

THE MOTIVATIONAL REGULATIONS OF SELF-DETERMINATION THEORY  
AND OBJECTIVELY-ASSESSED EXERCISE PARTICIPATION AND THE  
MEDIATING EFFECTS

THESIS

Presented to the Graduate Council of  
Texas State University-San Marcos  
in Partial Fulfillment  
of the Requirements

for the Degree

Master of SCIENCE

by

Kyle T. Patek

San Marcos, Texas  
August 2013

THE MOTIVATIONAL REGULATIONS OF SELF-DETERMINATION THEORY  
AND OBJECTIVELY-ASSESSED EXERCISE PARTICIPATION AND THE  
MEDIATING EFFECTS

Committee Members Approved:

---

Lisa Lloyd, Chair

---

Karen Meaney

---

Brian Miller

---

Eric Schmidt

Approved:

---

J. Michael Willoughby  
Dean of the Graduate College

**COPYRIGHT**

by

Kyle T. Patek

2013

## **FAIR USE AND AUTHOR'S PERMISSION STATEMENT**

### **Fair Use**

This work is protected by the Copyright Laws of the United States (Public Law 94-553, section 107). Consistent with fair use as defined in the Copyright Laws, brief quotations from this material are allowed with proper acknowledgment. Use of this material for financial gain without the author's express written permission is not allowed.

### **Duplication Permission**

As the copyright holder of this work I, Kyle Patek, refuse permission to copy in excess of the "Fair Use" exemption without my written permission.

## **ACKNOWLEDGEMENTS**

I would firstly like to thank Dr. Lloyd, Carolyn Clay, Allison Rissel, and all of the Total Wellness staff for allowing me to conduct my research through the Worksite Wellness program. I would also like to thank all of the participants who volunteered to take part in my research. Without the help of the program, the Total Wellness staff, and the participants, this research would not have been possible. I would also like to thank Shauna Martin, whom, without her patience, support, encouragement, and love; this document would not have been attempted or completed. I would also like to thank Joseph Buckland, Allison Rissel, and Dr. Wiley for helping me stay focused and positive throughout this process.

Finally, I would like to thank my committee members. Dr. Meaney, thank you for not only teaching me the research process but also inspiring me to do my thesis. Dr. Schmidt, thank you for all of hours of edits you spent working with me on my thesis. My research is stronger because of your contributions to the writing process. Dr. Miller, thank you for your high expectations, which held me to a high standard and made me a true “scientist”. Finally, thank you Dr. Lloyd for your willingness to always help me become a better researcher, writer, student, and person. The countless hours that we spent together have set a great example for the type of mentor, person, and academician that I strive to be in the future. Please understand that all of your efforts combined have inspired me to pursue a doctoral degree and conduct research in the future.

This manuscript was submitted on July 9, 2013.

## TABLE OF CONTENTS

	<b>Page</b>
ACKNOWLEDGEMENTS.....	v
LIST OF TABLES.....	viii
LIST OF FIGURES.....	ix
ABSTRACT.....	x
CHAPTER	
I. THE RELATIONSHIPS BETWEEN THE VARIABLES OF SELF- DETERMINATION THEORY AND OBJECTIVELY-ASSESSED EXERCISE PARTICIPATION: A LITERATURE REVIEW.....	1
Methods.....	9
Discussion.....	10
Type of Motivation and Exercise Participation.....	10
Intrinsic motivation.....	11
Integrated regulation.....	13
Identified regulation.....	14
Introjected and external regulation.....	15
Amotivation.....	17
Basic Psychological Needs.....	18
Competence.....	18
Autonomy.....	20
Relatedness.....	21

Conclusions.....	23
References.....	27
<b>II. THE MOTIVATIONAL REGULATIONS OF SELF-DETERMINATION THEORY AND OBJECTIVELY-ASSESSED EXERCISE PARTICIPATION AND THE MEDIATING EFFECTS.....</b>	<b>35</b>
Theoretical Framework.....	36
Statement of Problem.....	39
Methods.....	42
Participants.....	42
Measures .....	43
Autonomy .....	43
Competence.....	44
Relatedness .....	44
Motivational regulations .....	44
Attendance .....	45
Results.....	45
Correlational Results.....	46
Regression Results .....	47
Discussion.....	49
Exercise Participation and Motivation.....	49
Basic Needs and Exercise Participation.....	51
Conclusions.....	56
References.....	65
<b>APPENDIX A: QUESTIONNAIRE.....</b>	<b>73</b>

## LIST OF TABLES

<b>Table</b>	<b>Page</b>
1. Description of Reviewed Studies on Motivation .....	25
2. Description of Reviewed Studies on Basic Needs .....	26
3. Participant Demographics .....	59
4. Means, Standard Deviations, Correlations and Alpha Reliabilities for Measured Variables .....	60
5. Step One of the Regression-based Tests for Mediation with Exercise Participation as the Criterion .....	61
6. Step Two of the Regression-based Tests for Mediation with Intrinsic Motivation as the Criterion .....	62
7. Step Two of the Regression-based Tests for Mediation with Identified Regulation as the Criterion .....	63
8. Steps Three and Four of Regression-based Tests for Mediation with Exercise Participation as the Criterion .....	64

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
1. SDT-based Relationships and Research Findings .....	58

**ABSTRACT**

THE MOTIVATIONAL REGULATIONS OF SELF-DETERMINATION THEORY  
AND OBJECTIVELY-ASSESSED EXERCISE PARTICIPATION AND THE  
MEDIATING EFFECTS

by

Kyle T. Patek, B.S.

Texas State University-San Marcos

August 2013

**SUPERVISING PROFESSOR: LISA LLOYD**

According to the Self-Determination Theory (SDT), intrinsic motivation and identified regulation are positively related to exercise participation, while introjected regulation, external regulation, and amotivation are negatively related to exercise participation. Also, according to Cognitive Evaluation Theory, a subtheory of the SDT, the satisfaction of the basic needs (autonomy, competence, and relatedness) is positively related to intrinsic motivation and identified regulation. These theoretical relationships have been confirmed by many researchers when exercise participation is measured via self-report questionnaires, however, few studies have tested these relationships with objectively-

assessed exercise participation. Therefore, the aim of this study was to clarify the relationships between five motivational regulations (i.e., intrinsic motivation, introjected regulations, external regulation, and amotivation) and exercise participation within a worksite wellness exercise program. Additionally, the relationship between the three basic needs (i.e., autonomy, competence, and relatedness) and exercise participation will be investigated to determine the mediating effects of intrinsic motivation and identified regulation. Participants (n=162; M = 12, F = 150) were members of a worksite wellness program offered by a school district in central Texas. The worksite wellness program consisted of weekly group exercise classes, monthly nutrition lectures, and comprehensive fitness testing at the beginning and end of a 4 month period. Prior to beginning the program, each participant completed a multi-section questionnaire examining all aforementioned variables. Participation was assessed using attendance records. Multiple regression analyses revealed that external regulation and autonomy were significant predictors of exercise participation. Further analysis, however, revealed that intrinsic motivation and identified regulation did not mediate the relationship between autonomy and exercise participation. Based on the results, it appears that individuals who are externally motivated or feel autonomous within an exercise program are likely to participate more often. These findings show partial support for Self-Determination Theory and Cognitive Evaluation Theory.

## CHAPTER I

### THE RELATIONSHIP BETWEEN THE VARIABLES OF SELF- DETERMINATION THEORY AND OBJECTIVELY- ASSESSED EXERCISE PARTICIPATION: A LITERATURE REVIEW

Results from the 2009-2010 National Health and Nutrition Examination Survey indicate that approximately 33% of U.S. adults are overweight and an additional 36% are obese or extremely obese (Flegal, Carroll, Kit, & Ogden, 2012). There are many factors that contribute to obesity, such as diet, genetics, drugs, metabolic diseases, socioeconomic status, physical activity, and environment (Navalpotro, Regidor, Ortega, Martinez, Villanueva, & Astasio, 2012). Generally speaking, however, obesity is a result of an energy imbalance, with daily energy intake consistently exceeding daily energy expenditure (Comana, 2012). Therefore, participation in regular physical activity is considered to be one of the most important steps that can be taken to decrease the likelihood of obesity (Carlson, Fulton, Galuska, Kruger, Lobelo, & Loustalot, 2008). Although the associations between regular physical activity and obesity, as well as other preventable diseases, such as hypertension, diabetes, and colon cancer, are well-known (Brown et al., 2004; Knowler et al., 2002; Richardson, Kriska, Lantz & Hayward, 2004),

a large percentage of U.S. adults do not engage in *sufficient* physical activity to experience the health benefits of physical activity (Carlson et al., 2008). For instance, based on results from a recent, large-scale study, 22% of U.S. adults are insufficiently active (i.e., engage in 10 to 149 minutes of physical activity per week) and 13.5% are inactive (i.e., engage in less than 10 minutes of physical activity per week) (Adabonyan, Loustalot, Kruger, Carlson, & Fulton, 2010).

While the reasons one might initiate and regularly participate in exercise over time are vast and complex, motivation appears to play a major role (Deci & Ryan, 1985; Ryan & Deci, 2000; Teixeira, Carraca, Markland, Silva, & Ryan, 2012). Several behavioral theories emphasize the role motivation plays in both adopting and sustaining a behavior, such as exercise, over time (Berlyne, 1967; Festinger, 1957; Glasser, 1984; McClelland, 1961). For example, one such theory commonly cited in the exercise literature as a means for understanding how motivation affects exercise behavior is the Self-Determination Theory (SDT). Briefly, SDT identifies three types of motivation (i.e., intrinsic, extrinsic, and amotivation) that regulate one's behavior (Ryan & Deci, 2000). Intrinsic motivation increases the likelihood that one will initiate and maintain a behavior over time, theoretically, for the enjoyment, personal accomplishment, and/or excitement associated with the behavior (Deci, 1975). Extrinsic motivation, on the other hand, results when a behavior is followed by an external reward, which serves to increase the likelihood of that behavior occurring in the future. This behavior, however, tends to discontinue when the external reward is no longer present (Lepper, Greene, & Nisbett, 1996). Amotivation is defined as the absence of any influence on a behavior and results

in an increase in the likelihood that the individual will not engage in a particular behavior.

With regard to extrinsic motivation, SDT postulates four types, ranging on a continuum from most self-determined to most controlled (i.e., integrated regulation → identified regulation → introjected regulation → external regulation) (Moustaka, Vlachopoulos, Kabitsis, & Theodorakis, 2012; Teixeira et al. 2012). Based on level of autonomy, these types are commonly grouped into two categories: self-determined extrinsic motivation and controlled extrinsic motivation. Self-determined extrinsic motivation involves acting by choice or self-endorsement and consists of integrated and identified behavioral regulations (Moustaka et al., 2012). Specifically, integrated regulation, the most self-determined, takes place when a person engages in an activity because it has been “fully incorporated into the self” (Dyrlund & Wininger, 2006) and is congruent with activities or behaviors he/she carries out in daily life (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2004). Identified regulation is evidenced when the individual identifies the benefits of a behavior and chooses to engage in that behavior because he/she values those benefits (Ryan & Deci, 2000). In contrast to self-determined extrinsic motivation, controlled extrinsic motivation involves acting in a certain way based on pressures to achieve outcomes external to the self and consists of introjected and external behavioral regulations (Moustaka et al., 2012). Introjected regulation occurs when a behavior’s motivation is derived from inward feelings, such as pride or guilt, whereas external regulation, the most controlled, is based on external rewards or punishments, such as compliments or negative judgment in social interaction (Ryan & Deci, 2000).

Based on SDT, exercise participation is purported to be positively impacted by intrinsic and self-determined extrinsic motivation (i.e., integrated regulation and identified regulation), and negatively impacted by controlled-extrinsic motivation (i.e., introjected regulation and external regulation) and amotivation (Deci & Ryan, 1985). With regards to exercise participation, an intrinsically motivated individual, for instance, is likely to exercise regularly because he/she feels challenged, accomplished, and/or enjoyment when exercising. An extrinsically motivated person tends to participate in exercise to improve health or physical appearance (i.e., identified regulation), avoid feelings of guilt or shame (i.e., introjected regulation), and/or receive compliments in social interaction (i.e., external regulation). An amotivated person is not likely to exercise because he/she is not interested in exercise or does not value any benefits of exercise.

Despite the apparent thoroughness of SDT, research only supports its viable application to a limited extent. While positive relationships have been consistently observed between exercise participation and intrinsic motivation (Edmunds, Ntoumanis, & Duda, 2006; Edmunds, Ntoumanis, & Duda, 2008; Ingledew, Markland, & Ferguson, 2009; Markland, 2009; Milne, Wallman, Guilfoyle, Gordon, & Courneya, 2008; Ryan, Frederick, Leps, Rubio, & Sheldon, 1997; Sebire, Standage, & Vansteenkiste, 2011; Standage, Sebire, & Loney, 2008; Tsorbatzoudis, Alexandris, Zahariadis, & Grouios, 2006) as well as both integrated regulation (Duncan, Hall, Wilson, & Jenny, 2010; Edmunds, Ntoumanis, & Duda, 2007; Wilson, Rodgers, Loitz, & Scime, 2006) and identified regulation (Edmunds et al., 2006; Ingledew et al., 2009; Markland, 2009; Milne et al., 2008; Peddle, Plotnikoff, Wild, Au, & Courneya, 2008; Sebire et al., 2011), the negative relationships between exercise participation and controlled motives have not

been consistently observed (Ingledeew et al., 2009; Lewis & Sutton, 2011; Peddle et al., 2008; Sebire et al., 2011; Standage et al., 2008; Wilson et al., 2006; Wininger, 2007).

