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UTILIZING SELF-DETERMINATION THEORY TO ASSIST IN UNDERSTANDING
COLLEGE STUDENTS' MOTIVATION FOR PHYSICAL ACTIVITY

by

TYLER COE MCDANIEL

(Under the Direction of Brandonn Harris)

ABSTRACT

Obesity has become a national epidemic, (CDC, 2006; Desai, Miller, Staples, & Bravender, 2008), while causing life-threatening health conditions including cardiovascular disease, cancer, type 2 diabetes and other functional issues (Schoenborn & Strommel, 2011). It has been estimated that less than half of populations in industrialized countries are sufficiently physically active to prevent health issues (Sapkota, Bowles, Ham, & Kohl, 2005). The current study utilized the Self-Determination theory (SDT) by Deci and Ryan (1985, 2002) to help understand motivation, but more specifically exercise motivations. This study targeted basic psychological need (PNSE) and motivation regulations (BREQ-2) of a general population of college students. Correlations revealed that there were statistically significant correlations between achieving CDC physical activity recommendations and BMI, gender and four behavioral regulations (external, introjected, identified and intrinsic). These six variables developed a statistically significant logistic regression model ($\chi^2 = 28.92$, $df = 6$, $N = 83$, $p < .001$), predicting the correct group (achieved or not achieved) 74.7%. Additionally, there were not significant differences between psychological need and those who did and did not achieve CDC recommendations. Finally, there were statistically significant scores between four behavioral recommendations

(external, introjected, identified and intrinsic) and those who achieved and did not achieve physical activity. Implications of these findings, directions for future research, limitations and strengths of the study were also discussed.

INDEX WORDS: Physical Activity, Later Adolescents, Accelerometers, SDT

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by

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DEDICATION

I would like to dedicate this thesis to my family, my Mother and Father who have always been there for me to help me and support me in more ways than they will ever know. Without your love and support, I would not have made it this far in my academic career.

I would also like to dedicate this to my brother, Nick, and sister, Lindsay. I have learned so much from the both of you over the years, as well as your support and interest has meant so much to me. Additionally, I would like to dedicate this to my grandparents, Coe and Donna Dearth, for your love and support as I came down to GSU. It helped make the transition down here much easier.

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CHAPTER 1

Obesity has become a national epidemic, increasingly affecting all age groups in America (CDC, 2006; Desai, Miller, Staples, & Bravender, 2008). As a result, obesity-related expenses alone have been noted to annually cost in excess of \$215 billion (Hammond & Levine, 2010). Part of this cost comes from life-threatening health conditions including cardiovascular disease, cancer, and type 2 diabetes to name a few health issues (Schoenborn & Strommel, 2011). Although it is publicly known about many of the benefits that come from participating in regular exercise and physical activity (Craig & Cameron, 2004), it has been estimated that less than half of populations in industrialized countries are sufficiently physically active to overcome disease occurrence and promote health (Sapkota, Bowles, Ham, & Kohl, 2005). Thus, physical activity motivations should be investigated further in order to understand and potentially improve upon regular physical activity participation. A theory that has been monumental in understanding motivations in general, but more specifically motivations for exercise is the self-determination theory. In order to understand physical activity motivations, it is necessary to review physical activity recommendations as well as delve into the concepts that encompasses this dynamic theory.

Physical Activity Recommendations

In 1998, the American College of Sports Medicine (ACSM) and Center of Disease Control (CDC) published physical activity recommendations that they believed to be essential to prevent obesity in adults. These recommendations were meant to more specifically spell out the amount of physical activity that adults needed to stay healthy and were developed by physicians,

epidemiologists, exercise scientists and public health specialists. In 2008, updated recommendations were released by the CDC, stating that healthy adults (18-65 years old) should accrue at least 150 minutes of moderate intensity exercise a week (30 minutes a day/five days a week), or at least 75 minutes of vigorous intensity (15 minutes a day/five days a week), or a combination of moderate and vigorous exercise. Additionally, it was recommended that adults should participate in activities that maintain or increase muscle strength and endurance for at least two days a week. However, if a person intends to reduce their risk of chronic diseases and prevent unhealthy weight gain should exceed these minimum recommendations of physical activity (Haskell, et. al., 2007). According to the CDC, people should partake in moderate exercise for 300 minutes a week or vigorous exercise for 150 minutes a week. Accomplishing these guidelines is essential in maintaining a healthy lifestyle.

