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Daily Health Habits: The Effects of Autonomy, Competence, and Relatedness

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Daily Health Habits: The Effects of Autonomy, Competence, and Relatedness

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Dedication

This dissertation is dedicated to my loving parents, who have always supported every dream I have had. Your unconditional love and support means the world to me.

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Daily Health Habits: The Effects of Autonomy, Competence, and Relatedness

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Are you more likely to take better care of yourself if you have a good day? To help explore this question I designed a daily diary study examining the relationship between psychological need satisfaction predicting health habits and overall well-being. Participants (N =234) took part in several surveys; a baseline session measuring person-level feelings of autonomy, competence, and relatedness, in addition to motivations for working out and eating healthy. Then for 14 continuous days participants took daily surveys, measuring daily levels of needs satisfaction (through self-reporting on activities and social interactions), recording their health habits (diet, exercise, and sleep) and well-being (affect, vitality, symptomology). Daily fluctuations in need satisfaction seek to answers three research questions: 1) Are person-level feelings of need fulfillment (autonomy, competence, relatedness) in one's life globally and motivation for health behaviors associated with health habits (exercise, diet, sleep)? 2) Do daily experiences of need satisfaction (daily autonomy, competence, relatedness) predict changes in daily health habits (exercise, diet, sleep), even after accounting for person-level feelings of need fulfillment and motivation for health habits? 3) Does person-level need fulfillment and daily experiences of need satisfaction predict changes in daily psychological and

physical health? Hierarchical Linear Modeling (HLM) was used for the primary tests. For this dataset, the lower level unit, days, is nested within the higher level unit, persons. Results indicate that daily fluctuations in need satisfaction do matter. Daily autonomy, at both the within- and between-person level, positively and significantly predict exercise behaviors and overall well-being. Daily competence, at both the within- and between-person level, positively and significantly predict fruit and vegetable intake and overall well-being. Daily relatedness, at both the within- and between-person level, positively and significantly predicts overall well-being. Above and beyond a person's stable person-level indicators of these needs, daily fluctuations in need satisfaction are important for understanding why people engage in health habits, especially exercise. Findings have implications for helping people lead healthier lives, both physically and psychologically.

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Chapter 1 Introduction

OVERVIEW

Are you more likely to take better care of yourself if you have a good day? That is the general guiding question of this investigation. To explore this question a daily diary study was designed examining the relationship between self-determination need satisfaction and health habits. Participants (N = 234) took part in several surveys, a baseline session, and 14 daily surveys. The baseline session measured person levels of need fulfillment: autonomy, competence, and relatedness, in addition to motivations for working out and motivations for eating healthy. Then, for 14 consecutive days, participants took daily surveys, measuring daily levels of needs satisfaction (through self-reported activities and social interactions), daily health habits (through exercise, diet, and sleep quantity reports), and daily levels of psychological well-being (through self-reported vitality, affect valence, and symptomology).

This study design sought to shine some light on two unique research questions and one replication research question: 1) are person-level feelings of need fulfillment in one's life globally and motivation for health behaviors associated with health habits, 2) do daily experiences of need satisfaction predict changes in daily health habits, even after accounting for person-level need fulfillment and motivation for health habits, and 3) does person-level need fulfillment and daily experiences of need satisfaction predict changes in daily psychological and physical health? Findings from this investigation have implications for helping people lead healthier lives.

Preface: Scenario

In line with the general question, *are you more likely to take better care of yourself if you have a good day?,* consider the following scenario. Samantha and Amelia

are both college seniors at a large university. Like other college students, they enjoy spending time with friends, learning in their classes, and exploring their college town. During the fall semester, Samantha begins having some hard days, she has an incredibly difficult course load as she struggles to finish her biology degree, her best friend is currently studying abroad, and her boss at the coffee shop micro-manages her every move. On one particularly hard day, after getting in trouble at work and making a 65 on a biology quiz, Samantha decides to skip the gym and go for burgers instead. That night, she also has trouble sleeping. Amelia, on the other hand, is having a great fall semester. She is feeling really confident and supported as she completes her honors thesis in English. She is also able to spend most of her free time with her boyfriend of 2 years. After a great meeting with her thesis advisor, Amelia decides to squeeze in a bike ride through the park before meeting her boyfriend to cook dinner.

As this scenario illustrates, sometimes how a day is going, great in the case of Amelia and not so great in the case of Samantha, can influence the health habits people participate in. Samantha was feeling incompetent in her coursework and controlled at her job, potentially predicting her skipped workout and fast food dinner. Amelia, alternatively, felt academically successful after meeting with her advisor and close to her boyfriend, both of which could have potentially influence her bike ride through the park. Examining how day level psychological need satisfaction predicts health habits may be useful in understanding why some people engage in health habits and others do not. It will be helpful in understanding what influences people to take better care of themselves.

STATEMENT OF THE PROBLEM

Based on patterns reported by The World Health Organization (WHO), it would seem that North Americans are not very good at taking care of themselves. The WHO

(2002) reports that obesity is killing about 222,000 men and women a year in the United States and Canada alone. Major risks responsible for a substantial loss in healthy life expectancy include obesity, high cholesterol, high blood pressure, and tobacco use, resulting in a life expectancy of 67.6 years. Both high blood pressure and high cholesterol are closely related to an excessive consumption of fatty, sugary, and salty food. In addition, North Americans do not get anywhere near the suggested amount of moderate exercise, falling short of the recommended 150 minutes per week (Centers for Disease Control, 2014; Fletcher et al., 1996; Haskell et al., 2007). All of these health habits, a diet rich in fats and salt and a lack of exercise, contribute to being unhealthy. If these risks are addressed through healthy diet and exercise, then life expectancy can be expected to increase by 6.5 years (World Health Organization, 2002).

Understanding why people engage in healthy habits is increasingly important as more and more people continue to lead unhealthy lives. There are many benefits to participating in healthy behaviors. In addition to an increased life expectancy, health habits contribute to both psychological well-being (Fox, 1999; Paluska & Schwenk, 2000; Windle, Hughes, Linck, Russell, & Woods, 2010) and physical health (Fletcher et al., 1996; Hartley et al., 2012; Pilcher, Giner, & Sadowsky, 1997). Physical activity is especially important in offsetting disease, managing symptoms, and enhancing life expectancy (Blair & Connelly, 1996). Additionally, physical activity appears to help offset depression (Craft & Landers, 1998), lower anxiety (Long & van Stavel, 1995), and also increase life quality and vitality (Ryan & Deci, 2001). A healthy diet is also important and positively contributes to both psychological health (Strange, Samaraweera, Taggart, Kandala, & Stewart-Brown, 2014) and physical health (Hartley et al., 2012; Liu et al., 2000).

CONCEPTUAL FRAMEWORK

Self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000) will provide a lens for exploring the relationship between psychological health and daily health habits. Self-determination theory asserts that there are three basic psychological needs: autonomy, competence, and relatedness. Autonomy reflects the belief that one's actions are a result of one's own volition. Competence reflects a belief that one is capable of completing the actions and behaviors encountered. Relatedness reflects the belief that one feels connected and involved with those around them. According to self-determination theory, these three basic needs underlie adaptive motivation and psychological functioning (Ryan & Deci, 2000).

Research suggests that when these three needs are met individuals are more likely to function effectively and experience wellness (Deci & Ryan, 1985; Deci & Ryan, 2002; Ryan & Deci, 2000). In addition, self-determination theory is the only major theory of human motivation that both acknowledges spontaneous, intrinsically motivated activity and can also pinpoint the factors that either enhance or debilitate it (Ryan & Deci, 2007). There is research evidence to support the relationship between psychological need satisfaction and psychological well-being (Baard, Deci, & Ryan, 2004; Kasser & Ryan, 1996; McDonough & Crocker, 2007), physical health (Ng et al., 2012; Reinboth, Duda, & Ntoumanis, 2004), and health habits (Edmunds et al., 2006; Wilson, Rodgers, Blanchard, & Gessell, 2003).

Additionally, previous research has explored the relationship between daily need satisfaction and daily psychological well-being. Sheldon and his colleagues (1996) wrote an article, *What Makes for a Good Day? Competence and Autonomy in the Day and the Person,* where they used a diary study to examine how the daily satisfaction of two basic needs, autonomy and competence, leads to daily well-being. Daily well-being was a

composite score encompassing positive affect, subjective vitality, negative affect, and symptomology. They found that participants with higher baseline measures of trait autonomy and competence had better days on average. In addition, within-person analyses showed that better days were those in which autonomy and competence were rated higher, relative to the participant's baselines (Sheldon, Ryan, Reis, 1996). Reis and colleagues (2000) followed up with an article, *Daily Well-Being: The Role of Autonomy, Competence, and Relatedness,* which mirrored the first article with the addition of a relatedness variable and component. The research explored the hypothesis that daily variations in well-being may be understood in terms of the degree to which the three basic needs, autonomy, competence, and relatedness, are satisfied in daily activity. Results indicated a strong support for this hypothesis.

The design of this investigation is modeled on the two articles mentioned above. However, while this investigation follows the research design and methodology of the two articles, it has a unique focus on health habits. This investigation included an additional measure of motivational orientation towards health habits (exercise and healthy eating) and outcome measures focused on health habits (exercise, diet, and sleep quantity). So while there is research linking need satisfaction to psychological well-being and physical health, there has not been a study looking specifically at daily need satisfaction and daily health habits. The lens of self-determination theory will be instrumental in examining the relationship between daily psychological need satisfaction and health habits and how these influence a person's behavior over time.

SUMMARY OF THE METHODOLOGY

To address the research questions, the research design utilized a daily diary study method (See Figure 1 for a graphical representation of the measures used during the

investigation). Participants began the study by coming in person to hear about the design and complete all baseline measures. Baseline measures assessed person-levels of autonomy, competence, and relatedness, as well as motivation for working out and motivation for eating healthy. There was a three day time frame for participants to come in to complete the baseline measures. Once these three days had passed, participants began taking the daily surveys the following Thursday. Participants took daily surveys for 14 consecutive days. They were instructed to complete the daily survey before they went to bed each evening. All daily surveys were distributed through email utilizing the online survey system Qualtrics. Survey completion was checked at approximately 10:00 pm and reminders were sent to participants who had not yet completed the survey.

As mentioned previously, baseline measures were utilized to assess person-level concepts. To assess the three psychological need fulfillments the following scales were used: The Self-Determination Scale was used to assess a person-level of autonomy, the Multi-Dimensional Self-Esteem Inventory competence subscale was used to assess a person-level of competence, and the UCLA Loneliness Scale was used to assess a person-level of relatedness. To assess participants' person-level motivational orientations toward health habits two scales were used, the motivation for working out scale and the motivation for eating healthy scale. Demographic information was also collected and included, age, race, gender, ethnicity, year at the university, GPA, major, height, and weight.

Daily report measures included measures of health habits and daily well-being. The health habits reported included exercise (strenuous, moderate, and strength), diet (as measured by fruit and vegetable intake and fast food intake), and sleep quantity from the prior night. Daily well-being was measured by affect valence, psychological vitality, and symptomology. Participants also reported and rated daily need satisfaction. Participants

listed and rated the three activities they spent the most time on. The activities were rated according to a daily autonomy measure and a daily competence measure. Participants also reported and rated the three social interactions that took up the most time for them during the day. They rated each social interaction for how close and connected they felt to the person. This design was longitudinal in nature to explore the relations between daily need satisfaction and health habits, and how that changes over time.

Data analysis predominantly consisted of Hierarchical Linear Modeling (HLM) to explore the research questions. This analysis is useful given the structure of the data, in which lower level, days, is nested within a higher level unit, people. To address the first two research questions, a series of two-level random intercept only HLM models were conducted in which person-level autonomy, competence, and relatedness fulfillment and motivation for health behaviors, as well as daily ratings of need satisfaction, were used to predict health habits. To address the third research question, a similar series of two-level random intercept only HLM models were conducted in which person-level need fulfillment, as well as daily ratings of need satisfaction, were used to predict psychological and physical well-being.

Results indicate that daily fluctuations in need satisfaction do matter for health habits. Daily autonomy, at both the within- and between-person level, positively and significantly predict exercise behaviors and overall well-being. Daily competence, at both the within- and between-person level, positively and significantly predict fruit and vegetable intake and overall well-being. Daily relatedness, at both the within- and between-person level, positively and significantly predicts overall well-being. Above and beyond a person's stable person-level indicators of these need fulfillments, daily fluctuations in need satisfaction are important for understanding why people engage in

health habits, especially exercise. Findings have implications for helping people lead healthier lives, both physically and psychologically.

The remainder of this document will consist of chapter 2 through chapter 5. Chapter 2, the literature review, will begin by discussing the importance of health habits. Then, motivational theories predicting health habits will be briefly discussed. Self-determination theory will be explored, specifically how psychological need satisfaction is related to psychological health, physical health, and health habits. Chapter 3, methodology, will present the methods and procedures that were used in this daily diary study investigation. Chapter 4, results, will begin by summarizing some preliminary analyses (means, standard deviations, frequencies and percentages, and correlations) and conclude with the reporting of the HLM results to address the central three research questions. Chapter 5 will provide the discussion, including limitations and future directions.

Chapter 2 Literature Review

The literature review will begin by providing a brief introduction to the importance of health habits. Next, motivational theories commonly used to predict health behaviors will be briefly discussed. This will be followed by an overview of self-determination theory, including an explanation of the continuum of motivation and psychological well-being conceptualizations. Additionally, there will be an explanation of the three basic needs from self-determination theory: autonomy, competence, and relatedness, and how they relate to psychological wellness, physical health, and health habits. Following that, the importance of daily fluctuations in behavior will be briefly discussed in order to explain further the study design. Finally, the literature review will conclude with the research questions, hypotheses, and rationale.

IMPORTANCE OF HEALTH HABITS

Understanding why people engage in healthy behaviors is critically important in our current U.S. society in which health concerns such as obesity, substance use, and cardiovascular disease remain among the top potentially preventable causes of death (Allison, Fontaine, Manson, Stevens, & VanItallie, 1999; Bogg & Roberts, 2004; Danaei et al., 2009; Mokdad, Marks, Stroup, & Gerberding, 2004). Although physical health and health habits can be conceptually and operationally defined in many different ways, physical well-being is often defined in a general population as the absence of physical symptoms, such as headache, stomach ache, cough, and sore throat, (DeLongis & Folkman, 1988; Emmons, 1991) and health habits are defined by levels of physical activity (Gunnell, Wilson, Zumbo, Mack, & Crocker, 2012; Gunnell, Crocker, Mack, Wilson, & Zumbo, 2014; Mack et al., 2012) and fruit and vegetable intake (Blanchflower, Oswald, & Stewart-Brown, 2013; White, Horwatch, & Conner, 2013).

Physical well-being is also generally conceptually defined to be the absence of more severe symptoms and diseases. The narrow definition above is highlighted because that is how this proposed investigation will measure the construct. Sleep quantity is an additional aspect of healthy living (Pilcher, Ginter, & Sadowsky, 1997; Wong et al., 2013).

Each of these, physical activity, diet, and sleep, are used to operationalize health habits given their relation with greater physical health (Fletcher et al., 1996; Hartley et al., 2012; Hooper, 2007; Liu et al., 2000; Pilcher, Ginter, & Sadowsky, 1997). Research indicates that regular physical activity is associated with controlling diabetes, lowering blood pressure, and preventing obesity (Fletcher et al., 1996). Fruit and vegetable consumption has been consistently linked with improved physical health, such as preventing cardiovascular disease (Hartley et al., 2012, Hooper, 2007; Liu et al., 2000) and reducing the risk of other diseases, such as cancer, stroke, type 2 diabetes, obesity, dementia, and osteoporosis (Boeing et al., 2012; NHS, 2009). Likewise, getting 7 to 8 hours of sleep per night is positively associated with health and longevity (Pilcher, Ginter, & Sadowsky, 1997).

In fact, in light of the many known benefits, various federal organizations have created health behavior guidelines and emphasized the many benefits, both psychologically and physically, to leading a healthy lifestyle. For example, both The World Health Organization (WHO) and the American Heart Association have recommended health behavior guidelines related to diet and exercise. To maintain and improve cardiovascular health, the American College of Sports Medicine and the Centers for Disease Control and Prevention recommend, at least 150 minutes of moderate exercise per week, such as walking or swimming, or 75 minutes of vigorous physical activity each week, such as running (Fletcher et al., 1996; Haskell et al., 2007).

Additionally, the U.S. Department of Health and Human Services and the U.S. Department of Agriculture (2015) recommend at least 2 ½ cups of vegetables and 2 cups of fruit per day. This is an increase in fruit and vegetable intake recommendations from just five to ten years ago when the U.S. Department of Agriculture (2005), and the Cardiovascular Review Group (1994) recommended five portions of fruits and vegetables a day (Johansson & Anderson, 1998).

Moreover, the benefits of such health habits are not only related to physical well-being, participating in health habits and high physical well-being are also related to greater psychological health and a higher quality of life (Fox, 1999; Paluska & Schwenk, 2000; Stranges, Samaraweera, Taggart, Kandala, & Stewart-Brown, 2014; White, Horwatch, & Conner, 2013). Psychological well-being is often considered to be composed of two components, hedonic well-being and eudaimonic well-being. Hedonic well-being is generally considered the presence of positive affect, the absence of negative affect, and the feeling that one's life is satisfying (Sylvester et al., 2012). Eudaimonic well-being goes a step further and focuses on self-actualization (Reinboth, Duda, & Ntoumanis, 2004). Several studies have highlighted the beneficial role of physical activity on aspects of psychological well-being, both hedonic and eudaimonic, across the lifespan including general mental health, quality of life, and lower anxiety and depression (Fletcher et al., 1996; Mack et al., 2012; Schuch, Vasconcelos-Moreno, & Fleck, 2011; Windle, Hughes, Linck, Russell, & Woods, 2010). In an extensive review of the role of exercise and physical activity on several components of psychological well-being, including anxiety, depression, mood and affect, health-related quality of life, cognitive functioning, and self-esteem, there was remarkable consistency in the evidence for a positive association between exercise and the broad range of components of psychological well-being (Ekkekakis & Backhouse, 2009). In addition, research has

shown that individual bouts of exercise can facilitate more positive affect (Wilson & Rodgers, 2007). Additional evidence suggests that the consumption of fruits and vegetables can promote greater psychological health, including overall well-being and positive affect (e.g., Stranges, Samaraweera, Taggart, Kandala, & Stewart-Brown, 2014; White, Horwath, & Corner, 2013). The discussed findings suggest that following these recommendations on physical health and dietary guidelines can increase the quality of a person's life and even lead to a longer life.

Despite the benefits of exercise and fruit and vegetable intake, many Americans simply do not follow the recommendations suggested by health organizations, 25.4% of adults reported participating in no physical activity for 2014 (Centers for Disease Control, 2014), and 37.7% of adults reported consuming fruit and vegetables less than one time each day (Centers for Disease Control, 2013). Health-related behaviors are now the primary factors contributing to poor health outcomes, such as cardiovascular disease and cancer (Bogg & Roberts, 2004). The WHO (2002) reported that being overweight or obese is an important determinant of health and can raise the risk of heart disease, strokes, diabetes, and many forms of cancer. In 2000, the leading causes of death were tobacco, poor diet and physical inactivity, and alcohol consumption (Mokdad, Marks, Stroup, & Gerberding, 2004). In addition, in an examination of national data, Danaei and colleagues (2009) found that the four most common causes of death, including heart disease, lung cancer, stroke, and chronic obstructive pulmonary diseases, were all related to health habits and could thus be prevented. The health habits most responsible for causing these deaths were smoking, high blood pressure, overweight, obesity, physical inactivity, high blood glucose, cholesterol, sodium, fatty acids, alcohol use, and low intake of fruit and vegetables (Danaei et al., 2009). Obesity alone was estimated to contribute to 280,000 deaths annually in the United States adult population (Allison,

Fontaine, Manson, Stevvens, & Vanltallie, 1999). In addition to the physical damage caused by poor health habits, alcohol intake and obesity are associated with low mental well-being (Stranges, Samaraweera, Taggart, Kandala, & Stewart-Brown, 2014). Taken together, it seems there is a health crisis in America.