Based on a summary of these findings, the research has yielded only a partial validation of SDT. Regardless, both theory and research clearly suggest that intrinsic motivation and self-determined extrinsic motivation, to a lesser degree, impact exercise behavior. Thus, understanding the conditions that influence these types of motivation, therefore, could prove beneficial toward promoting and maintaining exercise behavior.

The Cognitive Evaluation Theory (CET), a subtheory of SDT, provides one means for understanding the conditions that influence motivation. Briefly, CET proposes that intrinsic motivation is enhanced by the satisfaction of three basic psychological needs: autonomy (the quality or state of being self-governed), competence (the capacity to function or develop in a particular way), and relatedness (a feeling of meaningful connection to others in one's social environment) (Ryan & Deci, 2000, Ryan & Deci, 2002). Results have varied as to how substantial an impact the satisfaction of the three basic needs has on intrinsic motivation, and which basic need(s), if any, is most conducive to increasing intrinsic motivation. For example, research has consistently and clearly shown that intrinsic motivation is related to competence but has been unable to confirm that a relationship, either positive or negative, exists between these motivations and both autonomy and relatedness (Goudas, Biddle, Fox, & Underwood, 1995; Matosic, Cox, & Amorose, 2013; Nunez, Martin-Albo, Paredes, Rodriguez, & Chipana, 2010; Reeve & Deci, 1996; Vallerand & Reid, 1984). Furthermore, while the exercise research has confirmed an association between intrinsic motivation and needs satisfaction, there is speculation that other forms of motivation, i.e., self-determined extrinsic motivations, are

also associated with needs satisfaction (Ryan & Deci, 2000; Teixeira et al., 2012), which Edmunds et al. (2008) confirmed.

Given the theoretical relationships between motivation and both exercise behavior and needs satisfaction, it is logical to assume that needs satisfaction is related to exercise behavior. In other words, if one's basic needs are satisfied, one's motivation to engage in a particular behavior, such as exercise, increases, resulting in a greater likelihood of initiating and maintaining that behavior. Research has confirmed that of the three basic needs, competence is consistently positively related to exercise participation (Dyrlund & Wininger, 2006; Edmunds et al., 2006; Edmunds et al., 2008; McDonough & Crocker, 2007; Milne et al., 2008; Puente & Anshel, 2010; Vlachopoulos & Michailidou, 2006). From a practical perspective, a person who is/feels highly competent will likely be intrinsically motivated to engage in and sustain exercise behavior. Conversely, an individual who is/feels incompetent will likely exhibit controlled extrinsic motivation and, thus, will likely engage in less or no exercise behavior (Craike, 2008; Teixeira et al. 2012). Similarly focused research, however, has yielded discordant findings with regard to whether a positive relationship exists between exercise participation and either autonomy or relatedness (Dyrlund & Wininger, 2006; Edmunds et al. 2006; Edmunds et al., 2007; Edmunds et al., 2008; Levy & Cardinal, 2004; McDonough & Crocker, 2007; Vlachopoulos & Michailidou, 2006). These findings suggest that autonomy and relatedness may play a lesser role, if any, in affecting the likelihood of one engaging in or maintaining exercise behavior.

Discrepancies between theory and research in the exercise motivation field are due, at least in part, to the method(s) used in measuring exercise participation (i.e., self-

report versus objective assessments). Self-report measures of exercise participation often place an inherent limitation on the results as the researcher cannot control for social desirability bias (i.e., responses intended to create a more desirable image) or inaccurate responses due to poor memory (Paulhus, 1991). When objective measures are used, however, these issues appear to be eliminated. Regardless of the methodology, a positive relationship has indeed been shown to exist between exercise participation and intrinsic motivation (Edmunds et al., 2006; Edmunds et al., 2008; Ingledew et al., 2009; Markland, 2009; Milne et al., 2008; Ryan et al. 1997; Standage et al., 2008; Tsorbatzoudis et al., 2006). However, integrated regulation has, to my knowledge, only been investigated four times with three studies reporting a positive association with self-report exercise participation (Duncan et al., 2010; Edmunds et al., 2007; Wilson et al., 2006) and no relationship with objectively-assessed exercise participation (Wininger, 2007). On the other hand, clear, consistent relationships between exercise participation and the other three types of extrinsic motivations (i.e., identified, introjected, and external regulations) have not been revealed. For instance, research results have consistently shown a positive relationship between exercise participation and identified regulation when self-report measures are used (Edmunds et al., 2006; Ingledew et al., 2009; Markland, 2009; Milne et al., 2008; Peddle et al., 2008), but have been mixed when objective measures are used (Ryan et al., 1997; Sebire et al., 2011; Wininger, 2007). Additionally, research results have not consistently revealed a negative relationship between exercise participation and controlled motivation (introjected and external) either self-report or objective measures of exercise participation are used (Ingledew et al., 2009; Lewis & Sutton, 2011; Peddle et al., 2008; Sebire et al., 2011; Standage et al., 2008; Wilson et al., 2006; Wininger, 2007).

Finally, it is commonly asserted that amotivation interferes with exercise participation (Ryan, Williams, Patrick, & Deci, 2009), and in the one study could be found to have investigated the association between exercise participation and amotivation when measured objectively, a negative relationship was confirmed (Wininger, 2007). Though there are few studies confirming this proposed relationship, there remains a strong belief among researchers that a negative association between exercise participation and amotivation truly exists (Ryan, et al., 2009). In short, while the theory states that exercise participation is positively associated with both intrinsic motivation and self-determined extrinsic motivation (integrated and identified regulation) and negatively associated with controlled extrinsic motivation (introjected and external regulations) (Deci & Ryan, 1985), research utilizing objective measures of exercise participation has only confirmed positive relationships between exercise participation and intrinsic motivation (Ryan et al., 1997; Sebire et al., 2011; Standage et al., 2008; Wininger, 2007).

In summary, SDT aims to explain the role motivation plays in both initiation and maintenance of a behavior, such as exercise. As part of the SDT, the CET more specifically provides a basis for understanding the conditions (e.g., satisfaction of the basic needs) that impact motivation itself. As such, SDT often serves as a framework for research designed to investigate the complex relationships between exercise and both motivation and need satisfaction. However, due to the large quantity of studies and the quality of methodologies implemented (e.g., self-report vs. objective measures of exercise participation), any clear, consistent understanding of these relationships is limited, at best. While the majority of research using self-report measures of exercise participation verifies these relationships, studies using objective measures of exercise

participation are limited and have reported discordant results (Dyrlund & Wininger, 2006; Edmunds et al., 2008; Levy, Polman, & Borkoles, 2008; Podlog & Dionigi, 2009; Ryan et al., 1997; Sebire et al., 2011; Standage et al., 2008; Wininger, 2007).

Consequently, there is a need to review valid, rigorous studies on motivation, need satisfaction, and objectively measured exercise participation in order to better elucidate the SDT-based constructs that have clearly been shown to affect exercise behavior. The purpose of this review, therefore, is to provide a better grasp of the complex relationships between objective measures of exercise participation and: a) motivation, as defined by SDT, and b) satisfaction of the basic needs. From this, more effective behavioral strategies that target the satisfaction of the basic needs could possibly be developed and implemented, thereby promoting and maintaining exercise participation.

### **Methods**

The research articles for this review were identified by accessing the Academic Search Complete, Alternative Health Watch, Medline, PsycINFO and SPORTDiscus databases, as well as through reference lists of relevant journal articles. These databases were searched using the key words “self-determination theory,” “exercise,” “autonomy,” “competence,” “relatedness,” “motivation,” and “participation”. For inclusion in this review, studies had to be written in English, published in peer-reviewed journals after 1980, and available through the university’s library database or as an interlibrary loan. Articles were excluded if they were anecdotal, a single case study, or an editorial. Studies were included in the review if they measured levels of autonomy, competence, relatedness, or type of motivation in relation to participation, attendance, or attrition within an exercise program. Following the aforementioned criteria, 67 studies were

considered for evaluation. All studies involving adolescent participants or diseased populations were excluded, and only studies involving apparently healthy, overweight, and obese adults were selected for review. Studies were also excluded if exercise participation was measured via self-report questionnaires. After all exclusions, the literature search identified 8 studies on basic psychological needs, type of motivation, and exercise participation and, thus, constitute the basis of this study.

## **Discussion**

### **Type of Motivation and Exercise Participation**

Extensive literature supports SDT to some degree, as the relationships between exercise participation and certain types of motivation have been shown to exist. As mentioned above, a positive relationship between exercise participation, when measured objectively and via self-report, and intrinsic motivation (Edmunds et al., 2006; Edmunds et al., 2008; Ingledew et al., 2009; Markland, 2009; Milne et al., 2008; Ryan et al. 1997; Sebire et al., 2011; Standage et al., 2008; Tsorbatzoudis et al., 2006). A positive relationship between exercise participation and integrated regulation (Duncan et al., 2010; Edmunds et al., 2007; Wilson et al., 2006) has been clearly established when self-report measures are used, but non-existent when objective measures are used (Wininger, 2007). When measured objectively, the relationship between exercise participation and identified regulation has been positive (Sebire et al., 2011) and nonexistent (Ryan et al., 1997; Wininger, 2007). When measured via self-report or objective measurement, a negative relationship between exercise participation and both controlled motivational regulations (Ingledew et al., 2009; Lewis & Sutton, 2011; Peddle et al., 2008; Sebire et al., 2011; Standage et al., 2008; Wilson et al., 2006; Wininger, 2007) and amotivation has

not been clearly established (Lewis & Sutton, 2011; Peddle et al., 2008; Wilson, Rodgers, Fraser, & Murray, 2004; Wininger, 2007). See Table 1 for a summary of the research reviewed below.

**Intrinsic motivation.** Based on SDT, individuals are expected to show greater participation to exercise behavior when they report high ratings of intrinsic motivation. In the articles selected for review, three studies measured intrinsic motivation and all showed a positive relationship between objectively-assessed exercise participation and intrinsic motivation (Edmunds et al. 2008; Ryan et al. 1997; Standage et al., 2008; Wininger, 2007). For instance, in an observational study by Standage et al. (2008), 52 British university male and female students completed the Behavioral Regulation in Exercise Questionnaire to assess their motivation for exercise. The participants also wore Actiheart accelerometers for 8 days to determine, in part, whether they met the ACSM/AHA guidelines for engaging in a sufficient amount of moderate physical activity. Results showed that a positive relationship existed between meeting physical activity guidelines and intrinsic motivation ( $r = .34, p < .01$ ).

With further support for SDT, a similar study Sebire et al., 2011 found a positive association between intrinsic motivation and objectively-assessed exercise participation. In this study, 101 participants completed the Behavioral Regulation in Exercise Questionnaire to assess their motivation for exercise. The participants also wore Actiheart accelerometers for 8 days to determine how many minutes of physical activity they engaged in throughout that time. The participants also kept a log of activities, so the researchers could adjust the times based on purposeful exercise. The result revealed a positive relationship between intrinsic motivation and exercise participation.

In a prospective study by Ryan et al. (1997a), 40 university students and employees signed up independently for either a 10-week Tae Kwon Do class or an Aerobics class. Participant motives were measured and separated into intrinsic motives or body-related (i.e., identified regulation) motives based on their responses to the Motivation for Physical Activities Measure. Attendance in the classes was measured by the instructors of the classes. If a participant did not attend a class during the first three weeks, he/she was considered a dropout. The researchers operated under the assumption that aerobic participants participated in aerobics in order to change their appearance while the Tae Kwon Do participants participated in Tae Kwon Do for the challenge and interest in the sport. As expected, the Tae Kwon Do participants showed higher ratings of intrinsic motives and those ratings were shown to be positively related to attendance. However, only three broad motives were assessed (i.e., enjoyment, competence, and body-related motives) and the sample was small, which deters the generalizability of the findings. Thus, a follow-up study, employing a larger sample size ( $n = 155$ ) and a more extensive and differentiated assessment of motives (i.e., competence, enjoyment, fitness, appearance, and social motives), was conducted to further explore the relations between initial motives and participation in a different activity. Some additional factors assessed were the length of each workout, and the degree of both enjoyment and challenge of each workout. All participants were required to sign in and out each time they exercised for a 10-week period, and from these records attendance was assessed. Results revealed that participation, workout length, and enjoyment of workout were all positively associated with intrinsic motives focused enjoyment and competence.

Additionally, Wininger (2007) used blind treadmill walking to assess the relationship between motivational regulations for exercise and distance walked. In this prospective design, 58 undergraduate male and female participants completed the Exercise Motivation Scale to determine what motivates them to exercise. The participants then walked on a manual treadmill for 15 minutes at a self-selected speed. The treadmill display was hidden so that the individual could not see any feedback of distance or speed. The results supported SDT with intrinsic motivation and exercise participation sharing a positive relationship.

While the majority of studies have described associations and relationships, Edmunds et al. (2008) applied the theory to investigate whether an SDT instructional style of group exercise would affect satisfaction of basic psychological needs, motivational regulations, and exercise participation. Using a 10-week exercise program, 25 female university students received group exercise instruction from a SDT-trained instructor and 31 female university students received typical instruction style (e.g., the instructor initiates the exercises while the attendees follow along). The results revealed that the experimental group experienced significantly greater improvements in intrinsic motivation over time and attended significantly more classes than the control group. In light of the results from previous studies (Edmunds et al., 2008; Ryan et al., 1997; Standage, et al., 2008; Wininger, 2007), it is fairly evident that intrinsic motivation is positively related to exercise participation and interventions that target intrinsic motivation are likely to improve exercise participation.

**Integrated regulation.** The most self-determined extrinsic motivation, integrated regulation, is expected to make participants more likely to engage in exercise over time.

