermore, the overlap between basic needs and eudaimonic well-being would likely be reduced with alternative conceptualizations of eudaimonic well-being that do not incorporate autonomy and relatedness. Waterman et al. (2008), for example, define eudaimonic well-being as personal expressiveness, and Deci and Ryan (2008) generally define eudaimonic well-being as being fully functioning. Thus, the potential overlap between basic

needs and eudaimonic well-being may only apply to Ryff's (1989) conceptualization of eudaimonic well-being, in which case basic needs and eudaimonic well-being should be applied in a way that reflects the function of each construct. The differing functions of basic needs and eudaimonic well-being were reflected in the current study as the hypothesized model of mediation was organized to reflect a theoretical framework in which basic need satisfaction promoted eudaimonic well-being.

In addition to the potential overlap among basic needs and eudaimonic well-being, the meaningfulness of the model of partial mediation is further questioned as causal mediation cannot be claimed due to the cross-sectional design of the current study. Causal mediation requires a cause-effect pathway in order for the path to be intervened by the mediating variable (Bauman et al., 2002), and the mediating variable must be assessed independently from the independent and dependent variable (Baron & Kenny, 1986). Cross-sectional designs, however, lack a longitudinal design and temporal order of the variables, and they assess all variables at one time point (Baron & Kenny; Bauman et al.; Mathieu & Taylor, 2006; Wood, Goodman, Beckmann, & Cook, 2008). Despite these shortcomings, cross-sectional designs may be both practical and theoretical; they may generate hypotheses about causal relationships and mediators, and they may test and modify theory (Bauman et al.). Rather than assume that basic relationships exist and conduct presumptuous intervention studies, cross-sectional designs provide evidence as to whether or not these relationships exist in a timely and economically-friendly fashion (Brown et al., 1999). By following a cross-sectional design, the current study provides a level of support for basic need satisfaction working as a potential mediator; however, basic need satisfaction cannot be claimed as a causal mediator. Since the influence of basic need satisfaction on eudaimonic well-being remains exploratory and level of HEPA was not significantly related to

eudaimonic well-being, the focus returns to the key finding in the current study that experiencing hedonia or eudaimonia during HEPA were significantly related to eudaimonic well-being.

The lack of a relationship between level of HEPA and eudaimonic well-being may be due to the concept of HEPA, as HEPA appears to include activities that are believed to be *health-enhancing*, but may not contribute to our health greater than general physical activity<sup>8</sup>. The criteria that determines what activities are considered health-enhancing (i.e., activities that are  $\geq 4$  MET's) may seem to be inclusive to a wide range of activities; however, the SQUASH narrows the list of potential health-enhancing activities and only inquires about 14 specific activities. Thus, there appears to be disconnect between the intent of HEPA to include a variety of physical activities, and the SQUASH which excludes activities that may be health-enhancing but are not included in the scale. For example, the SQUASH specifically inquires about active commuting via bicycling but omits active commuting via other means (e.g., rollerblading). Alternatively, measures of physical activity that generally inquire about different levels of physical activity (e.g., moderate, strenuous) allow for the consideration of all types of activity, rather than restricting responses to one specific type of activity. Whereas more general measures of physical activity that assess a wide-range of activity may be more conducive to our health, the disconnect between the intent of HEPA and the limited number of activities included in the SQUASH may have contributed to the non-significant relationship between HEPA and eudaimonic well-being.

The significant relationship between experiencing elements of well-being during HEPA and eudaimonic well-being is based on an understanding of the HEMA scale as reflecting the

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<sup>8</sup> Exploratory analyses were carried out with two additional measures of physical activity to explore whether or not HEPA is unique from general physical activity to eudaimonic well-being: The Godin Leisure Time Exercise Questionnaire (Godin & Shephard, 1985; GLTEQ; see Appendix L) and the Behavior Risk Factor Surveillance System (BRFSS; see Appendix M). The relationships between the SQUASH and these measures were analyzed, and the analyses for hypothesis testing were re-run substituting the additional physical activity measures for the SQUASH (see Appendix N).

extent to which hedonia and eudaimonia are experienced during HEPA. This understanding differs from Huta's (personal communication, April 21, 2008) understanding, who believes the scale refers to hedonia and eudaimonia as motives for doing an activity. The disconnect between our interpretations of the scale may have, in turn, lead to a flawed application of the HEMA scale and subsequent interpretation of the results. Adhering to Huta's understanding of the scale would require re-interpretation of many of the findings in the current study; namely, that the significant relationship between the HEMA scale and eudaimonic well-being would reflect a relationship between having hedonic or eudaimonic motives for HEPA and eudaimonic well-being<sup>9</sup>.

Despite the differing interpretations of the HEMA scale, the scale's conceptualization of eudaimonic well-being is comparable to that of the current study, whereas other measures that assess what is experienced during activity – such as the Personally Expressive Activities Questionnaire (PEAQ; Waterman, 1993) – define eudaimonic well-being differently. Rather than reflecting human potential, Waterman defines eudaimonic well-being as reflecting personal expressiveness, which is reflected in the PEAQ which assesses enjoyment and personal expressiveness in various activities. As the current study conceptualized eudaimonic well-being as achieving human potential, it was important to incorporate measures that reflected this. The eudaimonic items on the HEMA scale reflect achieving human potential (e.g., *Through your physical activity, how much are you pursuing excellence or a personal ideal?*), whereas the eudaimonic items on the PEAQ reflect personal expressiveness (e.g., *I feel a special fit or meshing when engaging in this activity*). The HEMA scale was appropriate for the current study as it maintains an understanding of eudaimonic well-being as achieving human potential, which complies with the conceptualization of eudaimonic well-being in the current study.

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<sup>9</sup> The reader is reminded to refer to Appendix E for the pilot study which clarified whether participants were interpreting the instructions on the HEMA scale as referring to “motives” or “experience”.

The conceptualization of eudaimonic well-being that was applied in the current study consists of six individual dimensions that together reflect optimal psychological functioning and development towards achieving human potential (Ryan & Deci, 2001; Ryff, 1989). Although the individual dimensions are discernible from one another and are represented as separate subscales on the SPWB, eudaimonic well-being might best be reflected by the composite score obtained from the SPWB rather than by each individual subscale. According to Ryff, achieving human potential includes autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. Ryff does not emphasize any dimension as more important than another as all six dimensions are necessary to reflect eudaimonic well-being and optimal functioning at one's human potential. Exploring each subscale in isolation may provide understanding into the nuances of each dimension and the subsequent complexity of psychological well-being, as was done in the current study; however, it is likely best to ultimately consider eudaimonic well-being as a composite of all six dimensions in order to accurately reflect Ryff's conceptualization of eudaimonic well-being as including all six dimensions of optimal psychological functioning and development.

The current study provides support for using the composite of eudaimonic well-being, as similar relations were found between eudaimonic well-being and the other variables in the study when using the composite and when using the six individual dimensions. For example, just as HEPA was not significantly related to the composite of eudaimonic well-being, HEPA was not related to any of the individual dimensions. Experiencing eudaimonia during HEPA displayed significant relations with both the composite of eudaimonic well-being ( $r = .37, p < .01$ ) and all six dimensions (autonomy  $r = .14, p < .01$ ; environmental mastery  $r = .30, p < .01$ ; personal growth  $r = .32, p < .01$ ; positive relations with others  $r = .20, p < .01$ ; purpose in life  $r = .38, p <$

.01; self-acceptance  $r = .41, p < .01$ ). Similarly, the relations that eudaimonic well-being had with both experiencing hedonia during HEPA and basic need satisfaction were similar with the composite and individual dimensions of eudaimonic well-being.

Just as the composite and individual dimensions of eudaimonic well-being displayed similar relations with the other variables in the current study, fairly similar results were found from hypothesis testing when using the composite and when using each individual dimension of eudaimonic well-being. The moderation hypothesis (i.e., Hypothesis 1) was not supported when using the composite of eudaimonic well-being or any of the individual dimensions. The unique variance hypothesis (i.e., Hypothesis 2a) was supported when using the composite of eudaimonic well-being and when using three of the individual dimensions; experiencing eudaimonia during HEPA predicted unique variance beyond HEPA and experiencing hedonia during HEPA on personal growth, purpose in life, and self-acceptance. The only exception was that experiencing eudaimonia during HEPA did not predict unique variance on autonomy, environmental mastery, and positive relations with others. The mediation hypothesis (i.e., Hypothesis 2b) was partially supported when using the composite of eudaimonic well-being and three individual dimensions (i.e., personal growth, purpose in life, self-acceptance) in that the data were consistent with a model of partial mediation. The data were consistent with a model of complete mediation with the remaining three dimensions of eudaimonic well-being (i.e., autonomy, environmental mastery, positive relations with others).

The similar relations and results from hypothesis testing for the composite and individual dimensions of eudaimonic well-being suggest that all six dimensions may be a function of a greater underlying factor of well-being, which is in accordance with one of the structural models of the SPWB which suggests that all six dimensions belong to a single conceptual domain of

psychological well-being (Ryff & Keyes, 1995). To provide the best assessment of the underlying psychological well-being factor, it may be best to assess eudaimonic well-being as a composite so as to not exclude any of the six individual dimensions that Ryff (1989) considers necessary to be eudaimonically-well. The current study applied Ryff's conceptualization of eudaimonic well-being and found that contrary to previous findings suggesting that engaging in physical activity is related to psychological well-being (e.g., Bray & Kwan, 2006; Brooks & Magnusson, 2007; Poon & Fung, 2008), level of HEPA was not significantly related to the composite or individual dimensions of eudaimonic well-being. However, both experiencing hedonia during HEPA and experiencing eudaimonia during HEPA were significantly related to the composite and all six dimensions of eudaimonic well-being, which suggests that the focus might not be on *level* of HEPA, but rather what is *experienced* during HEPA.

## CHAPTER 4

### 4.1 SUMMARY AND CONCLUSIONS

This study found that level of HEPA was not associated with eudaimonic well-being. Although *level* of HEPA was not an important contributor to eudaimonic well-being, *experiencing* hedonia or eudaimonia while engaging in HEPA were significant predictors of eudaimonic well-being. Furthermore, experiencing eudaimonia during HEPA explained 2.2% unique variance in eudaimonic well-being beyond HEPA and experiencing hedonia during HEPA. Over and above this, the data were consistent with a model of partial mediation whereby basic need satisfaction appears to partially account for the relationship between experiencing eudaimonia during HEPA and eudaimonic well-being.

In conclusion, it appears as though elements of well-being – whether hedonic or eudaimonic – should be experienced while engaged in HEPA, as they appear to be significant predictors of eudaimonic well-being. Simply engaging in HEPA does not appear to be sufficient. Additionally, future research that more appropriately examines the mediating role of basic need satisfaction may prove that the satisfaction of competence, autonomy, and relatedness plays a fundamental role in nurturing eudaimonic well-being. The current study also highlights the importance of assessing psychological well-being via both hedonic and eudaimonic means, rather than solely in terms of hedonic well-being – as has been the trend in the majority of previous research (Ryan & Deci, 2001). The similarities and differences between hedonic and

eudaimonic well-being – which have been addressed here and elsewhere (e.g., Deci & Ryan, 2008; Huta & Ryan, 2008; Keyes et al., 2002; Waterman et al., 2008) – suggest that hedonia and eudaimonia appear to work in a complementary manner. Although hedonia and eudaimonia prescribe different approaches to living (i.e., happiness versus human potential; Ryan & Deci), both types of well-being are positive mental health constructs that can co-occur with each other (Waterman et al.), which suggests that optimal psychological wellness likely consists of elements of both hedonia and eudaimonia.