One strategy to address this crisis would be to understand how and why people participate in whatever level and form of healthy habits. In that vein, this investigation attempts to examine the extent to which fluctuations in the daily psychological experiences of a typical young adult population contribute to health habits, such as exercise, diet, and sleep. The purpose of this investigation is to understand better what predicts health behaviors, from a motivational perspective.

MOTIVATIONAL THEORIES PREDICTING HEALTH BEHAVIORS

Understanding motivation for health habits is complex, and there are several ways to think about how people make decisions around health habits, such as exercise and diet. The most developed approaches in health psychology accentuate the individual and their cognitions, thoughts, and beliefs. These models are collectively referred to as social cognition models, which hold the assumption that an individual's behavior is best understood in terms of his or her perceptions of the social environment (Conner & Norman, 2005). Social cognition models include many theories such as: the health belief model (Rosenstock, 1974), the theory of planned behavior (Ajzen, 1985, 1991), health locus of control (Sanders, 1982), and self-efficacy theory or social cognitive theory (Bandura, 1977, 1997). All of these theories describe in some way the key cognitions and their inter-relationships in the regulation of health behaviors (Conner & Norman, 2005). According to these models deciding to practice health habits is a result of a rational decision-making process based upon review of the available information.

The health belief model is one of the oldest and most widely used models in health psychology and consists of four conditions that both explain and predict a health-related behavior: 1) a person believes his or her health is in jeopardy, 2) a person perceives the threat as being potentially serious, 3) a person believes that there are benefits from practicing a recommended behavior to address the threat to their health, and thus, 4) a person initiates action toward the behavior (Green, 2002; Rosenstock, 1974). This model was initially developed in the 1950's to help understand and explain why people were participating or not participating in x-ray screenings for tuberculosis. The model continued to evolve in the 1970's and 1980's as a way of understanding cognitive factors predisposing a person to a health behavior (Green, 2002). A key component to consider is the benefits and barriers of engaging in the health behavior, such as the perceived susceptibility of the health threat and the severity of the outcome. The benefits must outweigh the barriers in order for the person to want to engage in the health behavior.

The theory of planned behavior (Ajzen, 1985, 1991) is an extension of the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and proposes that it is essential to assess the amount of control, both internal (such as skills, abilities, information, and emotions) and external (such as situation or environmental factors), an individual has over behaviors and attitudes (Morisky, 2002). The theory of planned behavior suggests that a person's intentions and perceptions of control over that behavior determine whether he/she will engage in a behavior. Similarly, the health locus of control (Sanders, 1982) construct emphasizes the importance of perceptions of control over behavior and includes mastery, self-efficacy, and personal competence. People with an internal loci of control believe that they have command over their own behaviors,

whereas people with an external loci of control believe that outside forces have a greater control over their own actions (Darity, 2008; Rotter, Seeman, & Liverants, 1962).

Self-efficacy theory or social cognitive theory (Bandura, 1977, 1997) is one of the most commonly used theories in health psychology and is also a key component in parts of the above mentioned theories. In very simple terms, self-efficacy is one's belief that one can perform the behavior that produces the outcome desired. In terms of health habits, self-efficacy is the belief that one can perform the exercise or eating habit one desires. Self-efficacy beliefs influence health habits and physical well-being by influencing the adoption of healthy behaviors, the cessation of unhealthy behaviors, and the maintenance of behavioral changes (Maddux, 2007). An additional component of social cognitive theory is the outcomes people expect their actions to produce. Outcome expectation can take three forms: 1) physical, which includes physical pleasures and pains the behavior produces, 2) social, which includes the social response it evokes whether positive or negative, and 3) self-evaluative, which include both positive and negative evaluations of behaviors (Bandura, 2004). A health habit behavior is more likely to occur if self-efficacy is high and outcome expectations are high.

Although focusing on the individual and their perceptions of their abilities is important in understanding motivation for health habits, such focus only gets at part of the explanation. The health belief model offers a solid framework for explaining and predicting health habits utilizing four conditions. However, meta-analysis examining the predictive power of the model found it lacking in consistent predictive power for many behaviors because its scope is limited to predisposing factors (Harrison, Mullen, & Green, 1992) and only two of the four conditions (benefits and barriers) were predictive over time, suggesting the direct effects version of the health belief model is not recommended for use (Carpenter, 2010). The theory of planned behavior offers a good

explanation for volitional behavior in health behaviors from an individual perspective, but does not identify the origins of the antecedents of the behavior (Chatzisarantis, Hagger, & Smith, 2007). Self-determination theory, on the other hand, offers a more organismic approach to motivation that allows for a focus on the environmental possibilities and individual perspectives, as seen in dispositional orientations that gives rise to motivation states and subsequent behavior (Hagger & Chatzisarantis, 2009). Although self-efficacy theory has been found to be very predictive of health related outcomes (Holden, 1992) and health behaviors (AbuSabha & Achterberg, 1997), it requires that the self-efficacy scale be tailored to the particular domain of functioning that is the object of interest (Bandura, 2006). This investigation is not interested in how domain specific self-efficacy predicts health habits, but rather how daily psychological need satisfaction, globally, predicts health habits. Self-determination theory, reviewed next, is a macro-theory of human motivation that provides another lens for understanding the motivation behind health behaviors.

SELF-DETERMINATION THEORY AND WELL-BEING

According to self-determination theory, three basic and universal psychological needs underlie adaptive motivation and psychological functioning: autonomy, competence, and relatedness (Deci & Ryan, 1985; Deci & Ryan, 2002; Ryan & Deci, 2000). When these needs are satisfied, the self is able to function effectively, and well-being is supported. Autonomy reflects the belief that one's actions are a result of one's own volition. This feeling of volition is necessary to sustain motivated behavior and effective functioning (Deci & Ryan, 1985). Competence reflects a belief that one is capable of completing the actions and behaviors needed to accomplish desired outcomes within the environment. Competence is essential for individuals to approach challenges in

an optimal way, allowing them to learn and develop (Deci & Ryan, 1985). Relatedness reflects the belief that one feels connected and involved with others. This feeling of connectedness is crucial for social and emotional development (Baumeister & Leary, 1995). In addition to the three psychological needs, self-determination theory also illustrates how motivation can flow along a continuum.

Continuum of motivation

Self-determination theory postulates that motivation flows along a continuum from non-self-determined motivation to self-determined motivation (see Figure 2 for a visual representation of the continuum). On the far left is the least self-determined (amotivation), technically off the continuum, as the continuum begins with controlled forms of motivation (external regulation and introjected regulation) followed by autonomous forms of motivation (identified, integrated), and culminating in the most self-determined form of motivation (intrinsic motivation).

On the far left and technically off the continuum is amotivation, which represents a total absence of self-determination, when people lack the intention to engage in a behavior, and experience a lack of choice and volition. Amotivation is often associated with disengagement, negative affect, and self-disparagement (Levesque, Copeland, & Deci, 2008). People who experience amotivation toward working out and eating healthy would not participate in those health habits.

Beginning on the continuum, there are then four types of extrinsic motivation, two of which are more externally controlled (external regulation and introjected regulation) and two of which are more autonomous (identified regulation and integrated regulation). The two controlled forms of motivation are external regulation and introjected regulation, meaning they have an external perceived locus of causality. External regulation,

commonly referred to as extrinsic motivation, results in a behavior done to get rewards or avoid punishments and often is due to feelings of pressure or obligations (Levesque, Copeland, & Deci, 2008). Individuals who are externally regulated to participate in health habits would agree with statements such as, "I am exercising because I feel like I have no choice, others make me do it." Introjected regulation is characterized by internal pressures such as ego involvement or the avoidance of feelings of guilt (Levesque, Copeland, & Deci, 2008). Individuals with an introjected regulation towards diet would agree with statements such as, "I would feel bad about myself if I did not eat healthy."

There are two types of autonomous motivation in the extrinsic motivation category, identified regulation and integrated regulation, both of which have an internal locus of causality. Identified regulation results when a person feels a sense of value or importance toward the behavior and thus feels a sense of volition towards the behavior (Levesque, Copeland, & Deci, 2008). An individual who was behaving out of identified regulation would agree with statements such as, "I have a strong value for being active and healthy." Integrated regulation is experienced when a person believes the activity is an important part of his/her identity (Levesque, Copeland, & Deci, 2008). For example, individuals who are behaving out of integration would agree with such statements as, "I am running in this 5K because being physically fit is an important part of who I am."

On the far right side of the continuum and the motivation that is most self-determined lies intrinsic motivation. When an activity or behavior is regulated by intrinsic motivation, it is performed solely because the person is interested, and it brings a sense of personal satisfaction (Levesque, Copeland, & Deci, 2008). Individuals who are behaving out of intrinsic motivation would agree with statements such as, "I am playing basketball because I really find it interesting and enjoyable." Experiencing highly self-

determined forms of motivation is associated with a sense of vitality, energy, happiness, well-being, and enjoyment (Levesque, Copeland, & Deci, 2008).

Psychological well-being conceptualizations

As mentioned previously, psychological well-being has been described as composed of two components, hedonic well-being and eudamonic well-being. Hedonic or subjective well-being, refers to the presence of positive affect, the absence of negative affect, and the feeling that one's life is satisfying (Sylvester et al., 2012). This perspective of well-being can be characterized as focusing on happiness, specifically a sense of pleasure attainment and pain avoidance (Reinboth, Duda, Ntoumanis, 2004; Ryan & Deci, 2001). To measure hedonic well-being, researchers often rely on three primary components: greater life satisfaction, the presence of positive mood or higher positive affect, and the absence of negative mood or low levels of negative affect (Diener & Lucas, 1999; Mack et al., 2012; Sylvester et al., 2012). These components result in an overall measure of subjective well-being. Hedonic well-being concerns people's cognitive and affective evaluations of their lives.

Eudaimonic well-being goes a step further and focuses on self-realization. This perspective defines well-being in the sense that a person is fully functioning and engaged in the world, experiencing personal growth and development (Reinboth, Duda, & Ntoumanis, 2004). In essence, eudaimonic well-being is more than just happiness; it results when people are living in accordance with their true self (Ryan & Deci, 2001). Researchers have measured eudaimonic well-being by examining six constructs: autonomy, personal growth, self-acceptance, life purpose, environmental mastery, and positive relatedness (Mack et al., 2012; Ryan & Deci, 2001). Vitality is also considered an aspect of eudaimonic well-being (Ryan & Deci, 2001) because being vital and

energetic is part of what it means to be able to experience one's true self. These constructs theoretically and operationally define psychological well-being and are suggested to promote emotional and physical health (Ryff & Singer, 1998). For the purposes of this proposed investigation both hedonic and eudaimonic well-being will be examined. Hedonic well-being will be measured each day and will focus on positive and negative affect, symptomology, and psychological vitality. Eudaimonic well-being will be measured by trait variables, looking at trait levels of the three psychological needs.

Psychological need satisfaction and psychological well-being

Research suggests that when the three needs are met, individuals are more likely to function effectively and experience wellness. Sheldon and colleagues (1996) found that daily satisfaction of two psychological needs, autonomy and competence led to daily well-being. In an extension of that study, Reis and colleagues (2000) found that daily variations in the three psychological needs, autonomy, competence, and relatedness, were predictive of having a good day. Additional research has also found links between self-determination's psychological needs and experiences of well-being. For example, Kasser and Ryan (1993, 1996) found that emphasizing intrinsic goals, such as goals for affiliation, personal growth and the community, that satisfied basic needs, was positively associated with indicators of well-being including self-esteem, self-actualization, as well as less depression and anxiety (Kasser & Ryan, 1993; Kasser & Ryan, 1996).

Likewise, it has been found that satisfaction of the needs for autonomy, competence, and relatedness in the work place is related to enhanced well-being, as measured by a lack of depression and anxiety at work, as well as better job performance (Baard, Deci, & Ryan, 2004). Feelings of autonomy have also been consistently found to relate to well-being. For example, Ryan, Bernstein, and Brown (2010) researched how

psychological need satisfaction and the day of the week effects impacted mood, vitality, and physical symptoms among men and women in a variety of occupations. The researchers found that people experienced greater autonomy on the weekends, resulting in higher wellness as measured by increased positive affect, increased vitality, and decreased negative affect (Ryan, Bernstein, & Brown, 2010).

Outside of the work domain, researchers have also explored how autonomy supportive exercise environments and instructors influence psychological and physical well-being. Reinboth, Duda, and Ntourmanis (2004) found that when athletes perceived their coaches to be autonomy supportive, they felt more autonomous, which in turn predicted subjective vitality and intrinsic satisfaction with the sport. Competence was also found to predict positive affect, negative affect, and physical self-worth for adult dragon boaters in the Pacific Northwest (McDonough & Crocker, 2007). Markland (1999) found that perceived competence positively predicted intrinsic motivation among women participating in aerobic classes. Reinboth, Duda, and Ntoumanis (2004) found that the satisfaction of the need for competence emerged as the strongest predictor among the three needs for psychological well-being, as measured by subjective vitality, among adolescent British male athletes. Thus, there is clear research linking psychological need satisfaction to psychological well-being.

Psychological need satisfaction and physical health

Satisfaction of the three psychological needs has also been positively related with physical health. For example, in their meta-analysis Ng and colleagues (2012) found that correlations between autonomy supportive health care climates and measures of physical health, as measured by weight loss and tobacco abstinence, ranged from .08 to .39, with an average effect size of .28 for weight loss, .23 for exercise and physical activity, and

.12 for smoking abstinence. This is indicative of autonomy support within health care climates positively predicting higher levels of patient autonomy within the health behavior domain.

Additionally, Reinboth, Duda, and Ntoumanis (2004) found that the satisfaction of the need for competence emerged as the strongest predictor among the three needs for physical well-being, as measured by a lack of physical symptomology, among adolescent British male athletes. That is, feeling competent in a sporting behavior was related to lower physical symptomology. Ryan, Bernstein, and Brown (2010) also researched how psychological need satisfaction and the day of the week impacted physical symptoms among men and women in a variety of occupations. The researchers found that people experienced greater autonomy on the weekends, resulting in higher wellness as measured by fewer somatic symptoms (Ryan, Bernstein, & Brown, 2010).

Psychological need satisfaction and health habits

In addition to explaining the predictors of psychological and physical well-being, self-determination theory has substantial promise for explaining an individual's health behaviors (Biddle, 1997). Deci and Ryan (2011) hypothesized that psychological need satisfaction predicts behavioral engagement in health practices, such as smoking cessation, weight loss, and medication adherence, because it provides the necessary energy and direction to continue engaging in a health behavior. That is, need satisfaction provides the psychological resources necessary to engage in behaviors that have desirable outcomes in the long-run, but may be undesirable to undertake in the immediate present.

Moreover, as mentioned previously, motivation for a given health habit behavior can vary along a continuum from highly controlled to more volitionally endorsed and self-determined, with those individuals with more autonomous motivation being more

likely to engage in health behaviors (Deci & Ryan, 2002). Specifically, within the health habits context, the continuum may be beneficial in explaining variations in health habits. People whose motivations fall within the autonomous motivation categories (identified regulation, integrated regulation, and intrinsic motivation) are most likely to participate in health habit behaviors. Additionally, when the three psychological needs are satisfied, a more autonomous motivational orientations likely, which can also help explain enduring health habit behavior and greater well-being (Wilson et al., 2008). Self-determination theory is useful in specifying both the nature of motivation and the processes responsible for cultivating the internalization of values into a more integrated motivational structure (Wilson & Rodgers, 2008), making it very appealing to utilize to help explain health habit motivation.

Research has supported these assertions. Competence and autonomy need fulfillment has been found to be positively correlated with more self-determined exercise regulations, such as intrinsic motivation and identified regulation for participating in exercise, and in turn positively related to exercise behavior and physical fitness among participants in a 12-week prescribed exercise program (Wilson, Rodgers, Blanchard, & Gessell, 2003). Additionally, researchers have demonstrated that self-regulation of healthy behaviors, such as abstaining from tobacco, being physically active, and taking prescribed medications follows from the provision of greater need support and satisfaction of the basic needs (Ng et al., 2012). Ng and colleagues (2012) conducted a meta-analysis of self-determination theory applied to health contexts to examine the strength of the findings that satisfaction of the three needs leads to improved mental health, through lower depression, anxiety, and higher quality of life and also better physical health behaviors, such as increased exercise and healthier diet. They found these

relationships to be consistent in the literature, with the three needs predicting improved mental health and higher levels of health behaviors.

A look across the existing research linking need satisfaction to health behaviors (e.g., Edmunds, Ntoumanis, & Duda, 2006; Markland, 1999; Wilson, Longley, Muon, Rodgers, & Murray, 2006) suggests that competence and autonomy appear to be more central to explaining variation in health behaviors, particularly exercise, whereas relatedness may play a weaker role. For example, Edmunds and colleagues (2006) found that autonomy, competence, and relatedness need satisfaction (as measured in regards to the exercise domain) were all related to self-determined motivation for exercise participation, and competence need fulfillment directly predicted strenuous exercise participation among adults who reported regularly taking part in exercise classes. Ntoumanis (2001) found perceived competence to be an important predictor of identified and intrinsic motivation and subsequent effort and intention to participate in physical activity in the future. Competence was also found to predict physical activity levels, as measured by the number of times participants engaged in leisure time exercise, and was also a major predictor of self-determined motivation for adult dragon boaters in the Pacific Northwest (McDonough & Crocker, 2007).

Relatedness seems to play the weakest role in the relationship between psychological needs and health. In a systematic review of psychological need satisfaction in exercise contexts, Wilson and colleagues (2008) found that across the 31 studies synthesized, participants reported greater satisfaction of their needs for competence and autonomy compared to the need for relatedness in exercise settings. Nonetheless, a high sense of relatedness can still be expected to promote greater well-being (Ryan, Bernstein, & Brown, 2010). Despite this more distal role, researchers have long noted an association between social relationships and health, with those who are more socially isolated being

less healthy, both psychologically and physically, than others (House, Landis, & Umberson, 1988). In a review of 81 studies, Uchino and colleagues (1996) found that social support was reliably related to beneficial effects on aspects of physiological processes, including cardiovascular health, and the endocrine and immune systems. Although evidence suggests that the relationship between social support and health is particularly important for older adults, the review also indicated that social support has beneficial relationships with physiological processes across different age groups (Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Although there has been research examining the relationship between social support and human health, many studies have been focused on negative experiences, for example, on how stressors such as divorce and widowhood can create stress and compromise mental and physical functioning (Ryff & Singer, 1998).

There is strong evidence to support that psychological need fulfillment is related to health habits. The previous studies are domain specific in their need satisfaction ratings and outcomes, as for example, studies of how satisfaction of the three basic needs in the exercise domain predicted exercise habits. This investigation was focused on extending this research by examining how daily need satisfaction in life globally predicts health habits.