In order to better try to understand why some people accomplish these recommendations and why others do not, it is important to understand motivations behind exercising. One theory that has been attempting to do this for many years is self-determination theory.

Self-Determination Theory

Self-determination theory (SDT; Deci & Ryan, 1985, 2002) is a well-developed theory that accounts for motivations in many disciplines, such as education, psychotherapy, health and well-being, as well as sport and exercise. In the broader perspective, self-determination is used as a framework to understand and study human motivation. Simply put, SDT is, “an approach to human motivation that highlights people’s inner motivational resources in explaining healthy personality development and autonomous self-regulation” (Reeve, Deci & Ryan, 2004, pp. 33). Recently, there has been a large increase in the number of studies that utilized this theory to

investigate health promotion and physical activity behaviors (Wilson & Rogers, 2008; Edmunds, Ntoumanis & Duda, 2006; Wilson et al., 2003). Essentially, there are four theories that are integrated to develop the overarching, larger theory of SDT. In order to better understand SDT, the subsequent sections will delve into greater detail about the constructs surrounding self-determination theory. There will be an overview of the organismic integration theory, including its six types of motivation (amotivation, external regulation, introjected regulation, identified regulation, integrated regulation and intrinsic motivation), as well as the basic psychological need theory (competence, relatedness and autonomy). Additionally, cognitive evaluation theory and causality orientations theory will be overviewed in order to comprehensively understand SDT. Finally, recent research with self-determination theory and physical activity will be thoroughly discussed throughout each section.

Organismic Integration Theory. SDT is considered an organismic integration theory of motivation. Organismic theories in psychology have two main core principles: (1) behavior is regulated by internal structures that are built upon through experiences, and (2) humans are active by nature. The second concept is exemplified by the notion of intrinsic motivation. This is saying that overall, SDT is expressing that these external regulations can be internalized into internal regulations. As Deci and Moller (2005) noted, “self-determination theory maintains that people can internalize behaviors and values to differing degrees, ranging from taking them in but not accepting them as their own, to internalizing them and integrating them into their sense of self” (p. 559). An internally regulated behavior would be seen as completely identifying with the activity, feeling it was self-regulated and part of their value system, as well as integrating it with the self. On the contrary, an externally regulated action would not be internalized at all, but would be done in order to avoid punishment or to attain a reward (Deci & Moller, 2005). Deci

and Ryan (1985) believed extrinsic regulations had the capability to become intrinsic regulations, which is why amotivation, four types of extrinsic motivation and intrinsic motivation fall along a continuum. This process of internalization is seen as an active process within SDT.

To best understand how extrinsic motivation can develop into self-determined regulations, one can visualize these different types of motivation on a continuum of self-determination. Along this continuum from least autonomous to most autonomous are the four types of extrinsic motivation and intrinsic motivation, respectively. Amotivation is first, characterized by lack of intention to act at all. Next are the four different types of extrinsic motivation; external regulation, introjected regulation, identified regulation and integrated regulation. Finally, the most autonomous motivation is intrinsic regulation. In understanding this continuum better, it will be easier to conceptualize this idea of ultimately being able to regulate one's motivation (See Figure 1).

Amotivation. As previously mentioned, amotivation is considered a lacking of intention to act. This lacking of intention could also be seen as not valuing an activity (Ryan, 1995), not feeling competent enough to do the activity (Deci, 1975), or not believing that one will be able to achieve the expected outcomes from the activity (Seligman, 1975).

External Regulation. The first type of extrinsic motivation is also the least autonomous. Individuals who partake in a behavior because they are trying to obtain external rewards or to avoid punishment, are said to be externally regulated (Deci & Ryan, 1985), thus making them contingency-dependent behaviors (Deci & Moller, 2005). External regulation behaviors experience a controlled or alienated sense of regulation, while feeling a sense of external perceived locus of causality.