#### 4.2 LIMITATIONS

As is the case with all research studies, the current study is not without its limitations. Although the sample size was large and exceeded the minimum number of participants recommended for correlation (i.e., 85 participants; Cohen, 1992), multiple regression (i.e., 60-94 participants with four predictor variables; Cohen as cited in Green, 1991; Stevens, 1992; Vincent, 2005), and interaction analyses (i.e., 127-135 participants; Aiken & West, 1991), participant selection was not random. Random selection is ideal as each individual in the population has an equal probability of being selected, which provides a sample that is representative of the population and allows for generalization (Creswell, 2003). Although the desire may be to apply the results from the current study to men and women undergraduate students – or even undergraduate students from the U of S – such a generalization is problematic as the convenience sample used in this study means that any inference about the sample may not be present in the population (Thomas et al., 2005). Since the sample consisted of undergraduate students at the U of S who were likely interested in physical activity and psychological health, this is who the results are likely most applicable to. Furthermore, since the sample consisted of individuals who were generally eudaimonically-well ( $M_{\text{eudaimonic well-being}} = 4.68$ ), the results are

likely generalizable to individuals who are mentally healthy. Given that lifespan developmental theories have stressed the differing challenges confronted by individuals as they get older (Ryff, 1989), and the expected changes in eudaimonic well-being across the lifespan (e.g., older adults have significantly higher environmental mastery than young adults; young adults have significantly higher personal growth than older adults; Ryff 1989, 1995), it is important to acknowledge that the sample in the current study might experience changes in well-being as they age. As eudaimonic well-being appears to change with age, it is also possible that the path leading to eudaimonic well-being, activities that individuals find well-being in, and the importance of well-being may also change across the developmental lifespan. Thus, the findings from the current study might or might not be generalizable to another age group.

Another limitation to this study pertains to the measurement of eudaimonic well-being, as the SPWB is quite lengthy and may have created participant burden. With a total of 84 items (i.e., six 14-item subscales), the SPWB comprised almost half of the total 167 items in the questionnaire package, which took approximately 31 minutes and 50 seconds to complete. The length of the SPWB may have contributed to the amount of missing data in the data set, as missing data points from the SPWB (i.e., 47 items) comprised approximately one-third of the total missing data points (i.e., 143 items). Although the amount of missing data may seem like a lot, the amount of data that was generated by the sample exceeded 80000 items (i.e., 158 questionnaire items x 524 participants; not including demographics). Thus, the amount of missing data from the SPWB contributed 0.06% to the data set. Nonetheless, since shorter versions of the SPWB are available – including 9-item and 3-item subscales – it may have been beneficial to use a shorter version of the scale as this may have reduced the time it took to complete the entire questionnaire package, and therefore reduced participant burden. The shorter

versions of the scale, however, are not recommended for high quality assessments of well-being as they do not adequately cover the content of the six well-being dimensions, and the 3-item subscale version in particular has low internal consistency (C. Ryff, personal communication, November 7, 2007). As Ryff employs the 14-item subscale version of the scale in the majority of her own work (e.g., Ryff & Essex, 1992; Ryff, Keyes, & Hughes, 2003; Ryff et al., 2004), the 14-item subscale version was used in the current study.

Basic need satisfaction is another variable that may have been better assessed with a measure other than the PNSE scale, as the original scale measures perceived psychological need satisfaction in *exercise* contexts (Wilson, Rogers, et al., 2006), and was not developed for physical activity contexts. The items on the scale specifically refer to exercise, and were developed based on the experiences and opinions of exercisers, exercise physiologists, and exercise instructors (among others). Although exercise – defined as a form of physical activity that is undertaken to achieve a particular objective (Lox, Martin Ginis, Petruzzello, 2006) – may be considered a form of physical activity (and HEPA certainly includes exercise), the PNSE scale was not created with the intention of measuring basic need satisfaction in general physical activity contexts. To limit the concern that the scale refers to exercise contexts, the wording of the scale items were modified for the current study – with permission from the scale developer – to refer to physical activity contexts. The scale is also applicable to the sample in the current study (i.e., undergraduate students with a range of physical activity levels) as the original scale was validated for use with a sample of undergraduate students who had a variety of physical activity/exercise involvement.

### 4.3 RECOMMENDATIONS FOR FUTURE RESEARCH

Future studies that explore the relationship between HEPA and eudaimonic well-being should consider developing a new measure to assess HEPA, to remedy the gap between the narrow list of activities included in the SQUASH and the nature of HEPA as including a wide-variety of physical activities. Developing a measure that better reflects the conceptual nature of HEPA will allow for a more appropriate examination of the relationship between HEPA and eudaimonic well-being, rather than the relationship between a limited number of physical activities (i.e., the SQUASH) and eudaimonic well-being. Since Wendel-Vos et al. (2003) do not specify how they created the items on SQUASH, the quality of the scale and the extent to which the scale reflects HEPA is uncertain. Future research should consider following instrument development techniques, such as those put forth by Allen and Yen (1979) and Simms (2008). For example, scale development may follow a rational-theoretical approach (i.e., the scale should be consistent with the understanding of the target construct), empirical criterion keying (i.e., items on the scale can discriminate between two groups of individuals), or factor-analytic and internal consistency method (i.e., the scale demonstrates good discriminant validity; Simms). Following such guidelines and documenting this information would provide evidence for a high quality instrument that reflects the underlying construct of interest. Future research that includes a quality measure of HEPA will not only provide insight regarding the extent to which HEPA contributes to achieving human potential (if it does at all), it will also allow for further analysis as to the differences – if any – between HEPA and general physical activity.

Although there was justification for exploring the relationship between HEPA and eudaimonic well-being in the current study (i.e., theoretically there should be a relationship between health behaviours and eudaimonic well-being; Ryff & Singer, 2008), future research might explore the relationship between activities from other domains and eudaimonic well-being.

As eudaimonic well-being reflects optimal growth at one's highest potential, it may be logical to choose activities that appear to be conducive to eudaimonia, such as work-related activities, academic pursuits, and activities that individuals personally hold in high regard (e.g., hobbies that give individuals a feeling of mastery and growth). Exploring what activities are associated with eudaimonic well-being will provide understanding as to what activities and experiences play a significant role in achieving human potential.

Future research may also wish to explore the extent to which being eudaimonically-well potentially influences the different types of activities that we choose to engage in and what is experienced during those activities. Rather than resting upon the interpretation in the current study that engagement in eudaimonic activities is associated with eudaimonic well-being, it is possible that the relationship works in the opposite direction such that eudaimonically-well individuals might choose specific activities that incorporate elements of well-being, or they find elements of well-being in whatever they are doing. It is plausible that an individual's level of eudaimonic well-being is associated with and influences what types of activities are engaged in, as well as what is experienced during those activities. Perhaps the level of development and perspective that individuals with high eudaimonic well-being bring to their experiences and activities compels them to participate in activities that are inherently eudaimonic/hedonic, or allows them to experience elements of well-being in whatever they are doing (including physical activity). Future research that explores the extent to which level of eudaimonic well-being influences the types of activities we engage in and what is experienced during those activities will address one of the challenges with correlational results where the direction of the relationship cannot be determined (i.e., it cannot be determined which variable is influencing the other variable; Brown et al., 1999).

Another potential direction for future research is to implement an experimental manipulation to further examine whether or not experiencing eudaimonia during HEPA moderates the relationship between HEPA and eudaimonic well-being. As Baron and Kenny (1986) explained, interactions are common when there is a surprisingly weak or inconsistent relationship between a predictor variable and a criterion variable – such as the unexpectedly weak association between HEPA and eudaimonic well-being in the current study. As an example, an experimental study could manipulate what is experienced during HEPA (i.e., eudaimonia or no-eudaimonia) and then examine whether or not this influences the relationship between HEPA and eudaimonic well-being. Future research may also examine the potential moderating role of experiencing *hedonia* during HEPA, as this variable was also significantly related to eudaimonic well-being in the current study. If a moderation hypothesis was supported, this would suggest that level of HEPA can be related to eudaimonic well-being under certain circumstances (i.e., when elements of eudaimonia or hedonia are experienced during HEPA). If the experimental manipulation found that experiencing eudaimonia or hedonia during HEPA did not moderate the relationship between HEPA and eudaimonic well-being, this would provide further evidence that level of HEPA likely plays an insignificant role in eudaimonic well-being. Either way, an experimental manipulation will provide further insight into the relationship between HEPA and eudaimonic well-being by exploring whether or not it can be influenced by a moderating variable.

Future research may also more appropriately address the potential mediating role of basic need satisfaction in a longitudinal design. Results from the current study suggest that the data are consistent with a model of partial mediation, whereby basic need satisfaction may partially account for the relationship between experiencing eudaimonia during HEPA and eudaimonic

well-being. The limitations inherent in this finding due to the cross-sectional nature of the study were addressed in the Discussion section. Of primary concern is the exploratory nature of the mediation analysis and, therefore, the inability to interpret basic need satisfaction as a causal mediator. Nonetheless, the results provide a degree of support for future research to employ a longitudinal study to examine the mediating role of basic need satisfaction between experiencing eudaimonia during HEPA and eudaimonic well-being. An example of a basic longitudinal study would be to have three separate measurement time points that span a pre-determined length of time (e.g., three weeks). At Week 1, the extent to which eudaimonia is experienced during HEPA would be manipulated and assessed. In addition, basic need satisfaction and eudaimonic well-being would be assessed at Week 1. All three variables would also be assessed at the remaining two time points (i.e., Week 2 and Week 3). Data analysis would examine the mediation in the relationship between experiencing eudaimonia during HEPA at Week 1 and eudaimonic well-being at Week 3 by basic need satisfaction at Week 2. Such a longitudinal study would appropriately test for causal mediation as it would provide temporal order of the variables, uncover a cause-effect pathway, and assess the stability of constructs over time.

#### 4.4 IMPLICATIONS

The majority of previous research has tended to narrowly define physical activity as structured exercise and sport (Acevedo & Ekkekakis, 2006), as well as conceptualize psychological well-being as either the absence of psychological maladies or satisfaction with life (i.e., hedonic well-being; Ryan & Deci, 2001). This study attempted to look at physical activity and psychological health in a new light by incorporating a variety of physical activities as well as assessing mental well-being via eudaimonic well-being. Results suggest that simply engaging in HEPA is likely not associated with eudaimonic well-being, which contradicts a large amount of

research supporting a direct relationship between physical activity and psychological well-being (especially when conceptualized as hedonic well-being; e.g., Fuzhong et al., 2001; Penedo & Dahn, 2005; Stubbe et al., 2007), as well as information that is easily accessible to the general public such as health-related websites (e.g., <http://healthandfitness.sympatico.msn.ca/Home/>; <http://www.prevention.com/cda/homepage.do>). Although the results suggest that engaging in more HEPA is not necessarily associated with more eudaimonic well-being, results further suggest that what is experienced during HEPA might be more significant to eudaimonic well-being. Experiencing elements of well-being – whether hedonic (e.g., experience pleasure) or eudaimonic (e.g., pursue excellence) – while engaging in HEPA was significantly related to and a significant predictor of eudaimonic well-being in my research. Future replications of the findings in the current study will work to inform health-care practitioners that promoting engagement in HEPA, in and of itself, may not be enough to be associated with eudaimonic well-being and reaching human potential.