DAILY FLUCTUATIONS IN WELL-BEING

Prior research has established that the daily diary method can be useful in identifying links and providing a more nuanced understanding of the relationship between psychological need satisfaction and well-being. There has been research examining the relationship between daily psychological need satisfaction and daily well-being in the work context (Hoof & Geurts, 2014: Roche & Lieke, 2011), among elite athletes (Gagne, Ryan, & Bargmann, 2003: Quested, Duda, Ntoumanis, & Maxwell;

2013), and among college students (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Sheldon, Ryan, & Reis, 1996). However, there has not been a daily diary study conducted examining the relationship between daily psychological need satisfaction and daily health habits among a general college population.

The two articles examining the relationship between psychological need satisfaction and well-being among college students were the models for this investigation. Sheldon and his colleagues (1996) wrote an article, *What Makes for a Good Day? Competence and Autonomy in the Day and the Person*, where they used a diary study to examine how the satisfaction of two basic needs, autonomy and competence, led to daily well-being, above and beyond trait levels of autonomy and competence. Daily well-being was composed of a composite score of affect valence, vitality, and symptomology. They found that participants with higher baseline measures of trait autonomy and competence had better days on average. In addition, within-person analysis showed that better days were those in which autonomy and competence were rated higher, relative to the participants' baseline.

Reis and colleagues (2000) followed up with an article, *Daily Well-Being: The Role of Autonomy, Competence, and Relatedness*, that mirrored the Sheldon and colleagues (1996) article with the addition of the relatedness component. The study explored the hypothesis that daily variations may be understood in terms of the three basic needs from self-determination theory: autonomy, competence, and relatedness, being satisfied in daily activity. Results indicated a strong support for this hypothesis. These two article point to a strong relationship to both person-level need fulfillment and day-level need satisfaction contributing to well-being.

There is much to be gained by studying experiences and behaviors over time, because it allows for an appreciation of the complexity, richness, and informativeness of

ordinary activity. The within-person design approach is ideal for examining how variations in activities and experiences across time influence outcomes, allowing for an examination of the ebb and flow of everyday activities (Reis & Gable, 2000). Diary studies in particular allow for an examination of ongoing experiences across everyday situations and offer the opportunity to identify more clearly the antecedents, correlates, and consequences of daily experiences (Bolger, Davis, & Rafaeli, 2003) and to distinguish consequences of daily experiences from that of traits or cumulative experiences.

EMERGING ADULTHOOD SAMPLE

Participants in this study range in age from 17 – 25, the time frame Arnett (2000; 2007; 2014) characterizes as emerging adulthood. Emerging adulthood is a critical period for the establishment of lifelong positive and risky health-related behaviors. One key component of emerging adulthood is identify exploration. It is a time of freedom from parents, social roles, and adult responsibilities allowing for an intensive exploration, people are able to try on different possibilities and explore alternative of who they may want to be before making enduring decision (Kuther, T. L., 2006). It is a critical time to understand how health habits are supported because while dietary and exercise habits often originate in childhood they become more permanently established during adolescence (Cohen, Brownell, & Felix, 1990).

INVESTIGATION

This investigation sought to expand upon these prior diary studies in particular, and the research on need satisfaction and health behaviors more broadly, by exploring the link between fluctuations in daily need satisfaction and daily health habits, specifically exercise, diet, and sleep, rather than solely focusing on psychological and physical well-

being outcomes. Like previous diary studies, this investigation focused on both person-level need fulfillment and daily experiences of need satisfaction. However, the current investigation will expand on the prior diary studies of need satisfaction by including among person-level measures, the motivation for health habits. Research has shown that motivations for working out and eating healthy can range along a continuum from external motivation to internal motivation, with intrinsic motivation for health behaviors being most strongly linked to health behavior (e.g. Sebire, Standage, & Vasnsteenkiste, 2009; Vansteenkiste, Simons, Soenens, & Lens, 2004). By examining person-level measures, such as how autonomous, competent, and related people feel in their lives as a whole, as well as their motivation for exercising and eating healthy, we can gain an understanding of the unique person-level differences. That is, person-level measures and analyses ask why one person usually feels good and practices healthy behaviors whereas another does not. In contrast, daily measures and analyses of people's daily experiences assessed over time can address what qualities about that day are associated with engaging in health habits and feeling better or worse on one day relative to one's baseline.

To summarize, psychological needs have been linked with psychological health, physical health, and health habits. In fact, some research has suggested that day to day fluctuations in needs, as well as person-level need fulfillment, predicts overall psychological and physical well-being. Research has also suggested that hedonic, but not eudaimonic well-being or need satisfaction, predicts health habits, specifically food choices (White, Horwath, & Conner, 2013). However, research has yet to show, in a typical population of young adults, whether day to day fluctuations in needs (eudaimonic well-being), as well as person-level eudaimonic well-being and motivation for health habits, predict daily engagement in health habits, in addition to psychological and physical well-being.

This investigation was intended to provide a nuanced understanding of both why some people participate in beneficial health habits, such as exercise and fruit and vegetable intake, whereas others do not, as well as why people engage in health behaviors on some days and not others.

Research Questions

More specifically, the current proposal addressed the following research questions:

1. Are person-level feelings of need fulfillment (autonomy, competence, and relatedness) in one's life globally and motivation for health behaviors (motivation for working out and motivation for eating healthy) associated with health habits (exercise, diet, and sleep)?
2. Do daily experiences of need satisfaction (daily autonomy, daily competence, and daily relatedness) predict (changes in) daily health habits (exercise, diet, and sleep), even after accounting for person-level feelings of need fulfillment and motivation for health habits?

In addition, this investigation was a replication of previous studies and addressed the question:

3. Does person-level need fulfillment (autonomy, competence, and relatedness) and daily experiences of need satisfaction (daily autonomy, daily competence, and daily relatedness) predict (changes in) daily psychological and physical health (overall well-being)?

Hypotheses

Hypothesis 1: Person-level motivations for health behaviors will be positively associated with health habits.

Rationale 1: Motivational orientations towards health habits has helped explain participation in exercise and diet. Teixeira and colleagues (2012) in a systematic review examining exercise and self-determination theory found that motivation is a critical factor in supporting sustained exercise. Specifically, they found that identified regulation is predictive of short term adoption of exercise programs, whereas intrinsic motivation is predictive of long-term exercise adherence (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). Additionally, in another review, Teixeira and colleagues (2011) found that motivation quality plays an important role in the capacity to adopt and sustain healthful diets. I expected to find that motivational orientations towards health habits would be related to participation in exercise and healthy eating.

Hypothesis 2: Daily experiences of need satisfaction will predict changes in daily health habits.

Rationale 2: Numerous studies have indicated that need satisfaction is positively related to health habits (Ntoumanis, 2001; Reinboth, Duda, & Ntoumanis, 2004). However, they have not specifically looked at how these needs fluctuate over time and influence health habits daily. Even studies that did take a daily approach to understanding how daily affect influences health habits (White, Horwath, & Conner, 2013) did not look at need satisfaction at the daily level. This investigation filled in this gap and examined how fluctuations in daily need satisfaction predicted daily health habits. I expected to find that greater daily need satisfaction would predict an increase in daily exercise, diet, and sleep – health habits, since the prior day.

Hypothesis 3: Daily experiences of need satisfaction will predict changes in daily psychological and physical health.

Rationale 3: Prior research has already shown a strong link between daily experiences of need satisfaction predicting changes in daily well-being (Sheldon, Ryan,

& Reis, 1996; Reis, Collins, & Berscheid, 2000). Both Sheldon and colleagues (1996) and Reis and colleagues (2000) found that daily need fulfillment predicted daily psychological hedonic well-being as measured by positive affect, negative affect, vitality, as well as daily physical well-being as measured by physical symptomology. As my investigation was modeled on these two prior studies and measured the same variables (in addition to others), I also expected to find that daily need fulfillment would predict daily psychological and physical well-being. Given the call for more replications in psychological science (Cumming, 2014; Nosek & Lakens, 2015; Simons, 2014), I saw as one worthy aim of my investigation to verify previous findings regarding the link between psychological needs and psychological and physical well-being.

Figure 3 provides for a visual representation of how the constructs relate to each other in regards to the research questions and hypothesis statements.

Chapter 3 Methods

Chapter 3 will discuss the research procedures for the investigation, including sampling, data collection, and measures utilized. I will conclude by explaining the data analysis methodology.

DESIGN

Data were collected in three separate waves. The first wave of data was collected during the week of March 17th, 2014. The second and third waves of data were collected in fall 2014. Specifically, the second wave of data collection began during the week of September 29th, 2014 and the third wave began during the week of October 27th, 2014.

Participants

The sample included college students from the Educational Psychology subject pool participating in research for course credit at a large university in the Southwest. There were no restrictions placed on the sample, anyone assigned (during the first wave) or self-selecting (during the second and third wave) to the study could participate. Sixty-eight participants participated in the study during wave 1, 59 participants participated in wave 2, and 126 participants participated during wave 3, for a combined total sample of 253. However, an excessive amount of data was missing for five students (explained following a description of the procedure and measures). Additionally, six master's level students were removed from the sample and 8 students over the age of 25 were removed, thus the total sample used for all analyses included 234 participants. See Table 1 for all demographic information.

During the first wave, research participants were predominantly female (n = 42; 67.7%) and ranged in age from 18 through 25, with a mode age of 21. For the second wave, 67.9% (n = 36) of research participants were female and participants ranged in age

from 18 through 25, with a mode age of 21. Research participants in the third wave were predominantly female also (n = 73; 61.3%), and ranged in age from 17 to 25, with a mode age of 21. In the combined total sample, the majority of the sample was female (n = 151; 64.5%) and ranged in age from 17 to 25, with a mode age of 21. The greater percentage of female relative to male participants is common for students enrolled in courses in Educational Psychology.

Participants were from all grade levels at the university. During the first wave, more of the participants were in their senior year (n = 29; 46.8%), with juniors (n = 14) compromising 22.6% of the sample, sophomores (n = 11) 17.7%, and with both freshman (n = 4) and 5th year seniors (n = 4) making up 6.5% each. During the second wave, the majority of participants were again in their senior year (n = 29; 54.7%), followed by sophomores (n = 9) 17.0%, juniors (n = 7), 13.2%, fifth year seniors (n = 6) 11.3% of the sample, and finally freshman (n = 2) with only 3.8% of the sample. During the third wave, more participants were in their senior year (n = 54; 45.4%), followed by fifth year seniors (n = 24; 20.2%), sophomores (n = 19) 16.0%, juniors (n = 19) 16.0%, and freshman (n = 3) only 2.5%. For the combined total data set, the majority of the sample was seniors (n = 112; 47.9%), juniors (n = 40) 17.1%, whereas sophomores represented (n = 39) 16.7%, fifth year seniors (n = 34) represented 14.5%, and freshman (n = 9) 3.8%.

The mean GPA of students in the study was 3.29 during the first wave, 3.24 during the second wave, and 3.26 during the third wave. The mean GPA of students in the combined total sample was 3.27. There was a wide range of majors represented.

During the first wave, the sample consisted of 54.8% European American (n = 34), 32.3% Asian (n = 20), 6.5% Hispanic (n = 4), 3.2% African American (n = 2), 1.6% Native American (n = 1), and 1.6% Multi-Racial (n = 1) students. During the second wave the sample consisted of 49.1% European American (n = 26), 22.6% Asian (n = 12),

20.8% Hispanic (n = 11), 3.8% African American (n = 2), 0% Native American (n = 0), and 3.8% identified as Multi-Racial (n = 2) students. During the third wave the sample consisted of 54.6% European American (n = 65) European American, 18.5% Asian (n = 22), 17.6% Hispanic (n = 21), 3.4% African American (n = 4), 0% Native American (n = 0), and 5.9% identified as Multi-Racial (n = 7) students. The final combined sample consisted of 53.4% European American (n = 125), 23.1% Asian (n = 54), 15.4% Hispanic (n = 36), 3.4% African American (n = 8), 0.44% Native American (n = 1), and 4.3% Multi-Racial (n = 10) students. The multi-racial group is composed of those participants who had marked multiple ethnicities when filling out the demographic information.

Data Collection Procedure

Data collection utilized a daily diary study method. Participants began by attending an in-person meeting to hear about the study and complete a series of baseline measures assessing person-level measures of autonomy, competence, relatedness, and motivation for working out and eating healthy. All baseline measures except for one, the Multi-Dimensional Self-Esteem Inventory competence subscale, were administered to participants using the online survey system, Qualtrics. The Multi-Dimensional Self-Esteem Inventory competence subscale was administered to participants on paper due to requirements by the publishing group PAR. There was a three day time frame, Monday through Wednesday, for participants to schedule the computer lab session to complete baseline measures in person.

Once this timeframe passed, participants began taking the daily surveys on a Thursday, specifically on March 20th, October 2nd, or October 30th for the respective waves. Participants completed daily surveys every day for 14 days assessing daily experiences of autonomy, competence, and relatedness, as well as their health habits

(exercise, diet, and sleep) for the day, and an assessment of their overall daily well-being, as measured by affective valence, vitality, and symptomology. They were instructed to complete the survey before they went to bed each night. The evening time frame is consistent with other daily diary study methodologies (Reis, Sheldon, et al., 2000; Sheldon, Ryan, Reis, 1996; Verstuyf, Vansteenkiste, Soenens, Boone, & Mouratidis, 2013). The surveys were formatted in Qualtrics to only present one item at a time to research participants. This was done to facilitation a pleasant survey completion experience for participants because many of them took the daily survey on their cell phones.

All daily surveys were distributed through email utilizing the online survey system, Qualtrics. Survey completion was checked at approximately 10:00 pm each evening, and reminders were sent to those students who had not yet completed their survey. The reminder emails were also sent through Qualtrics.

Baseline Measures

There were multiple baseline measures to assess person-level constructs (see Appendix A for all baseline measures and their items). The Self-Determination Scale (SDS), the Multi-Dimensional Self-Esteem Inventory (MSEI) competence subscale, the UCLA Loneliness Scale, the Motivation for Working Out Scale, and the Motivation for Eating Healthy Scale were used. Demographic information about age, race, gender, ethnicity, year at the university, GPA, major, height, and weight, were also collected. Self-reported height and weight were collected in order to calculate Body Mass Index (BMI). BMI was calculated using a formula. First, the self-reported weight in pounds was multiplied by 0.45 to convert to kilograms (the metric conversion factor). Second, the self-reported height in feet and inches was changed to inches and the height in inches was

multiplied by 0.025 to convert to meters (the metric conversion factor). Third, the answer from step 2 was squared. Finally, I divided the answer from step 1 by the answer from step 3 to get the BMI. According to the World Health Organization (2002), BMI is used to assess the prevalence of being overweight and obesity.

The Self-Determination Scale (SDS) is a 10-item scale, with two 5-item subscales using a 5 point response scale. The subscales are awareness of oneself and perceived choice in one's actions. The two subscales can be combined into one overall self-determination score by averaging the items from both subscales. Overall, the scale was designed to assess individual differences in the extent to which people tend to function in an autonomous or self-determined way (Sheldon, Ryan, & Reis, 1996). The 10-items ask respondents to describe the relative appropriateness of a matched pair of self-determined and non-self-determined alternatives. For example, one pair includes "A: I am free to do whatever I decide to do and B: What I do is often not what I'd choose to do." This is a reverse coded item example. A five-point response scale was used, with 1 (only A feels true), 3 (both feel equally true), and 5 (only B feels true). Internal consistency reliability (alpha) for the final combined dataset was .79.

The Multi-Dimensional Self-Esteem Inventory (MSEI) competence subscale was utilized to assess a person-level perception of competence. The MSEI is a self-report inventory that provides measures of the components of self-esteem (O'Brien & Epstein, 1988). I was only interested in the subscale measuring competence. The competence subscale is a 10 item scale utilizing two different 5 point Likert response scales ranging from 1 (completely false) to 5 (completely true) and 1 (almost never) to 5 (very often). The first four items on the scale utilize the first Likert response scale and include items such as: "I am usually able to demonstrate my competence when I am being evaluated." The last six items on the scale utilize the second Likert response scale and include items

such as: “How often do you approach new tasks with a lot of confidence in your ability?” The 10 items are then summed to create the overall competence subscale. Internal consistency reliability (alpha) for the final dataset was .83.

The UCLA Loneliness Scale was given to assess person-level experiences of relatedness. The UCLA Loneliness Scale is a 20 item scale with a 4 point Likert response scale ranging from 1 (never) to 4 (always). There are 11 negatively worded (lonely) items and 9 positively (non-lonely) items in the scale (Russel, 1996). The scale scoring procedure normally calculates a value so that the higher the score the more lonely you are. However, for the purposes of this study, the items were reverse coded, so that higher scores indicated greater relatedness or less loneliness. An example item includes: “How often do you feel outgoing and friendly?” Internal consistency reliability (alpha) for the final dataset was .94.

Motivation for Working Out was measured with the Exercise Self-Regulation Questionnaire (SRQ-E), and the Motivation for Eating Healthy Scale was a modified version of the SRQ-E. These questionnaires were meant to measure the reasons why a person works out or eats healthy. For example, a sample item would include: “Q: Why do you work out? A: Because working out is important and beneficial for my health and lifestyle.” Or “Q: Why do you eat healthy? A: Because I feel pressured to eat healthy.” The scale is structured to provide responses indicating levels of external regulation, introjected regulation, identified regulation, and intrinsic motivation one feels when engaging in these activities. Both scales are 12 item scales using a Likert response scale ranging from 1 (not at all true), 4 (somewhat true), to 7 (very true). From the questions, four subscale scores can be calculated: external regulation, introjected regulation, identified regulation, and intrinsic motivation. These were calculated by averaging the responses for each of the subscale’s items. A Relative Autonomy Index (RAI) was also

calculated using the following formula to combine the subscale scores: (2 X Intrinsic Motivation) + Identified Regulation – Introjected Regulation – (2 X External Regulation) (Ryan & Connell, 1989). There are currently no published reports that have utilized the SRQ-E, though there is research that has been conducted using the scales. Internal consistency reliability (alpha) for the final dataset for Motivation for Working Out were: external regulation $\alpha = .75$, introjected regulation $\alpha = .70$, identified regulation $\alpha = .80$, and intrinsic motivation $\alpha = .88$. Internal consistency reliability (alpha) for the final dataset for Motivation for Eating Healthy were; external regulation $\alpha = .72$, introjected regulation $\alpha = .70$, identified regulation $\alpha = .83$, and intrinsic motivation $\alpha = .83$.

Additionally, a total need satisfaction composite score was created by taking the mean of the self-determination scale, the MSEI competence subscale, and the UCLA loneliness scale (reverse scored).

Daily Reports Measures

The daily report measures occurred every day for 14 days, beginning on a Thursday and allowing the survey collection to span two weekends. Participants were instructed to complete the survey measures before they went to bed each night. The daily report measures included measures on daily well-being: affect valence scale, psychological vitality scale, a symptom checklist, as well as a daily health habits report. Participants also reported and rated daily need satisfaction for autonomy, competence, and relatedness. Please see Appendix B for all daily report measures.

The Diener and Emmons (1984) affect valence scale measures positive and negative affect using a 9 item scale, listing adjectives. Positive adjectives include: joyful, happy, pleased, enjoyment/fun. Negative adjectives include: depressed, worried/anxious, frustrated, angry/hostile, and unhappy. Participants rated the extent to which they

experienced each emotion each day using a 7 item Likert response scale, ranging from 1 (not at all) to 7 (extremely). A positive affect valence score was calculated by taking the mean of the four positive adjectives. A negative affect valence score was calculated by taking the mean of the five negative adjectives. Internal consistency reliability (alpha) for the final dataset were .94 for positive affect and .87 for negative affect.