Introjected Regulation. The second type of extrinsic motivation is characterized by a need to maintain self-esteem. Although the individual feels that they are regulating the behavior, it is not experienced as part of the self, therefore classifying it as an external perceived locus of control. Additionally, introjected regulation is expressed through partaking in tasks in order to relieve feelings of guilt or anxiety, as well as to accomplish something for the ego or pride (Ryan & Deci, 2000). An introjected behavior is internal to the person (i.e. they chose to do it), however it is external to their integrated self (Deci & Moller, 2005)

Identified Regulation. The third type of extrinsic motivation is more autonomous than the previous two. This regulation is characterized by the individual not only deciding to partake in the behavior, but to also see the benefit of task at hand. For example, “A boy who memorizes spelling lists because he sees it as relevant to writing” (Ryan & Deci, 2000, pg. 62). Although the task might not be interesting or fun, there is some perceived personal importance to achieve the task, thus identifying with the behavior. If one understands and accepts the value of the behavior, then they are *identifying* with it (Deci & Moller, 2005).

Integrated Regulation. This form is the most autonomous and self-regulated type of extrinsic motivation and is characterized by the individual integrating the behavior with other aspects of the self (Ryan & Deci, 2000). It can also be seen as the most mature form of extrinsic motivation (Deci & Moller, 2005). Integrated regulation occurs when regulations are completely conformed to the self, and included in self-evaluations and beliefs of personal needs. Although integrated regulations share many characteristics of intrinsic motivation, it is still a form extrinsic motivation because the goals of these tasks are aimed at accomplishing something extrinsic to the self, instead of being for the pure enjoyment or interest of the task (Deci & Ryan, 1985).

Intrinsic Regulation. The most autonomous and self-regulated behaviors are considered intrinsic motivation. This type of regulation is an innate motivation, and fully self-determined. An intrinsically motivated person participates in an activity for the satisfaction of activity and for no other reason; there is no separable consequence. For example, a person could participate in an activity for the fun of the activity or even for the challenge of it, but ultimately there is no external reason, whether it is rewards or even pressure, for participating in an activity (Ryan & Deci, 2000).

People who partake in intrinsically motivated activities have a distinct advantage over people who only partake in extrinsically motivation activities. Ryan and Deci (2000) state that, “From birth onward, humans, in their healthiest states, are active, inquisitive, curious, and playful creatures, displaying a ubiquitous readiness to learn and explore” (pp. 56). It is not possible to only partake in intrinsically motivated activities, especially as adults with a job and life in general; however, participating in intrinsically motivating activities has been shown to improve health (Ryan & Deci, 2000). Since everyone is different, some activities will be fun and challenging and intrinsically motivating for some people, while others will feel as though they are forced to participate. Intrinsic motivation is important because it is necessary for a person to develop socially, cognitively, and physically. Through intrinsic motivation, a person is able to increase skills and knowledge. The ultimate goal of SDT is to explain human motivation. With this in mind, organismic integration theory’s contribution to this goal is to express how external regulations can be internalized, making the behaviors more self-determined and autonomous. In order to better understand how this occurs, it is essential to investigate previous research.

There have been several studies investigating the relationship between physical activity and SDT constructs. Previous research on physical activity has shown that identified and

intrinsic regulations encourage enduring patterns of such behaviors compared to less self-regulated and more controlled external and introjected regulations. Mullan and Markland (1997) analyzed participant's behavioral regulation in respect to stages of change in exercise. Their results indicated that those participants in the later stages of change experienced more self-determined behavior, and that the later in the stage of change process one is, the more self-determined their behavior is. Additionally, Pelletier, Fortier, Vallerand and Briere (2001) investigated swimmers' perceptions of their coaches support (autonomy or control), five different forms of regulation (intrinsic, identified, introjected, external, and amotivation), and persistence. Data were collected from participants at three different time points including baseline, 10 months after initial collection, and 22 months after initial collection. Their analyses revealed that swimmers who experienced controlling coaches expressed non self-determined regulations including external regulation and amotivation. Additionally, when coaches were more supportive of their swimmers' autonomy, swimmers expressed higher levels of self-determined motivations. Furthermore, individuals who expressed higher self-determined scores at initial collection also showed higher persistence scores at the two follow-up data collection points. As expected, individuals who showed amotivated behavior at initial collection had much higher rates of attrition at data collection 2 and 3, as well as participants who showed external regulations at initial collection did not affect persistence at data collection 2 but did become negatively associated at data collection 3.