To acquire health benefits, physical activity promotion programs often target the amount of physical activity that should be engaged in. For example, the Public Health Agency of Canada (2003) recommends 60 minutes of physical activity every day to acquire health benefits such as improved fitness, weight control, stronger muscles and bones, lower blood pressure, and decreased risk of depression, heart disease, obesity, and adult-onset diabetes. To acquire more health benefits, the Public Health Agency of Canada recommends adding more activity – more time, more effort, and/or more often. Physical activity promotion programs that encourage participating in more activity to acquire health benefits may be applicable to some areas of health (e.g., physiological), however these programs may not be as effective when addressing *psychological* benefits – and more specifically eudaimonic benefits. To benefit eudaimonic well-

being – to be fully functioning and achieve human potential (Ryan & Deci, 2001) – health-care practitioners may need to re-think the way they promote physical activity. In order to contribute to the highest of all psychological goods (i.e., eudaimonia; Ryan & Deci), the focus may not be on promoting participation in *more* activity, but rather promoting engagement in activities where pleasure and relaxation are experienced, insight is gained, and excellence is pursued as the results from my study suggest that this may contribute to a different kind of health promotion, where eudaimonic well-being is targeted and achieving optimal psychological functioning is the goal.

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APPENDICES

APPENDIX A

Demographics Questionnaire

**Health and Physical Activity:  
QUESTIONNAIRE PACKAGE**

*Thank you for taking the time to participate in this study. This questionnaire should take you approximately 30 minutes to complete. Please answer each question honestly. If you feel uncomfortable answering any question, you may choose to skip over it if you wish. If you have any questions at all, please feel free to contact the researchers at anytime. This first part of the questionnaire is designed to describe the people participating in this study. All information received is held in confidence. Please provide your...*

**Gender:** \_\_\_\_\_

**Age:** \_\_\_\_\_

**Height:** \_\_\_\_\_

**Weight:** \_\_\_\_\_

**Year of university:** \_\_\_\_\_

**College/Department:** \_\_\_\_\_

**Marital Status:**

Married/Common Law

Widowed

Separated/Divorced

Single

**Sociocultural Information:**

*How would you describe yourself? You may mark more than one or specify, if applicable.*

\_\_\_ White

\_\_\_ Aboriginal

\_\_\_ Chinese

\_\_\_ South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)

\_\_\_ Black

\_\_\_ Filipino

\_\_\_ Latin American

\_\_\_ Southeast Asian (e.g., Vietnamese, Cambodian, Malaysian, Laotian, etc.)

\_\_\_ Arab

\_\_\_ West Asian (e.g., Iranian, Afghan, etc.)

\_\_\_ Korean

\_\_\_ Japanese

\_\_\_ Other - Specify \_\_\_\_\_

APPENDIX B

Short Questionnaire to Assess Health-Enhancing Physical Activity

## Health-Enhancing Physical Activity

*Think about an average week in the past months.*

*Please indicate **how many days per week** you performed the following activities, how much time **on average** you were engaged in this, and (if applicable) how strenuous this activity was for you?*

COMMUTING ACTIVITIES (round trip)	days per week	average time per day		Effort (circle please)
<b>Walking to/from work or school</b>	_____ days	_____ hour	_____ minutes	slow/moderate/fast
<b>Bicycling to/from work or school</b>	_____ days	_____ hour	_____ minutes	slow/moderate/fast

LEISURE TIME ACTIVITIES	days per week	average time per day		Effort (circle please)
<b>Walking</b>	_____ days	_____ hour	_____ minutes	slow/moderate/fast
<b>Bicycling</b>	_____ days	_____ hour	_____ minutes	slow/moderate/fast
<b>Gardening</b>	_____ days	_____ hour	_____ minutes	light/moderate/intense
<b>Odd jobs</b>	_____ days	_____ hour	_____ minutes	light/moderate/intense
<b>Sports (please write down yourself; e.g., tennis, dancing, skating, swimming,)</b>				
<b>1.</b> .....	_____ days	_____ hour	_____ minutes	light/moderate/intense
<b>2.</b> .....	_____ days	_____ hour	_____ minutes	light/moderate/intense
<b>3.</b> .....	_____ days	_____ hour	_____ minutes	light/moderate/intense
<b>4.</b> .....	_____ days	_____ hour	_____ minutes	light/moderate/intense

<b>HOUSEHOLD ACTIVITIES</b>	<b>days per <i>week</i></b>	<b>average time per day</b>	
<b>Light household work</b> (cooking, washing dishes, ironing, child care)	_____ days	_____ hour	_____ minutes
<b>Intense household work</b> (scrubbing floor, walking with heavy shopping bags)	_____ days	_____ hour	_____ minutes

<b>ACTIVITY AT WORK AND SCHOOL</b>	<b>average time per <i>week</i></b>	
<b>Light work</b> (sitting/standing with some walking, e.g., a desk job)	_____ hour	_____ minutes
<b>Intense work</b> (regularly lifting heavy objects at work)	_____ hour	_____ minutes

APPENDIX C

Scales of Psychological Well-Being

## Health-Enhancing Physical Activity

*The following set of questions deals with how you feel about yourself and your life. Please remember that there are no right or wrong answers.*

Circle the number that best describes your present agreement or disagreement with each statement.	Strongly Disagree	Disagree Somewhat	Disagree Slightly	Agree Slightly	Agree Somewhat	Strongly Agree
1. Most people see me as loving and affectionate.	1	2	3	4	5	6
2. Sometimes I change the way I act or think to be more like those around me.	1	2	3	4	5	6
3. In general, I feel I am in charge of the situation in which I live.	1	2	3	4	5	6
4. I am not interested in activities that will expand my horizons.	1	2	3	4	5	6
5. I feel good when I think of what I've done in the past and what I hope to do in the future.	1	2	3	4	5	6
6. When I look at the story of my life, I am pleased with how things have turned out.	1	2	3	4	5	6
7. Maintaining close relationships has been difficult and frustrating for me.	1	2	3	4	5	6
8. I am not afraid to voice my opinions, even when they are in opposition to the opinions of most people.	1	2	3	4	5	6
9. The demands of everyday life often get me down.	1	2	3	4	5	6
10. In general, I feel that I continue to learn more about myself as time goes by.	1	2	3	4	5	6
11. I live life one day at a time and don't really think about the future.	1	2	3	4	5	6
12. In general, I feel confident and positive about myself.	1	2	3	4	5	6
13. I often feel lonely because I have few close friends with whom to share my concerns.	1	2	3	4	5	6
14. My decisions are not usually influenced by what everyone else is doing.	1	2	3	4	5	6

## Health-Enhancing Physical Activity

Circle the number that best describes your present agreement or disagreement with each statement.	Strongly Disagree	Disagree Somewhat	Disagree Slightly	Agree Slightly	Agree Somewhat	Strongly Agree
15. I do not fit very well with the people and the community around me.	1	2	3	4	5	6
16. I am the kind of person who likes to give new things a try.	1	2	3	4	5	6
17. I tend to focus on the present, because the future nearly always brings me problems.	1	2	3	4	5	6
18. I feel like many of the people I know have gotten more out of life than I have.	1	2	3	4	5	6
19. I enjoy personal and mutual conversations with family members or friends.	1	2	3	4	5	6
20. I tend to worry about what other people think of me.	1	2	3	4	5	6
21. I am quite good at managing the many responsibilities of my daily life.	1	2	3	4	5	6
22. I don't want to try new ways of doing things - my life is fine the way it is.	1	2	3	4	5	6
23. I have a sense of direction and purpose in life.	1	2	3	4	5	6
24. Given the opportunity, there are many things about myself that I would change.	1	2	3	4	5	6
25. It is important to me to be a good listener when close friends talk to me about their problems.	1	2	3	4	5	6
26. Being happy with myself is more important to me than having others approve of me.	1	2	3	4	5	6
27. I often feel overwhelmed by my responsibilities.	1	2	3	4	5	6
28. I think it is important to have new experiences that challenge how you think about yourself and the world.	1	2	3	4	5	6
29. My daily activities often seem trivial and unimportant to me.	1	2	3	4	5	6
30. I like most aspects of my personality.	1	2	3	4	5	6
31. I don't have many people who want to listen when I need to talk.	1	2	3	4	5	6

## Health-Enhancing Physical Activity

Circle the number that best describes your present agreement or disagreement with each statement.	Strongly Disagree	Disagree Somewhat	Disagree Slightly	Agree Slightly	Agree Somewhat	Strongly Agree
32. I tend to be influenced by people with strong opinions.	1	2	3	4	5	6
33. If I were unhappy with my living situation, I would take effective steps to change it.	1	2	3	4	5	6
34. When I think about it, I haven't really improved much as a person over the years.	1	2	3	4	5	6
35. I don't have a good sense of what it is I'm trying to accomplish in life.	1	2	3	4	5	6
36. I made some mistakes in the past, but I feel that all in all everything has worked out for the best.	1	2	3	4	5	6
37. I feel like I get a lot out of my friendships.	1	2	3	4	5	6
38. People rarely talk to me into doing things I don't want to do.	1	2	3	4	5	6
39. I generally do a good job of taking care of my personal finances and affairs.	1	2	3	4	5	6
40. In my view, people of every age are able to continue growing and developing.	1	2	3	4	5	6
41. I used to set goals for myself, but that now seems like a waste of time.	1	2	3	4	5	6
42. In many ways, I feel disappointed about my achievements in life.	1	2	3	4	5	6
43. It seems to me that most other people have more friends than I do.	1	2	3	4	5	6
44. It is more important to me to "fit in" with others than to stand alone on my principles.	1	2	3	4	5	6
45. I find it stressful that I can't keep up with all of the things I have to do each day.	1	2	3	4	5	6
46. With time, I have gained a lot of insight about life that has made me a stronger, more capable person.	1	2	3	4	5	6
47. I enjoy making plans for the future and working to make them a reality.	1	2	3	4	5	6
48. For the most part, I am proud of who I am and the life I lead.	1	2	3	4	5	6