Ryan and Frederick's (1997) Psychological Vitality Scale assessed the degree to which participants felt physically and mentally vigorous and alert. This is considered to be an aspect of eudaimonic well-being (Ryan & Deci, 2001). This study used the 6 item state level version of the scale. Participants rated how true each statement was for them at the time they were taking the survey, on a 7 point response scale ranging from 1 (not at all true) to 7 (extremely true). Statements include items such as: "Currently I feel so alive I just want to burst and I feel energized right now." Internal consistency reliability (alpha) for the final dataset was .90.

The symptoms checklist was a brief measure inspired by Emmons (1991) symptoms checklist. The original checklist is a 9 item checklist asking participants indicate the degree to which they experienced the following symptoms that day: headaches, stomachache/pain, chest/heart pain, runny or congested nose, coughing/sore throat, faintness/dizziness, shortness of breath, acne/pimples, stiff/sore muscles, or other. Other researchers (Reinboth & Duda, 2006; Reinboth, Duda, & Ntoumanis, 2004) have typically removed acne/pimples from the checklist when distributing the survey to an adolescent population, because adolescents might be personally sensitive to such a question. The checklist used in the current study was further modified and condensed to three items for this study; felt ill, felt tired/fatigue, and had pain/discomfort. Participants responded using a 7 point Likert response scale ranging from 1 (not at all) to 7 (extremely). The checklist was condensed to keep the daily surveys an appropriate length

and because a composite score of physical symptomology could still be calculated based on the three items. Internal consistency reliability (alpha) in the final data set was .71.

In addition to measuring each aspect of well-being separately, a composite measure of overall well-being was calculated to provide a convenient overall estimate of an individual's global sense of well-being for that day. First, each individual scale, positive and negative affect, symptoms, and subjective vitality, were standardized. Then, the sum of the two negative measures, negative affect and symptoms, was subtracted from the sum of the two positive measures, positive affect and subjective vitality. Therefore, a score of 0 on this composite represents average well-being on an average day for the full sample.

The daily healthy habits report was created for this study. It included three measures of exercise, two measures of diet (eating fruits and vegetables and fast food), and hours of sleep from the previous night. In the second and third waves of data collection, participants also reported the number of steps they took during the day.

For self-reported exercise, participants were asked to report how many hours they spent that day doing the following activities: strenuous exercise (biking fast, aerobics, running, basketball), moderate exercise (walking quickly, baseball, volleyball), and exercises to strengthen or tone the muscles (push-ups, weight training). The rating scale was; none, ½ hour – 1 hour today, 1 hour – 2 hours today, 2 hours – 3 hours today, and 3 hours or more today. The exercise items were split over three categories in order to cover a wide range of exercise types and activities. The three types of exercises were averaged together to form one exercise composite score.

For diet, participants were asked to report how much of the following did they eat that day; fast food and fruits and vegetables. These questions used a 4 point scale ranging from 0 (I did not eat this) to 4 (4 or more times today). Participants were also asked to

report how many hours they slept the previous night. During the second and third wave participants also reported their number of steps during the day. Participants kept track of their step totals using an app on their phones.

The daily need satisfaction measures were modeled on the previous research done by Sheldon and colleagues (1996) and Reis and colleagues (2000). Daily autonomy and competence need satisfaction was measured by having participants list and rate the three activities they spent the most time on that day. They typed in their responses about the activities in Qualtrics. Examples of reported activities include, "spending time with a friend", "working at my on campus job", "attending my ALD class." Those activities were rated according to a daily autonomy measure and a daily competence measure. The daily autonomy measure asked them to rate, on a scale from 1 (not at all) to 7 (completely) their motivation for doing the activity. There was one item each measuring an intrinsic motive, an identified motive, an introjected motive, and an external reason. A summary autonomy score was created for each activity with the following weights: intrinsic (+2), identified (+1), introjected (-1), and external (-2) (Ryan & Connell, 1989). A daily autonomy score was computed by averaging across each participant's three nominated activity. The daily competence measure asked participants to rate how effective they felt doing the activity on a scale from 1 (not at all effective) to 7 (extremely effective). Daily competence scores were calculated by averaging across the three activities.

To measure daily relatedness need satisfaction, participants were also asked to list the three social interactions that took up the most time for them during the day. Then they rated each social interaction for how close and connected they felt to the person during the interaction on a scale from 1 (not at all) to 7 (extremely). Summary daily relatedness scores were computed by averaging across all three interactions.

Additionally, a daily need satisfaction composite variable was created by taking the mean of all three needs, daily autonomy, daily competence, and daily relatedness.

Survey Completion

During the first wave, 68 students completed the in-person baseline measure, one person was removed from the study due to failure to complete 11 daily surveys, two master's students were removed, and three students over the age of 25 were removed, for an n of 62. All other remaining participants missed three or fewer daily surveys, with 83.87% of participants completing all required surveys consisting of the baseline and 14 daily surveys. During the second wave, 59 students completed the in-person baseline measures. However, two students did not complete both sides of the measure administered on paper – the MSEI competence subscale, and were subsequently dropped from analysis, additionally one master's student and three students over the age of 25 were removed for an n of 53. All other remaining participants missed 7 or fewer daily surveys, with 67.92% of participants completing all required surveys. During the third wave, 126 students completed the in-person baseline measures, five individuals were removed from the study due to a failure to complete 12 daily surveys and additionally two participants over the age of 25 were removed, for an n of 119. All remaining participants missed 10 or fewer daily surveys, with 58.82% of participants completing all required surveys. In the three waves participants were not able to miss more than 12 daily surveys. Table 2 reports the frequencies of survey completion for all three waves and the combined total sample. To prevent bias in sampling participants were included even if they missed some daily surveys, this is a common recommended practice (Bolger & Laurenceau, 2013; Enders, 2010). Additionally, all included daily report measures

include all items, if participants took a daily report survey they completed the entire survey. With the three waves of data collection combined the total N was 234.

Chapter 4 Results

Chapter 4 will begin by summarizing some preliminary analyses (means, standard deviations, frequencies and percentages, skewness and correlations). Chapter 4 will conclude with the reporting of the HLM results to address the three research questions: 1) Are person-level feelings of need fulfillment (autonomy, competence, relatedness) in one's life globally and motivation for health behaviors (motivation for working out and eating healthy) associated with health habits (exercise, diet, sleep)?, 2) Do daily experiences of need satisfaction (daily autonomy, competence, relatedness) predict changes in daily health habits (exercise, diet, sleep), even after accounting for person-level feelings of need satisfaction and motivation for health habits?, and 3) Does person-level need fulfillment (autonomy, competence, relatedness) and daily experiences of need satisfaction (daily autonomy, competence, relatedness) predict changes in daily psychological and physical health (overall well-being, affect, symptomology, vitality)?

Preliminary Analyses

To provide some initial assessment of whether the existing dataset would provide support for the hypotheses put forward in this study, preliminary analyses were conducted. Analyses were conducted on the final combined data set, composed of all waves of data, for an N of 234. Means and standard deviations were computed for all trait level variables (Self-Determination Scale, UCLA Loneliness Scale, and Motivation for Working Out Scale, and the Motivation for Eating Healthy Scale) and day level variables (Affect Valence, Physical Symptoms Measure, Overall Well-Being – which is a composite measure made up of positive affect, negative affect, vitality, and symptomology, Daily Relatedness, Daily Autonomy, Daily Competence, and all reported

health habits: exercise, fast food intake, fruit and vegetable consumption, and hours of sleep). Table 3 lists these means and standard deviations.

In addition, frequencies and percentages were calculated for five of the health habits, exercise (strenuous exercise, moderate exercise, and strength exercise) and diet (fast food and fruit and vegetable intake). Table 4 lists these frequencies of occurrence and percentages across all 14 days and across all participants. There was a total of 3,061 daily reports across the duration of the study. For exercise, overall, participants self-reported not exercising the majority of the time; 54.4% reported no strenuous exercise, 29.2% no moderate exercise, and 69.5% no strength exercise. Those who did report exercising most frequently reported doing less than ½ hour, ½ hour to an hour, or an hour to 2 hours, as reported in order of most to least frequent (strenuous exercise: 16.9%, 16.5%, and 9% respectively; moderate exercise: 30.1%, 25.5%, and 10.7% respectively; strength exercise: 15.1%, 10.1%, and 4.7% respectively). For reported fruit and vegetable intake, over the course of the two weeks, participants reported eating them, with only 22.8% of participants saying they did not eat any fruit and vegetables. For reported fast food intake, 75.6% of participants reported not eating any fast food during the two weeks. If they did eat it, it seems they only ate it one time (21.1%). Only 3.2% of participants reported eating fast food twice or more during the two week period.

Skewness was examined on the health habit variables, specifically exercise and diet. Skewness values for strenuous exercise (1.26) and strength training exercise (1.78) indicate that those values are skewed because they do not fall within the -1 to 1 range. However, moderate exercise (.78) was not skewed. Examination of the histogram for moderate exercise also shows a normal distribution. Fast food (2.24) was skewed, whereas fruit and vegetable intake (.43) was not skewed. Examination of the histogram for fruit and vegetable intake shows a relatively normal distribution.

Correlations were also calculated at the person level. The pattern of correlations were examined among the various predictor and outcome variables. For each participant, aggregate daily need satisfaction (autonomy, competence, and relatedness), health habits (exercise, fast food, fruit and vegetable, and sleep), and well-being (positive affect, negative affect, vitality, and symptomology) scores were created by summing across all 14 days' worth of data. Correlations among these variables, as well as with person-level measures are reported in Table 5. Daily variables came from individual reports gathered daily during the two weeks, aggregated scores were those daily variables averaged across the two week data collection, and person-level variables were those measures that were given at the beginning of the study (i.e. person-level measures of self-determination, competence, and relatedness).

The three person-level measures of need satisfaction, which were measured at baseline, demonstrated moderate correlations between .45 and .58. Correlations among the three aggregated daily need satisfaction measures were also all significantly correlated. The autonomy-competence correlation was significant, $r(234) = .26$, $p < .01$, as were the autonomy-relatedness correlation $r(234) = .30$, $p < .01$, and competence-relatedness correlation $r(234) = .59$, $p < .01$, and the latter was also the highest. This follows the pattern of correlations found in Reis and colleagues (2000).

The correlation between person-level competence and daily competence was significant, $r(234) = .29$, $p < .01$ and the correlation between person-level relatedness and daily relatedness, $r(234) = .43$, $p < .01$. These correlations are also similar to the correlations found by Reis and colleagues (2000). Further, the correlation between person-level self-determination and daily autonomy was significant, $r(234) = .24$, $p < .01$. Reis and colleagues (2000) did not find a significant correlation between these variables, whereas this investigation did. Additionally, the well-being composite score correlated

significantly with all three person-level variables (self-determination, competence, and relatedness), both motivations for healthy habits (motivation for working out and motivation for eating healthy) and all three daily need scores.

The two person-level measures of motivation for healthy habits correlated positively with each other, $r(234) = .61$, $p < .01$. The person-level measure of motivation for eating healthy was positively and significantly correlated with fruit and vegetable intake, $r(234) = .25$, $p < .01$, and negatively and significantly correlated with fast food intake, $r(234) = -.17$, $p < .01$. However, the person-level measure of motivation for exercise was not significantly correlated with exercise, $r(234) = .06$, $p = .38$.

Most importantly, correlations between some daily needs and aggregated health habits were significant and in the expected direction. The correlations between daily autonomy and both exercise, $r(234) = .17$, $p < .05$, and fruit and vegetables intakes, $r(234) = .13$, $p < .05$, were positive and significant. Likewise, the correlations between daily competence and fruit and vegetable intake, $r(234) = .24$, $p < .01$, and sleep $r(234) = .17$, $p < .01$, were both positive and significant. The correlation between daily relatedness and fruit and vegetable intake was also positive and significant, $r(234) = .24$, $p < .01$. Additionally, the correlation between aggregated daily exercise and aggregate daily fruit and vegetable intake was significant and positive, $r(234) = .34$, $p < .01$.

Hypothesis Testing with HLM

I used hierarchical linear modeling (HLM) (Bryk & Raundenbush, 1992) for my primary tests of the hypotheses. HLM is particularly useful for these data because it accounts for the hierarchically nested design of the data set. For this particular dataset, the lower level unit, days, is nested within the higher level unit, persons. Additionally, HLM treats person-level findings as a random effect, rather than a fixed effect, thereby

allowing for a generalization of the findings to the population. This analysis also allows the possibility that the within-person slopes may differ significantly from one person to another, which makes it more useful than simply running an ANOVA or regression.

The person-level predictors, which were measured at the beginning of the two weeks, were the person-level measures of self-determination, competence, relatedness, and motivation for health habits. Motivation for working out was only included in the models that included exercise as outcomes, and motivation for eating healthy was only included in the models that included diet as outcomes. The day-level predictors were daily ratings of autonomy, competence, and relatedness. The prior day's value for each outcome variable also was entered to control for possible carryover effects from one day to the next that have been shown in some studies. Only the last 13 days of each participants' data could be used because there was no prior day for the first day of data collection. If a prior day's value was missing, due to a missing daily survey, then the closest prior day's value was carried forward. If a participant completed a daily survey then the entire survey was present, there were never any missing items.

HLM estimates day-level and person-level effects simultaneously. Thus, person-level effects are statistically independent of one another and of day-level effects. Similarly day-level effects control for one another, the prior day's outcome, and the person-level variables.

Day-level outcomes were estimated by the following equation:

$$WB_{ij} = \beta_{0j} + \beta_1 X_{1ij} + \beta_2 X_{2ij} + \beta_3 X_{3ij} + \beta_4 X_{4ij} + e_{ij}$$

Person-level were estimated by the following equation:

$$\beta_{0j} = G_{00} + G_{01} X_{1j} + G_{02} X_{2j} + G_{03} X_{3j} + G_{04} X_{4j} + G_{05} X_{5j} + u_{0j}$$

I began my exploration of the data by examining how participants' health habits and overall well-being changed over time. To explore this question, I estimated a series of two-level (day, participant) regression models where the intercept was allowed to randomly vary using the Mixed procedure in SPSS 23. In each model, I included response day to represent time over the course of the two weeks at level 1. Response day was grand-mean centered. To accommodate for any missing data, I used a maximum likelihood estimate procedure with robust estimates of standard errors (REML) as recommended by Enders (2010). Because adjacent residuals in repeated measures data may be correlated across measurement occasions, I specified an AR(1) correlated error structure.

Results (please see Table 6) suggested that most health habits and well-being measures, including strenuous exercise, moderate exercise, combined exercise, sleep, positive affect, negative affect, vitality, and symptomology, declined across the two week study time frame, while overall well-being increased. The greatest decline occurred for symptomology. There was no systematic change in strength exercise or the two diet variables, fruit and vegetable intake and a fast food intake, across the two week study time frame.

I then examined whether participants' health habits and overall well-being varied across wave of the data collection. I estimated a series of two-level (day, participant) regression models where the intercept was allowed to randomly vary using the Mixed procedure in SPSS 23. Wave was dummy coded to represent the three different waves at level 2 in each model. To accommodate for any missing data, I used a maximum likelihood estimate procedure with robust estimates of standard error (REML) and again

specified an AR(1) correlated error structure. There were no significant differences among waves for any of the outcomes and wave is not included in any other analyses.

Relations between participant reported daily need satisfaction and health habits

Hypotheses about the relation between daily experiences of need satisfaction (daily autonomy, competence, and relatedness) and changes in daily health habits were tested with a series of two-level (day and participant) regressions where the intercept was allowed to randomly vary. For each multilevel model, at level 1 I included time, each of the three person-level variables (self-determination, competence, and relatedness), each of the three daily need satisfaction variables (autonomy, competence, and relatedness), and the outcome reported on the previous day, and time. Models with exercise outcomes also had motivation for working out as a person-level measure, while models with the diet outcomes had motivation for eating healthy as a person-level measure. The prior day's value for the outcome was entered to control for possible carryover effects from one day to the next (e.g. see Reis et al., 2000 for an example of this strategy). The most recent day of reporting was carried forward for the purposes of lagging. Including the prior day's outcome values as a predictor allowed me to model change in the outcome from one report to the next as a function of participants' perceptions of daily need satisfaction reported on the same day as the outcome. The only outcome that was not lagged, but rather lead forward, was sleep. Participants reported how much sleep they had the night before, so that variable was lead forward with the original reporting acting as the lag.

To deconstruct between- and within-person effects, daily within-person predictors were person-mean centered (around each person's own average score) and between-person predictors were grand-mean centered (around the average score of the group of

participants). Time and prior day's score were grand-mean centered since they were simply control variables in these models. Again, I used the Mixed procedure in SPSS 23, a maximum likelihood estimate procedure with robust estimates of standard errors (REML), and specified an AR(1) correlated error structure. The results of these analyses can be seen in Table 7 and 8.

At the day level, across both exercise and diet outcomes, results largely confirmed my hypothesis that daily need satisfaction would predict changes in daily health habits, controlling for time, the outcome on the prior day, and person-level measures.

Exercise Outcomes

The combined exercise score related positively and significantly to baseline person-level relatedness fulfillment. Baseline person-level relatedness fulfillment is also positively and significantly related to daily moderate exercise. Baseline person-level self-determination and competence fulfillment were not significantly related to any of the exercise outcomes. Additionally, the motivation for working out scale, which was only modeled with exercise outcomes, was not significantly related to any of the exercise outcomes.

Daily need satisfaction of autonomy, at both the within- and between-levels, was positively and significantly related to the combined exercise, strenuous exercise, and moderate exercise outcomes. Daily need satisfaction of autonomy was not significantly related to strength training at either the within- or between-level.

There were no significant relationships between daily need satisfaction of competence, at either the within- or between-person level, to any of the exercise outcomes.

Daily need satisfaction of relatedness, at either the within- or between-level, did not significantly predict any of the exercise outcomes.

Diet Outcomes

Baseline person-level need satisfaction of autonomy, competence, and relatedness were not significantly related to the diet outcomes, fruit and vegetable intake and fast food intake. Two significant relationships were found with the motivation for eating healthy and diet outcomes. Motivation for eating healthy was positively and significantly related to fruit and vegetable intake and negatively and significantly related to fast food intake.

Daily need satisfaction of autonomy at the within-person level was negatively and significantly related to fruit and vegetable intake. However at the between-person level it was not significantly related. There was no significant relationship between daily need satisfaction of autonomy and fast food intake at either the within- or between-person level.

Daily need satisfaction of competence at both the within- and between-person level was significantly and positively related to fruit and vegetable intake. There was no significant relationship between daily need satisfaction of competence and fast food at either the within- or between-person level.

Daily need satisfaction of relatedness at the within-person level significantly and positively related to fast food intake. No other significant relationships between daily need satisfaction of relatedness and fast food intake, at either the within- or between-person level was found.

Sleep Outcomes

Baseline person-level need fulfillment measures of self-determination, competence, and relatedness did not significantly relate to sleep.

On the day level, two day level variables positively and significantly related to sleep. Daily need satisfaction of autonomy at the within-person level was positively and significantly related to sleep. Aggregated person-level need satisfaction of competence, at the between-person level, also positively and significantly related to sleep.

Relations between participant reported daily need satisfaction and overall well-being

Hypotheses about the relation between daily experiences of need satisfaction (daily autonomy, competence, and relatedness) and changes in daily overall well-being were tested with a series of two-level (day and participant) regressions where the intercept was allowed to randomly vary. For each multilevel model, at level 1 I included time, each of the three person level variables, each of the three daily need satisfaction variables, and the outcome reported on the previous day, and time. The prior day's value for the outcome was entered to control for possible carryover effects from one day to the next. The most recent day of reporting was carried forward for the purposes of lagging. Including the prior day's outcome values as a predictor allowed me to model change in the outcome from one report to the next as a function of participants' perceptions of daily need satisfaction reported on the same day as the outcome.