To our knowledge, only one study using objective assessment of exercise participation exists regarding integrated regulation. Of note is the dearth of research regarding integrated regulation, which is most likely due to difficulties in measurement of the construct caused by its similarity to intrinsic motivation. Wininger (2007) was the only study found to have measured integrated regulation and objective exercise participation, which resulted in no relationship shared between the two ( $r = .21, p = .13$ ). Further investigation is needed to create a reliable measure of integrated regulation and its possible relationship with exercise participation.

**Identified regulation.** SDT predicts that participants who report high levels of identified regulation are more likely to participate to exercise programs. Interestingly however, and within the limited number of studies using objective assessment of exercise participation, identified regulation has been found to have no relationship with objectively-assessed participation in two studies and a positive relationship in only one. In the study by Ryan et al. (1997), though aerobics participants showed higher ratings of body-related motives and lower ratings of intrinsic motives and attended fewer classes when compared to the Tae Kwon Do participants, no relationship was reported between identified motives and attendance. Therefore, the researchers speculated that some other factors besides levels of identified motives attributed to the variations of attendance to aerobics classes. As mentioned above, a second study conducted to address the limitations reported by Ryan et al. (1997a), Ryan et al. (1997b) separated identified motives into appearance and fitness goals with both yielding no relationship to exercise participation. Wininger (2007) found similar results as identified regulation ( $r = .12, p = .41$ ) showed no significant relationship with distance walked on the treadmill.

In contrast to the aforementioned studies, one study found a significant positive relationship between exercise participation and identified regulation (Sebire et al., 2011). Autonomous motivation (a combined measure of intrinsic motivation and identified regulation, was shown to positively predict objectively-assessed exercise participation. Identified regulation has been confirmed to have a positive association with exercise participation when measured via self-report, but little research has been conducted to confirm this relationship exists with objective measures of exercise participation.

**Introjected and external regulation.** SDT predicts that participants who report high levels of introjected or external regulation are less likely to adhere to exercise programs. As with research involving identified regulation, the dearth of studies using objective assessment of exercise participation often found no relationship between objectively-assessed participation and neither introjected nor external regulation (Wininger 2007; Sebire et al., 2011; Standage et al., 2008). In Wininger (2007), mentioned above, introjected regulation ( $r = -.05, p = .74$ ) and external regulation ( $r = -.25, p = .07$ ) showed no significant relationship with distance walked on the treadmill.

Similar results were found in an investigation of motivation and exercise behavior by Standage, et al. (2008). After data analysis, introjected and external regulation showed no relationship with sufficient engagement of moderate intensity physical activity, while SDT proposes more controlled types of motivation to be a hindrance to exercise participation. These findings are similar to previous research that relied on self-report exercise participation data (Ingledeew et al., 2009; Lewis & Sutton, 2011; Peddle et al., 2008; Wilson et al., 2006). Although the accelerometers measured exercise time objectively, researchers were uncertain whether the sections of time measured were

always that of purposeful exercise as opposed to general physical activity (Standage et al., 2008). In a similar study, the controlled extrinsic motivations also showed no relationship with exercise time measured via accelerometers (Sebire et al., 2011). Research with objective observers of the exercise time of the participants could be beneficial in ensuring accuracy of exercise behavior and participation. In short, the findings did not support the SDT's proposition that exercise participation and both introjected and external regulation were related, and researchers suggested that exercise participations would not be affected by high or low levels of introjected or external regulation.

In one study, however, external regulation was found to have a perceived positive relationship with exercise participation (Podlog & Dionigi, 2009). Unlike the previous studies and using a qualitative design, Podlog and Dionigi (2009) proposed a relationship between external regulation and exercise participation. Ten factory workers (9 males) were interviewed as a group to explore the perceived factors that affected their participation to a 7-week worksite wellness exercise program. The researchers discussed the factors affecting participation from the SDT perspective of need fulfillment. In regard to external regulation, participants said that feeling an obligation to other group members and the trainer motivated them to attend more frequently in order to avoid "letting others down" by missing exercise days. This positive association between feelings of social judgment and participation suggests that external regulation could be associated with increased participation. This is interesting given that SDT states that external regulation is a controlled motivational regulation that is associated with reductions in exercise participation (Craike, 2008). This study used qualitative assessment which prevents the

determination of a statistical relationship between the variables of interest. The results of this study nevertheless, suggest that external regulation within a worksite wellness program may have a significant impact on exercise participation. This conflicting evidence warrants further investigation of the relationship between external regulation and program participation within an exercise program, such as worksite wellness or group exercise.

A limited amount of research regarding the relationship between controlled extrinsic motivation and objectively-assessed exercise participation exists. Of the limited research of this relationship, no studies have been able to validate the SDT-proposed relationship between exercise participation and either introjected or external regulation. Further research should be conducted to explain the effect of the controlled extrinsic motivations on exercise participation within an exercise program where participation or attendance can be objectively assessed.

**Amotivation.** Of the studies included for review, only one measured the relationship between amotivation and exercise participation (Wininger, 2007). In this study, amotivation was found to be negatively correlated with distance walked on a treadmill ( $r = -.31, p = .02$ ). This findings are consistent with SDT and many other studies that assessed exercise behavior and participation (Daley & Duda, 2006; Markland, 2009; Peddle et al., 2008). However to our knowledge, there has been only one study conducted concerning amotivation, and more research should be done to determine the relationship between amotivation and objectively-assessed exercise participation. In fact, a noted limitation of Standage et al. (2008) was the omittance of measuring amotivation and suggested that further research is needed to determine if the

relationship between amotivation and objectively-assessed exercise participation supports SDT.

### **Basic Psychological Needs**

The CET proposes that satisfaction of the three basic psychological needs (i.e., autonomy, competence, and relatedness) should result in higher ratings of intrinsic motivation and self-determined motivational regulations, which should then result in enhanced exercise participation. Though this has been evidenced by studies that measured exercise participation via self-report (Barbeau, Sweet, & Fortier, 2009; Peddle et al., 2008), results vary considerably for autonomy and relatedness across studies using objectively-assessed exercise participation (Dyrlund & Wininger, 2006; Edmunds et al., 2008; Levy et al., 2008; Podlog & Dionigi, 2009). This section reviews the inconsistent findings of studies that have explored the associations between each of the basic psychological needs and type of motivation along with the implications for exercise participation. See Table 2 for a summary of the research reviewed below.

**Competence.** In previous research (Edmunds et al., 2006; Edmunds et al., 2008; McDonough et al., 2007; Milne et al., 2008; Puente & Anshel, 2010; Vlachopoulos & Michailidou, 2006), a high level of competence was shown to be important when participation was measured by self-report survey. Furthermore, in one study, competence was reported to positively impact exercise participation in particular (Podlog & Dionigi, 2009). Competence was determined by the participants of the worksite wellness program to be a crucial factor in increasing attendance stating a sense of fulfillment from learning new physical skills and body movements caused them to attend more classes. The participants also stated that improvements in competence of the movement patterns of the

exercises were “a direct consequence of the trainer’s proficiency, knowledge, and enthusiasm” (Podlog & Dionigi, 2009 p. 782). This suggests that participants may show greater participation in an exercise program as they feel increasingly competent and those increases in competence could very well be dependent upon the competence of the exercise instructor. This suggests a need to investigate the effect of the competence of the instructor on the increases in competence over time of the exerciser.

Dyrlund and Wininger (2006) showed support for CET in regard to competence in a study measuring need satisfaction and objectively-assessed exercise participation. In this investigation, 189 undergraduate students who participated in not-for-credit exercise classes at the university fitness center with attendance tracked via sign-in sheets. The participants completed questionnaires designed to assess need satisfaction within an exercise setting. Competence was found to account for 6% of the variance in exercise participation. This positive relationship follows the theoretical propositions of CET and suggests that increases in competence could lead to increases in frequency of exercise participation.

In the only experimental study measuring competence and objectively-assessed exercise participation (Edmunds et al., 2008), an inconsistency emerged regarding the effect of increased competence on motivational regulations. Based on theory, in the study by Edmunds et al. (2008), it was expected that SDT-based instruction group would show greater increases in satisfaction of autonomy, competence, and relatedness, as well as a shift toward intrinsic motivation and more self-determined motivational regulations (i.e., integrated regulation and identified regulation). This expectation was only partially met with the intervention group showing larger increases in competence than the control

group, as no changes in motivational regulations were observed. According to CET, the fulfillment of psychological needs should enhance internalized motivational regulations. While the increased ratings of competence were accompanied by significantly higher attendance in exercise classes, the increased rating of competence were not accompanied by increased ratings of intrinsic motivation, which conflicts with CET.

**Autonomy.** Research on the relationship between the basic need of autonomy and self-report exercise participation has been reported with one reporting a positive relationship (Levy & Cardinal, 2004), one reporting a negative relationship (McDonough et al., 2007) and others reporting no relationship (Edmunds et al., 2006; Edmunds et al., 2007; Vlachopoulos & Michailidou, 2006). In the three studies measuring autonomy and objective exercise participation (Dyrlund & Wininger, 2006; Levy et al., 2008; Podlog & Dionigi, 2009), the results are mixed as well.

For instance, Dyrlund & Wininger (2006) found autonomy to account for no variance in exercise participation as well as no variance in exercise enjoyment (e.g., intrinsic motivation). However, the non-significance of autonomy with both intrinsic motivation and exercise participation is most likely due to low scale reliability.

Conversely, in a prospective design, Levy et al. (2008) tracked the participation of 70 male and female participants with tendonitis injuries requiring attendance to an eight to 10 week rehabilitation program. Autonomy was measured via the Health Care Climate Questionnaire and participation was measured via attendance of rehabilitation sessions (calculated by dividing the number of rehabilitation sessions attended by the number of prescribed rehabilitation visits), SIRAS of rating of participation during appointments, and self-report measure of home rehabilitation participation. In agreement with SDT, it

was determined that high ratings of autonomy led to better in-session participation and attendance of appointments among the participants with high ratings of autonomy. These results show full support of the relationship predicted by CET. However, in a more recent study, the opposite was shown to occur (Podlog & Dionigi, 2009).

The participants of a worksite wellness program reported that certain factors that reduced the degree of autonomy they experienced actually enhanced program attendance (Podlog & Dionigi, 2009). Participants said that feeling an obligation to other group members and the trainer motivated them to attend more frequently in order to avoid “letting others down” or “receiving a hard time” for missing exercise days. These findings suggest that after participants join the exercise program by their own volition, reductions in autonomy may be effective in increasing participation. CET suggests that reductions in autonomy are said to reduce the levels of intrinsic motivation and self-determined regulations, which should reduce participation to an exercise program. This conflicting evidence warrants further investigation of the relationship between autonomy and program participation within a worksite wellness program.

**Relatedness.** The majority of previous studies investigating the relationship between relatedness and factors associated with enhancing self-report exercise participation showed no association between the two variables (Edmunds et al., 2006; Edmunds et al., 2007; Levy & Cardinal, 2004; McDonough et al., 2007; Vlachopoulos & Michailidou, 2006). Relatedness is a basic psychological need said to increase positive behavioral regulations when satisfied (Deci & Ryan, 1985), but in the two studies using objectively-assessed exercise participation, results conflicted with each other and CET (Dyrlund & Wininger, 2006; Edmunds et al., 2008). In a qualitative study, Podlog and

Dionigi (2009) used participant panel discussions to qualitatively assess the possible influence of relatedness need fulfillment on exercise participation with findings indicating a positive association exists.

In participant panel discussions, relatedness factors described by the factory workers in Podlog & Dionigi (2009) consisted of the development of friendships, the sharing of tangible and emotional help, and “friendly competition” among other participants in the exercise class. An additional factor that “thwarted” fulfillment of relatedness was lack of support from the participant’s family. This study determined that experiencing a sense of camaraderie and social connectedness through coworker interactions, providing emotional support, and assisting one another in performing exercises are key sources of relatedness need fulfillment and exercise participation. Further investigation is needed to establish if relatedness has any effect on exercise behavior, specifically regular participation.

Dyrlund and Wininger (2006) found evidence in opposition to CET. In a surprising result, relatedness was actually found to be a negative predictor of exercise participation ( $\beta = -.24, p = .001$ ). However, in this study, only two items were used to assess relatedness resulting in low scale reliability ( $\alpha = .57$ ). Due to this limitation, the authors stated that the implications of this finding are questionable. Though the relationship between relatedness and exercise participation opposed the speculated SDT-based relationship, CET was shown support in that relatedness was found to be positively related to exercise enjoyment (e.g., intrinsic motivation) and account for 21% of the variance in this construct. However, as stated earlier, the low reliability of the relatedness scale makes this result limited at best.

Similar to the results discussed earlier in this review, Edmunds et al. (2008) found that an experimental group elicited increased ratings of relatedness throughout a group exercise program. This group did show higher ratings of relatedness than the control group and attended significantly more classes than the control group. However, after statistical analysis, results showed that increased relatedness ratings had no effect on intrinsic motivation. According to CET, increased relatedness should result in higher ratings of intrinsic motivation, which did not occur. The results of this study show that relatedness can be positively associated with exercise participation but may have no effect on intrinsic motivation. Further research is needed to determine if relatedness has an effect on motivational regulations for exercise.

### **Conclusions**

Based on the limited amount of research on motivational regulations, basic psychological need fulfillment, and objectively-assessed exercise participation, only partial support for the relationships purported by SDT and CET exists. Consistent with SDT, intrinsic motivation has been shown to have a positive relationship with exercise participation via self-report and objective assessment. Due to its similarity to intrinsic motivation, integrated regulation has not been investigated thoroughly enough to confirm or dispute its proposed theoretical relationship with exercise participation. Further research needs to be conducted in order to develop appropriate, reliable scales to measure integrated regulation. The true discrepancies with STD lie within the proposed relationships between exercise participation when measured objectively and identified, introjected, and external regulation, with the majority of studies showing no relationship between these three types of motivation and objectively-assessed exercise participation.