## Health-Enhancing Physical Activity

Circle the number that best describes your present agreement or disagreement with each statement.	Strongly Disagree	Disagree Somewhat	Disagree Slightly	Agree Slightly	Agree Somewhat	Strongly Agree
49. People would describe me as a giving person, willing to share my time with others.	1	2	3	4	5	6
50. I have confidence in my opinions, even if they are contrary to the general consensus.	1	2	3	4	5	6
51. I am good at juggling my time so that I can fit everything in that needs to be done.	1	2	3	4	5	6
52. I have a sense that I have developed a lot as a person over time.	1	2	3	4	5	6
53. I am an active person in carrying out the plans I set for myself.	1	2	3	4	5	6
54. I envy many people for the lives they lead.	1	2	3	4	5	6
55. I have not experienced many warm and trusting relationships with others.	1	2	3	4	5	6
56. It's difficult for me to voice my own opinions on controversial matters.	1	2	3	4	5	6
57. My daily life is busy, but I derive a sense of satisfaction from keeping up with everything.	1	2	3	4	5	6
58. I do not enjoy being in new situations that require me to change my old familiar ways of doing things.	1	2	3	4	5	6
59. Some people wander aimlessly through life, but I am not one of them.	1	2	3	4	5	6
60. My attitude about myself is probably not as positive as most people feel about themselves.	1	2	3	4	5	6
61. I often feel as if I'm on the outside looking in when it comes to friendships.	1	2	3	4	5	6
62. I often change my mind about decisions if my friends or family disagree.	1	2	3	4	5	6
63. I get frustrated when trying to plan my daily activities because I never accomplish the things I set out to do.	1	2	3	4	5	6
64. For me, life has been a continuous process of learning, changing, and growth.	1	2	3	4	5	6

## Health-Enhancing Physical Activity

Circle the number that best describes your present agreement or disagreement with each statement.	Strongly Disagree	Disagree Somewhat	Disagree Slightly	Agree Slightly	Agree Somewhat	Strongly Agree
65. I sometimes feel as if I've done all there is to do in life.	1	2	3	4	5	6
66. Many days I wake up feeling discouraged about how I have lived my life.	1	2	3	4	5	6
67. I know that I can trust my friends, and they know they can trust me.	1	2	3	4	5	6
68. I am not the kind of person who gives in to social pressures to think or act in certain ways.	1	2	3	4	5	6
69. My efforts to find the kinds of activities and relationships that I need have been quite successful.	1	2	3	4	5	6
70. I enjoy seeing how my views have changed and matured over the years.	1	2	3	4	5	6
71. My aims in life have been more a source of satisfaction than frustration to me.	1	2	3	4	5	6
72. The past had its ups and downs, but in general, I wouldn't want to change it.	1	2	3	4	5	6
73. I find it difficult to really open up when I talk with others.	1	2	3	4	5	6
74. I am concerned about how other people evaluate the choices I have made in my life.	1	2	3	4	5	6
75. I have difficulty arranging my life in a way that is satisfying to me.	1	2	3	4	5	6
76. I gave up trying to make big improvements or changes in my life a long time ago.	1	2	3	4	5	6
77. I find it satisfying to think about what I have accomplished in life.	1	2	3	4	5	6
78. When I compare myself to friends and acquaintances, it makes me feel good about who I am.	1	2	3	4	5	6
79. My friends and I sympathize with each other's problems.	1	2	3	4	5	6
80. I judge myself by what I think is important, not by the values of what others think is important.	1	2	3	4	5	6

## Health-Enhancing Physical Activity

Circle the number that best describes your present agreement or disagreement with each statement.	Strongly Disagree	Disagree Somewhat	Disagree Slightly	Agree Slightly	Agree Somewhat	Strongly Agree
81. I have been able to build a home and a lifestyle for myself that is much to my liking.	1	2	3	4	5	6
82. There is truth to the saying that you can't teach an old dog new tricks.	1	2	3	4	5	6
83. In the final analysis, I'm not so sure that my life adds up to much.	1	2	3	4	5	6
84. Everyone has their weaknesses, but I seem to have more than my share.	1	2	3	4	5	6

APPENDIX D

Hedonic and Eudaimonic Motives for Activities Scale

*Below are a number of questions pertaining to your health-enhancing physical activities (i.e. physical activity at work/school, household physical activity, leisure-time physical activity, and commuting physical activity). Try to recall as best you can how you typically feel in general when engaged in health-enhancing physical activity. Please use the scale provided.*

Through your health-enhancing physical activity, how much are you...

1. relaxing?

<input type="checkbox"/>							
1	2	3	4	5	6	7	
Not at all						Very much	

2. doing something you believe in?

<input type="checkbox"/>							
1	2	3	4	5	6	7	
Not at all						Very much	

3. experiencing pleasure?

<input type="checkbox"/>							
1	2	3	4	5	6	7	
Not at all						Very much	

4. developing a skill, learning, or gaining insight into something?

<input type="checkbox"/>							
1	2	3	4	5	6	7	
Not at all						Very much	

5. enjoying yourself?

<input type="checkbox"/>							
1	2	3	4	5	6	7	
Not at all						Very much	

6. pursuing excellence or a personal ideal?

<input type="checkbox"/>							
1	2	3	4	5	6	7	
Not at all						Very much	

Through your health-enhancing physical activity, how much are you...

7. developing your potential?

<input type="checkbox"/>							
1	2	3	4	5	6	7	
Not at all						Very much	

8. being entertained?

<input type="checkbox"/>							
1	2	3	4	5	6	7	
Not at all						Very much	

APPENDIX E

Pilot Study

In an attempt to clarify the interpretation of the instructions on the HEMA scale (i.e., do participants interpret the scale as referring to “motives” or “experience”), a pilot study was conducted. After obtaining ethical approval from the Behavioural Research Ethics Board, men and women undergraduate students ( $N = 37$ ) enrolled in a second-year Sociology course volunteered to participate in the study. Participants completed a paper and pencil version of the HEMA scale and indicated what they were thinking about when completing the scale by responding to the following item:

When responding to the previous questions, some people were thinking about what they intended to do/were motivated to do, while some people were thinking about what they were experiencing during HEPA. Which is true for you (i.e., choose which of the two statements is most like you and decide whether this is “really true” or “sort of true”; choose only ONE square)?

Really True For me	Sort of True For me						
<input type="checkbox"/>	<input type="checkbox"/>	<b>When responding to the questions above, I was thinking about what I intended to do/ was motivated to do</b>	OR	<b>When responding to the questions above, I was thinking about what I was experiencing during physical activity</b>	<input type="checkbox"/>	<input type="checkbox"/>	
					Sort of True For me	Really True For me	

Results showed that 73.0% (i.e., 27 participants) of respondents were thinking about what they were experiencing during HEPA, with six participants indicating this was *sort of true for me* and 21 participants indicating this was *really true for me*; 10.8% (i.e., 4 participants) were thinking about what they were motivated to do, with two participants indicating this was *sort of true for me* and two participants indicating this was *really true for me*; and, 16.2% (i.e., 6 participants) indicated that they were thinking about both what they were experiencing during HEPA as well as what they were motivated to do. The results provide some degree of confidence that the

participants generally interpreted the instructions on the HEMA scale in reference to the extent to which eudaimonia and hedonia are experienced during HEPA, despite what the name of the scale suggests.

APPENDIX F

Satisfaction with Life Scale

*Below are five statements with which you may agree or disagree. Using the 1-7 scale below, indicate your agreement with each item by placing the appropriate number in the line preceding that item. Please be open and honest in your responding.*

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Slightly Disagree</b>	<b>Neither Agree or Disagree</b>	<b>Slightly Agree</b>	<b>Agree</b>	<b>Strongly Agree</b>

\_\_\_\_\_ 1. In most ways my life is close to my ideal.

\_\_\_\_\_ 2. The conditions of my life are excellent.

\_\_\_\_\_ 3. I am satisfied with life.

\_\_\_\_\_ 4. So far I have gotten the important things I want in life.

\_\_\_\_\_ 5. If I could live my life over, I would change almost nothing.

APPENDIX G

Positive and Negative Affect Scale

## Health-Enhancing Physical Activity

*This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to the word. Indicate to what extent you generally feel this way, that is, how you feel on the average. Use the following scale to record your answers.*

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Very slightly or not at all</b>	<b>A little</b>	<b>Moderately</b>	<b>Quite a bit</b>	<b>Extremely</b>
_____ interested				_____ irritable
_____ distressed				_____ alert
_____ excited				_____ ashamed
_____ upset				_____ inspired
_____ strong				_____ nervous
_____ guilty				_____ determined
_____ scared				_____ attentive
_____ hostile				_____ jittery
_____ enthusiastic				_____ active
_____ proud				_____ afraid

APPENDIX H

Psychological Need Satisfaction in Exercise Scale

*The following statements represent different feelings people have when they are physically active. Please answer the following questions by considering how you typically feel when you are physically active. Please respond using the scale provided.*

1. I feel that I am able to complete physical activities that are personally challenging.

<input type="checkbox"/>						
1	2	3	4	5	6	
False					True	

2. I feel free to be physically active in my own way.

<input type="checkbox"/>						
1	2	3	4	5	6	
False					True	

3. I feel attached to my physical activity companions because they accept me for who I am.

<input type="checkbox"/>						
1	2	3	4	5	6	
False					True	

4. I feel free to make my own physical activity program decisions.

<input type="checkbox"/>						
1	2	3	4	5	6	
False					True	

5. I feel confident I can do even the most challenging physical activities.

<input type="checkbox"/>						
1	2	3	4	5	6	
False					True	

6. I feel confident in my ability to perform physical activities that personally challenge me.

<input type="checkbox"/>						
1	2	3	4	5	6	
False					True	

7. I feel like I share a common bond with people who are important to me when we are physically active together.

<input type="checkbox"/>						
1	2	3	4	5	6	
False					True	

8. I feel capable of completing physical activities that are challenging to me.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

9. I feel a sense of camaraderie with my physical activity companions because we are physically active for the same reasons.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

10. I feel like I am in charge of my physical activity program decisions.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

11. I feel like I have a say in choosing the physical activities that I do.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

12. I feel like I am capable of doing even the most challenging physical activities.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

13. I feel close to my physical activity companions who appreciate how difficult physical activity can be.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

14. I feel free to choose which physical activities I participate in.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

15. I feel connected to the people who I interact with while we are physically active together.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

16. I feel like I get along well with other people who I interact with while we are physically active together.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

17. I feel good about the way I am able to complete challenging physical activities.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

18. I feel like I am the one who decides what physical activities I do.

<input type="checkbox"/>					
1	2	3	4	5	6
False					True

APPENDIX I

Copy of Certificate of Ethical Approval



Behavioural Research Ethics Board (Beh-REB)  
**Certificate of Approval**

PRINCIPAL INVESTIGATOR  
 Karl C. Kowaluk

DEPARTMENT  
 Kinesiology

IRB #  
 09-207

INSTITUTION(S) WHERE RESEARCH WILL BE CONDUCTED:  
 University of Saskatchewan  
 Saskatoon, SK

STUDENT RESEARCHERS  
 Leah Pasenski

SPONSOR  
 SOCIAL SCIENCES AND HUMANITIES RESEARCH COUNCIL OF CANADA (SSHRC)

TITLE  
 Health-Enhancing Physical Activity and Endomorphic Well-Being

ORIGINAL REVIEW DATE  
 23-Aug-2008

APPROVAL ON  
 15-Sep-2008

APPROVAL OF:  
 Ethics Application  
 Consent Protocol

EXPIRY DATE  
 11-Sep-2009

Full Board Meeting:

Date of Full Board Meeting:

Delegated Review:

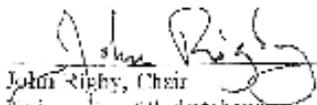
**CERTIFICATION**

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

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

**ONGOING REVIEW REQUIREMENTS**

In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within six months of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: [http://www.usask.ca/research/ethics\\_review/](http://www.usask.ca/research/ethics_review/)

  
 John Rigby, Chair  
 University of Saskatchewan  
 Behavioural Research Ethics Board

Please send all correspondence to:

Ethics Office  
 University of Saskatchewan  
 Room 307 K19 Hall, 117 Science Place  
 Saskatoon SK S7N 0C8  
 Telephone: (306) 938-2975 Fax: (306) 938-2388

APPENDIX J

Consent Form<sup>10</sup>

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<sup>10</sup> The consent form was used in conjunction with the larger longitudinal tracking study.