Again, to deconstruct between- and within-person effects, daily within-person predictors were person-mean centered (around each person's own average score) and between-person predictors were grand mean centered (around the average score of all participants). Time and prior day's score were grand mean centered. Again, I used the Mixed procedure in SPSS 23, a maximum likelihood estimation procedure with robust

estimates of standard errors (REML), and specified an AR(1) correlated error structure. The results of these analyses can be seen in Table 9.

Baseline person-level need fulfillment of relatedness was significantly and positively related to the overall well-being composite score and significantly and negatively related to negative affect. Baseline competence was significantly and positively related to positive affect. No other significant relationships emerged between baseline person-level need fulfillment of self-determination, competence, and relatedness and the overall well-being composite score or individual well-being components (affect, vitality, symptomology).

All daily need satisfaction variables of autonomy, competence, and relatedness at both, within- and between-levels, were positively and significantly related to overall well-being and positive affect. Daily need satisfaction of autonomy, competence, and relatedness at both, within- and between-levels, were also positively and significantly related to vitality, except for daily autonomy at the between-person level, which was positive but not significant. Daily need satisfaction of autonomy, competence, and relatedness at both, within- and between-levels, were negatively and significantly related to negative affect at both levels, except for daily relatedness at the between-person level which is negative, but not significant. The three daily needs at the within-person level were negatively and significantly related to symptomology.

Chapter 5 Discussion

Chapter 5 will begin by examining results in relation to the stated proposed hypothesis from chapter 2, with particular emphasis on two outcome variables, exercise and fast food. Next limitations, both methodological and conceptual will be discussed. Chapter 5 will conclude with a section on implications for theory, practice, and future directions.

Self-determination theory proposes that humans are naturally oriented toward growth, health, and well-being (Patrick & Williams, 2012). This study provides support for this idea – particularly in the sense that the more a person's needs are met generally each day, the more likely he or she is to engage in healthy behaviors, such as diet and exercise, and to experience an overall increased sense of well-being. Additionally, self-determination theory integrates both the role of the person, including their inner resources, and the role of the social context in human motivation. This study also extends this idea into a new realm of physical health.

HYPOTHESIS EXAMINATION

There were three research questions this study was designed to explore, two unique research questions: 1) Are person-level feelings of need fulfillment (autonomy, competence, relatedness) in one's life globally and motivation for health behaviors (motivation for working out and eating healthy) associated with health habits (exercise, diet, sleep)?, 2) Do daily experiences of need satisfaction (daily autonomy, competence, relatedness) predict changes in daily health habits (exercise, diet, sleep), even after accounting for person-level feelings of need satisfaction and motivation for health habits?, and one replication research question: 3) Does-person level need fulfillment (autonomy, competence, relatedness) and daily experiences of need satisfaction (daily

autonomy, competence, relatedness) predict changes in daily psychological and physical health (overall well-being, affect, symptomology, vitality?

Additionally, there were three proposed hypothesis statements: 1) Person-level motivations for health behaviors will be positively associated with health habits, 2) Daily experiences of need satisfaction will predict daily changes in health habits, and 3) Daily experiences of need satisfaction will predict changes in daily psychological and physical health. Results will be discussed in relation to the three stated hypothesis statements.

Hypothesis 1: Person-level motivations for health behaviors will be positively associated with health habits.

There is substantial research that demonstrates people who report more self-determined motives for working out also report engaging in more regular physical activity, specifically increased exercise (Rodgers, Hall, Duncan, Pearson, & Milne, 2010). Additionally, research has found that identified regulation is predictive of short term adoption of exercise programs, while intrinsic motivation is more predictive of long-term exercise adherence (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). That was not the case in this study. Motivation for working out, which was measured at the beginning of the study, was negatively related to moderate and strenuous exercise and positively related to strength training exercise; however, none of these relationships were significant. It appears that motivation for working out attitudes measured at the beginning of this study were not predictive of actual exercise health habits. This could partly be explained by examining exercise motivation trends based on the age of this study sample, young adults in their early twenties. Research suggests one of the most common reasons for physical activity engagement among young adults around 20 years of age includes weight control for appearance purposes, physical attractiveness, and social recognition (Brunet & Sabiston, 2011). These motivations can place an increased pressure for young

adults to look good, which is more in line with introjected regulation – a controlling motive and low autonomy form of motivation – and less in line with more autonomous motives. A high score on the motivation for working out scale in this study indicates a more autonomous motivation towards exercise. While the motivation for working out scale did not predict daily exercise, person-level relatedness did. This could be explained by those with a boyfriend or work out buddy system in place already feeling higher levels of person-level feelings of relatedness and also working out more on any given day.

However, the motivation for eating healthy scale, also measured at the beginning of the study, positively predicted fruit and vegetable intake and negatively predicted a fast food intake. This scale, measures a more autonomous motive for eating healthy, so this study findings indicates that the more autonomous people feel in general as a person, the more likely they are to eat healthy by eating more fruits and vegetables and less fast food. This is not a surprising outcome given the existing literature. Similar results have been found by Pelletier and colleagues (2004) who found that autonomous motives for eating regulation were associated positively with healthier eating. Verstuyf and colleagues (2016) also found that more autonomous motives were associated with more healthy and less disordered eating behaviors.

While person-level motivations for working out did not positively predict daily exercise habits, person-level motivations for eating health did. There was partial support for hypothesis 1.

Hypothesis 2: Daily experiences of need satisfaction will predict changes in daily health habits.

In terms of the daily needs in this study, autonomy seemed to have the most predictive power. The results of this study indicate that the more autonomous people feel, on both the day level and over time, the more likely they are to take better care of

themselves by engaging in strenuous exercise, moderate exercise, or combined exercise. Autonomy on any given day relative to baseline self-determination positively predicted daily reports of strenuous exercise, moderate exercise, and combined exercise. At the same time, participants who on average, over the two weeks, reported higher levels of autonomy also reported higher levels of strenuous exercise, moderate exercise, combined exercise, and overall well-being. Additionally, the more autonomous participants felt on any given day, relative to their baseline level of self-determination, was positively predictive of their daily report of sleep. Therefore, daily levels of autonomy need satisfaction seem important for healthier exercise and sleep patterns.

It has already been shown that autonomy is critical for psychological well-being (Ryan, Bernstein, & Brown, 2010) and physical well-being (Reinboth, Duda, & Ntourmanis, 2004). While most of these studies utilize autonomy in domain specific situations, for example health care autonomy predicting health practices in a residential treatment facility, this study provides evidence to suggest that global daily autonomy also has an impact on health behaviors.

It is also important to remember that person-level motivation for working out, measured at the beginning of the study was not predictive of daily exercise habits, as previously discussed in relation to hypothesis 1. Despite this, daily levels of autonomy, at both the within- and between-person levels, was predictive of strenuous exercise, moderate exercise, and combined exercise. So above and beyond a person's motivational orientation towards exercise, feelings of autonomy experienced at the day level did predict whether a person would engage in exercise. The more autonomous they felt, the more likely they were to exercise. While motivation is a critical variable to understanding exercise adherence, this study indicates that it is also important to understand one's need satisfaction during the day and how that can influence health habits. Understanding the

daily motivational processes underlying the decisions to engage in healthy habits can provide useful insights into the promotion of long-term health habits, such as healthy diet and long-term physical activity adoption (Silva et al., 2010).

However, autonomy on any given day, relative to the baseline measure of self-determination, negatively predicted participants' daily reports of fruit and vegetables. It appears that daily autonomy negatively predicts reported fruit and vegetable intake, in that the more autonomy people feel on any given day relative to their baseline the fewer fruit and vegetables they will eat on that day. Perhaps daily feelings of autonomy are influential on activities that require additional time, such as exercise, but not as predictive for activities that people must do each day anyway, such as eating. The feeling of daily autonomy could be a more motivating force for those health habits that require setting aside a time and a place to perform, i.e. exercise. Daily autonomy does not appear to be as influential on diet as it is on exercise. This could be attributed to the other needs, competence and relatedness, being more predictive of diet habits.

The daily need satisfaction of competence and relatedness seem to offer a fuller picture towards health habits that involve diet. Particularly, competence need satisfaction is important for predicting healthy diet behaviors. The results of this study indicate the more competence people feel, on both the day level and over time, the more likely they are to report eating fruit and vegetables. Competence on any given day relative to baseline levels of competence, positively predicted daily reports of fruit and vegetable intake, and participants who on average over the two weeks reported higher competence also reported higher fruit and vegetable intake. Additionally, participants who on average over the two weeks reported higher levels of competence also reported more sleep. Verstuyf and colleagues (2012) found that daily fluctuations in need satisfaction were associated positively with daily fluctuations in healthy eating behaviors. This study's

findings are in line with what Verstuyf found, specifically the finding that daily competence at both the within- and between-person level predicts fruit and vegetable intake.

Daily relatedness is also important for predicting diet behaviors. The results of this study indicate that relatedness on any given day relative to baseline levels of relatedness positively predicted participants' daily reports of fast food intake. To help explain why within-person feelings of daily relatedness positively influenced fast food intake we can turn to the ideas of social influences on food choice. Bagozzi (2000) states that, "eating with friends is, by definition, a social act with the opportunity for direct experience of social pressure." Also, when eating with friends in a fast food restaurant, individuals may be more susceptible to peer pressure influencing their choices around food. For example, the effect of subjective norms on intentions to eat specific foods in fast food restaurants would be stronger for eating with friends than for eating alone (Bagozzi, 2000). Additionally, according to Brindal (2015) there are three key areas of social influence that could affect eating behavior: 1) minimal eating norms, where females may eat smaller meals to appear more feminine (Chaikan & Pilner 1987); 2) matching norms, where people change food intake (increasing or decreasing) relative to the intake of a co-eater; and 3) social facilitation, the presence of other people increasing the amount eaten, possibly due to time-extension, eating in the presence of others can extend meal durations, which then can increase the amount eaten. Brindal also stresses that in the real world social influences may affect food selection behavior rather than intake behavior at the time of eating. Both these perspectives help explain why daily relatedness positively predicted fast food intake in the current study. Perhaps when people are out with their friends, feeling more related, they are also celebrating the

weekend or a successful event or milestone, making splurging food choices, and indulging in desserts.

The literature indicates there are also possible relationships between exercise and diet. While this study did not explicitly examine the relationship between these two health habits there is evidence to suggest that exercise and diet are related behaviors. Both epidemiological and experimental studies (Dunn et al., 2005; Jakicic, Wing, & Winters-Hart, 2002; Pronk et al., 2004) show that physically active people tend to adopt more healthful diets than non-active people. However, the extent of and underlying mechanisms for these behavioral covariances are largely unknown (Andrade et al., 2010). This study began to shed some light on these underlying mechanisms by analyzing which daily needs influence health habits, both diet and exercise, that in turn contribute to being more physically active and healthy in diet over time. Additionally, there may be some reciprocal effect occurring at the day level, specifically in the motivational level. For instance, success at eating healthy may also positively influence motivation and confidence for exercising as well (Mata et al., 2009). For example, feeling autonomous on the day level and over time positively predicts exercise behavior, while feeling competent on the day level and over time positively predicts eating additional fruit and vegetables. These two needs being satisfied on the day level may be interacting together to contribute to a more healthy lifestyle.

In addition to the motivation for healthy eating predicting diet behaviors, researchers also believe that our emotions and our diet can be linked. Even as far back as 1989 researchers were contemplating the idea that food and our emotions might influence each other. Specifically Lyman (1989) summarized a series of studies looking at how our emotions dictate our preferred food choices, noting that "just as food determines our moods so do our moods determine what we eat (p. 44)." While this study did not

specifically examine ‘moods’ there was an examination of daily need satisfaction predicting food choices and it is clear this relationship is complicated. Daily competence positively predicts healthy eating behaviors, but daily autonomy does not. Perhaps this is due to other psychosocial factors also influencing food choices, factors that were not captured in the scope of this study. Additionally, Verstuyf and colleagues (2013) noted that although some studies documented associates between the psychological needs and eating behaviors, no studies had investigated these associations at the within-person level. Even though needs have been studied in relation to overall well-being and studies have systematically demonstrated that satisfaction of these needs is associated with greater well-being at both the within- and between-person level, there is a lack of this research done in relation to needs and eating behaviors (Verstuyf, Vansteenkiste, Soenens, Boone, & Mouratidis, 2013). This study attempted to address this lack of research by demonstrating that there is a relationship between daily need satisfaction and daily diet choices.

To get a clear picture of what contributes to healthy habits, exercise and diet, and overall well-being, it is important to look at all three daily needs individually as they contribute in unique ways. Daily autonomy seems to have the most predictive power, especially in terms of exercise and sleep. Daily competence and daily relatedness further round out the explanation in terms of sleep and both forms of diets (fruits and vegetables and fast food intakes). This study did provide support for hypothesis 2.

Hypothesis 3: Daily experiences of need satisfaction will predict changes in daily psychological and physical health.

All three daily needs positively predicted overall well-being, which replicates those findings in Sheldon, Ryan, and Reis (1996) and in Reis and colleagues (2000), the studies from which I mirrored my study design. Daily autonomy, competence, and

relatedness at both the within- and between- person level positively and significantly predicted overall well-being. Prior research had already shown a strong link between daily experiences of need satisfaction predicting changes in daily well-being (Sheldon, Ryan, & Reis, 1996; Reis, Collins, & Berscheid, 2000). Both, Sheldon and colleagues (1996) and Reis and colleagues (2000) found that daily need fulfillment predicted daily psychological hedonic well-being as measured by positive affect, negative affect, vitality, as well as daily physical well-being as measured by physical symptomology. As the investigation is modeled off these two prior studies and measured the same variables (in addition to others), I also found that daily need satisfaction did predict daily psychological and physical well-being. Given the call for more replications in psychological science (Cumming, 2014; Nosek & Lakens, 2015; Simons, 2014), I am excited this investigation was useful in verifying previous findings regarding the link between psychological needs and psychological and physical well-being. Findings from this study indicate that there is support for hypothesis 3.

In conclusion, self-determination theory emphasizes the importance of understanding how someone's person-level needs relate to his or her need satisfaction levels on any given day and that these psychological needs play a critical role in the process of growth and integration. Therefore, it stands to reason that the fulfillment of these needs on any given day can play a role in how much a person takes care of themselves or engages in positive health habits. Furthermore, when the basic needs of autonomy, competence, and relatedness are satisfied, people can develop a more general self-determined orientation toward themselves and their social surroundings (Verstuyf, Patrick, Vansteenkiste, & Teixeira, 2012). This more general self-determined orientation can contribute to people being more likely to be motivated in their tasks, persist in the face of difficulty, and experience a more motivating life. This study further highlights

that when those needs are met on a basic level, people are also more likely to take better care of themselves through exercise, healthy diet and better sleep, and experience greater overall well-being. This could be due to the salience of these needs being met allowing the person to focus on other things. Perhaps once a person has those three basic needs, autonomy, competence, and relatedness satisfied on a day level they can focus on other things, such as exercise, diet, and sleep. This study indicates that satisfaction of daily needs not only supports motivation and well-being, as we already know, but actually translates into health behaviors. This could perhaps be due to feeling daily need satisfaction frees up cognitive and behavioral space to focus on other additional things, such as exercise, diet, and sleep.

LIMITATIONS

Although my study has revealed several important findings, there are also some methodological and conceptual limitations. First, although participants were contacted for 14 consecutive days to gather data, the analyses does not allow for conclusions about causality or direction of the effects within the day. Although I speculate that need satisfaction precedes health habits and overall well-being within a particular day, the opposite direction might be equally plausible. Second, although daily diary methods allow for investigating the dynamics involved in healthy habits and overall well-being in an ecologically valid way, an experience-sampling study design could have provided an even closer observation of the sequence of within-day processes. For example, if participants were asked to complete the survey at several random points during the day, the procedure could have diminished recall effects and gotten a real-time portrait of need fulfillment and health habits in that moment. Another possible limitation to this study's research design is that the participants may, to some extent, have been reactive to the

process of self-monitoring (Rutledge, Groesz, Linke, Woods, & Herbst, 2011) and the act of documenting their daily habits may have prompted them to change their daily habits (Schmitz, Klug, & Schmidt, 2011) or respond in socially desirable ways. Participants knew they would be asked to complete a survey each evening about their health habits, diet, and exercise. This foreknowledge may have inadvertently influenced their health habits because they knew they would be asked to report them, and thus, these habits perhaps were not representative of their general health habits. There were also some measurement limitations, particularly in the diet section. Participants were asked to report how much fast food they ate that day and while examples were given there could have been a subjective interpretation of what is fast food. For example, if a participant ate at Chipotle they may not have considered that fast food and reported it under that category. In future research more nuanced measures of diet should be included. It would also be helpful to include a measure of how participants identify as athletic or not. Another possible limitation is all study measures were self-reported. It might be helpful for future research to build on these present findings by also utilizing observational and multi-informational assessments in addition to the daily diary component. Additionally, generalizability is limited by the fact that only college students from a large research university in the Southwest were studied.

IMPLICATIONS FOR THEORY, PRACTICE, AND FUTURE DIRECTIONS

Despite these limitations, I believe that this study has important theoretical and clinical implications. The study has revealed that, in addition, to between-person variations, there is also variation within-persons in their health habits. Thus, a one-time measurement of people's (person-level) need satisfaction and health behaviors is only a snap shot of the dynamics in their daily life, and it fails to capture the complexity of the

underlying person-level and day-level processes at work. Investigating the dynamics in health habits over time allows for including within-person predictors in addition to relatively more stable person-level differences.

These study findings also indicated that although there are stable differences between participants, variability in one person's health habits can be observed depending on other experiences throughout the day. Professionals who work to guide people in modifying their lifestyles to include more healthy habits can use this knowledge to help improve their clients' skills to deal with more difficult days, thus making their strategies more effective. For example, professionals could offer a conceptual tool kit to patients helping them notice when their basic psychological needs are being met or not being met, being mindful of this, and striving to interact in situations to increase need satisfaction.

In future research it would be beneficial to explore these relationships in additional populations and age groups. I believe that some of these relationships may change based on the ethnic makeup of the research sample. I would be interested in continuing this research in college student populations, but expanding to include a more diverse set of participants. Perhaps by recruiting participants from colleges and universities across the country, such as the northeast and California. Also, having college students from community colleges, liberal arts colleges, and mid-sized universities would be beneficial. This would allow for a more nuanced picture of how daily need satisfaction and health habits are related across ethnic groups and socioeconomic statuses. I would also be interested to see how some of these patterns change based on developmental level. I am very interested in replicating this study in a population of late elementary or middle school students. Doing so could shed some light on how daily need satisfaction fluctuations predict health habits in different developmental groups. This would allow for a more complete developmental picture to emerge on the relationship between daily need

satisfaction predicting exercise, diet, and sleep. This work could help show how people develop health habits from a young age and through early adolescence. It could have implications for designing programs to raise health awareness and health education among families and children. Additionally, when people are experiencing health and well-being, both physically and psychologically, they are more likely to excel academically and personally.