Another variable that have been shown to affect motivational regulations is gender. Wilson, Rodgers, Fraser, and Murray (2004) concluded that there are minor differences among gender for exercise regulations. Their participants displayed intrinsic and identified regulations were strongest correlated to autonomous behaviors for both men and women. However, results

showed that introjected was more positively correlated to self-regulated in women than in men. Lastly, in both men and women, identified regulation was most important factor in predicting exercise regulations, their current exercise behavior and behavioral intentions to continue exercising. On the contrary, Wilson, Rodgers, Blanchard and Gessell (2003) found that participants who displayed identified regulation more strongly predicted self-reported exercise than intrinsic motivation in participants who took part in a 12-week structured exercise program.

This theory is essential for SDT, however, the other three theories that are encompassed in SDT are equally as important to understand and explain motivations. In order to better understand how to facilitate intrinsic motivation, it is necessary to understand the theory of basic psychological need.

Basic Psychological Need Theory. This theory posits that there are three basic psychological need that need to be achieved in order to successfully achieve intrinsic motivation. These include competence, relatedness, and autonomy. When these three needs are met environmentally, a person is able to actively engage in the activity, express emotions positively and achieve psychological growth. If these needs are not met then growth and development will be thwarted.

Autonomy. This need is met when a person believes that they are deciding to do the activity or are involved in the planning process of the activity, as opposed to having someone else force their decisions or events on them. In other words, the behavior is self-determined and not strictly determined by someone else. When this occurs, the person feels as if they have sense of freedom of whether to partake in the activity or not giving them a sense of internal locus of control.

Competence. Competence is the need to achieve a certain amount of effectiveness at a task or in a certain environment or situation. Achieving competence will be exhibited as an innate desire for one to seek out and master challenges (Deci, 1975). In achieving this, a person will be able to develop skills and talents appropriately.

Relatedness. Relatedness is the need to establish bonds with people, connecting them emotionally and interpersonally to people in relationships of warm and caring bonds (Baumeister & Leary, 1995; Deci & Ryan, 1991; Ryan & Powelson, 1991).

An important aspect of SDT is to understand the concept of facilitating versus undermining intrinsic motivation. When these three basic psychological needs are achieved, intrinsic motivation is facilitated. SDT is framed around this concept of facilitating self-regulated intrinsic motivation. In order to better understand the complex multidimensional relationships between these three needs and intrinsic motivation, it is necessary to understand how these needs are intertwined with exercise.

There is a lack of research examining the importance of perceptions of autonomy and relatedness in exercise behaviors. Additionally, only a few studies have even looked at all three basic psychological needs concurrently (Frederick-Recascino, 2002; McDonough & Crocker, 2007; Vallerand, 2001; Wilson et al., 2002). Further, recent studies have shown mixed results in regards to the relationship between the basic psychological needs and exercise self-regulations. Edmunds, Ntoumanis, and Duda (2007) implemented a 3-month exercise prescription program on overweight and obese individuals. They found that individuals that adhered more regularly to exercise showed higher self-efficacy to overcome their barriers than those that did not adhere as much. Additionally, individuals with higher exercise adherence showed better relatedness scores

than those that did not. However, Wilson, Rodgers, and Fraser (2002) found conflicting results. They were investigating psychometrics measures for the Behavioral Regulation in Exercise Questionnaire (BREQ). Participants were from a university setting and included students and staff who were enrolled in group exercise classes. They found there was a weak relationship between relatedness and self-regulated behavior.

More recent cross-sectional studies of exercisers showed that perceived competence has a stronger relationship to self-determined exercising than autonomy or relatedness (Edmunds, Ntoumanis & Duda, 2006; Wilson et al., 2003). In 2006, Edmunds and colleagues studied autonomy support, psychological need satisfaction, motivational regulations and exercise behavior. All participants had at least partaken in moderate exercise with regard to the study. As expected, they found that satisfying all three basic psychological needs (autonomy, competence and relatedness) expressed more self-determined motivations. Interestingly, identified and introjected regulations showed to be significantly positive predictors for strenuous exercise and total exercise behaviors. Also, competency was shown to positively predict strenuous exercise as well. Additionally, when partaking in organized group fitness classes, participants had better basic psychological need satisfaction when they perceived autonomy support from the class leader. Finally, they found that competence was a partial mediator between autonomy support and intrinsic motivation. This study, like many others, is very important in showing the application of self-determination theory with regards to exercise.