In light of these mixed findings, there is a need for further investigation of the relationship between each of these regulations and objectively-assessed exercise participation.

The relationship between need fulfillment and type of motivation also requires further investigation due to inconsistencies in the research involving CET and exercise participation. Fulfillment of competence has been shown to have a positive relationship with intrinsic motivation and integrated regulation. However, research has not consistently shown a positive association between internalized motivation (i.e., intrinsic motivation and integrated regulation) and autonomy or relatedness. Future studies need to consider the limitations of previous studies by testing larger sample sizes with more diversity (i.e., males and females ranging in age), objectively assessing the exercise sessions, tracking changes in motives of participants throughout an exercise program, and looking at possible mediators of these relationships.

Results from this review indicate a need for further investigation of the relationship between motivational regulations and exercise participation within exercise programs in which participation can be objectively assessed. In addition, further research is needed to determine the relationship between the three basic psychological needs and the motivational regulations that influence objectively-assessed exercise participation. A further understanding of these relationships can then serve as the framework for establishing strategies designed to fulfill the basic needs that are likely to increase the type of motivation that is likely to guide the engagement of a positive behavior.

Table 1.  
*Description of Reviewed Studies on Motivation*

Reference	Sample	Relationships with objectively-assessed exercise participation						
		N	IM	INT	ID	INTRO	EX	AMOT
Ryan et al., 1997a	40	+	nm	∅	∅	nm	nm	nm
Ryan et al., 1997b	155	+	nm	∅	∅	nm	nm	nm
Standage et al., 2008	52	+	nm	nm	∅	∅	∅	nm
Sebire et al., 2011	101	+	nm	+	∅	∅	∅	nm
Wininger, 2007	58	+	∅	∅	∅	∅	∅	-

*Legend:* IM, intrinsic motivation; INT, integrated regulation; ID, identified regulation;

INTRO, introjected regulation; EX, external regulation; AMOT, amotivation; (+),

positive associations, (-), negative associations; ∅, no association; nm, not measured.

Table 2.  
*Description of Reviewed Studies on Basic Needs*

Reference	Sample n	Relationships with objectively-assessed exercise participation		
		Autonomy	Competence	Relatedness
Dyrlund & Wininger, 2006	189	∅	+	-
Edmunds et al., 2008	56	+	+	+
Levy et al., 2008	70	+	nm	nm
Podlog & Dionigi, 2009	10	-	+	∅

*Legend:* (+), positive associations, (-), negative associations; ∅, no association; nm, not measured.

## References

- Adabonyan, I., Loustalot, F., Kruger, J., Carlson, S., & Fulton, J. (2010). Prevalence of highly active adults--Behavioral Risk Factor Surveillance System, 2007. *Preventive Medicine, 51*(2), 139-143.
- Barbeau, A., Sweet, S. N., & Fortier, M. (2009). A path-analytic model of self-determination theory in a physical activity context. *Journal Of Applied Biobehavioral Research, 14*(3), 103-118.
- Berlyne, D. E. (1967). Arousal and reinforcement. *Nebraska Symposium on Motivation, 15* 1-10.
- Brown, D., Brown, D., Heath, G., Balluz, L., Giles, W., Ford, E., & Mokdad, A. (2004). Associations between physical activity dose and health-related quality of life. *Medicine & Science in Sports & Exercise, 36*(5), 890-896.
- Carlson, S., Fulton, J., Galuska, D., Kruger, J., Lobelo, F., & Loustalot, F. (2008). Prevalence of self-reported physically active adults --- United States, 2007. *MMWR: Morbidity & Mortality Weekly Report, 57*(48), 1297-1300.
- Chatzisarantis, N. D., Hagger, M. S., Biddle, S. H., Smith, B. B., & Wang, J. K. (2003). A meta-analysis of perceived locus of causality in exercise, sport, and physical education contexts. *Journal Of Sport & Exercise Psychology, 25*(3), 284-306.
- Comana, F. (2012). The Energy Balance Equation. *IDEA Fitness Journal, 9*(3), 34-43.
- Craike, M. J. (2008). Application of Self-Determination Theory to a Study of the Determinants of Regular Participation in Leisure-Time Physical Activity. *World Leisure Journal, 50*(1), 58-69.

- Daley, A. J., & Duda, J. L. (2006). Self-determination, stage of readiness to change for exercise, and frequency of physical activity in young people. *European Journal of Sport Science*, 6(4), 231-243.
- Deci, E. L. (1975). *Intrinsic motivation*. New York, NY US: Plenum Press.
- Deci, E., & Ryan, R. (1985). *Intrinsic Motivation and Self-determination in Human Behavior*. New York: Plenum Publishing Co.
- Duncan, L. R., Hall, C. R., Wilson, P. M., & Jenny, O. O. (2010). Exercise motivation: a cross-sectional analysis examining its relationships with frequency, intensity, and duration of exercise. *International Journal of Behavioral Nutrition & Physical Activity*, 77-15.
- Dyrlund, A. K., & Wininger, S. R. (2006). An evaluation of barrier efficacy and cognitive evaluation theory as predictors of exercise attendance. *Journal Of Applied Biobehavioral Research*, 11(3-4), 133-146.
- Edmunds, J., Ntoumanis, N., & Duda, J. L. (2006). A Test of Self-Determination Theory in the Exercise Domain. *Journal Of Applied Social Psychology*, 36(9), 2240-2265.
- Edmunds, J., Ntoumanis, N., & Duda, J. L. (2007). Adherence and well-being in overweight and obese patients referred to an exercise on prescription scheme: A self-determination theory perspective. *Psychology of Sport & Exercise*, 8(5), 722-741.
- Edmunds, J., Ntoumanis, N., & Duda, J. (2008). Testing a self-determination theory-based teaching style intervention in the exercise domain. *European Journal Of Social Psychology*, 38(2), 375-388.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford University Press.

- Flegal, K., Carroll, M., Kit, B., & Ogden, C. (2012). Prevalence of obesity and trends in the distribution of body mass index among US adults. 1999-2010. *JAMA: The Journal of the American Medical Association*, 307 (5), 491-497.
- Glasser, W. (1984). *Control theory: a new explanation of how we control our lives*. Harper and Row, New York.
- Goudas, M., Biddle, S., Fox, K., & Underwood, M. (1995). It ain't what you do, it's the way you do it. Teaching style affects children's motivation in track and field lessons. *Sport Psychologist*, 9(3), 254-264.
- Ingledeew, D. K., Markland, D., & Ferguson, E. (2009). Three levels of exercise motivation. *Applied Psychology: Health & Well-Being*, 1(3), 336-355.
- Knowler, W. C., Barrett-Connor, E. E., Fowler, S. E., Hamman, R. F., Lachin, J. M., Walker, E. A., & Nathan, D. M. (2002). Reduction in incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine*, 346(6), 393-403.
- Lepper, M. R., Greene, D., & Nisbett, R. E. (1996). Undermining children's intrinsic interest with external reward: A test of the 'Overjustification' hypothesis. In S. Fein, S. Spencer (Eds.), *Readings in social psychology: The art and science of research* (pp. 10-18). Boston, MA US: Houghton, Mifflin and Company.
- Levy, S., & Cardinal, B. (2004). Effects of a self-determination theory-based mail-mediated intervention on adults' exercise behavior. *American Journal of Health Promotion*, 18(5), 345-349.

- Levy, A. R., Polman, R. J., & Borkoles, E. (2008). Examining the relationship between perceived autonomy support and age in the context of rehabilitation participation in sport. *Rehabilitation Psychology, 53*(2), 224-230.
- Lewis, M., & Sutton, A. (2011). Understanding exercise behavior: examining the interaction of exercise motivation and personality in predicting exercise frequency. *Journal of Sport Behavior, 34*(1), 82-97.
- Markland, D. (2009). The mediating role of behavioral regulations in the relationship between perceived body size discrepancies and physical activity among adult women. *Hellenic Journal of Psychology, 6*(2), 169-182.
- Matosic, D., Cox, A. E., & Amorose, A. J. (2013). Scholarship status, controlling coaching behavior, and intrinsic motivation in collegiate swimmers: a test of cognitive evaluation theory. *Sport, Exercise, and Performance Psychology*. Advanced online publication.
- McClelland, D. C. (1967). *The achieving society*. New York, NY US: Free Press.
- McDonough, M. H., & Crocker, P. 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*(5), 645-663.
- Milne, H. M., Wallman, K. E., Guilfoyle, A., Gordon, S., & Courneya, K. S. (2008). Self-determination theory and physical activity among breast cancer survivors. *Journal of Sport & Exercise Psychology, 30*(1), 23-38.

- Moustaka, F. C., Vlachopoulos, S. P., Kabitsis, C., & Theodorakis, Y. (2012). Effects of an autonomy-supportive exercise instructing style on exercise motivation, psychological well-being, and exercise attendance in middle-age women. *Journal Of Physical Activity & Health*, 9(1), 138-150.
- Navalpotro, L., Regidor, E., Ortega, P., Martinez, D., Villanueva, R., & Astasio, P. (2012). Area-based socioeconomic environment, obesity risk behaviours, area facilities and childhood overweight and obesity: Socioeconomic environment and childhood overweight. *Preventive Medicine*, 55(2), 102-107.
- Nunez, J., Martin-Albo, J., Paredes, A., Rodriguez, O., & Chipana, N. (2011). The mediating role of perceived competence: testing a motivational sequence in university students. *Universitas Psychologica*, 10(3), 669-680.
- Paulhus, D. L. (1991). Measurement and control of response bias. In J. P. Robinson, P. R. Shaver, L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (pp. 17-59). San Diego, CA US: Academic Press.
- Peddle, C., Plotnikoff, R., Wild, T., Au, H., & Courneya, K. (2008). Medical, demographic, and psychosocial correlates of exercise in colorectal cancer survivors: an application of self-determination theory. *Supportive Care In Cancer*, 16(1), 9-17.
- Podlog, L., & Dionigi, R. A. (2009). Psychological Need Fulfillment among Workers in an Exercise Intervention: A Qualitative Investigation. *Research Quarterly For Exercise And Sport*, 80(4), 774-787.

- Puente, R., & Anshel, M. (2010). Exercisers' perceptions of their fitness instructor's interacting style, perceived competence, and autonomy as a function of self-determined regulation to exercise, enjoyment, affect, and exercise frequency. *Scandinavian Journal of Psychology, 51*(1), 38-45.
- Reeve, J., Deci, E. (1996). Elements if the competitive situation that affect intrinsic motivation. *Personality & Social Psychology Bulletin, 22*, 24-33.
- Richardson, C., Kriska, A., Lantz, P., & Hayward, R. (2004). Physical activity and mortality across cardiovascular disease risk groups. *Medicine & Science in Sports & Exercise, 36*(11), 1923-1929.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68-78.
- Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination theory: An organismic-dialectical perspective. In E. L. Deci, R. M. Ryan (Eds.) , *Handbook of self-determination research* (pp. 3-33). Rochester, NY US: University of Rochester Press.
- Ryan, R. M., Frederick, C. M., Lepas, D. D., Rubio, N. N., & Sheldon, K. M. (1997). Intrinsic motivation and exercise participation. *International Journal of Sport Psychology, 28*(4), 335-354.
- Ryan, R. M., Williams, G. C., Patrick, H., & Deci, E. L. (2009). Self-determination theory and physical activity: The dynamics of motivation in development and wellness. *Hellenic Journal of Psychology, 6*(2), 107-124.

- Sebire, S. J., Standage, M., & Vansteenkiste, M. (2011). Predicting objectively-assessed physical activity from the content and regulation of exercise goals: Evidence for a mediational model. *Journal of Sport & Exercise Psychology, 33*(2), 175-197.
- Standage, M., Sebire, S. J., & Loney, T. (2008). Does Exercise Motivation Predict Engagement in Objectively Assessed Bouts of Moderate-intensity Exercise?: A Self-Determination Theory Perspective. *Journal Of Sport & Exercise Psychology, 30*(4), 337-352.
- Teixeira, P. J., Carraça, 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 & Physical Activity, 9*(1), 78-107.
- Tsorbatzoudis, H., Alexandris, K., Zahariadis, P., & Grouios, G. (2006). Examining the relationship between recreational sport participation and intrinsic and extrinsic motivation and amotivation. *Perceptual & Motor Skills, 103*(2), 363-375.
- Vallerand, R. J., & Reid, G. (1984). On the causal effects of perceived competence on intrinsic motivation: a test of cognitive evaluation theory. *Journal of Sport Psychology, 6*(1), 94-102.
- Vlachopoulos, S. P., & Michailidou, S. (2006). Development and initial validation of a measure of autonomy, competence, and relatedness in exercise: The Basic Psychological Needs in Exercise Scale. *Measurement in Physical Education and Exercise Science, 10*(3), 179-201.
- 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., Rodgers, W. M., Fraser, S. N., & Murray, T. C. (2004). Relationships between exercise regulations and motivational consequences in university students. *Research Quarterly for Exercise & Sport*, 75(1), 81-91.
- Wilson, P. M., Rodgers, W. M., Loitz, C. C., & Scime, G. (2006). 'It's Who I Am...Really!' The importance of integrated regulation in exercise contexts. *Journal of Applied Biobehavioral Research*, 11(2), 79-104.
- Wininger, S. R. (2007). Self-determination theory and exercise behavior: An examination of the psychometric properties of the exercise motivation scale. *Journal of Applied Sport Psychology*, 19, 471–486.