Tables

Table 1 – Demographic Information

		Wave 1 (n = 62)	Wave 2 (n = 53)	Wave 3 (n = 119)	Total (N = 234)
Gender					
	Female	67.7% (n = 42)	67.9% (n = 36)	61.3% (n = 73)	64.5% (n = 151)
	Male	32.3% (n = 20)	32.1% (n = 17)	38.7% (n = 46)	35.5% (n = 83)
Age Range		18 – 25 Mode = 21	18 – 25 Mode = 21	17 – 25 Mode = 21	17 – 25 Mode = 21
Grade level					
	Freshman Year	6.5% (n = 4)	3.8% (n = 2)	2.5% (n = 3)	3.8% (n = 9)
	Sophomore Year	17.7% (n = 11)	17.0% (n = 9)	16.0% (n = 19)	16.7% (n = 39)
	Junior Year	22.6% (n = 14)	13.2% (n = 7)	16.0% (n = 19)	17.1% (n = 40)
	Senior Year	46.8% (n = 29)	54.7% (n = 29)	45.4% (n = 54)	47.9% (n = 112)
	Fifth Year Senior	6.5% (n = 4)	11.3% (n = 6)	20.2% (n = 24)	14.5% (n = 34)
GPA		Mean = 3.29	Mean = 3.24	Mean = 3.26	Mean = 3.27

Table 1 – Demographic Information (continued)

		Wave 1 (n = 62)	Wave 2 (n = 53)	Wave 3 (n = 119)	Total (N = 234)
Ethnicity					
	European American	54.8% (n = 34)	49.1% (n = 26)	54.6% (n = 65)	53.4% (n = 125)
	Asian	32.3% (n = 20)	22.6% (n = 12)	18.5% (n = 22)	23.1% (n = 54)
	Hispanic	6.5% (n = 4)	20.8% (n = 11)	17.6% (n = 21)	15.4% (n = 36)
	African American	3.2% (n = 2)	3.8% (n = 2)	3.4% (n = 4)	3.4% (n = 8)
	Native American	1.6% (n = 1)	0% (n = 0)	0% (n = 0)	0.4% (n = 1)
	Multi-Racial	1.6% (n = 1)	3.8% (n = 2)	5.9% (n = 7)	4.3% (n = 10)

Table 2 – Frequencies of Daily Survey Completion by Wave

	Wave 1	Wave 2	Wave 3	Total
Daily Report Number	Frequency	Frequency	Frequency	Frequency
1	61	52	108	221
2	60	47	102	209
3	61	51	101	213
4	62	51	108	221
5	61	52	114	227
6	62	53	118	233
7	62	50	114	226
8	60	44	109	213
9	60	45	109	214
10	60	48	110	218
11	61	47	110	218
12	62	45	112	219
13	58	51	108	217
14	62	50	100	212

Table 3 – Means and Standard Deviations of all Person Level and Day Level Variables

	Means	Standard Deviations
Person level		
Self-determination	3.88	0.59
Competence	37.14	5.71
Relatedness	3.01	0.51
Total need satisfaction	14.68	2.09
Motivation for working out		
External regulation	4.77	1.41
Introjected regulation	4.27	1.41
Identified regulation	5.41	1.28
Intrinsic motivation	4.03	1.64
Relative Autonomy Index (RAI)	-0.34	5.27
Motivation for eating healthy		
External regulation	3.77	1.47
Introjected regulation	4.27	1.46
Identified regulation	5.29	1.37
Intrinsic motivation	3.90	1.61
Relative Autonomy Index (RAI)	1.27	4.86
Day level		
Autonomy	0.97	6.62
Competence	5.48	1.16
Relatedness	4.82	1.16
Daily need satisfaction	3.76	2.48
Positive affect	4.91	1.34
Negative affect	2.48	1.28
Vitality	4.15	1.35
Symptoms	2.82	1.40
Overall well-being	0.03	2.96
Health habits		
Strenuous exercise	0.92	1.22
Moderate exercise	1.33	1.18
Strength building exercise	0.52	0.91
Combined exercise	2.77	2.48
Fruit and vegetables	1.47	1.14
Fast food	0.28	0.55
Sleep	7.10	1.93
Steps	7520.99	6563.97

Table 4 – Frequencies and Percentages of Health Habits

	Exercise					
	Strenuous Exercise		Moderate Exercise		Strength Exercise	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
None	1665	54.4	893	29.2	2126	69.5
Less than 1/2 hour	516	16.9	921	30.1	461	15.1
1/2 hour - 1 hour	504	16.5	781	25.5	308	10.1
1 hour - 2 hours	277	9	328	10.7	144	4.7
2 hours - 3 hours	43	1.4	82	2.7	15	0.5
3 hours or more	56	1.8	56	1.8	7	0.2
Total	3061	100	3061	100	3061	100

	Diet			
	Fruit and Vegetables		Fast Food	
	Frequency	Percent	Frequency	Percent
I did not eat this	699	22.8	2314	75.6
1 time	955	31.2	647	21.1
2 times	847	27.7	81	2.6
3 times	395	12.9	13	0.4
4 or more times	165	5.4	6	0.2
Total	3061	100	3061	100

Table 5 – Correlations between Trait and Aggregate Day Level Variables

	SDS	MSEI	UCLA	MWO RAI	MEH RAI	SEX	BMI	DAUT	DC	DREL	AV P	AV N	PVS	PSM	OWB	EX	FV	FF
Person Level Predictors																		
MSEI	.45**																	
UCLA	.58**	.46**																
MWO RAI	.27**	.26**	.38**															
MEH RAI	.25**	.17*	.28**	.61**														
SEX	.03	-.11	.11	-.15*	-.05													
BMI	.01	.12	-.05	-.18**	-.27**	-.22**												
Daily Needs																		
DAUT	.24**	.18**	.28**	.35**	.26**	-.03	-.04											
DC	.36**	.29**	.34**	.07	.13*	.22**	-.04	.26**										
DREL	.31**	.21**	.43**	.22**	.26**	.27**	-.10	.30**	.59**									
Daily Well-Being																		
AV P	.36**	.34**	.44**	.19**	.20**	.15*	-.02	.35**	.61**	.63**								
AV N	-.42**	-.34**	-.51**	-.34**	-.33**	.03	.02	-.32**	-.44**	-.41**	-.52**							
PVS	.36**	.29**	.42**	.14*	.12	.10	.03	.29**	.44**	.49**	.75**	-.49**						
PSM	-.18**	-.15*	-.14*	-.23**	-.20**	.21**	-.06	-.17**	-.07	-.07	-.12	.50**	-.19**					
OWB	.43**	.37**	.50**	.28**	.27**	0	.02	.37**	.51**	.53**	.78**	-.82**	.81**	-.60**				
Daily Health Habits																		
EX	-.05	-.01	.11	.06	.05	-.05	.11	.17**	-.04	.02	.06	-.01	.20**	.05	.07			
FV	.10	.09	.22**	.10	.25**	.26**	-.07	.13*	.24**	.24**	.27**	-.18**	.21**	.04	.20**	.34**		
FF	-.07	.02	-.11	-.12	-.17**	-.19**	.23**	-.04	-.11	-.04	-.09	.15*	-.03	.11	-.12	.05	-.30**	
SL	.07	.07	.11	-.04	-.01	0	.05	.03	.17**	.07	.19**	-.22**	.11	-.15*	.22**	-.05	-.03	-.12

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Abbreviation explanations: SDS – self-determination, MSEI – competence, UCLA – relatedness, MWO RAI – motivation for working out relative autonomy index, MEH RAI – motivation for eating healthy relative autonomy index, DAUT – daily autonomy, DC – daily competence, DREL – daily relatedness, AV P – positive affect, AV N – negative affect, PVS – vitality, PSM – symptoms, OWB – overall well-being, EX – exercise combined, FV – fruit and vegetables, FF – fast food, SL – sleep

Table 6 – Multilevel Regressions with Time Predicting Participants' Daily Experiences

	Predictors		
	Intercept	Time	
Outcome		*b*(SE)	*β*
Strenuous exercise	.924	-.028(.004)	-.091**
Moderate exercise	1.334	-.025(.004)	-.086**
Strength exercise	.534	.002(.003)	.009
Combined exercise	2.793	-.051(.009)	-.082**
Fruits and vegetables	1.468	.007(.004)	.023
Fast food	.285	-.003(.002)	-.024
Sleep	7.127	-.022(.009)	-.045*
Overall well-being	-.015	.020(.010)	.027*
Positive affect	4.892	-.021(.005)	-.063**
Negative affect	2.491	-.022(.004)	-.069**
Vitality	4.137	-.020(.004)	-.058**
Symptomology	2.841	-.046(.005)	-.131**

Notes: The "time" variable reflects the day of reporting across the two weeks. *b* = unstandardized regression coefficient. *β* = standardized regression coefficient. Standardized estimates were computed using the following formula (Hox, Moerbeek, & van de Schoot, 2010): *β* = (b*sdx)/sdy. SE = standard error. *$p < .05$, **$p < .001$

Table 7 – Multilevel Regressions with Daily Need Satisfaction Predicting Exercise

	Exercise							
	Strenuous Exercise		Moderate Exercise		Strength Exercise		Combined Exercise	
Predictor	*b*(SE)	*β*	*b*(SE)	*β*	*b*(SE)	*β*	*b*(SE)	*β*
Baseline person-level need fulfillment								
Self-determination	-.169(.104)	-.081	-.108(.086)	-.053	-.097(.081)	-.062	-.362(.214)	-.085
Competence	.003(.009)	.012	-.013(.008)	-.063	0(.008)	.001	-.014(.020)	-.032
Relatedness	.219(.127)	.092	.218(.107)	.094*	.165(.101)	.092	.610(.260)	.125*
Motivation for	-.006(.010)	-.026	-.011(.009)	-.049	.007(.008)	.041	-.013(.021)	-.027
Working Out								
Daily need satisfaction								
Autonomy	.009(.003)	.039**	.006(.003)	.028*	.004(.003)	.022	.020(.007)	.044**
Competence	-.014(.024)	-.009	-.005(.023)	-.004	.016(.018)	.014	-.006(.048)	-.002
Relatedness	.013(.022)	.009	.020(.020)	.014	-.001(.016)	-.001	.033(.042)	.011
Aggregated (person-level) need satisfaction								
Autonomy	.032(.014)	.098*	.026(.012)	.080*	.002(.011)	.079	.078(.029)	.116**
Competence	-.083(.072)	-.058	.006(.059)	.008	-.089(.056)	-.084	-.151(.147)	-.053
Relatedness	-.072(.080)	-.046	.071(.065)	.047	-.054(.061)	-.046	-.034(.164)	-.011
Lagged outcome	.034(.018)	.034	.230(.018)	.230	.009(.018)	.009	.101(.018)	.101**
Time	-.004(.005)	-.014	-.005(.004)	-.017	.009(.004)	.040*	-.002(.009)	-.003

Notes: The "lagged outcome" variable reflects the prior day's value for the outcome. The "time" variable reflects the day of reporting across the 2 weeks. *b* = unstandardized regression coefficient. *β* = standardized regression coefficient. Standardized estimates were computed using the following formula (Hox, Moerbeek, & van de Schoot, 2010): $\beta = (b*sdx)/sdy$. SE = standard error. $*p < .05$, $**p < .001$

Table 8 – Multilevel Regressions with Daily Need Satisfaction Predicting Diet and Sleep

	Diet					
	Fruit & Vegetable		Fast Food		Sleep	
Predictors	*b*(SE)	*β*	*b*(SE)	*β*	*b*(SE)	*β*
Baseline person-level need fulfillment						
Self-determination	-.150(.111)	-.077	-.003(.048)	-.003	-.024(.118)	-.007
Competence	-.004(.010)	-.018	.006(.004)	.063	-.003(.011)	-.010
Relatedness	.235(.133)	.106	-.081(.057)	-.075	.113(.141)	.030
Motivation for Eating	.035(.011)	.152**	-.011(.005)	-.094*		
Healthy						
Daily need satisfaction						
Autonomy	-.006(.003)	-.029*	.002(.002)	.024	.042(.006)	.120**
Competence	.059(.021)	.041**	-.023(.013)	-.033	.026(.044)	.011
Relatedness	.020(.018)	.015	.025(.011)	.038*	.054(.038)	.024
Aggregated (person-level) need satisfaction						
Autonomy	.001(.015)	.004	.002(.006)	.013	-.005(.016)	-.009
Competence	.168(.075)	.128*	-.049(.032)	-.076	.180(.080)	.081*
Relatedness	.067(.086)	.046	.046(.037)	.065	-.085(.089)	-.035
Lagged outcome	.025(.019)	.024	-.148(.019)	-.148**	.098(.018)	.098**
Time	.011(.005)	.038*	-.004(.003)	-.033	-.019(.008)	-.040*

Notes: The "lagged outcome" variable reflects the prior day's value for the outcome. The "time" variable reflects the day of reporting across the 2 weeks. *b* = unstandardized regression coefficient. *β* = standardized regression coefficient. Standardized estimates were computed using the following formula (Hox, Moerbeek, & van de Schoot, 2010): $\beta = (b*sdx)/sdy$. SE = standard error. $*p < .05$, $**p < .001$

Table 9 – Multilevel Regressions with Daily Need Satisfaction Predicting Overall Well-Being

	Overall Well-Being		Positive Affect		Negative Affect		Vitality		Symptomology	
Predictors	*b*(SE)	*B*	*b*(SE)	*β*	*b*(SE)	*β*	*b*(SE)	*β*	*b*(SE)	*B*
Baseline person-level need fulfillment										
Self-determination	.262(.185)	.052	-.018(.075)	-.008	-.109(.082)	-.050	.106(.096)	.046	-.115(.075)	-.048
Competence	.030(.017)	.057	.014(.007)	.059*	-.008(.008)	-.036	.008(.009)	.032	-.004(.007)	-.017
Relatedness	.574(.222)	.099**	.123(.090)	.047	-.370(.099)	-.147**	.217(.115)	.082	-.044(.090)	-.016
Daily need satisfaction										
Autonomy	.073(.007)	.135**	.033(.003)	.136**	-.024(.003)	-.105**	.024(.003)	.097**	-.013(.003)	-.051**
Competence	.365(.052)	.096**	.135(.025)	.078**	-.144(.024)	-.087**	.113(.022)	.065**	-.095(.025)	-.052**
Relatedness	.511(.046)	.148**	.277(.022)	.177**	-.146(.021)	-.098**	.198(.020)	.125**	-.062(.023)	-.038*

Notes: The "lagged outcome" variable reflects the prior day's value for the outcome. The "time" variable reflects the day of reporting across the 2 weeks. *b* = unstandardized regression coefficient. *β* = standardized regression coefficient. Standardized estimates were computed using the following formula (Hox, Moerbeek, & van de Schoot, 2010): *β* = (b*sdx)/sdy. SE = standard error. *$p < .05$, **$p < .001$

Table 9 – Multilevel Regressions with Daily Need Satisfaction Predicting Overall Well-Being (continued)

	Overall Well-Being		Positive Affect		Negative Affect		Vitality		Symptomology	
Predictors	*b*(SE)	*B*	*b*(SE)	*β*	*b*(SE)	*β*	*b*(SE)	*β*	*b*(SE)	*B*
Aggregated (person-level) need satisfaction										
Autonomy	.070(.024)	.087**	.021(.010)	.059*	-.024(.011)	-.069*	.018(.013)	.049	-.019(.010)	-.050
Competence	.391(.126)	.114**	.263(.051)	.170**	-.160(.056)	-.108**	.142(.065)	.091*	.031(.051)	.019
Relatedness	.514(.142)	.136**	.354(.058)	.208**	-.079(.063)	-.049	.269(.074)	.156**	.012(.057)	.007
Lagged outcome	.212(.017)	.212**	.185(.017)	.185**	.223(.017)	.224**	.247(.017)	.246**	.488(.016)	.489**
Time	.016(.010)	.022	-.016(.005)	-.048**	-.016(.005)	-.051**	-.006(.004)	-.018	-.013(.004)	-.038*

Notes: The "lagged outcome" variable reflects the prior day's value for the outcome. The "time" variable reflects the day of reporting across the 2 weeks. *b* = unstandardized regression coefficient. *β* = standardized regression coefficient. Standardized estimates were computed using the following formula (Hox, Moerbeek, & van de Schoot, 2010): *β* = (b*sdx)/sdy. SE = standard error. *$p < .05$, **$p < .001$

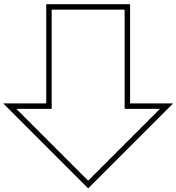
Appendices

APPENDIX A - FIGURES

Figure 1 – Study Design

Baseline Measures – to be done in person

- Self-Determination Scale
- Multi-Dimensional Self-Esteem Inventory (MSEI) – competence subscale
- UCLA Loneliness Scale
- Motivation for Working Out and Eating Healthy Scale
- Demographics



Daily Measures – complete every evening for 14 days

Health Habits

- Exercise (strenuous, moderate, and strength)
- Fruit and vegetable consumption
- Fast food consumption

Well-being

- Affect Valence
- Vitality Scale
- Symptom Checklist

Need Satisfaction

- List and rate 3 activities
    - Rate them according to:
        - Daily autonomy measure
        - Daily competence measure
- List and rate 3 social interactions
    - Rate them according to:
        - Daily connectedness