## *Physical Activity & Health*

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You are invited to participate in a research project entitled **Health-Enhancing Physical Activity and Eudaimonic Well-being**. Please read this form carefully, and **feel free to email or call the researchers with any questions** you might have.

### **Researchers:**

Leah Besenski  
Master's of Science Candidate  
College of Kinesiology  
University of Saskatchewan  
Phone: 966-1123  
Email: leah.besenski@usask.ca

Dr. Kent Kowalski  
Professor Kinesiology  
College of Kinesiology  
University of Saskatchewan  
Phone: 966-1079  
Email: kent.kowalski@usask.ca

**Purpose and Procedure:** The purpose of this study is to investigate the relationship between physical activity and eudaimonic well-being, which is an index of positive psychological health. Eudaimonic well-being may be defined as what you experience (the outcome) when you are fully functioning psychologically at your true and highest potential. This is different from simply experiencing enjoyment, pleasure, or happiness.

This study will consist of three time points. At time 1, you are asked to complete a questionnaire package containing questions related to your psychological well-being and physical activity behaviours. A sample question is "How many days per week do you do moderate activities (e.g., brisk walking, bicycling) for at least 10 minutes at a time?" The questionnaire package will take approximately 30 minutes to complete.

If you are willing, you will be contacted (via email) in six months to participate in time 2, and again in another six months to participate in the time 3. Time 2 and 3 will consist of a shorter questionnaire package, taking approximately 15-20 minutes to complete, that will be completed via an online web-based survey at a computer of your choosing at any location. **Please note that participating in time 1 does not mean that you must participate in time 2 and time 3.** Participation in this study is completely voluntary. In an effort to show our appreciation for your time, participants will be entered into two separate time periods of draws. After time 1, two draws will be made for University of Saskatchewan bookstore gift certificates valued at \$100 each. After time 2, participants will be entered to win compensation for half of a three credit unit course (i.e., reimbursed for 1.5 credit units). Those eligible for the second draw will be those who have complete data at time 1 and time 2. Winners for all of the draws will be randomly selected and notified via email.

**Potential Benefits:** Although there are no known personal benefits to participating, this study will provide insight into the relationship between various types of physical activity and different dimensions of psychological health. This is an important step in order for researchers to better understand the psychological benefits of physical activity.

**Potential Risks:** There are no known physical or psychological risks associated with participating in this study. In the event that you would like to further discuss your feelings regarding the issues discussed in the study, Student Counseling Services can assist you. They can be contacted at (306) 966-4920. You are encouraged to contact the researchers at any time (before, during, or after the study) to ask any questions that you may have.

**Storage of Data:** All research material will be stored securely in the office of Dr. Kent Kowalski at the University of Saskatchewan. Electronic documents from online surveys will be copied onto a CD and will be locked by password in read only format. By doing so, documents cannot be modified without the research password. Only the researchers will have access to the data. No data will be stored on any computer hard drives once the study is complete. The data will be stored for a minimum of five years after completion of the study. This is standard protocol for any data that may be published in an academic journal and/or presented at a professional conference

**Confidentiality:** Although your NSID is requested in the questionnaire package, it will only be used by the researchers to contact you to invite you to participate in time 2 and time 3 as well as to match your questionnaire packages over the three time points. After you have been contacted for the remaining two time points and your questionnaire packages have been matched, all NSIDs will be removed from the data file. The data from the study will be used for the student researcher's Master's thesis, as well as to produce a manuscript in hopes of publishing in a scholarly journal and/or being presented at a conference. Only the research team will have access to the completed questionnaire packages. Written reports of the data will be reported in aggregate/summarized form so that it will not be possible to identify individuals.

**Right to Withdraw:** Your participation is voluntary, and you can answer only those questions that you are comfortable with. Not answering a question or withdrawing from the study will result in no penalty to you or anyone else. You may withdraw from the study for any reason, at any time, without penalty of any sort and the decision to withdraw will not affect any of your current or future activities. In order to withdraw from the online survey, simply close your web-browser at any time. If you withdraw from the study, any data that you have contributed will be destroyed at your request. Prior to the remaining phases of the study, you will be asked if you still wish to participate.

**Questions:** If you have any questions concerning the research project, please feel free to contact the researchers at any point. This research project has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board on September 15, 2008. Any questions regarding your rights as a participant may be addressed to that committee through the Ethics Office (966-2084). Out of town participants may call collect.

You may contact the research team to find out the results of the study or request a copy of the published manuscript.

**Consent to Participate:**

**I have read and understood the description provided; I have had an opportunity to ask questions and my questions have been answered. I consent to participate in the research**

**project, understanding that I may withdraw my consent at any time. A copy of this Consent Form has been given to me for my records.**

\_\_\_\_\_  
(Name of Participant)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature of Participant)

\_\_\_\_\_  
(Signature of Researcher)

***Online survey addition:***

**Consent to Participate:**

**I have read and understood the description provided; I have had an opportunity to ask questions and my questions have been answered. I consent to participate in the research project, understanding that I may withdraw my consent at any time.**

Yes

No

APPENDIX K

Qualitative Study

Although my thesis research suggests that the actual level of HEPA might be less important to eudaimonic well-being than the experiences individuals have while participating in HEPA, the specific role of HEPA in eudaimonic well-being is poorly understood. While it was found that experiencing elements of well-being while engaging in HEPA was associated with eudaimonic well-being ( $r_s = .37 - .40, p < .01$ ) our understanding of this relationship is limited. In the current study, experiencing hedonia and eudaimonia during HEPA was limited to eight items on the HEMA scale, with four items assessing hedonia and four items assessing eudaimonia. Limiting the assessment of eudaimonia to four items appears to under represent the domain of eudaimonic well-being as Ryff (1989) had envisioned. For example, while Ryff's conceptualization of eudaimonic well-being consists of autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance, the HEMA scale items include belief in the activity, skill development, pursuing excellence, and developing potential (which are then summed to form a eudaimonia composite). As a result, a qualitative approach was used, which was meant to build on and inform these initial quantitative results (Creswell, 2009). More specifically, the purpose of this study was to further explore the role that HEPA plays in eudaimonic well-being. First, it explored *if* HEPA is an important contributor to eudaimonic well-being. Second, it considered *how* HEPA may contribute to eudaimonic well-being.

### *Participants and Procedures*

After obtaining approval from the University of Saskatchewan's Behavioural Research Ethics Board, as well as approval from course professors, a research assistant visited undergraduate classes and invited women to participate. Potential participants were informed about the purpose and procedure of the study, provided with an opportunity to ask questions, and

invited to complete a questionnaire package consisting of an informed consent form, demographics, the SQUASH, and the SPWB. Also included was a four-quadrant grid in which participants placed themselves along a continuum of HEPA and eudaimonic well-being based on their self-selected level of physical activity and well-being (see Appendix K.1). Participants had the option of completing a paper-and-pencil version of the questionnaire package or an online web-based survey. Forty-eight women ( $M_{\text{age}} = 23.1$  years) completed the questionnaire package, 10 of which volunteered to participate in one-on-one, semi-structured interviews ( $M_{\text{age}} = 24.6$  years). Three women from the initial forty-eight self-reported low eudaimonic well-being. There was a significant relationship between scores from the SQUASH and self-selected level of physical activity in the four-quadrant grid ( $r = .32, p < .05$ ). The women who volunteered to participate in the interviews did not significantly differ from the women who did not volunteer on either their SQUASH scores ( $t = 0.16, p = .88$ ) or level of eudaimonic well-being ( $t = -0.14, p = .89$ ).

Based on self-placement in the four-quadrant grid of HEPA and eudaimonic well-being, the women who were interviewed classified themselves as belonging to one of the following groups: high eudaimonic well-being and high HEPA ( $n = 4$ ); high eudaimonic well-being and low HEPA ( $n = 4$ ); and low eudaimonic well-being and high HEPA ( $n = 1$ ). One participant placed herself at the center of the quadrant, representing the midpoint between high and low eudaimonic well-being and HEPA. The specific types of physical activities that the women participated in varied greatly, ranging from basketball and volleyball, to surfing and swimming, to hiking and yoga. The activities they reported also included active commuting, fitness, and household activities, reflecting the context of HEPA used for this study.

The interviews began with the women responding to open-ended questions that asked them to describe how they would define eudaimonic well-being (e.g., “What is needed to reach human potential? What does achieving the best in you involve?”). This was followed by the women being provided with an outline of Ryff’s (1989) perspective of eudaimonic well-being and an invitation for them to comment on each dimension of eudaimonic well-being (e.g., “How do your feelings of this dimension play a role – if any – in the achievement of your human potential? Are there any dimensions that you would add?”). The women were then reminded of the definition of HEPA, and asked to discuss their participation in (e.g., “What types of physical activities do you engage in?”). These initial discussions were meant to provide the women context for the study and a general understanding of what was meant by the term “eudaimonic well-being”, which is not typically part of everyday discourse. Subsequently, the discussions then turned to the main research question and focused on if and how physical activity contributes to eudaimonic well-being (e.g., “What role does physical activity play – if any – in achieving your human potential?”). To be consistent with Ryff’s framework, the women were also specifically asked about the role of HEPA in the promotion autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. Finally, they were asked whether or not someone can reach their potential without being physically active.

The interviews, lasting approximately 90 minutes each, were audiotaped and transcribed verbatim, resulting in 208 pages of single-spaced text. After transcription, all of the interviews were read and reread to gain a general and holistic sense of the text, as well as to reflect on the textual meaning (Creswell, 2003; Goulding, 2005). During this initial stage of analysis, notes were made in margins and general thoughts about the data were recorded. A coding process then began by organizing the content into chunks and labeling those organizations with an *in vivo*

term (i.e., a term that includes the actual language of the participant; Creswell). These emergent themes were then compared back to the original transcripts to ensure consistency. All transcripts were then reread to ensure that the themes were reflected in the text. I independently conducted the coding process while my supervisor took part in peer debriefing in order to enhance the accuracy of the themes and interpretation (Creswell). Lack of agreement between us was resolved by revisiting the transcribed interviews. Direct quotes are used from the women to provide a rich description of the themes.