## CHAPTER II

### THE MOTIVATIONAL REGULATIONS OF SELF-DETERMINATION THEORY AND OBJECTIVELY-ASSESSED EXERCISE PARTICIPATION AND THE MEDIATING EFFECTS

More than two thirds of adult men and women in the United States are overweight or obese (Flegal, Carroll, Kit, & Ogden, 2012). Considering that obesity is a major risk factor for chronic diseases (e.g., heart disease, stroke, and diabetes), lessening the prevalence of obesity has become a primary focus of public health research and interventions (Brown et al., 2004; Knowler et al., 2002; Richardson, Kriska, Lantz & Hayward, 2004). Regular physical activity has been identified as one of the most important ways of decreasing the likelihood of obesity (Carlson, Fulton, Galuska, Kruger, Lobelo, & Loustalot, 2008). Despite this, the prevalence of obesity continues to rise, largely because most individuals engage in insufficient physical activity, including structured exercise (Garber et al., 2011; Tremblay, Colley, Saunders, Healy, & Owen, 2010).

## **Theoretical Framework**

While the reasons one begins and continues exercising over time are vast and complex, motivation appears to play a major role (Deci & Ryan, 1985; Ryan & Deci, 2000; Teixeira, Carraca, Markland, Silva, & Ryan, 2012). One theory commonly cited in the exercise literature as a means for understanding how motivation affects exercise behavior is the Self-Determination Theory (SDT). Briefly, SDT identifies three types of motivation (i.e., intrinsic, extrinsic, and amotivation) that regulate one's behavior (Deci & Ryan, 2000). Unlike intrinsic motivation and amotivation, however, extrinsic motivation consists of four types that fall into two broad categories based on their level of autonomy: self-determined extrinsic motivation (integrated and identified regulation) and controlled extrinsic motivation (introjected and external regulation). Based on the postulates of SDT, intrinsically motivated individuals are likely to exercise regularly because they feel challenged, accomplished, and/or enjoyment when exercising. Externally motivated persons, on the other hand, tend to participate in exercise simply because exercise has been incorporated into their concept of self (i.e., integrated regulation), to improve health or physical appearance (i.e., identified regulation), avoid feelings of guilt or shame (i.e., introjected regulation), and/or receive compliments in social interaction (i.e., external regulation). Amotivated persons are not likely to exercise because they are not interested in exercise or do not value any benefits of exercise. Theoretically, exercise participation is positively impacted by intrinsic and self-determined extrinsic motivation (i.e., integrated regulation and identified regulation), and negatively impacted by controlled-extrinsic motivation (i.e., introjected regulation and external regulation) and amotivation (Deci & Ryan, 1985; Ryan & Deci, 2000).

Research, however, has only partially confirmed the validity of SDT with regard to exercise participation. Though positive relationships have been consistently observed between exercise participation and intrinsic motivation (Edmunds, Ntoumanis, & Duda, 2006; Edmunds, Ntoumanis, & Duda, 2008; Ingledew, Markland, & Ferguson, 2009; Markland, 2009; Milne, Wallman, Guilfoyle, Gordon, & Courneya, 2008; Ryan, Frederick, Lepas, Rubio, & Sheldon, 1997; Sebire, Standage, & Vansteenkiste, 2011; Standage, Sebire, & Loney, 2008; Tsorbatzoudis, Alexandris, Zahariadis, & Grouios, 2006), integrated regulation (Duncan, Hall, Wilson, & Jenny, 2010; Edmunds, Ntoumanis, & Duda, 2007; Wilson, Rodgers, Loitz, & Scime, 2006), and identified regulation (Edmunds et al., 2006; Ingledew et al., 2009; Markland, 2009; Milne et al., 2008; Peddle, Plotnikoff, Wild, Au, & Courneya, 2008; Sebire et al., 2011), negative relationships between exercise participation and controlled extrinsic motivation (i.e., introjected regulation and external regulation) have not been consistently observed (Ingledew et al., 2009; Lewis & Sutton, 2011; Peddle et al., 2008; Sebire et al., 2011; Standage et al., 2008; Wilson et al., 2006; Wininger, 2007). In support of the theoretical postulates, research has clearly shown that both intrinsic motivation and self-determined extrinsic motivation impact exercise participation. Conversely, research has been unable to confirm whether controlled extrinsic motivation has any influence on exercise participation.

If intrinsic motivation and self-determined extrinsic motivation promote exercise participation, then understanding the conditions that influence these motivations may prove beneficial in fostering them. Toward that end, the Cognitive Evaluation Theory (CET), a subtheory of SDT, proposes that both intrinsic motivation (Deci & Ryan, 1985)

and self-determined extrinsic motivation (Ryan & Deci, 2000) are enhanced by the satisfaction of three basic psychological needs: autonomy (the quality or state of being self-governed), competence (the capacity to function or develop in a particular way), and relatedness (a feeling of meaningful connection to others in one's social environment). However, research has yet to fully validate these theoretical relationships. For example, while studies have shown that intrinsic motivation is clearly and consistently related to competence (Deci & Olson, 1989; Goudas, Biddle, Fox, & Underwood, 1995; Matosic, Cox, & Amorose, 2013; Philips & Lord, 1980), results are inconsistent with regard to the relationship(s) between intrinsic motivation and either autonomy or relatedness (Goudas et al., 1995; Matosic et al., 2013). In similar, though limited research, self-determined extrinsic motivation has shown to be associated with competence and autonomy, but not relatedness (Edmunds et al., 2008).

Given the theoretical relationships proposed by SDT between motivation and both exercise behavior and needs satisfaction, it is logical then to assume that need satisfaction is related to exercise behavior. In other words, satisfying one or more basic needs could positively impact motivation, resulting in a greater likelihood for exercise participation (Edmunds et al, 2006). This is partially supported by research, which has shown that competence is positively related to exercise participation (Barbeau, Sweet, & Fortier, 2009; Edmunds et al., 2006; Markland and Tobin, 2010; McDonough & Crocker, 2007; Peddle et al., 2008; Russell & Bray, 2009; Vlachopoulos & Michalidou, 2006). However, these same studies have been unable to verify whether a positive relationship exists between exercise participation and either autonomy or relatedness.

### **Statement of Problem**

Based on the theoretical postulates presented above, and supported to a limited extent by research, relationships exist among motivation, exercise behavior, and need satisfaction in that: 1) intrinsic motivation and self-determined extrinsic motivation are related to exercise participation; 2) intrinsic motivation and self-determined extrinsic motivation are related to satisfaction of the three basic needs; and 3) the satisfaction of the three basic needs are related to exercise participation. The relationship between need satisfaction and exercise participation may be more complex and mediated by other variables, such as motivation. Given that need satisfaction is related to intrinsic motivation and self-determined extrinsic motivation and these motivations are related to exercise participation, then the relationship between need satisfaction and exercise participation may be explained by the mediating effects of motivation. Within these relationships, motivation is a common variable that inherently suggests that there is a mediating effect provided by motivation, in that the satisfaction of a need results in the occurrence/increase in motivation, resulting in exercise behavior. However, research on the mediating potential of motivation is very limited and, at times, inadequate.

The discrepancies between the SDT-based postulates and research findings may be due, at least in part, to the method(s) used in measuring exercise participation (i.e., self-report versus objective assessments). For example, research results have consistently shown a positive relationship between exercise participation and identified regulation when self-report measures are used (Edmunds et al., 2006; Ingledew et al., 2009; Markland, 2009; Milne et al., 2008; Tsorbatzoudis et al., 2006), but have been limited and mixed showing a positive association (Sebire et al., 2011) and no association (Ryan

et al., 1997; Wininger, 2007) when objective measures are used. Research results have also revealed a negative relationship between exercise participation and controlled motivation (introjected and external regulation) when self-report measures are used (Murcia, Gimeno, & Camacho, 2007), but have been mixed when objective measures are used (Podlog & Dionigi, 2009; Sebire et al., 2011; Standage et al., 2008; Wininger, 2007). Finally, though it is commonly asserted that amotivation interferes with exercise participation (Ryan, Williams, Patrick, & Deci, 2009), only one study, to my knowledge, has confirmed this, specifically with regard to the association between amotivation and objectively-measured exercise participation (Wininger, 2007). Due to the differences in methodologies implemented (e.g., self-report vs. objective measures of exercise participation) in studies investigating the aforementioned SDT-based postulates, any clear, consistent understanding of the relationships among exercise participation, need satisfaction, and motivation is limited, at best. While the majority of research has utilized self-report measures of exercise participation and has verified most of these relationships (Edmunds et al., 2006; Ingledew et al., 2009; Markland, 2009; Milne et al., 2008; Murcia et al., 2007; Tsorbatzoudis et al., 2006), studies using objective measures of exercise participation are limited and have reported discordant results (Dyrlund & Wininger, 2006; Edmunds et al., 2008; Podlog & Dionigi, 2009; Ryan et al., 1997; Sebire et al., 2011; Standage et al., 2008; Wininger, 2007). The discrepancies between theory and research are summarized in Figure 1.

Based on the differences between the theoretical postulates of SDT and the research findings, the first aim of the current study was to investigate the relationships between objectively-assessed exercise participation and the controlled extrinsic

motivations as well as amotivation. In light of the previous findings, the hypotheses were as follows:

H1. Introjected regulation and exercise participation are not related.

H2. External Regulation and exercise participation are not related.

H3. Amotivation and exercise participation are negatively related.

The research regarding the relationships between exercise participation and basic need satisfaction has been inconsistent and at times, in conflict with the theoretical postulates of SDT and CET. Additionally, research investigating the possible mediating effects of intrinsic motivation and identified regulation on the relationships between need satisfaction and exercise participation. Therefore, the second aim of the current study was to investigate the possible mediating effects of intrinsic motivation and identified regulation on the relationship between satisfaction of each of the basic needs and objectively-assessed exercise participation. Thus, based on the theoretical postulates of SDT and CET, the hypotheses regarding mediation are as follows:

H4. The relationship between autonomy and exercise participation is mediated by intrinsic motivation.

H5. The relationship between competence and exercise participation is mediated by intrinsic motivation.

H6. The relationship between relatedness and exercise participation is mediated by intrinsic motivation.

H7. The relationship between autonomy and exercise participation is mediated by identified regulation.

H8. The relationship between competence and exercise participation is mediated by identified regulation.

H9. The relationship between relatedness and exercise participation is mediated by identified regulation.

A further understanding of the relationships between objectively-assessed exercise participation and both controlled extrinsic motivation and need satisfaction, as well as the mediating effects of intrinsic motivation and identified regulation, can serve as the framework for establishing effective strategies designed to fulfill the basic needs, which in turn could increase intrinsic motivation and identified regulation in order to promote exercise participation.

## **Methods**

### **Participants**

Participants were teachers, administrators, and staff employees recruited from a Worksite Wellness program offered by a school district located in Central Texas. At the time, the school district employed approximately 1100 employees, of these 194 were enrolled in the Worksite Wellness program. The program was offered at 9 of the districts' campuses, the district office, and the transportation services facility and consisted of periodic fitness assessments, monthly education classes, and weekly exercise classes (2 per week at 10 sites and 4 per week at the transportation services facility to accommodate for varied shift times). Registration for the Worksite Wellness Program was optional with a total cost of \$100 for four months of group exercise classes consisting of circuit-training, Zumba<sup>®</sup>, cardio-resistance training (hi and low impact aerobics and kick boxing), walking, and yoga. Each 45-minute class was taught by certified exercise instructors and took place in the respective school gymnasiums directly after completion

of the work day. All participants completed a health history questionnaire prior to taking exercise classes. Participants considered to be at high risk were advised to seek physician approval prior to participation, while they also had the option to participate without physician approval by signing a waiver form. Full reimbursement of the \$100 membership fee was given to those participants who attended 28 exercise classes (approximately 2 classes per week) and took no more than 2 personal days off from work over the course of the 4-month Worksite Wellness program.

Although 194 subjects registered for the exercise program, only 162 provided complete and useable data. Thus, the 32 subjects who failed to provide such data were compared to the 162 who did on as many characteristics as possible for which data were provided. This attrition analysis relied on t-tests for continuous variables (i.e., age, blood pressure, resting heart rate, BMI, and number of cardiovascular disease risk factors) and chi-square tests for categorical variables (i.e., gender and cardiovascular disease risk status). All t-tests were non-significant and only one chi-square test was significant (Pearson chi-square = 4.08,  $p < .05$ ) indicating that men were more likely to drop out of the study than women. See Table 1 for demographic data.

### **Measures**

**Autonomy.** The Locus of Causality for Exercise Scale (Markland & Hardy, 1997) was used to assess autonomy. Three items assessed the extent to which an individual exercises out of choice rather than because they feel that they have to exercise (I exercise because I like to rather than because I feel I have to; Exercising is not necessarily something I would choose to do, rather it is something I feel I have to do; Having to exercise is a bit of a bind but it has to be done). Responses were scored on a 7-point

Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). The scale has been used to assess autonomy for exercise in a number of studies (e.g., Edmunds et al., 2007; Markland, 1999; Markland & Hardy, 1997). Cronbach's alpha for scores on this scale in the current study was .67.

**Competence.** The competence subscale of the Basic Psychological Needs in Exercise Scale (Vlachopoulos & Michailidou, 2006) was used to assess competence in exercise settings. The subscale consisted of 4 items (e.g., I feel that I execute very effectively the exercises of my training program) with responses scored on a 7-point Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Cronbach's alpha in this study was .71.