Figure 2 – Motivation Continuum

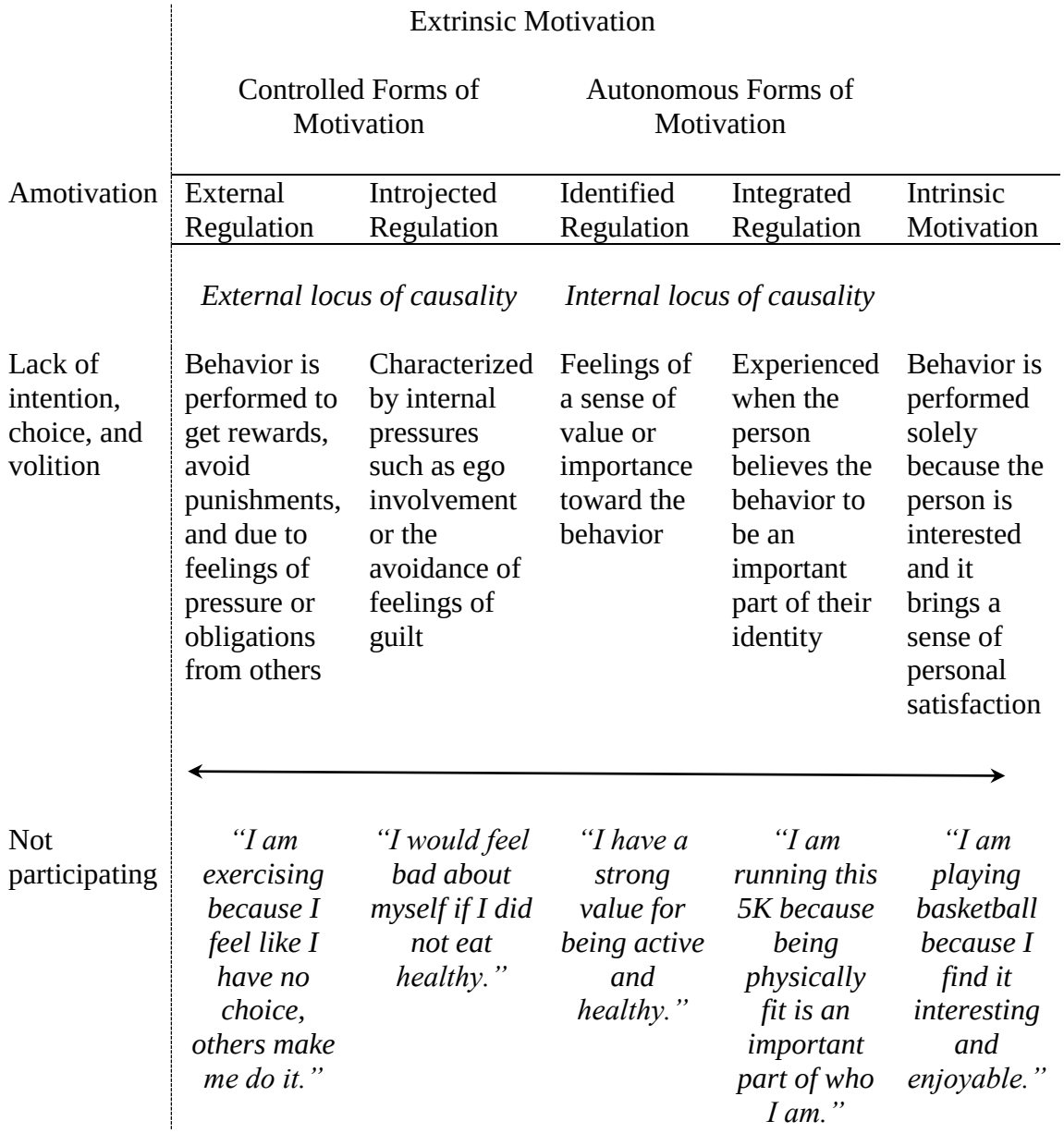
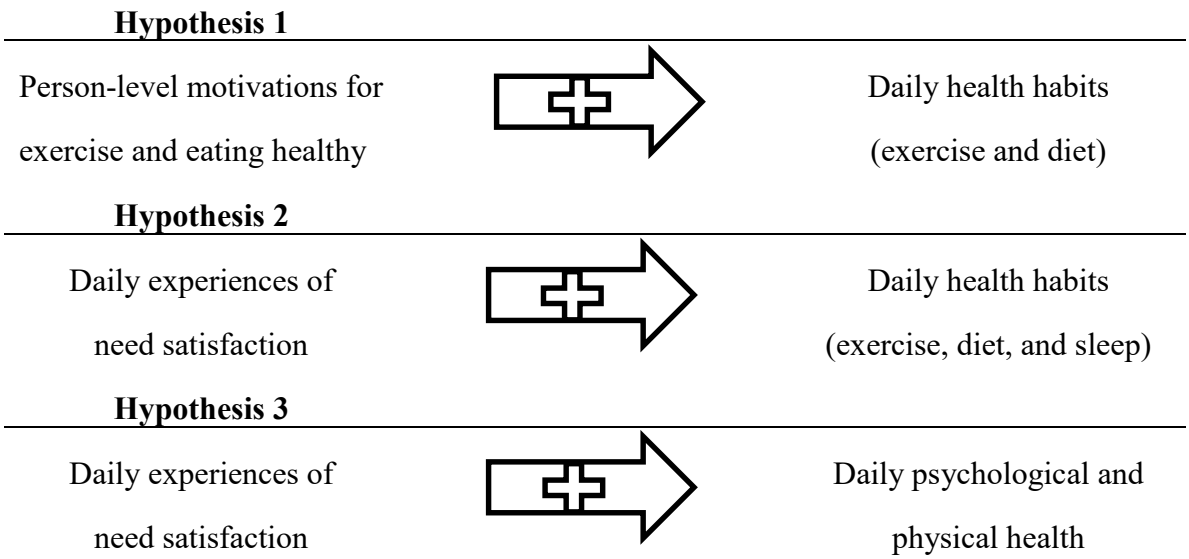


Figure 3 – Hypothesis Figure



APPENDIX B – BASELINE MEASURES

Demographics

Year in school

What year are you in school?

(1) Freshman

(2) Sophomore

(3) Junior

(4) Senior

(5) Fifth year senior

GPA

What is your current overall GPA? _____

Sex

What is your gender?

(1) Female

(2) Male

Race/ethnicity

What is your race/ethnicity? (please mark all that apply)

(1) African American or Black

(2) Asian, Pacific Islander, or Asian American

(3) European American or White

(4) Hispanic or Latino/a

(5) Native American

Age

How old are you? _____ years

Major

What is your current major or area of interest (if you have not yet declared your major):

Height/Weight

What is your height in inches?

What is your weight in pounds?

Self-Determination Scale

Instructions: Please read the pairs of statements, one pair at a time, and think about which statement within the pair seems more true to you at this point in your life. Indicate the degree to which statement A feels true, relative to the degree that Statement B feels true, on the 5-point scale shown after each pair of statements. If statement A feels completely true and statement B feels completely untrue, the appropriate response would be 1. If the two statements are equally true, the appropriate response would be a 3. If only statement B feels true, the appropriate response would be a 5. And so on.

Only A feels true 1 2 3 4 5 Only B feels true

1. A. I always feel like I choose the things I do.
   B. I sometimes feel that it's not really me choosing the things I do.
2. A. My emotions sometimes seem alien to me.
   B. My emotions always seem to belong to me.
3. A. I choose to do what I have to do.
   B. I do what I have to, but I don't feel like it is really my choice.

4. A. I feel that I am rarely myself.

   B. I feel like I am always completely myself.

5. A. I do what I do because it interests me.

   B. I do what I do because I have to.

6. A. When I accomplish something, I often feel it wasn't really me who did it.

   B. When I accomplish something, I always feel it's me who did it.

7. A. I am free to do whatever I decide to do.

   B. What I do is often not what I'd choose to do.

8. A. My body sometimes feels like a stranger to me.

   B. My body always feels like me.

9. A. I feel pretty free to do whatever I choose to.

   B. I often do things that I don't choose to do.

10. A. Sometimes I look into the mirror and see a stranger.

    B. When I look into the mirror I see myself.

UCLA Loneliness Scale

Instructions: The following statements describe how people sometimes feel. For each statement, please indicate how often you feel the way described by selecting the number that matches your feelings.

Here is an example:

How often do you feel happy?

If you never felt happy, you would respond “never”; if you always feel happy, you would respond “always.”

Never	Rarely	Sometimes	Always
1	2	3	4

1. How often do you feel that you are “in tune” with the people around you? (R)
2. How often do you feel that you lack companionship?
3. How often do you feel that there is no one you can turn to?
4. How often do you feel alone?
5. How often do you feel part of a group of friends? (R)
6. How often do you feel that you have a lot in common with the people around you? (R)
7. How often do you feel that you are no longer close to anyone?
8. How often do you feel that your interests and ideas are not shared by those around you?
9. How often do you feel outgoing and friendly? (R)
10. How often do you feel close to people? (R)
11. How often do you feel left out?
12. How often do you feel that your relationships with others are not meaningful?
13. How often do you feel that no one really know you well?
14. How often do you feel isolated from others?
15. How often do you feel that you can find companionship when you want it? (R)
16. How often do you feel that there are people who really understand you? (R)
17. How often do you feel shy?
18. How often do you feel that people are around you but not with you?
19. How often do you feel that there are people you can talk to? (R)
20. How often do you feel that there are people you can turn to?

MSEI – Competence Subscale

Use the following scale for your responses to the following questions:

1 2 3 4 5

Completely false Completely true

I am usually able to demonstrate my competence when I am being evaluated.

Most people who know me consider me to be a highly talented and competent person.

There are no areas in which I have truly outstanding ability. (R)

I am usually able to learn new things very quickly.

Use the following scale for your responses to the following questions:

1 2 3 4 5

Almost never Very often

How often do you expect to perform well in situations that require a lot of ability?

How often do you have trouble learning difficult new tasks?

How often do you feel that you can do well at almost anything you try?

Have you ever felt that you lack the intelligence needed to succeed in certain types of interesting work?

How often do you feel that you are not as intelligent as you would like to be?

How often do you approach new tasks with a lot of confidence in your ability?

Motivation for Working Out

There are a variety of reasons why people work out. Please indicate how true each of these reasons is for why you work out.

1 2 3 4 5 6 7

Not at all true Very true

Why do you work out?

1. Because I simply enjoy working out.
2. Because working out is important and beneficial for my health and lifestyle.
3. Because I would feel bad about myself if I didn't do it.
4. Because it is fun and interesting.
5. Because others like me better when I am in shape.
6. Because I'd be afraid of falling too far out of shape.
7. Because it helps my image.
8. Because it is personally important to me to work out.
9. Because I feel pressured to work out.
10. Because I have a strong value for being active and healthy.
11. For the pleasure of discovering and mastering new training techniques.
12. Because I want others to see me as physically fit.

Motivation for Eating Healthy

There are a variety of reasons why people eat healthy. Please indicate how true each of these reasons is for why you eat healthy.

1 2 3 4 5 6 7

Not at all true Very true

Why do you eat healthy?

1. Because I simply enjoy eating healthy.
2. Because eating healthy is important and beneficial for my health and lifestyle.
3. Because I would feel bad about myself if I didn't do it.
4. Because it is fun and interesting.
5. Because others like me better when I am healthy.
6. Because I'd be afraid of falling too far out of shape.
7. Because it helps my image.
8. Because it is personally important to me to eat healthy.
9. Because I feel pressured to eat healthy.
10. Because I have a strong value for being healthy.
11. For the pleasure of discovering and mastering new ways to eat healthy.
12. Because I want others to see me as healthy.

APPENDIX C – DAILY SURVEY MEASURES

Health Habits

Daily Exercise

Today how many hours did you spend doing the following activities?

Strenuous exercise (heart beats rapidly).

Examples: biking fast, aerobics, dancing, running, basketball, tennis, swimming laps, soccer

None

Less than ½ hour today

½ hour – 1 hour today

1 hour – 2 hours today

2 hours – 3 hours today

3 hours or more today

Moderate exercise (not exhausting)

Examples: walking quickly, baseball, easy biking, volleyball, skateboarding

None

Less than ½ hour today

½ hour – 1 hour today

1 hour – 2 hours today

2 hours – 3 hours today

3 hours or more today

Exercises to strengthen or tone your muscles

Examples: push-ups, sit-ups, or weight lifting/training

None

Less than ½ hour today

½ hour – 1 hour today

1 hour – 2 hours today

2 hours – 3 hours today

3 hours or more today

How many steps did you walk today, according to your pedometer app?

(Only wave 2 and 3 completed this health habit question.)

Daily Diet

Today, how much of the following did you eat?

Fast food (such as McDonald's, Taco Bell, Whataburger, Sonic, Burger King)

I did not eat this

1 time today

2 times today

3 times today

4 or more times today

Fruits and vegetables (such as apples, carrots, oranges, leafy greens, tomatoes, strawberries)

I did not eat this

1 time today

2 times today

3 times today

4 or more times today

Prior Night's Sleep

How many hours did you sleep last night?

Affect Valence

Instructions – Please rate the extent to which you experienced each emotion today.

1 2 3 4 5 6 7

Not at all Extremely

1. Joyful
2. Happy
3. Pleased
4. Enjoyment/Fun
5. Depressed
6. Worried/Anxious
7. Frustrated
8. Angry/Hostile

9. Unhappy

Psychological Vitality Scale

Instructions - Please respond to each of the following statements in terms of how you are feeling right now. Indicate how true each statement is for you at this time, using the following scale:

1 2 3 4 5 6 7

Not at all true Extremely true

1. At this moment, I feel alive and vital
2. Currently I feel so alive I just want to burst
3. At this time, I have energy and spirit
4. I look forward to each new day
5. At this moment, feel alert and awake
6. I feel energized right now

Physical Symptom Measure

Instructions – Please indicated the extent to which you experienced any of these symptoms today.

1 2 3 4 5 6 7

Not at all Extremely

1. Felt ill (runny or congested nose, coughing or sore throat, faintness or dizziness)
2. Felt tired/fatigue
3. Had pain/discomfort (headache, stomach pain, chest pain, stiff or sore muscles)

Daily autonomy

Please make a note about the 3 activities at which you spent the most time on today (besides sleeping).

For example:

Activity 1: Attending my class Human Learning, Cognition and Motivation

Activity 2: Working at Cactus Café

Activity 3: Watching a movie with my roommate

For each activity, read the following statements and rate how closely each statement reflects why you did the activity.

1 2 3 4 5 6 7

Not at all Completely

1. Something about your situation forced you to do it.
2. You made yourself do it, to avoid feeling anxious or guilty.
3. Interesting or not, you felt that it expressed your values.
4. You did it purely for the interest and enjoyment in doing it.

Daily competence

For each activity, rate how effective you felt doing the activity.

1 2 3 4 5 6 7

Not at all effective Extremely effective

1. How competent did you feel doing Activity 1?
2. How competent did you feel doing Activity 2?
3. How competent did you feel doing Activity 3?

Daily social interactions

Please list the 3 social interactions that have taken the greatest amount of time today.

For example:

Social interaction 1: Spending time with my coworker

Social interaction 2: Watching the movie with my roommate

Social interaction 3: Having dinner with my boyfriend

For each social interaction please rate the extent to which you felt close and connected to the person during the interaction.

1 2 3 4 5 6 7

Not at all Extremely

1. How close and connected did you feel to the person during social interaction 1?
2. How close and connected did you feel to the person during social interaction 2?
3. How close and connected did you feel to the person during social interaction 3?

References

AbuSabha, R., & Achterberg, C. (1997). Review of Self-Efficacy and Locus of Control for Nutrition- and Health-Related Behavior. *Journal of the American Dietetic Association, 97*(10), 1122-1132. doi: http://dx.doi.org/10.1016/S0002-8223(97)00273-3

Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior*: Springer.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.

Allison, D. B., Fontaine, K. R., Manson, J. E., Stevens, J., & VanItallie, T. B. (1999). Annual deaths attributable to obesity in the United States. *JAMA, 282*(16), 1530-1538. doi: 10.1001/jama.282.16.1530

Andrade, A. M., Coutinho, S. R., Silva, M. N., Mata, J., Vieira, P. N., Miderico, C. S., …Teixeira, P. J. (2010). The effect of physical activity on weight loss is mediated by eating self-regulation. *Patient Education and Counseling, 79*(3), 320-326.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist, 55(*5), 469-480. doi:10.1037/0003-066X.55.5.469

Arnett, J. J. (2007). Emerging adulthood: What is it, and what is it good for? *Child Development Perspectives, 1*(2), 68-73. doi:10.1111/j.1750-8606.2007.00016.x

Arnett, J. J. (2014) Adolescence and Emerging Adulthood: A Cultural Approach. Pearson Educational Limited.

Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: A motivational basis of performance and well-being in two work ettings. *Journal of Applied Social Psychology, 34*(10), 2045-2068.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191.

Bandura, A. (1997). *Self-efficacy: The exercise of control*: Macmillan.

Bandura, A. (2004). Self-Efficacy. In N. B. Anderson (Ed.), *Encyclopedia of Health and Behavior* (Vol. 2, pp. 708-714). Thousand Oaks, CA: SAGE Reference.

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-efficacy beliefs of adolescents, 5*(307-337).

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497.

Biddle, S. J. H. (1997). Cognitive theories of motivation and the physical self. In K. R. Fox (Ed.), *The physical self from motivation to well-being* (pp. 59 - 82). Champaign, IL: Human Kinetics.

Blair, S. N., & Connelly, J. C. (1996). How much physical activity should we do? The case for moderate amounts and intensities of physical activity. *Research Quarterly for Exercise and Sport, 67*(2), 193-205.

Blanchflower, D., Oswald, A., & Stewart-Brown, S. (2013). Is psychological well-being linked to the consumption of fruit and vegetables? *Social Indicators Research, 114*(3), 785-801. doi: 10.1007/s11205-012-0173-y

Boeing, H., Bechthold, A., Bub, A., Ellinger, S., Haller, D., Kroke, A., . . . Watzl, B. (2012). Critical review: vegetables and fruit in the prevention of chronic diseases. *European Journal of Nutrition, 51*(6), 637-663. doi: 10.1007/s00394-012-0380-y

Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin, 130*(6), 887-919. doi: 10.1037/0033-2909.6.887

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology, 54*(1), 579-616.

Bolger, N., & Laurenceau, J. P. (2013). Intensive longitudinal methods: An introduction to diary and experience sampling research (Methodology in the social sciences). New York, New York: The Guilford Press.

Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult romantic attachement: An integrative overview. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 46-76). New York: Guilford Press.

Bryk, A., & Stephen, W. (1992). *Hierarchical linear models for social and behavioral research: applications and data analysis methods.* Newberry Park, CA: Sage.

Cardiovascular Review Group. (1994). *Committee of Medical Aspects of Food Policy (COMA) nutritional aspects of cardiovascular disease*. London: HMSO.

Carpenter, C. J. (2010). A meta-analysis of the effectiveness of health belief model variables in predicting behavior. *Health Communication, 25*(8), 661-669.

Centers for Disease Control and Prevention. (2013) *State Indicator Report on Fruits and Vegetables, 2013.* Atlanta, GA: Centers for Disease Control and Prevention, U.S. Department of Health and Human Services.

Centers for Disease Control and Prevention. (2014) *State Indicator Report on Physical Activity, 2014.* Atlanta, GA: Centers for Disease Control and Prevention, U.S. Department of Health and Human Services.

Chatzisarantis, N., Hagger, M. S., & Smith, B. (2007). Influences of perceived autonomy support on physical activity within the theory of planned behavior. *European Journal of Social Psychology, 37*(5), 934.

Cohen, R. Y., Brownell, K. D., & Felix, M. R. J. (1990). Age and sex differences in health habits and beliefs of schoolchildren. *Health Psychology, 9,* 208-224.

Conner, M., & Norman, P. (2005). *Predicting health behaviour*: McGraw-Hill Education (UK).

Craft, L. L., & Landers, D. M. (1998). The effect of exercise on clinical depression and depression resulting from mental illness: A meta-analysis. *Journal of Sport & Exercise Psychology, 20*(4), 339.

Cumming, G. (2014). The new statistics: Why and how. *Psychological Science, 25*(1), 7-29. doi: 10.1177/0956797613504966

Danaei, G., Ding, E. L., Mozaffarian, D., Taylor, B., Rehm, J., Murray, C. J. L., & Ezzati, M. (2009). The preventable causes of death in the united states: Comparative risk assessment of dietary, lifestyle, and metabolic risk factors. *PLoS Med, 6*(4), e1000058. doi: 10.1371/journal.pmed.1000058

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

Deci, E. L., & Ryan, R. M. (2000). The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227-268.

Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research*: University Rochester Press.

Deci, E. L., & Ryan, R. M. (2011). Self-determination theory. *Handbook of theories of social psychology, 1*, 416-433.

DeLongis, A., & Folkman, S. (1988). The impact of daily stress on health and mood: Psychological and social resources as mediators. *Journal of Personality and Social Psychology, 54*(3), 486-495.

Diener, E., & Emmons, R. A. (1985). The independence of positive and negative affect. *Journal of Personality and Social Psychology, 47*(5), 1105-1117.

Diener, E., & Lucas, R. E. (1999). Personality and subjective well-being. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: Foundations of hedonic psychology* (pp. 213): Russell Sage Foundation.

Dunn, C. L., Hannan, P. J., Jeffery, R. W., Sherwood, N. E., Pronk, N. P., & Boyle, R. (2005). The comparative and cumulative effects of a dietary restriction and exercise on weight loss. *International Journal of Obesity, 30*(1), 112-121.

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2006). A test of self-determination theory in the excercise domain. *Journal of Applied Social Psychology, 36*(9), 2240-2265.

Ekkekakis, P., & Backhouse, S. H. (2009). Exercise and psychological well-being. In R. Maughan (Ed.), *Olympic textbook of science in sport*. Hoboken, NJ: Wiley-Blackwell.

Emmons, R. A. (1991). Personal stivings, daily life events, and psychological and physical health. *Journal of Personality, 59*(3), 453-472.

Enders, C. K. (2010). *Applied missing data analysis.* New York: Guillford.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior*. Reading, MA: Addison-Wesley.