### *Results*<sup>11</sup>

#### *Eudaimonic Well-being*

Before being introduced to Ryff's (1989) model of eudaimonic well-being, initial discussions as to what the women thought is necessary to achieve human potential focused on success, importance of the self, significant others, good health, and achieving/maintaining balance in life. Although not necessarily identical to Ryff's dimensions of eudaimonic well-being, many of the areas identified by the women resembled elements of Ryff's conceptualization of eudaimonic well-being. For example, many of the women noted both goal setting and goal attainment as crucial factors to achieving success and therefore reaching human potential. Having goals in life happens to be a key element to *Purpose in Life* – one of Ryff's dimensions of eudaimonic well-being. *Self-acceptance*, another of Ryff's dimensions, was directly stated as important to reaching human potential when the women identified various self-related variables as needing to be in place in order to reach human potential (e.g., self-respect, self-acceptance, and self-confidence). In a similar vein, *Positive Relations with Others* was alluded to when the women identified having encouragement and support from others (e.g., parents, friends, family) as an important factor to achieving human potential. Many of the

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<sup>11</sup> The women self-selected pseudonyms, which are used here, to protect their confidentiality.

women also reported that in order to maintain balance in life and achieve human potential, it is important to be well-rounded and diversified, which is similar to elements of *Personal Growth* where individuals should be open to new experiences and continued development. All of Ryff's dimensions were ultimately mentioned or alluded to in some form or another.

After discussing what comprises human potential, the women were presented with Ryff's (1989) conceptualization of eudaimonic well-being and generally agreed with the six dimensions that Ryff outlined. Only two of the women were not in complete agreement with Ryff's conceptualization of eudaimonic well-being. Although these two women agreed that all six dimensions are necessary to reach human potential, they both expressed the need for an additional dimension not encompassed by the original dimensions. Simone discussed how happiness should perhaps comprise its own dimension and expressed, "I think that about covers it...except happiness...When I'm feeling really happy...all these things kind of come more easily and everything". Similarly, Sally shared that overcoming hardships is necessary to reach human potential and stated, "...I always believe that you have to go through lots of like hardships in life to become like the person you are...Hardships. It makes you who you are." The majority of the women, however, reported agreement with Ryff's dimensions proposed as necessary to achieve human potential. The interviews continued with open-ended questions that ultimately allowed the women to share their thoughts regarding to what extent – if any – HEPA contributes to eudaimonic well-being.

#### *Physical Activity Contributing to Eudaimonic Well-Being*

Despite their level of HEPA, all of the women expressed that physical activity is necessary to reach their own human potential. Reflecting this perspective, Keera stated, "I would

say it's important...for me, yes. It's very important to me cause I mean I've grown up in physical activity", while Lynn expressed,

Absolutely...because mentally I am much more content when I am at least striving for something...I don't know if it's because you feel like you're progressing or you feel like you are doing something really wonderful for your body...I don't know if that's what it is, but I always feel better. Always.

After reflecting on their initial decision that physical activity is necessary to achieve their human potential, five of the women went on to discuss that while physical activity is essential to their own eudaimonic well-being, this is not necessarily the case for everyone because it "depends on how you see yourself...someone else could be happy with themselves without being physically active" (Simone). Specifically, the women discussed that physical activity contributes to their eudaimonic well-being by providing an avenue for *goal setting/striving*, providing them with *bonding experiences*, allowing for *reflections on the self*, and developing a *physical and able body*.

#### *Goal Setting/Striving*

When discussing *how* physical activity might contribute to their eudaimonic well-being, most of the women expressed that physical activity provides an avenue for success, as it allows for goal setting and goal attainment, provides examples of successful results, and provides positive reinforcement

...because it's one of those things that you can set very concrete goals for yourself. So whether it's you know, I'm working towards lifting more weights, or working towards running longer, or I'm working towards running at a higher level, whatever the case may be. It's just one of those things that if you feel achievement in that part, you see that you can achieve in other ways too. (Jenny)

Many of the women discussed that physical activity specifically provides an avenue for goal setting/achieving in the development of personal growth. For example, Lynn expressed, "I guess it's teaching long term goal setting...it's teaching me so many things...(so the goals and

objectives have changed)...and I'm okay with that...Now, it's about being my best. Doing what I can do". The women also described how physical activity can play an important role in feelings of purpose in life, which was expressed in Simone's statement, "...ever since I've started playing ultimate frisbee I feel like I have something that I can improve at...I do have some drive...so it helps to have like that, an athletic goal that is part of my purpose". Most of the women expressed that they are able to see improvements in their physical activity, which shows them that they are successful and continuing to grow and learn. For example, Keera explained,

You have dance exams every year and when you pass your exams, like, you're learning more and more and more. You're learning more skills, more jumps, more turns. You are learning things way more complex. You are learning how to hold your body properly...proper posture... different stretches even. So those all they help you kind of reach a potential and they help make you feel good about yourself.

Similarly, Jessica reflected on how physical activity challenges her to grow and stated,

...you can challenge yourself with it. Like I mean you're always kind of growing mentally but you know physically as well. You know you can challenge yourself or try something new...or doing something on a harder level. So it does help me grow personally.

Some of the women also discussed how setting and achieving physical activity goals provides them with the strength and courage to set and achieve goals in other domains of their life, which allows for opportunities to grow and contributes to their purpose in life. Jenny summed it up as,

...you can set like mini goals for yourself and once you attain them it gives you a kind of, "Wow, I did this little step, maybe I can push further", you know. And it's just it's definitely a positive reinforcement factor that way...I think being physically active gives you the skills to put into the other points in your life...if you're working towards a degree that's something a little more abstract, you know if you're doing something physically it shows that, "Okay, if I do this and I take these steps, it's going to work"...if you're setting abstract goals you're going to know that you can attain them because you've attained your concrete ones in another part of your life.

### *Bonding Experiences*

Another main way that the women thought physical activity plays a role in their eudaimonic well-being is that it allows for significant others to be a part of their lives. Physical

activity allows them to spend time with and connect with others because "...it gives you time to build those human relations" (Jenny). Most of the women reported that physical activity provides an opportunity to connect with others and build positive, warm, trusting, and fulfilling relationships, which contributes to their eudaimonic well-being. When discussing how her physical activity participation has provided bonding experiences, Hannah stated, "...I have played on lots of team sports and so...you automatically have relationships with others...it involves warm, trusting, and fulfilling relationships...I still like talk to people...and I just have connections and stuff with people".

In addition, almost all of the women talked about how physical activity assists in developing positive relations with others by providing a bonding experience and reciprocal support system. Some of the women discussed how being active with others allows them to be comfortable, open, and honest. Elaborating on the bond that she feels with her physical activity companions, Lindsay stated,

... it's a bonding experience. You can share in it and feel more comfortable talking to other people about body image and how you feel that day...I feel that if I'm in a room full of active people and you know, talking about if one's happy or sad that day, you can tie physical activity into it...we can talk about those aspects more. But if I'm in a room full of people who aren't active, aren't fit, aren't healthy, it's much harder to talk about feelings and it plays into what we've done that day and how you're living your life.

Many of the women also identified physical activity as a way to provide support for others and receive support in return, leading to positive relations with others. Jenny discussed the reciprocal support system she finds in physical activity and stated,

...it kinda goes to the support system too again. So you know if you are a couple or family trying to lose weight and get into better shape then it's a matter of you know, "We'll do it together, we'll be each other's support system if...one of us gets stuck then we've got someone to turn to". You know it's again support system and knowing you're not alone in it.

### *Reflections on the Self*

Further discussion as to how the women thought physical activity might play a role in their eudaimonic well-being focused on how physical activity contributes to the self by providing confidence, being exposed to new experiences (i.e., continuing to grow and learn), and acquiring new skills that can be used in different domains (e.g., time management, stress management). Reflecting on the way physical activity positively influences other domains, Lynn expressed, “Knowing that I can do it. So, if I can do that then you know I can do something else”. Simone also discussed the positive effects that stem from physical activity and impact other areas of her life and stated, “...everything else just works better. Like, like I eat better is one thing. And like, I think I manage my time better...I think I concentrate better and work better”. Many of the women also expressed that physical activity allows for a focus on the self as it provides time to self-reflect. Elaborating on this notion, Jenny shared, “...it’s a way of teaching yourself how to take a step back and self-evaluate too...when you start pushing yourself too hard...it causes you to be more self aware”.

In addition, all of the women reported that physical activity further contributes to the self by working as a stress release and learning time management skills, which helps them manage their lives better. Simone reported that physical activity “...helps me focus better and manage my time better...and I studied better when I was studying, like this is exercise time, this is study time, and this is work time”. Most of the women also expressed that physical activity contributes to the self because it allows them to be independent, autonomous, and “...in control of at least one element of my life” (Lynn). Many of the women expressed that with physical activity, they get to make their own choices, plan their own work-outs, set their own schedules, and prioritize their life as they choose. Reflecting on the autonomy she experiences with physical activity, Sally stated, “...that’s my own choice...it’s my own determination, like I do it on my own. Like

I get up – I would be happy to sleep in an extra three hours every morning, but I get up...you know”.

*Physical and Able Body*

Another way that almost all of the women reported that physical activity contributes to achieving their human potential is by having a healthier body. Keera shared that physical activity “...makes me more healthy. When I’m more physically active I’m not sick as much”. Some women discussed that physical activity allows them to sleep better, some identified that it increases their energy, and others shared that it improves their mental alertness. Many of the women also addressed the healthy mind-body connection that physical activity provides, such as Hannah who stated, “I think that it’s really important to keep your body in shape and then...your mind and everything will follow”.

All of the women thought that physical activity contributes to their self-acceptance, and specifically the acceptance of their physical self. Many of the women discussed that they feel more content with their bodies – the good and the bad, their strengths and weaknesses – when they are physically active. Reflecting on this, Lynn stated, “I think it’s (physical activity) really made a huge difference in being able to say, ‘This is where I am’”, and Jenny elaborated,

I know I’ve got the upper body strength of a kitten I always say. That’s one of those things I have to accept...so I know that. And I mean it’s strength versus weakness and saying “That’s not my strongest point, I need to work on that”...So it’s accepting the weaknesses and knowing that they aren’t limitations...And just as well accepting your strengths and knowing that just because you do have weaknesses it doesn’t mean you’re not really good at something else.

Many of the women specifically referred to body image, and addressed how physical activity contributes to having a positive body image, which is reflected in Lindsay’s comment, “I’d say self-acceptance feeds into personal body image and being able to accept who I am. If I wasn’t physically active I don’t know if I could maintain that, and therefore be happy with myself”.

In addition to physical activity allowing for acceptance of the physical self, some of the women reported that to be self-accepting, they need to physically use all of the functions of their body. Lindsay shared, "...to be who I am I think I need to keep active...And keep my body moving...And feel like I have used all my muscles and joints in a day". The women expressed that they have a positive attitude towards the self and feel a greater sense of self-acceptance if they know that they have used their bodies abilities. In addition, some of the women expressed that physical activity allows them to be in control of their life and environment because it provides them with a healthy, fit, and able-body that allows them to meet the demands of everyday life. Reflecting on this, Lindsay stated,

I feel like to live my everyday life I do need to be in good health and be physically able. If I wasn't, I think it would be a big change in my life...I would always like to be physically ready to do whatever comes my way.

Further, some of the women discussed that physical activity could be used as an aid to assist in overcoming injuries and health problems, which contributes to their autonomy because it instills feelings of independence and success. Lynn expressed, "It made me feel like I was finally doing something for myself to get better...Even if I walk home from the university, I am doing something to help me get better".