**Relatedness.** A relatedness questionnaire by Markland and Tobin (2010) was used to assess relatedness in exercise settings and was comprised of 8 items (e.g., "In exercise situations, I feel different from everybody else") Responses were scored on a 7-point Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Cronbach's alpha in the current study was .81.

**Motivational regulations.** The Behavioral Regulation in Exercise Questionnaire-2 (Markland & Tobin, 2004) was used to assess behavioral regulations in exercise and was completed by all participants prior to the start of the Worksite Wellness program. The scale is comprised of five subscales: Introjected regulation with 3 items (e.g., "I feel guilty when I don't exercise"), external regulation with 4 items (e.g., "I exercise because other people say I should"), amotivation with 4 items (e.g., "I don't see why I should have to exercise"), intrinsic motivation with 4 items (e.g., "I exercise because it's fun"), and identified regulation with 4 items (e.g., "I value the benefits of exercise"). Responses

were provided on a 7-point Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Cronbach  $\alpha$  values of internal consistency reliability for the BREQ-2 subscales were .68, .78, .69, .89, and .62, respectively.

**Attendance.** The criterion was attendance via a weekly register of attendance collected by the exercise instructor. Participants were required to sign-in upon arriving for the exercise class.

## Results

The hypotheses were tested using linear regression. Autonomy, competence, relatedness, introjected regulation, external regulation, and amotivation were used as predictors of the criterion of exercise participation. When the regression model resulted in a statistically significant omnibus F-score the beta weights were examined as tests of the hypotheses. For the variables whose relationship with exercise participation were hypothesized to be mediated by intrinsic motivation and identified regulation, Baron and Kenny's (1986) regression-based tests for mediation were used.

Baron and Kenny (1986) propose a four step procedure for regression-based tests for mediation. The steps are: (step 1) establish that a relationship exists to be mediated by regressing the criterion on all predictors and those non-significant predictors drop out of further study, (step 2) regress the mediator on all remaining significant predictors, (steps 3 and 4) regress the criterion on all significant predictors from step one as well as the remaining significant mediators in a hierarchical regression. If steps 1-3 yield significant results, step 4 will convey the extent of mediation as being full (i.e. betas are reduced to statistical non-significance in the presence of the mediators), partial (betas are reduced yet still statistically significant when the mediators are added to the hierarchical

regression), or no mediation (where no relationship exists to be mediated as evidenced in step one).

### **Correlational Results**

Numerous significant bivariate correlations were found between the predictor variables. Autonomy was significantly correlated with competence (.57,  $p < .001$ ), relatedness (.53,  $p < .001$ ), external regulation (-.59,  $p < .001$ ), amotivation (-.29,  $p < .001$ ). Competence was significantly correlated with relatedness (.57,  $p < .001$ ), external regulation (-.42,  $p < .001$ ), and amotivation (-.29,  $p < .001$ ). Relatedness was significantly correlated with the following predictor variables: external regulation (-.39,  $p < .001$ ) and amotivation (-.29,  $p < .001$ ). Introjected regulation was significantly correlated with amotivation (-.16,  $p < .05$ ). External regulation was significantly correlated with amotivation (.38,  $p < .001$ ). Among the mediator variables (intrinsic motivation and identified regulation), significant bivariate correlations existed with predictor variables. Intrinsic motivation was significantly correlated with autonomy (.68,  $p < .001$ ), competence (.69,  $p < .001$ ), relatedness (.62,  $p < .01$ ), external regulation (-.48,  $p < .001$ ), and amotivation (-.49,  $p < .001$ ). Identified regulation was significantly correlated with autonomy (.32,  $p < .001$ ), competence (.42,  $p < .001$ ), relatedness (.40,  $p < .001$ ), introjected regulation (.20,  $p < .05$ ), external regulation (-.30,  $p < .001$ ), and amotivation (-.55,  $p < .001$ ). Lastly, the two mediator variables were correlated with each other (.53,  $p < .001$ ). For the criterion variable (exercise participation), significant bivariate correlations were between autonomy (.29,  $p < .001$ ), competence (.17,  $p < .05$ ), and intrinsic motivation (.18,  $p < .05$ ). None of the correlations in the current study exceeded the limit of .85 set by Klein (2005) to indicate collinearity. See Table 2 for these results.

## Regression Results

In order to examine the relationships between two variables while statistically controlling for the impact of every other predictor variable, multiple regression was used. When the criterion of exercise participation was regressed on all six predictors, the resulting  $F$ -score was 3.91 ( $p < .01$ ). The  $R$ -squared was .13. Given the significant omnibus  $F$ -score, the regression coefficients were examined for statistical significance as tests of the hypotheses. The beta weight associated with introjected regulation was .12 ( $ns$ ) and therefore H1 was supported. The beta weight for external regulation was statistically significant at .19 ( $p < .05$ ), thus H2 was supported. The beta weight associated with amotivation was .11 ( $ns$ ) and therefore H3 was not supported. The beta weight for autonomy was .40 ( $p < .001$ ) and therefore H4 was partially supported and included in the tests for mediation. The beta weight associated with competence was .04 ( $ns$ ) and therefore H5 was not supported. The beta weight associated with relatedness was .04 ( $ns$ ) and therefore H6 was not supported. In total, two of six hypotheses predicting exercise participation were supported. See Table 3 for these results. Of note is that two predictors, whose relationships with the criterion were hypothesized to be mediated, dropped out of further analysis since they exhibited no relationship with the criterion. In sum, only autonomy had a relationship with exercise participation that could be mediated. As a result hypotheses H5, H6, H8, and H9 were not analyzed. This regression model was the first step of Baron and Kenny's (1986) tests for mediation.

In the second step of the test for mediation, simple bivariate regression was used to examine the relationship between autonomy and intrinsic motivation (one of the two mediators in the model). When intrinsic motivation was regressed on autonomy, the

resulting  $F$ -score was 136.93 ( $p < .001$ ). The variance explained in the criterion was 46%. Given the significant omnibus  $F$ -score, the regression coefficient was examined for statistical significance as a test of the hypothesis. The beta weight for autonomy was .68 ( $p < .001$ ) and therefore H4 was open for tests of mediation. See Table 4 for this result.

Since there was a second possible mediator in the model, identified regulation was regressed on autonomy as well. This resulted in an  $F$ -score of 18.62 ( $p < .001$ ). The variance explained in the criterion was 10%. Given the significant omnibus  $F$ -score, the regression coefficient was examined for statistical significance as a test of the hypothesis. The beta weight for autonomy was .32 ( $p < .001$ ) and therefore H7 was open for tests of mediation. See Table 5 for these results.

In order to determine if intrinsic motivation and identified regulation mediated the relationship between autonomy and exercise participation, hierarchical multiple regression was used. These tests are essentially steps three and four of Baron and Kenny's (1986) regression-based tests for mediation and were conducted simultaneously. In Model 1, when the criterion of exercise participation was regressed on autonomy, the resulting  $F$ -score was 15.15 ( $p < .001$ ). The variance explained in the criterion was 9%. Given the significant omnibus  $F$ -score, the regression coefficient for autonomy was examined for statistical significance as a test of the hypothesis. The beta weight for autonomy was .29 ( $p < .001$ ). In order to determine if the relationship between autonomy and exercise participation was mediated by intrinsic motivation and identified regulation, exercise participation was regressed on autonomy with intrinsic motivation and identified regulation added as a block in Model 2. In the full model with all three predictors, the overall  $F$ -score was 5.34 ( $p < .01$ ) and explained 9% of the variance in the criterion.

However, the two mediators added in in the second block of the hierarchical regression were not statistically significant predictors and therefore they do not mediate any relationships in the model, which nullifies H4 and H7. In fact, they added no variance explained to the model vis-a-vis the fact that the *R*-squared remained the same from block one to block two. See Table 6 for these results.

### **Discussion**

The first aim of this study was to clarify whether relationships exist between objectively measured exercise participation and controlled extrinsic motivations, amotivation, relatedness, and autonomy. Among the predictor variables, results revealed that exercise participation was related to only external regulation and autonomy. The second aim of this study was to determine if the relationships between objectively measured exercise participation and basic need satisfaction are mediated by intrinsic motivation and/or identified regulation. Due to the strength of the relationship between autonomy and exercise participation, analysis was then performed to determine whether intrinsic motivation and identified regulation served as mediating factors. This analysis revealed no mediation effect on the established relationship between exercise participation and autonomy.

### **Exercise Participation and Motivation**

Based on SDT, exercise participation is positively associated with both intrinsic motivation and self-determined extrinsic motivation (e.g., identified), and negatively associated with controlled extrinsic motivation (i.e., introjected and external) and amotivation. Previous research utilizing self-report and objective measures of exercise participation has only confirmed the associations between exercise participation and

intrinsic motivation (Edmunds et al., 2006; Edmunds et al., 2008; Ingledew et al., 2009; Markland, 2009; Milne et al., 2008; Ryan et al., 1997; Standage et al., 2008; Tsorbatzoudis et al., 2006; Wininger, 2007). While the research utilizing self-report measures of exercise participation have shown full support for SDT in regard to identified regulation (Edmunds et al., 2006; Ingledew et al., 2009; Markland, 2009; Milne et al., 2008; Peddle et al., 2008), studies investigating the relationship between objectively-assessed exercise participation and identified regulation have shown no relationship (Ryan et al., 1997; Wininger, 2007). Surprisingly, research, using self-report measures or objective assessment, has shown that controlled extrinsic motivations are unrelated to exercise participation rather than negatively related (Ingledew et al., 2009; Lewis & Sutton, 2011; Peddle et al., 2008; Standage et al., 2008; Wilson et al., 2006; Wininger, 2007). Furthermore, only one study has been conducted that explores a possible relationship between exercise participation and amotivation (Wininger, 2007), with results showing that exercise participation is negatively related to amotivation, which supports SDT. In short, the research related exercise participation and both intrinsic motivation and self-determined extrinsic regulations is relatively abundant, yielding results aligned with SDT postulates. Thus, the current study did not explore these relationships. On the other hand, research related to controlled extrinsic motivation conflicts with theoretical postulates, while research on amotivation, though limited, is aligned with SDT postulates. Thus, the current study investigated whether relationships exist between exercise participation and introjected regulations, external regulations, and amotivation. In contrast to SDT (Deci & Ryan, 1985; Ryan & Deci, 2000), but based on previous research (Standage et al., 2008; Wininger, 2007), I hypothesized that exercise

participation would not be related to either controlled extrinsic motivation. The results revealed no relationship between exercise participation and introjected regulation, which are consistent with previous research (Standage et al., 2008; Wininger, 2007), but in conflict with theory, thereby suggesting that introjected regulation may have no effect on exercise participation.

Most significantly and contrary to SDT, previous research, and my hypothesis, results revealed an association between exercise participation and external regulation, suggesting that external regulation may contribute to regular participation in exercise. Recognizing that a possible reason for this unexpected finding could be due to the reimbursement incentive, a post hoc independent t-test was conducted to determine if those individuals who met the minimum reimbursement threshold of 28 classes differed from those who attended less than 28 classes on the measure of external regulation. The groups did not differ significantly,  $t(160) = -.16, p = .87$ , thus ruling out the effect of reimbursement incentives. Nevertheless, results suggest that some other external regulator(s) influenced exercise participation.

Lastly, in contrast to theory and previous research, results of the current study revealed that exercise participation had no relationship with amotivation, suggesting that amotivation has no influence on exercise participation. These results, however, may be due to the low reliability ( $\alpha = .69$ ) of the amotivation scale employed.

### **Basic Needs and Exercise Participation**

Based on SDT, exercise participation is positively associated with intrinsic motivation and identified regulation (Deci & Ryan, 1985), and intrinsic motivation and identified regulation are positively associated with the satisfaction of autonomy,

competence and relatedness (Deci & Ryan, 1985; Ryan & Deci, 2000). Research findings have confirmed strong associations between exercise participation and intrinsic motivation and identified regulation (Edmunds et al., 2006; Ingledew et al., & Ferguson, 2009; Markland, 2009; Milne et al., & Courneya, 2008; Tsorbatzoudis et al., 2006), as well as between competence and both intrinsic motivation and identified regulation (Deci & Olson, 1989; Goudas et al., 1995; Matosic et al., 2013; Philips & Lord, 1980). However, findings have been mixed for relatedness and autonomy (Goudas et al., 1995; Matosic et al., 2013). According to CET, by affecting the type of motivation, the level of fulfillment, thus, indirectly affects exercise participation (Edmunds et al., 2006). Similar to the relationships between need satisfaction and motivation, research has shown partial support for the existence of a positive relationship by confirming that competence is positively related to exercise participation, but has reported discordant findings with regards whether a positive relationship exists between exercise participation and either autonomy or relatedness (Barbeau et al., 2009; Edmunds et al., 2006; Markland and Tobin, 2010; McDonough & Crocker, 2007; Peddle et al., 2008; Russell & Bray, 2009; Vlachopoulos & Michalidou, 2006). Thus, it is likely that if a relationship exists between exercise participation and any of the basic needs, that relationship would be mediated by intrinsic motivation and identified regulation. Therefore, it was hypothesized that a positive relationship would exist between exercise participation and satisfaction of each of the three basic needs and that these relationships would be mediated by both intrinsic motivation and identified regulation. First, a relationship had to be established between exercise participation and autonomy, competence, and relatedness in order to test the mediator hypotheses. In support of these hypotheses, autonomy was confirmed to be the

strongest predictor of exercise participation. Levy, Polman, and Borkoles (2008) showed a similar result regarding adherence to physical rehabilitation sessions. In agreement with CET, this finding suggests that if individuals are given choices or options within an exercise program, they are more likely to attend and participate regularly in exercise classes. Level of competence and relatedness, however, displayed no predictive relationship with exercise participation at all. This was especially unanticipated in regard to competence in that to my knowledge, the only two studies employing objective measures of exercise reported a positive relationship between competence and exercise participation (Dyrlund & Wininger, 2006; Edmunds et al., 2008). An explanation for this unexpected finding lies within the design of the Worksite Wellness program. The classes provided in the program were based on preferences expressed in a pilot study. Because the classes were chosen and designed for a predominantly overweight and obese population, the movements required to participate in the classes did not demand a high skill level. Therefore, if participants provided low ratings of exercise competence, the participation may not have shown a detriment. Conversely, if participants provided high ratings of competence, their participation may not have been enhanced because the classes did not demand a high skill level or familiarity. In regard to relatedness, based on CET, it was expected to have a positive relationship with exercise participation, but no relationship existed. However, the non-significance shown in the current study is not unlike the limited number of studies investigating the proposed relationship which have shown no relationship (Edmunds et al., 2008) and a negative relationship (Dyrlund & Wininger, 2006). The results of the current study conflict with findings in Dyrlund and

Wininger (2006), a similar study, in that they found significance between exercise participation and both competence and relatedness, and no significance with autonomy.