Fletcher, G. F., Balady, G., Blair, S. N., Blumenthal, J., Caspersen, C., Chaitman, B., . . . Pina, I. L. (1996). Statement on exercise: Benefits and recommendations for physical activity programs for all Americans a statement for health professionals by the committee on exercise and cardiac rehabilitation of the council on clinical cardiology, American Heart Association. *Circulation, 94*(4), 857-862.

Fox, K. R. (1999). The influence of physical activity on mental well-being. *Public Health Nutrition, 2*(3a), 411-418.

Gagne, M., Ryan, R. M., & Bargmann, K. (2003). Autonomy support and need satisfaction in the motivation and well-being of gymnasts. *Journal of Applied Sport Psychology, 15*(4), 372-390. doi: 10.1080/714044203

Green, L. W. (2002). Health belief model. In L. Breslow (Ed.), *Encyclopedia of Public Health* (Vol. 2, pp. 526-528). New York: Macmillan Reference USA.

Gunnell, K. E., Crocker, P. R. E., Mack, D. E., Wilson, P. M., & Zumbo, B. D. (2014). Goal contents, motivation, psychological need satisfaction, well-being and physical activity: A test of self-determination theory over 6 months. *Psychology of Sport and Exercise, 15*(1), 19-29. doi: 10.1016/j.psychsport.2013.08.005

Gunnell, K. E., Wilson, P. M., Zumbo, B. D., Mack, D. E., & Crocker, P. R. E. (2012). Assessing psychological need satisfaction in exercise contexts: Issues of score invariance, item modification, and context. *Measurement in Physical Education and Exercise Science, 16*(3), 219-236. doi: 10.1080/1091367x.2012.693340

Hagger, M. S., & Chatzisarantis, N. L. (2009). Integrating the theory of planned behaviour and self-determination theory in health behavior: a meta-analysis. *British Journal of Health Psychology, 14*, 275-302. doi: 10.1348/13S910708X3739S9

Harrison, J. A., Mullen, P. D., & Green, L. W. (1992). A meta-analysis of studies of the health belief model with adults. *Health Education Research, 7*(1), 107-116.

Hartley, L., Igbinedion, E., Thorogood, M., Clarke, A., Stranges, S., Hooper, L., & Rees, K. (2012). Increased consumption of fruit and vegetables for the primary prevention of cardiovascular diseases. *The Cochrane Database of Systematic Reviews, 2012*(5), CD009874. doi: 10.1002/14651858.CD009874

Haskell, W. L., Lee, I.-M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., . . . Bauman, A. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation, 116*(9), 1081.

Holden, G. (1992). The relationship of self-efficacy appraisals to subsequent health related outcomes. *Social Work in Health Care, 16*(1), 53-93. doi: 10.1300/J010v16n01_05

Hooff, M. L., & Geurts, S. A. (2014). Need satisfaction during free evening hours: Examining its role in daily recovery. *Stress and Health, 30*(3), 198-208.

Hooper, L. (2007). Primary prevention of CVD: Diet and weight loss. *BMJ Clinical Evidence, 2007*, 0219.

House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science, 241*(4865), 540-545.

Hox, J. J., Moerbeek, M., & van de Schoot, R. (2010). *Multilevel analysis: Techniques and applications:* Routledge.

Intrinsic Motivation and Self-Determination in Exercise and Sport. (2007). (M. S. Hagger & N. L. Chatzisarantis Eds.). Champaign, IL: Human Kinetics.

Jakicic, J. M., Wing, R. R., & Winters-Hart, C. (2002). Relationship of physical activity to eating behaviors and weight loss in women. *Medicine & Science in Sports and Exercise, 34*(10), 1653-1659.

Johansson, L., & Anderson, L. F. (1998). Who eats 5 a day?: Intake of fruit and vegetables among Norwegians in relation to gender and lifestyle. *Journal of the American Dietetic Association, 98*, 689-691.

Kasser, T., & Ryan, R. M. (1993). A dark side of the American dream: Correlates of financial success as a life aspiration. *Journal of Personality and Social Psychology, 65*, 410-422.

Kasser, T., & Ryan, R. M. (1996). Further examining the American dream: Differential correlates of intrinsic and extrinsic goals. *Personality and Social Psychology Bulletin, 22*(3), 280-287.

Kobau, R., Sneizek, J., & Zack, M. (2009). *US Centers for Disease Control and Prevention's well-being initiative: An overview.* Paper presented at the ISQOLS Conference: Measures and goals for the progress of societies, Florence.

Kuther, T. L. (2006). Emerging Adulthood. In N. J. Salkind (Ed.), *Encyclopedia of Human Development* (Vo. 1, pp. 454-456). Thousand Oaks, CA: SAGE Reference.

La Guardia, J. G., Ryan, R. M., Couchman, C. E., & Deci, E. L. (2000). Within-person variation in security of attachment: a self-determination theory perspective on attachment, need fulfillment, and well-being. *Journal of Personality and Social Psychology, 79*(3), 367.

Levesque, C., Copeland, K. J., & Deci, E. L. (2008). Self-Determination. In N. J. Salkind & K. Rasmussen (Eds.), *Encyclopedia of Educational Psychology* (Vol. 2, pp. 889-892). Thousand Oaks, CA: SAGE Publications.

Liu, S., Manson, J. E., Lee, I.-M., Cole, S. R., Hennekens, C. H., Willett, W. C., & Buring, J. E. (2000). Fruit and vegetable intake and risk of cardiovascular disease: the women's health study. *The American Journal of Clinical Nutrition, 72*(4), 922-928.

Locus of Control. (2008). In W. A. Darity, Jr. (Ed.), *International Encyclopedia of the Social Sciences* (2nd ed., Vol. 4, pp. 477-478). Detroit: Macmillan Reference USA.

Lyman, B. (1989). *A Psychology of Food: More Than a Matter of Taste.* New York, New York: Van Nostrand Reinhold.

Mack, D. E., Wilson, P. M., Gunnell, K. E., Gilchrist, J. D., Kowalski, K. C., & Crocker, P. R. E. (2012). Health-enhancing physical activity: associations with markers of well-being. *Applied Psychology: Health and Well-Being, 4*(2), 127-150. doi: 10.1111/j.1758-0854.2012.01065.x

Maddux, J. E. (2007). Self-Efficacy. In R. F. Baumeister & K. D. Vohs (Eds.), *Encyclopedia of Social Psychology* (Vol. 2, pp. 814-817). Thousand Oaks, CA: SAGE Publications.

Marco, C. A., & Suls, J. (1993). Daily stress and the trajectory of mood: Spillover, response assimilation, contrast, and chronic negative affectivity. *Journal of Personality and Social Psychology, 64*(6), 1053-1063.

Markland, D. (1999). Self-determination moderates the effects of perceived competence on intrinsic motivation in an exercise setting. *Journal of Sport & Exercise Psychology, 21*, 351-361.

Mata, J., Silva, M. N., Vieira, P. N., Carraca, E. V., Andrade, A. M. Coutinho, S. R., . . . Teixeira, P. J. (2009). Motivational 'spill-over' during weight control: Increased self-determination and exercise intrinsic motivation predict eating self-regulation. *Health Psychology, 28*(6), 709-716. doi:10.1037/a0016764

McDonough, M. H., & Crocker, P. R. E. (2007). Testing self-determined motivation as a mediator of the relationship between psychological needs and affective and behavioral outcomes. *Journal of Sport & Exercise Psychology, 29*, 645-663.

Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual causes of death in the United States, 2000. *JAMA, 291*(10), 1238-1245. doi: 10.1001/jama.291.10.1238

Morisky, D. E. (2002). Theory of Planned Behavior. In L. Breslow (Ed.), *Encyclopedia of Public Health* (Vol. 4, pp. 1190-1191). New York: Macmillan Reference USA.

National Health Service. (2009). Why 5 a day? Retrieved from http://www.nhs.uk/Livewell/5ADAY/Pages/Why5ADAY.aspx

Ng, J. Y. Y., Ntoumanis, N., Thogersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-determination theory applied to health contexts: A meta-analysis. *Perspectives on Psychological Science, 7*(4), 325-340. doi: 10.1177/1745691612447309

Nosek, B. A., & Lakens, D. (2015). Registered reports: A method to increase the credibility of published results. *Social Psychology, 45*(3), 137-141.

Ntoumanis, N. (2001). A self-determination approach to the understanding of motivation in physical education. *British Journal of Educational Psychology, 71*(2), 225-242. doi: 10.1348/000709901158497

O'Brien, E. J., & Epstein, S. (1988). *MSEI: The Multidimensional Self-Esteem Inventory, professional manual*. Odessa, FL: Psychological Assessment Resources.

Paluska, S. A., & Schwenk, T. L. (2000). Physical activity and mental health: current concepts. *Sports Med, 29*(3), 167-180.

Patrick, H., & Williams, G. C. (2012). Self-determination theory: its application to health behaviors and complementarity with motivational interviewing. *International Journal of Behavioral Nutrition and Physical Activity, 9*(18), b35.

Pelletier, L. G., Dion, S. C., Slovince-D'Angelo, M., & Reid, R. (2004). Why do you regulate what you eat? Relationships between forms of regulation, eating behaviors, sustained dietary behavior change, and psychological adjustment. *Motivation and Emotion, 28*(3), 245-277.

Pilcher, J. J., Ginter, D. R., & Sadowsky, B. (1997). Sleep quality versus sleep quantity: Relationships between sleep and measures of health, well-being and sleepiness in

college students. *Journal of Psychosomatic Research, 42*(6), 583-596. doi: http://dx.doi.org/10.1016/S0022-3999(97)00004-4

Pronk, N. P., Anderson, L. H., Crain, A. L., Martinson, B. C., O'Connor P. J., Sherwoood, N. E. & Whitebird, R. R. (2004). Meeting recommendations for multiple healthy lifestyle factors: Prevalence, clustering, and predictors among adolescent, adult, and senior health plan members. *American Journal of Preventative Medicine, 27*(2, Supplement), 25-33. doi: http://dx.doi.org/10.1016/j.amepre.2004.04.022

Quested, E., Duda, J. L., Ntoumanis, N., & Maxwell, J. P. (2013). Daily fluctuations in the affective states of dancers: A cross-situational test of basic needs theory. *Psychology of Sport and Exercise, 14*(4), 586-595.

Reinboth, M., & Duda, J. L. (2006). Perceived motivational climate, need satisfaction and indices of well-being in team sports: A longitudinal perspective. *Psychology of Sport and Exercise, 7*(3), 269-286. doi: 10.1016/j.psychsport.2005.06.002

Reinboth, M., Duda, J. L., & Ntoumanis, N. (2004). Dimensions of coaching behavior, need satisfaction and the psychological and physical welfare of young athletes. *Motivation and Emotion, 28*(3), 297-313.

Reis, H. T., Collins, W. A., & Berscheid, E. (2000). The relationship context of human behavior and development. *Psychological Bulletin, 126*(6), 844-872.

Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: The role of autonomy, competence, and relatedness. *Personality and Social Psychology Bulletin, 26*(4), 419-435. doi: 10.1177/0146167200266002

Roche, M., & Lieke, L. (2011). *A daily diary study of work-life balance: Utilizing a daily process model*. Paper presented at the Proceeding of the 25th ANZAM Conference: The Future of Work and Organisations, Wellington, New Zealand.

Rodgers, A., & Vaughan, P. (2002). Reducing risks, promoting healthy life *The World Health Report*. Geneva, Switzerland: World Health Organization.

Rodgers W. M., Hall, C. R., Duncan, L. R., Pearson, E., & Milne, M. I. (2010). Becoming a regular exerciser: Examining change in behavioral regulations among exercise initiates. *Psychology of Sport and Exercise, 11*(5), 378-386. doi:http://dx.doi.org/10.1016/j.psychsport.2010.04.007

Rosenstock, I. M. (1974). The health belief model and preventive health behavior. *Health Education Monographs, 2*(4), 354-386.

Rotter, J. B., Seeman, M., & Liverants, S. (1962). Internal versus external control of reinforecement: A major variable in behavior theory. In N. F. Washburne (Ed.), *Decisions, values and groups* (Vol. 2). New York: Pergamon Press.

Russell, D. W. (1996). The UCLA loneliness scale (version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment, 66*(1), 20-40.

Rutledge, T., Groesz, L. M., Linke, S. E., Woods, G., & Herbst, K. L. (2011). Behavioral weight management for the primary care provider. *Obesity Reviews, 12*(5), e290-e297. doi:10.1111/j.1467-789X.2010.00818.x

Ryan, R. M., Bernstein, J. H., & Brown, K. W. (2010). Weekends, work, and well-being: Psychological need satisfactions and day of the week effects on mood, vitality, and physical symptoms. *Journal of Social and Clinical Psychology, 29*(1), 95-122.

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalizations: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57*, 749-761.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist,* (55), 68-78.

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. In S. Fiske (Ed.), *Annual Review of Psychology* (Vol. 52, pp. 141-166). Palo Alto, CA: Annual Reviews, Inc.

Ryan, R. M., & Deci, E. L. (2007). Active human nature: Self-determination theory and the promotion and maintenance of sport, exercise, and health. In M. S. Hagger & N. L. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 1-22). Champaign, IL: Human Kinetics.

Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: subjective vitality as a dynamic reflection of well-being. *Journal of Personality, 65*(3), 529-565.

Ryff, C. D., & Singer, B. (1998). The contours of positive human health. *Psychological Inquiry, 9*(1), 1-28.

Sanders, G. S. (1982). *Social psychology of health and illness*: Psychology Press.

Schmitz, B., Klug, J., & Schmidt, M. (2011). Assessing self-regulated learning using diary measures with university students. *Handbook of self-regulation of learning and performance*, 251-266.

Schuch, F., Vasconcelos-Moreno, M., & Fleck, M. (2011). The impact of exercise on quality of life within exercise and depression trials: a systematic review. *Mental Health and Physical Activity, 4*(2), 43-48.

Sebire, S. J., Standage, M., & Vansteenkiste, M. (2009). Examining intrinsic versus extrinsic exercise goals: Cognitive, affective, and behavioral outcomes. *Journal of Sport & Exercise Psychology, 31*, 189-210.

Sheldon, K. M., Ryan, R. M., & Reis, H. T. (1996). What makes for a good day? Competence and autonomy in the day and in the person. *Personality and Social Psychology Bulletin, 22*(12), 1270-1279.

Simons, D. J. (2014). The value of direct replication. *Perspectives on Psychological Science, 9*(1), 76-80. doi: 10.1177/1745691613514755

Sonstroem, R. J. (1997). The physical self-system: a mediator of exercise and self-esteem. In K. R. Fox (Ed.), *The physical self: From motivation to well-being* (pp. 3-26). Champaign, IL: Human Kinetics.

Stranges, S., Samaraweera, P. C., Taggart, F., Kandala, N.-B., & Stewart-Brown, S. (2014). Major health-related behaviours and mental well-being in the general population: the Health Survey for England. *BMJ Open, 4*(9). doi: 10.1136/bmjopen-2014-005878

Suh, E., Diener, E., & Fujita, F. (1996). Events and subjective well-being: only recent events matter. *Journal of Personality and Social Psychology, 70*(5), 1091-1102.

Sylvester, B. D., Mack, D. E., Busseri, M. A., Wilson, P. M., & Beauchamp, M. R. (2012). Health-enhancing physical activity, psychological needs satisfaction, and well-being: Is it how often, how long, or how much effort that matters? *Mental Health and Physical Activity, 5*(2), 141-147. doi: 10.1016/j.mhpa.2012.10.004

Teixeira, P. J., Carraca, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 78. doi: 10.1186/1479-5868-9-78

Teixeira, P. J., Patrick, H., & Mata, J. (2011). Why we eat what we eat: the role of autonomous motivation in eating behavior regulation. *Nutrition Bulletin, 36*, 102-107.

Uchino, B. N., Cacioppo, J. T., & Kiecolt-Glaser, J. K. (1996). The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for health. *Psychological Bulletin, 119*(3), 488.

United States Department of Agriculture. (2005). *2005 Dietary Guidelines of Americans*. Washington, DC: Center for Nutrition Policy and Promotion.

United States Department of Agriculture. (2015). *2015-2020 Dietary Guidelines for Americans.* Retrieved from http://health.gov/dietaryguidelines/2015/guidelines/

Vansteenkiste, M., Simons, J., Soenens, B., & Lens, W. (2004). How to become a persevering exerciser? Providing a clear, future intrinsic goal in an autonomy supportive way. *Journal of Sport & Exercise Psychology, 26*, 232-249.

Verstuyf, J. Patrick, H., Vansteenkiste, M., & Teixeira, P. J. (2012). Motivational dynamics of eating regulation: a self-determination theory perspective. *International Journal of Behavioral Nutrition and Physical Activity, 9*(21).

Verstuyf, J. Vansteenkiste, M., Soenens, B., Boone, L., & Mouratidis, A. (2013). Daily ups and downs in women's binge eating symptoms: the role of basic psychological needs, general self-control, and emotional eating. *Journal of Social and Clinical Psychology, 32*(3), 335-361. doi:10.1521/jscp.2013.32.3.335

Verstuyf, J., Vansteenkiste, M., Soenens, B., & Soenens, B. (2016). Motivational dynamics underlying eating regulation in young and adult female dieters: Relationships with healthy eating behaviours and disordered eating symptoms. *Psychological Health*. doi:10.1080/08870446.2016.1143942

White, B. A., Horwath, C. C., & Conner, T. S. (2013). Many apples a day keep the blues away–Daily experiences of negative and positive affect and food consumption in young adults. *British Journal of Health Psychology, 18*(4), 782-798.

Williams, G. C., Grow, V. M., Freedman, Z. R., Ryan, R. M., & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintenance. *Journal of Personality and Social Psychology, 70*(1), 115.

Wilson, P. M., Longley, K., Muon, S., Rodgers, W. M., & Murray, T. C. (2006). Examining the contributions of perceived psychological need satisfaction to well-being in exercise. *Journal of Applied Biobehavioral Research, 11*(3-4), 243-264.

Wilson, P. M., Mack, D. E., Gunnell, K. E., Oster, K., & Gregson, J. P. (2008). Analyzing the measurement of psychological need satisfaction in exercise contexts: evidence, issues, and future directions. In M. P. Simmons (Ed.), *Sport and exercise psychology research advances*: Nova Science Publishers.

Wilson, P. M., & Rodgers, W. M. (2007). Self-determination theory, exercise, and well-being. In M. S. Hagger & N. L. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 101-112). Champaign, IL: Human Kinetics.

Wilson, P. M., Rodgers, W. M., Blanchard, C. M., & Gessell, J. (2003). The relationship between psychological needs, self-determined motivation, exercise attitudes, and physical fitness. *Journal of Applied Social Psychology, 33*(11), 2373-2392.

Wilson, P. M., & Rogers, W. T. (2008). Examining relationships between perceived psychological need satisfaction and behavioral regulations in exercise. *Journal of Applied Biobehavioral Research, 13*(3), 119-142.

Windle, G., Hughes, D., Linck, P., Russell, I., & Woods, B. (2010). Is exercise effective in promoting mental well-being in older age? A systematic review. *Aging & Mental Health, 14*(6), 652-669.

Wong, M. L., Lau, E. Y., Wan, J. H., Cheung, S. F., Hui, C. H., & Mok, D. S. (2013). The interplay between sleep and mood in predicting academic functioning, physical health and psychological health: a longitudinal study. *Journal of Psychosomatic Research, 74*(4), 271-277. doi: 10.1016/j.jpsychores.2012.08.014

World Health Organization. (2002). *The world health report 2002: Reducing risks, promoting healthy life*: World Health Organization.