### *Discussion*

This study explored if and how HEPA might contribute to eudaimonic well-being. Although the women in the study reported various levels of physical activity, all expressed support for physical activity as being necessary to reach their potential, while at the same time acknowledging that this might not be the case for everyone. The women expressed that physical activity contributes to their eudaimonic well-being via goal setting/striving, providing bonding experiences, allowing for reflections on the self, and developing a physical and able body. Taken together these results generally support Ryff's (1989) model of eudaimonic well-being, and show

important ways that actively engaging in health behaviours can contribute to eudaimonic well-being as Aristotle had envisioned.

As all of the women expressed that physical activity plays an important role in their eudaimonic well-being regardless of their level of physical activity, this reaffirms my quantitative finding that level of HEPA may be less important to eudaimonic well-being than what is experienced during HEPA. The women's discourse as to how physical activity contributes to their eudaimonic well-being was not limited or partial to the eight items on the HEMA scale. Although parts of the discussions resembled some of the HEMA scale items (e.g., the women expressed that physical activity allows them to experience success, which is similar to the sixth item on the HEMA scale – pursuing excellence), most of the ideas generated by the women diverged significantly from the items on the scale. For example, the women spent a great deal of time discussing how physical activity allows for bonding experiences and leads to improved physical health, both of which they thought are important components of reaching human potential and being eudaimonically-well. The HEMA scale, however, has no mention of building relationships with other people or physical health. The differences between the women's discourse and the items on the HEMA scale suggests that the HEMA scale, and potentially other quantitative surveys, may limit our understanding of the apparently complex relationship between physical activity and eudaimonic well-being.

References<sup>12</sup>

- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3<sup>rd</sup> Ed.). Thousand Oaks, CA: Sage.
- Goulding, C. (2005). Grounded theory, ethnography and phenomenology: A comparative analysis of three qualitative strategies for marketing research. *European Journal of Marketing*, 39, 294-308.

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<sup>12</sup> The following references are in addition to the reference list for the main thesis.

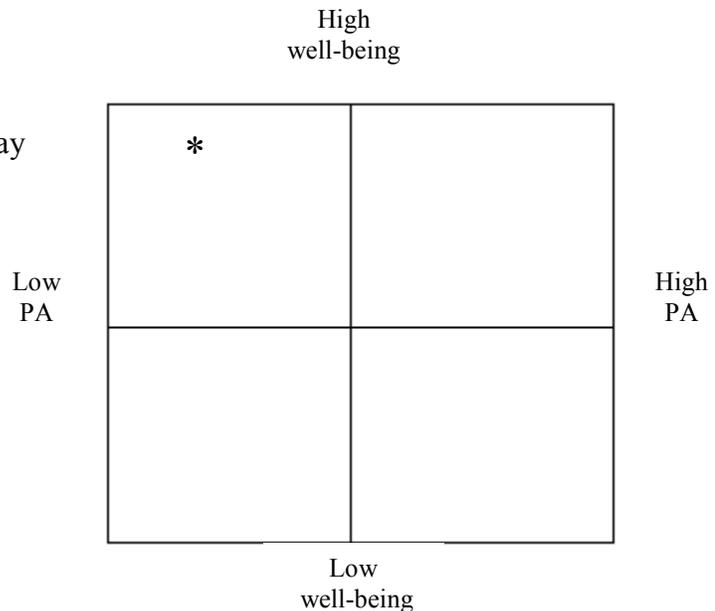
APPENDIX K.1

Four-Quadrant Grid Placement

In the four-quadrant grid on the next page the horizontal line represents your level of physical activity (PA) on a scale from low to high. The vertical line represents how you would rate your *eudaimonic* well-being ranging from low to high. Eudaimonic well-being may be defined as your thoughts and feelings that accompany behavior directed at achieving your human potential. This includes thoughts and feelings of:

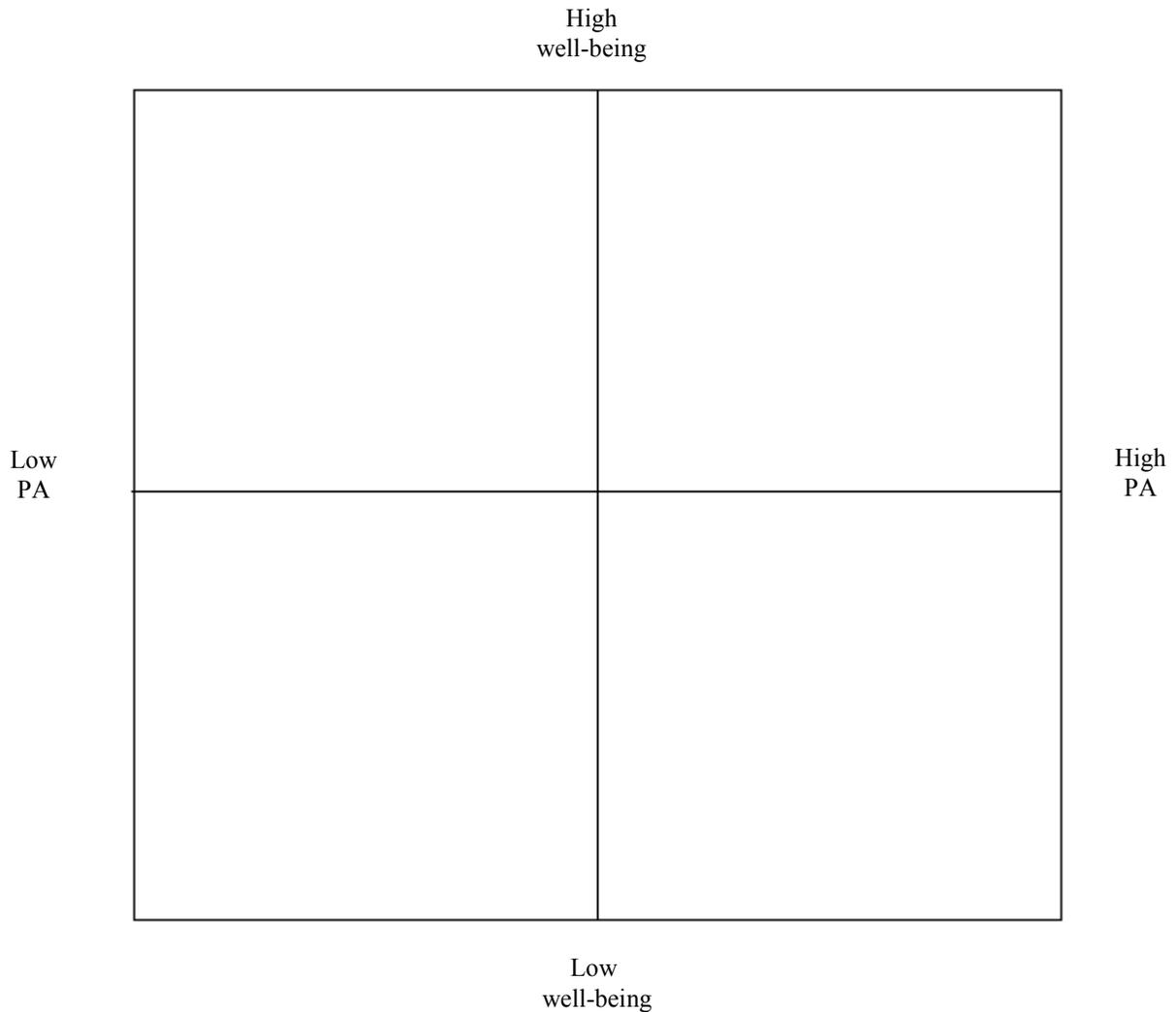
- 1.) **self-acceptance**- a high scorer has positive attitudes towards the self and acknowledges and accepts her good and bad qualities; a low scorer feels dissatisfied with the self and is troubled about certain personal qualities,
- 2.) **positive relations with others**- a high scorer has warm, trusting, fulfilling relationships; a low scorer has few close friends and finds it difficult to be warm and trust others,
- 3.) **autonomy**- a high scorer is self-determined, independent, and able to resist social pressures; a low scorer is concerned with expectations and evaluations of others and conforms to social pressures,
- 4.) **environmental mastery**- a high scorer makes use of surrounding opportunities and creates contexts suitable to personal needs and values; a low scorer feels unable to change or improve surrounding contexts and is unaware of surrounding opportunities,
- 5.) **purpose in life**- a high scorer has goals in life and a sense of direction and meaning in life; a low scorer lacks a sense of meaning in life and has few goals,
- 6.) **personal growth**- a high scorer has feelings of continued development, views the self as growing and expanding, and is open to experiences; a low scorer feels personal stagnation, lacks a sense of improvement, and feels bored and uninterested with life.

E.g., If I consider myself to have high eudaimonic well-being and a relatively low level of physical activity (PA), I may place my star as follows:



## Health-Enhancing Physical Activity

Now place one symbol in a quadrant that best represents your evaluation of your well-being and level of physical activity (PA).



APPENDIX L

Godin Leisure Time Exercise Questionnaire

Considering a **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your **free time**?

1. Mild exercise (minimal effort) \_\_\_\_\_ times per week  
(e.g., yoga, archery, fishing from river bank,  
bowling, horseshoes, golf, snow-mobiling,  
easy walking)
  
2. Moderate exercise (not exhausting) \_\_\_\_\_ times per week  
(e.g., fast walking, baseball, tennis, easy bicycling,  
volleyball, badminton, easy swimming, alpine skiing,  
popular and folk dancing)
  
3. Strenuous exercise (heart beats rapidly) \_\_\_\_\_ times per week  
(e.g., running, jogging, hockey, football,  
soccer, squash, basketball, cross country skiing,  
judo, rollerskating, vigorous swimming,  
vigorous long distance bicycling)

APPENDIX M

Behavior Risk Factor Surveillance System

*We are interested in two types of physical activity – vigorous and moderate. Vigorous activities cause large increases in breathing or heart rate while moderate activities cause small increases in breathing or heart rate.*

Now, thinking about the moderate activities you do when you are not working in a usual week, do you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate?

Yes                       No                       Don't Know/Not Sure

How many days per week do you do these moderate activities for at least 10 minutes at a time?

\_\_\_\_\_ Days/Week                       Don't Know/Not Sure

On days when you do moderate activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?

\_\_\_\_\_ Minutes                       Don't Know/Not Sure

Now, thinking about the vigorous activities you do when you are not working in a usual week, do you do vigorous activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?

Yes                       No                       Don't Know/Not Sure

How many days per week do you do these vigorous activities for at least 10 minutes at a time?

\_\_\_\_\_ Days/Week                       Don't Know/Not Sure

On days when you do vigorous activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?

\_\_\_\_\_ Minutes                       Don't Know/Not Sure

APPENDIX N

Hypothesis Testing with Additional Measures of Physical Activity

Although HEPA includes activities that are considered *health-enhancing*, it is possible that HEPA does not differ from general forms of physical activity. To explore whether or not HEPA is unique from general physical activity to eudaimonic well-being, two additional measures of physical activity were included in the current study. The general measures of physical activity were substituted for the SQUASH in hypothesis testing to see if different results emerged. Both additional measures of physical activity were simple, quick to administer, and contributed little to participant burden.