Due to the findings mentioned above, only the relationship between satisfaction of autonomy and exercise participation showed significance for possible mediation. Based on the propositions of SDT and CET, it was hypothesized that the positive relationship between autonomy and exercise participation would be mediated by intrinsic motivation and identified regulation. In other words, the relationship between autonomy and exercise participation only exists because autonomy increases levels of intrinsic motivation and identified regulation. It was determined that autonomy is positively associated with both intrinsic motivation and identified regulation, however, no mediation occurred. These findings still show partial support for CET because autonomy did have a significant relationship with intrinsic motivation and identified regulation. The lack of mediation shown suggests that satisfaction of autonomy alone can enhance participation in an exercise program. The implications of this finding are that instructors of exercise classes should attempt to increase feelings of autonomy by allowing the participants to choose certain aspects of the program or class.

Though few of the hypotheses in this study were supported, there is strength within the method used here. An asset to the study, objective assessment of exercise participation helps ensure a consistent and reliable dependent measure. The majority of studies regarding exercise participation employ questionnaires, which allow for limitations of inaccurate responses and social desirability bias. The present study also showed a unique environment in which to examine motivation to exercise. Worksite wellness programs that include an exercise component, in particular, have been shown to

be effective in controlling the body size and composition of workers, particularly for those employees who participate regularly (Anderson et al., 2009; Benedict & Arterburn, 2008). Unfortunately, among companies with exercise programs, approximately 80% of eligible employees do not participate (Morgan & O'Connor, 1988; Robroek, Van Lenthe, Van Empelen, & Burdorf, 2009; Song, Shephard, & Cox, 1982). Of the 20% who do participate, only half maintain participation (Morgan & O'Connor, 1988; Robroek et al., 2009; Song et al., 1982). Specifically, schools tend to have a large percentage of overweight and/or inactive employees (Webber, Rice, Johnson, Rose, Srinivasan, & Berenson, 2012). In a study of female elementary school teachers ( $n = 745$ ), Webber et al. (2012) found that 30% were overweight and 49% were obese, while the national averages are currently 34% overweight and 34% obese (Flegal, Carroll, Ogden, & Curtin, 2010). In the current study, 34% of the participants were overweight and 48% were obese. These statistics show a need for increasing physical activity for teachers in order to lower the risk of obesity and its related co-morbidities through the implementation of an employee worksite wellness program within a school setting. Because interest in worksite wellness programs is increasing (Goetzel & Ozminkowski, 2006), discovering ways to not only provide affordable and convenient exercise opportunities, but also determining what methods may increase the utilization of such programs by employees could help a chronically sedentary population more active.

The findings in the present study are not without limitations. The main limitation was the weak reliability of scores on the scales for introjected regulation ( $\alpha = .68$ ), amotivation ( $\alpha = .69$ ), autonomy ( $\alpha = .67$ ), and identified regulation ( $\alpha = .62$ ). Future research should be conducted to strengthen the psychometric properties of selected

scales. Additionally, while objective measurement of exercise participation eliminates the chance of social desirability bias within the dependent variable, the predictor variables were not controlled for this problem. Because each participant's name was attached to the survey, participants may have given ratings that they feel make them appear superior to their actual motivations or feelings in regard to exercise. Further, the Worksite Wellness program could not be assumed to have been the sole exercise for the participant as it may have been supplemental to their normal exercise regimen. Future research should collect data regarding the amount of exercise the participant plans on doing outside of the exercise classes.

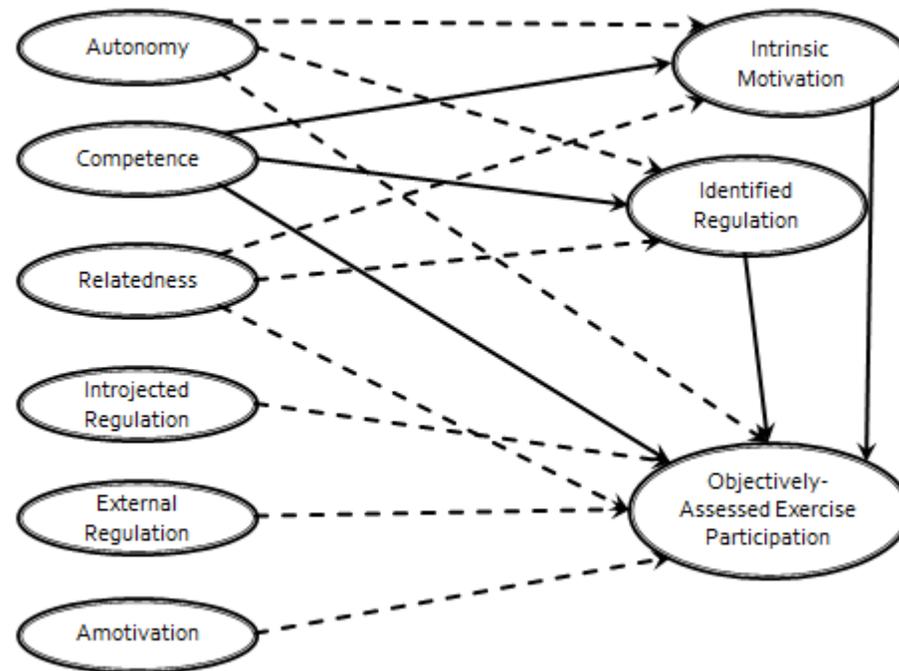
### **Conclusions**

In summary, the proposed relationships set forth by SDT in regard to the external regulation should be open to further investigation because the findings in the current study conflict with the theory and the research (Sebire et al., 2011; Standage et al., 2008; Wininger, 2007). As for CET, it appears that feelings of autonomy in exercise are more important than feelings of competence or feelings of relatedness with regard to regular exercise participation. Conclusions of this study provide evidence warranting further investigation of the effects of basic need satisfaction on exercise participation. By determining which basic need(s) facilitate intrinsic motivation and self-determined extrinsic motivation, programs can work to increase satisfaction of said need(s), thereby leading to an increase in objectively-assessed exercise participation over time. Based on the findings of the current study, fitness instructors and exercise program directors should work to improve feelings of autonomy by providing options and choices within the exercise classes, which will help provide the participants with a feeling of free will to

exercise as opposed to feelings of forced behavior. Participants who feel as if they can select the class they attend as well as the movements within the class are more likely to maintain participation over time.

Figure 1

*SDT-based Relationships and Research Findings*



*Note:* Solid lines indicate SDT postulates confirmed by research

Dashed lines indicate inconsistent and/or limited findings

Table 3

*Participant Demographics*

	Male	Female	Total
n	12	150	162
Age	42.92 ± 12.97	43.52 ± 12.78	43.47 ± 12.75
BMI	36.66 ± 10.57	30.33 ± 6.97	30.80 ± 7.44
%Overweight	8.33	36.00	34.2
%Obese	83.33	45.33	48.4
%High Risk	33.33	29.33	30.5
%Sedentary	33.33	45.33	44.4

Table 4

*Means, Standard Deviations, Correlations and Alpha Reliabilities<sup>a</sup> for Measured Variables*

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Introjected Regulation	4.29	1.30	(.68)								
2. External Regulation	2.58	1.24	.07	(.78)							
3. Amotivation	1.61	0.71	-.16*	.38***	(.69)						
4. Autonomy	3.97	1.36	-.12	-.59***	-.29***	(.67)					
5. Competence	4.64	1.03	-.10	-.42***	-.29***	.57***	(.71)				
6. Relatedness	4.80	0.99	-.15	-.39***	-.29***	-.53***	.57***	(.81)			
7. Intrinsic Motivation	5.14	1.22	-.02	-.48***	-.49***	.68***	.69***	.62**	(.89)		
8. Identified Regulation	6.21	0.74	.20*	-.30***	-.55***	.32***	.42***	.40***	.53***	(.62)	
9. Exercise Participation	20.97	11.21	.06	-.03	.02	.29***	.17*	.15	.18*	.03	--

*Note:* <sup>a</sup> Alpha reliabilities on diagonal

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Table 5

*Step One of the Regression-based Tests for Mediation with Exercise Participation as the Criterion*

Variable	Exercise participation as criterion					
	B	se	$\beta$	95% Confidence Intervals		Effect Size <sup>a</sup>
				Lower bound	Upper bound	
Constant	-5.03	7.65		-20.14	10.08	
Introjected Regulation	.98	.65	.12	-.30	2.26	.01
External Regulation	1.65	1.83	.19*	-.00	3.30	.02
Amotivation	1.66	1.29	.11	-.90	4.22	.01
Autonomy	3.15	.84	.40***	1.49	4.82	.08
Competence	.43	1.05	.04	-1.65	2.51	.00
Relatedness	.44	1.07	.04	-1.68	2.55	.00
F-score (df1, df2)	3.91 <sub>(6, 155)</sub> **					
$R^2$	.13					
Adjusted $R^2$	.10					

Note: <sup>a</sup> Squared semi-partial correlation

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Table 6

*Step Two of the Regression-based Tests for Mediation with Intrinsic Motivation as the Criterion*

Variable	Intrinsic motivation as criterion					
	B	se	$\beta$	95% Confidence Intervals		Effect Size <sup>a</sup>
				Lower bound	Upper bound	
Constant	2.90	.20		2.50	3.30	
Autonomy	.61	.05	.68***	.51	.71	.46
F-score (df1, df2)	136.93 <sub>(1, 162)</sub> ***					
$R^2$	.46					
Adjusted $R^2$	.45					

Note: <sup>a</sup> Squared semi-partial correlation

\*\*\*  $p < .001$

Table 7

*Step Two of the Regression-based Tests for Mediation with Identified Regulation as the Criterion*

Variable	Identified regulation as criterion					
	B	se	$\beta$	95% Confidence Intervals		Effect Size <sup>a</sup>
				Lower bound	Upper bound	
Constant	5.56	.16		5.25	5.88	
Autonomy	.18	.04	.32***	.10	.26	0.10
F-score (df1, df2)	18.62 <sub>(1, 162)</sub> ***					
$R^2$	.10					
Adjusted $R^2$	.10					

Note: <sup>a</sup> Squared semi-partial correlation

\*\*\*  $p < .001$

Table 8

*Steps Three and Four of the Regression-based Tests for Mediation with Exercise Participation as the Criterion*

Variable	Exercise Participation								
	Model one			Model two			95% Confidence Intervals		Effect Size <sup>a</sup>
	B	se	$\beta$	B	Se	$\beta$	Lower bound	Upper bound	
Constant	13.11	2.36		19.44	6.91		5.79	33.09	
Autonomy	2.35	.60	.29***	2.52	.82	.32**	.89	4.15	.05
Intrinsic Motivation				.07	1.02	.01	-1.94	2.09	.00
Identified Regulation				-1.18	1.30	-.08	-3.75	1.39	.00
F-score (df1, df2)	15.15 <sub>(1, 159)</sub> ***			5.34 <sub>(3, 157)</sub> **					
$R^2$	.09			.09					
Adjusted $R^2$	.08			.08					
$\Delta$ F-score (df1, df2)				.48 <sub>(2, 157)</sub>					
$\Delta R^2$				.01					

Note: <sup>a</sup> Squared semi-partial correlation

\*\*  $p < .01$

\*\*\*  $p < .001$

## References

- Anderson, L., Quinn, T., Glanz, K., Ramirez, G., Kahwati, L., Johnson, D., & ... Katz, D. (2009). The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity a systematic review. *American Journal Of Preventive Medicine, 37*(4), 340-357.
- Barbeau, A., Sweet, S. N., & Fortier, M. (2009). A path-analytic model of self-determination theory in a physical activity context. *Journal of Applied Biobehavioral Research, 14*(3), 103-118.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.
- Benedict, M., & Arterburn, D. (2008). Worksite-based weight loss programs: a systematic review of recent literature. *American Journal of Health Promotion, 22*(6), 408-416.
- Brown, D., Brown, D., Heath, G., Balluz, L., Giles, W., Ford, E., & Mokdad, A. (2004). Associations between physical activity dose and health-related quality of life. *Medicine & Science in Sports & Exercise, 36*(5), 890-896.
- Carlson, S., Fulton, J., Galuska, D., Kruger, J., Lobelo, F., & Loustalot, F. (2008) Prevalence of self-reported physically active adults --- United States, 2007. *MMWR: Morbidity & Mortality Weekly Report, 57*(48), 1297-1300.