### *Measures*

The GLTEQ (Godin & Shephard, 1985) has been used extensively in previous research as an assessment of physical activity behaviour (e.g., Courneya & Hellsten, 1998; Jung, Bray, & Martin-Ginis, 2008; Motl, McAuley, & DiStefano, 2005). The GLTEQ is a three-item, self-report physical activity measure that assesses the frequency of mild (e.g., “easy walking”), moderate (e.g., “fast walking”), and strenuous (e.g., “jogging”) exercise that is done for at least 15 minutes per session during a typical week. To score the GLTEQ, reported frequencies of mild, moderate, and strenuous activities are multiplied by three, five, and nine, respectively. Total weekly leisure activity is calculated by summing the products of the separate frequencies. Past research has shown that the GLTEQ correlates positively with exercise behaviour. Specifically, Godin and Shephard found the strongest association between reported strenuous exercise and VO<sub>2</sub> max ( $r = .35$ ). They also found the two-week test-retest reliability of the GLTEQ to be .74. Godin and Shephard concluded that the GLTEQ is a simple instrument that has value for the assessment of leisure time exercise behaviour.

The BRFSS was also used to assess physical activity behaviour. The BRFSS is a six-item, self-report instrument that measures the frequency and duration of time spent engaged in

moderate and vigorous physical activity. Scoring the BRFSS consists of classifying respondents as meeting the recommendations for moderate or vigorous physical activity (i.e., moderate physical activity for 30 or more minutes per day for 5 or more days per week, or vigorous activity for 20 or more minutes per day on 3 or more days per week), not meeting the recommendations for moderate or vigorous physical activity, and not knowing if they meet the recommendations for physical activity. This measure was applicable to the current study as it has previously been used in population health research. The BRFSS is part of a national survey conducted annually by the *Centers for Disease Control and Prevention* to collect information on health-risk behaviours (e.g., physical activity, diet) associated with premature death in the United States. Yore et al. (2007) found the test-retest reliability for the BRFSS to be .53 for moderate activity and .86 for vigorous activity. They also compared responses on the BRFSS with readings from an activity accelerometer over a three-week period and found significant relations for both moderate activity ( $r = .27$ ) and vigorous activity ( $r = .63$ ). Further validity stems from correlations with a walking pedometer over a three-week period for both moderate activity ( $r = .28$ ) and vigorous activity ( $r = .41$ ).

### *Results and Discussion*

The SQUASH exhibited significant relations with both the GLTEQ ( $r = .38, p < .01$ ) and the BRFSS (when participants met the recommendations for moderate or vigorous physical activity  $r = .16, p < .01$ ; when participants did not meet the recommendations for moderate or vigorous physical activity  $r = -.17, p < .01$ ). The significant relations among the measures suggest that this study reliably estimated participants' physical activity behaviours. A correlation matrix containing all of the variables in this study – including the additional measures of physical activity – is presented at the end of this appendix (see Table N.1).

The relations between the SQUASH and additional measures of physical activity present an interesting debate. The significant relations provides some evidence that the SQUASH, GLTEQ, and BRFSS may be assessing similar constructs, suggesting that the SQUASH may not be entirely distinct from more general assessments of physical activity (assuming that the SQUASH adequately assesses HEPA). Alternatively, had the relations among the measures not reached statistical significance, the case could be made that HEPA is unique from general forms of physical activity. Although the relations were statistically significant, they were also relatively weak which suggests that the SQUASH, and therefore HEPA, may be somewhat distinct from general physical activity.

Although the SQUASH was not significantly related to the SPWB ( $r = .05$ ) or any of the subscales ( $r_s = .01 - .06$ ), both the GLTEQ and the BRFSS exhibited significant relations with the SPWB and various subscales. The GLTEQ was significantly related to the SPWB ( $r = .09, p < .05$ ) and four of the six subscales (environmental mastery  $r = .10, p < .05$ ; personal growth  $r = .11, p < .05$ ; purpose in life  $r = .09, p < .05$ ; self-acceptance  $r = .09, p < .05$ ). Similarly, the BRFSS was significantly related to the SPWB ( $r = .19, p < .01$ ) and all six subscales (autonomy  $r = .10, p < .05$ ; environmental mastery  $r = .16, p < .01$ ; personal growth  $r = .16, p < .01$ ; positive relations with others  $r = .10, p < .05$ ; purpose in life  $r = .21, p < .01$ ; self-acceptance  $r = .18, p < .01$ ). Although the relations between the general measures of physical activity and the SPWB were weak, they highlight the potential differences between HEPA and general forms of physical activity. The significant relations between both additional measures of physical activity and the SPWB suggest that defining physical activity in a general manner (i.e., vigorous activity, moderate activity, mild activity) – as both the GLTEQ and BRFSS do – is significant to eudaimonic well-being. There is something about an imprecise and broad conceptualization of

physical activity that is associated with achieving human potential. Alternatively, defining physical activity in a restrictive manner by specifying certain activities and limiting the number of activities being inquired about – as the SQUASH does – is not conducive to eudaimonic well-being. While keeping in mind the size of the relationships, the results suggest that general forms of physical activity may be meaningful to achieving human potential, whereas HEPA may not be.

To further explore whether or not HEPA is unique from general physical activity to eudaimonic well-being, each additional measure of physical activity was substituted for the SQUASH and the analyses for hypothesis testing were re-run (please note, data analysis for the mediation hypothesis did not include the SQUASH and therefore running the analysis with the additional measures of physical activity was not necessary). As with the SQUASH, the moderation hypothesis (i.e., Hypothesis 1) was not supported when the additional measures of physical activity were substituted in. That is, experiencing eudaimonia during HEPA did not moderate the relationship between the GLTEQ and the SPWB, or the relationship between the BRFS and the SPWB.

It was predicted that experiencing eudaimonia during HEPA would account for unique variance in eudaimonic well-being beyond HEPA and experiencing hedonia during HEPA (i.e., Hypothesis 2a). Similar results were found when the SQUASH, the GLTEQ, and the BRFS were each entered as the assessment of physical activity. Very little differences were seen in each of the three regression models, with the full models accounting for between 18.2% and 18.8% of the variance in eudaimonic well-being, and experiencing eudaimonia during HEPA explaining an additional 1.6% to 2.2% variance. Neither the SQUASH nor the GLTEQ were significant predictors of eudaimonic well-being in their respective regression models. The BRFS ( $\beta = .11$ ,

$p < .01$ ,  $\Delta R^2 = .006$ ) was a significant predictor of eudaimonic well-being; however, the amount of variance accounted for was small.

The consistency among the hypothesis testing results, as well as the significant relations between the measures of physical activity suggests that all three measures of physical activity may be assessing similar constructs. There were, however, differences between the measures in that the SQUASH was not significantly related to the SPWB but the more general measures of physical activity were. The non-significant relations between the SQUASH and the SPWB suggest that HEPA may not be important to eudaimonic well-being. This point is debatable, however, and subject to an evaluation of whether or not the SQUASH represents an ideal assessment of HEPA (refer to the “Discussion” section in Chapter 3 for further reflection on this topic). As the more general measures of physical activity were significantly related to the SPWB, this suggests that physical activity – depending on how it is operationalized – may be associated with eudaimonic well-being. The results suggest that maintaining a broad understanding of physical activity and having measures that reflect this understanding is apparently related to achieving human potential.

Table N.1

*Pearson product moment correlations for HEPA, eudaimonic well-being, experiencing eudaimonia/hedonia during HEPA, basic need satisfaction, additional measures of physical activity, and hedonic well-being*

Variable	1.	2a.	2b.	2c.	2d.	2e.	2f.	2g.	3a.	3b.	4a.	4b.	4c.	4d.	5a.	5b.	6a.	6b.	6c.	
1. HEPA (SQUASH)	---																			
2a. Eudaimonic well-being (SPWB)	.05	---																		
2b. Autonomy	.04	.64**	---																	
2c. Environmental mastery	.03	.84**	.45**	---																
2d. Personal growth	.06	.72**	.40**	.50**	---															
2e. Positive relations with others	.06	.73**	.29**	.54**	.44**	---														
2f. Purpose in life	.01	.84**	.38**	.69**	.59**	.49**	---													
2g. Self-acceptance	.04	.89**	.45**	.72**	.56**	.61**	.76**	---												
Experiencing hedonia and eudaimonia during HEPA (HEMA)																				
3a. Experiencing eudaimonia during HEPA	.22**	.37**	.14**	.30**	.32**	.20**	.38**	.41**	---											
3b. Experiencing hedonia during HEPA	.14**	.40**	.20**	.38**	.27**	.26**	.32**	.42**	.66**	---										
4a. Basic need satisfaction (PNSE)	.24**	.46**	.22**	.42**	.37**	.31**	.39**	.43**	.57**	.50**	---									
4b. Autonomy	.10*	.46**	.31**	.40**	.38**	.30**	.39**	.40**	.35**	.38**	.73**	---								
4c. Competence	.26**	.38**	.20**	.38**	.32**	.17**	.33**	.36**	.52**	.42**	.87**	.55**	---							
4d. Relatedness	.20**	.31**	.07	.28**	.23**	.30**	.26**	.32**	.49**	.41**	.83**	.38**	.56**	---						
Physical activity																				
5a. GLTEQ	.38**	.09*	.03	.10*	.11*	.03	.09*	.09*	.31**	.20**	.32**	.17**	.34**	.24**	---					
5b. BRFS <sup>a</sup>	.16**	.19**	.10*	.16**	.16**	.10*	.21**	.18**	.29**	.21**	.30**	.22**	.31**	.21**	.39**	---				
Hedonic well-being																				
6a. SWLS	.05	.71**	.27**	.63**	.41**	.53**	.63**	.79**	.37**	.39**	.38**	.33**	.29**	.32**	.10*	.12**	---			
6b. PANAS positive subscale	.14**	.66**	.34**	.57**	.48**	.47**	.61**	.62**	.49**	.46**	.50**	.42**	.46**	.35**	.24**	.24**	.56**	---		
6c. PANAS negative subscale	.07	-.62**	-.45**	-.59**	-.38**	-.39**	-.46**	-.58**	-.08	-.17**	-.23**	-.24**	-.20**	-.14**	.00	-.09*	-.43**	-.29**	---	

Table N.1 continued

*Note.* \*  $p < .05$ . \*\*  $p < .01$ . <sup>a</sup> The BRFSS refers to the category where participants meet the recommendations for moderate or vigorous physical activity (i.e., moderate physical activity for 30 or more minutes per day for 5 or more days per week, or vigorous activity for 20 or more minutes per day on 3 or more days per week). *HEPA* refers to Health-Enhancing Physical Activity. *SQUASH* refers to the Short Questionnaire to Assess Health-Enhancing Physical Activity. *SPWB* refers to the Scales of Psychological Well-Being. *HEMA* refers to the Hedonic and Eudaimonic Motives for Activities Scale. *PNSE* refers to the Psychological Need Satisfaction in Exercise Scale. *GLTEQ* refers to the Godin Leisure Time Exercise Questionnaire. *BRFSS* refers to the Behaviour Risk Factor Surveillance System. *SWLS* refers to the Satisfaction With Life Scale. *PANAS* refers to the Positive and Negative Affect Scale.