- Deci, E. L., & Olson, B. C. (1989). Motivation and competition: their role in sports. In, *Goldstein, J.H. (ed.), Sports, games, and play: social and psychological viewpoints. 2<sup>nd</sup> ed. Hillsdale, N.J., L. Erlbaum Associates, 1989, p. 83-110.* United States.
- Deci, E., & Ryan, R. (1985). *Intrinsic Motivation and Self-determination in Human Behavior.* New York: Plenum Publishing Co.
- Duncan, L. R., Hall, C. R., Wilson, P. M., & Jenny, O. O. (2010). Exercise motivation: a cross-sectional analysis examining its relationships with frequency, intensity, and duration of exercise. *International Journal of Behavioral Nutrition & Physical Activity, 77-15.*
- Dyrlund, A. K., & Wininger, S. R. (2006). An evaluation of barrier efficacy and cognitive evaluation theory as predictors of exercise attendance. *Journal Of Applied Biobehavioral Research, 11(3-4), 133-146.*
- Edmunds, J., Ntoumanis, N., & Duda, J. L. (2006). A Test of Self-Determination Theory in the Exercise Domain. *Journal of Applied Social Psychology, 36(9), 2240-2265.*
- Edmunds, J., Ntoumanis, N., & Duda, J. L. (2007). Adherence and well-being in overweight and obese patients referred to an exercise on prescription scheme: A self-determination theory perspective. *Psychology of Sport & Exercise, 8(5), 722-741.*
- Edmunds, J., Ntoumanis, N., & Duda, J. (2008). Testing a self-determination theory-based teaching style intervention in the exercise domain. *European Journal Of Social Psychology, 38(2), 375-388.*

- Flegal, K., Carroll, M., Kit, B., & Ogden, C. (2012). Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *JAMA: The Journal of the American Medical Association*, 307 (5), 491-497.
- Flegal, K. M., Carroll, M. D., Ogden, C. L., & Curtin, L. R. (2010). Prevalence and trends in obesity among US adults, 1999-2008. *JAMA: Journal Of The American Medical Association*, 303(3), 235-241.
- Garber, C., Blissmer, B., Deschenes, M. R., Franklin, B. A., Lamonte, M. J., Lee, I., & ... Swain, D. P. (2011). Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory, Musculoskeletal, and Neuromotor Fitness in Apparently Healthy Adults: Guidance for Prescribing Exercise. *Medicine & Science in Sports & Exercise*, 43(7), 1334-1359.
- Goetzel, R. Z., Ozminkowski, R. (2006). What's holding you back: why should (or shouldn't) employers invest in health promotion programs for their workers?. *North Carolina Medical Journal*, 67(6), 428-430.
- Goudas, M., Biddle, S., Fox, K., & Underwood, M. (1995). It ain't what you do, it's the way you do it. Teaching style affects children's motivation in track and field lessons. *Sport Psychologist*, 9(3), 254-264.
- Halvari, H., Ulstad, S., Bagoien, T., & Skjesol, K. (2009). Autonomy support and its links to physical activity and competitive performance: mediations through motivation, competence, action orientation and harmonious passion, and the moderator role of autonomy support by perceived competence. *Scandinavian Journal of Educational Research*, 53(6), 533-555.

- Ingledeu, D. K., Markland, D., & Ferguson, E. (2009). Three levels of exercise motivation. *Applied Psychology: Health & Well-Being*, 1(3), 336-355.
- Klein, R. B. (2005). *Principles and practice of structural equation modeling* (2<sup>nd</sup> ed.). New York: Guilford Press.
- Knowler, W. C., Barrett-Connor, E. E., Fowler, S. E., Hamman, R. F., Lachin, J. M., Walker, E. A., & Nathan, D. M. (2002). Reduction in incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine*, 346(6), 393-403.
- Levy, A. R., Polman, R. J., & Borkoles, E. (2008). Examining the relationship between perceived autonomy support and age in the context of rehabilitation participation in sport. *Rehabilitation Psychology*, 53(2), 224-230.
- Lewis, M., & Sutton, A. (2011). Understanding exercise behavior: examining the interaction of exercise motivation and personality in predicting exercise frequency. *Journal of Sport Behavior*, 34(1), 82-97.
- Markland, D. (2009). The mediating role of behavioral regulations in the relationship between perceived body size discrepancies and physical activity among adult women. *Hellenic Journal of Psychology*, 6(2), 169-182.
- Markland, D., & Hardy, L. (1997). On the factorial and construct validity of the intrinsic motivation inventory: conceptual and operational concerns. *Research Quarterly for Exercise & Sport*, 68, 20-32.
- Markland, D., & Tobin, V. (2004). A modification of the behavioral regulation in exercise questionnaire to include assessment of amotivation. *Journal of Sport & Exercise Psychology*, 26, 191-196.

- Markland, D., & Tobin, V. (2010). Need support and behavioral regulations for exercise among exercise referral scheme clients: The mediating role of psychological need satisfaction. *Psychology of Sport & Exercise, 11*(2), 91-99.
- Matosic, D., Cox, A. E., & Amorose, A. J. (2013). Scholarship status, controlling coaching behavior, and intrinsic motivation in collegiate swimmers: a test of cognitive evaluation theory. *Sport, Exercise, and Performance Psychology*. Advanced online publication.
- McDonough, M. H., & Crocker, P. 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*(5), 645-663.
- Milne, H. M., Wallman, K. E., Guilfoyle, A., Gordon, S., & Courneya, K. S. (2008). Self-determination theory and physical activity among breast cancer survivors. *Journal of Sport & Exercise Psychology, 30*(1), 23-38.
- Morgan, W. P., & O'Connor, P. J. (1988). Exercise and mental health. In , *In, Dishman, R.K. (ed.), Exercise participation. Its impact on public health, Champaign, Ill., Human Kinetics Publishers, c1988, p. 91-121* United States:1988
- Murcia, J., Gimeno, E., & Camacho, A. (2007). Measuring self-determination motivation in a physical fitness setting: validation of the Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) in a Spanish sample. *Journal of Sports Medicine & Physical Fitness, 47*(3), 366-374.

- Peddle, C., Plotnikoff, R., Wild, T., Au, H., & Courneya, K. (2008). Medical, demographic, and psychosocial correlates of exercise in colorectal cancer survivors: an application of self-determination theory. *Supportive Care in Cancer*, *16*(1), 9-17.
- Phillips, J. S., & Lord, R. G. (1980). Determinants of intrinsic motivation: Locus of control and competence information as components of Deci's Cognitive Evaluation Theory. *Journal of Applied Psychology*, *65*(2), 211-218.
- Podlog, L., & Dionigi, R. A. (2009). Psychological Need Fulfillment among Workers in an Exercise Intervention: A Qualitative Investigation. *Research Quarterly for Exercise and Sport*, *80*(4), 774-787.
- Richardson, C., Kriska, A., Lantz, P., & Hayward, R. (2004). Physical activity and mortality across cardiovascular disease risk groups. *Medicine & Science in Sports & Exercise*, *36*(11), 1923-1929.
- Robroek, S. W., Van Lenthe, F. J., Van Empelen, P., & Burdorf, A. (2009). Determinants of participation in worksite health promotion programmes: a systematic review. *International Journal of Behavioral Nutrition & Physical Activity*, *6*, 1-12.
- Russell, K. L., & Bray, S. R. (2009). Self-determined motivation predicts independent, home-based exercise following cardiac rehabilitation. *Rehabilitation Psychology*, *54*(2), 150-156.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68-78.

- Ryan, R. M., Frederick, C. M., Lepes, D. D., Rubio, N. N., & Sheldon, K. M. (1997). Intrinsic motivation and exercise participation. *International Journal of Sport Psychology*, 28(4), 335-354.
- Ryan, R. M., Williams, G. C., Patrick, H., & Deci, E. L. (2009). Self-determination theory and physical activity: The dynamics of motivation in development and wellness. *Hellenic Journal of Psychology*, 6(2), 107-124.
- Sebire, S., Standage, M., & Vansteenkiste, M. (2011). Predicting objectively assessed physical activity from the content and regulation of exercise goals: evidence for a mediational model. *Journal of Sport & Exercise Psychology*, 33(2), 175-197.
- Song, T. K., Shephard, R. J., & Cox, M. M. (1982). Absenteeism, employee turnover and sustained exercise participation. / Absenteisme, rotation du personnel et participation soutenue a un programme d' activite physique. *Journal of Sports Medicine & Physical Fitness*, 22(3), 392-399.
- Standage, M., Sebire, S. J., & Loney, T. (2008). Does Exercise Motivation Predict Engagement in Objectively Assessed Bouts of Moderate-intensity Exercise?: A Self-Determination Theory Perspective. *Journal of Sport & Exercise Psychology*, 30(4), 337-352.
- Teixeira, P. J., Carraça, 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 & Physical Activity*, 9(1), 78-107.
- Tremblay, M., Colley, R., Saunders, T., Healy, G., & Owen, N. (2010). Physiological and health implications of a sedentary lifestyle. *Applied Physiology, Nutrition & Metabolism*, 35(6), 725-740.

- Tsorbatzoudis, H., Alexandris, K., Zahariadis, P., & Grouios, G. (2006). Examining the relationship between recreational sport participation and intrinsic and extrinsic motivation and amotivation. *Perceptual & Motor Skills, 103*(2), 363-375.
- Vlachopoulos, S. P., & Michailidou, S. (2006). Development and initial validation of a measure of autonomy, competence, and relatedness in exercise: The Basic Psychological Needs in Exercise Scale. *Measurement in Physical Education and Exercise Science, 10*(3), 179-201.
- Webber, L. S., Rice, J. C., Johnson, C. C., Rose, D., Srinivasan, S. R., & Berenson, G. S. (2012). Cardiovascular Risk Factors and Physical Activity Behavior Among Elementary School Personnel: Baseline Results from the ACTION! Worksite Wellness Program: Cardiovascular Risk Factors and Physical Activity Behavior Among Elementary School. *Journal of School Health, 82*(9), 410-416.
- Wilson, P. M., Rodgers, W. M., Loitz, C. C., & Scime, G. (2006). 'It's Who I Am...Really!' The importance of integrated regulation in exercise contexts. *Journal of Applied Biobehavioral Research, 11*(2), 79-104.
- Wininger, S. R. (2007). Self-determination theory and exercise behavior: An examination of the psychometric properties of the exercise motivation scale. *Journal of Applied Sport Psychology, 19*, 471-486.

**APPENDIX A**  
**QUESTIONNAIRE**

Printed Name: \_\_\_\_\_

**PART 1**

The following statements are in regard to your feelings about exercise. Using the scale below, please indicate your level of agreement or disagreement by writing the appropriate number in **the space at the right** of each statement.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree Nor Agree	Somewhat Agree	Agree	Strongly Agree

- In exercise situations, I feel different from everybody else ..... \_\_\_\_\_
- In exercise situations, I feel I make a huge progress with respect to the end result I pursue..... \_\_\_\_\_
- I exercise because I like to rather than because I feel I have to..... \_\_\_\_\_
- I don't see why I should have to exercise..... \_\_\_\_\_
- I exercise because other people say I should..... \_\_\_\_\_
- I feel guilty when I don't exercise..... \_\_\_\_\_
- I value the benefits of exercise..... \_\_\_\_\_
- I exercise because it's fun..... \_\_\_\_\_
- I feel lonely when I exercise ..... \_\_\_\_\_
- I feel that I execute very effectively the exercises of my training program..... \_\_\_\_\_
- I can't see why I should bother exercising..... \_\_\_\_\_
- In exercise situations I feel supported ..... \_\_\_\_\_
- I take part in exercise because my friends/family/partner say I should..... \_\_\_\_\_
- It's important for me to exercise regularly..... \_\_\_\_\_
- I enjoy my exercise sessions..... \_\_\_\_\_
- I feel out of place when I exercise ..... \_\_\_\_\_
- I feel that exercise is an activity in which I do very well..... \_\_\_\_\_
- I don't see the point in exercising..... \_\_\_\_\_
- I feel that I can manage with the requirements of the training program I am involved..... \_\_\_\_\_
- Exercising is not necessarily something I would choose to do, rather it is \_\_\_\_\_

- something I feel I have to do..... \_\_\_\_\_
- I don't feel like I fit in when I exercise ..... \_\_\_\_\_
- I find exercise a pleasurable activity..... \_\_\_\_\_
- I feel ashamed when I miss an exercise session..... \_\_\_\_\_
- I exercise because others will not be pleased with me if I don't..... \_\_\_\_\_
- I feel isolated when I exercise ..... \_\_\_\_\_
- I think exercising is a waste of time..... \_\_\_\_\_
- I feel under pressure from my friends/family to exercise..... \_\_\_\_\_
- In exercise situations I feel that people are interested in me..... \_\_\_\_\_
- I get pleasure and satisfaction from participating in exercise..... \_\_\_\_\_
- I think it's important to make the effort to exercise regularly..... \_\_\_\_\_
- I feel like a failure when I haven't exercised in a while..... \_\_\_\_\_
- In exercise situations I feel accepted ..... \_\_\_\_\_
- Having to exercise is a bit of a bind but it has to be done..... \_\_\_\_\_

## **VITA**

Kyle Turner Patek was born in Houston, Texas, on February 26, 1988, the son of Jill Turner Patek. After completing his work at Brazos High School, Wallis, Texas, in 2006, he entered Texas A&M University. He received the degree of Bachelor of Science from Texas A&M University in August 2010. In January of 2011, he entered the Graduate College of Texas State University-San Marcos and began his work as a Graduate Teaching Assistant in the Department of Health and Human Performance.

Permanent Email Address: [kylepatek@txstate.edu](mailto:kylepatek@txstate.edu)

This thesis was typed by Kyle Turner Patek.