In further investigating SDT and exercise, Wilson and Rogers (2008) found that all three basic psychological needs were pivotal in internalizing exercise behaviors. They investigated 291 exercisers that participated in aerobic exercise classes at a Canadian university. After collecting data on motivation regulations (BREQ; Mullan, Markland & Ingledew, 1997), basic

psychological need in exercise (PNSE; Wilson, Rogers, Rodgers & Wild, 2006), and self-reported physical activity, they found that all three psychological needs play an important role in understanding exercise motivations. It was found that autonomy and perceived competence were more satisfied in these exercise classes than relatedness was. Additionally, identified and intrinsic motivation was more strongly felt than were external or introjected exercise regulations. In other words, these participants felt they had more control over their exercise behavior. However, this was a group fitness setting in which participants decided to participate on their own and work out by choice, potentially attributing to these results. There are a few limitations to this study that Wilson and Rogers pointed out, which should be considered for future studies. First, the participants were taken from optional exercise classes, thus future research should also look into using participants that are not necessarily regular exercisers and see their types of motivation regulations. Second, this study used self-report physical activity data, but future research should use physical activity tracking devices such as accelerometers or pedometers. This study is crucial in the development of the current study.

Cognitive Evaluation Theory (CET). Cognitive evaluation theory (Deci, 1975) explains how external events, such as social and interpersonal events, affect intrinsic motivation. This sub-theory of SDT states that in order to achieve intrinsic motivation, feelings of competence and autonomy must be present. CET conceptualizes external events as containing two different aspects; a controlling aspect and an informational aspect. As with the controlling aspect, the more self-determined or more control that the person has on the activity, the more intrinsically motivated they will feel since they have a sense of autonomy. On the contrary, if they feel someone else is very controlling then they will have less intrinsic motivation because they will not feel a sense of autonomy. In regards to the informational aspect, effective communication

that is positive feedback, or competence-affirmation, will enhance intrinsic motivation because it is increasing the belief of competence. However, if the feedback is construed as negative or suggesting incompetence, then the person will feel incompetent, thus creating a less intrinsically motivated activity. Cognitive evaluation theory is essential to understand external factors that affect intrinsically motivated activities (Reeve, Deci, & Ryan, 2004).

Causality Orientations Theory. Causality orientations theory is best summarized as describing people's individual orientation differences with respect to motivational forces (Deci & Ryan, 1985). In other words, this theory explains how people account for differences in environmental situations, and then how they react to these differences. There are three different types of orientations that a person can experience during events. These include autonomy orientation, control orientation, or impersonal orientation to any particular event. When an autonomy orientation is experienced, whether it is intrinsic motivation or extrinsic motivation, then the behavior is self-regulated and self-determined. "Highly-autonomy oriented individuals are motivated primarily by intrinsic motivation and autonomous types of extrinsic motivation, relying heavily on psychological needs, personal interests, and integrated values in regulating their behavior" (Reeve, Deci, & Ryan, 2004; p.40). Control orientation can be experienced when someone is concerned about the control of the event. Generally, this is not a self-regulating situation because typically a high control-oriented person would be "motivated primarily by external and introjected regulations, relying principally on environmental rewards and constraints, social directives, and beliefs and values that have been introjected, not personally endorsed" (Reeve, Deci, & Ryan, 2004; p.40). Either way, this orientation does not have a sense of choice. Lastly, impersonal orientation is relevant when competence is not felt for a particular situation or behavior. This orientation is not intentional, and can be erratic. At the core of this

necessarily affiliated with an exercise class. As these guidelines set forth by the CDC are intended for the general population, it is important to understand a “general” population’s motivation for exercising. Further, little research has investigated gender differences, and what has been done seemed is equivocal (Wilson, Rodgers, Fraser & Murray, 2004). It is important to either corroborate or object to their findings. Finally, although much research has investigated basic psychological needs, there seems to be some discrepancies between the relationships of competence, as well as relatedness to physical activity and motivational regulations (Edmunds, Ntoumanis & Duda, 2007; Wilson, Rodgers, & Fraser, 2002). These are all issues that cannot be fully justified with one study, however, these are issues that the current study intends to investigate in order to build upon the current research.

Current Study

The current study is aimed at investigating basic psychological needs and motivation regulations of a general population of college students. Physical activity decreases continuously with age (Nadar, 2008) with the lowest levels occurring in late adolescence, 18-24 years old (Troiano et al 2008). This population was chosen because research shows that college years are highly influential in shaping many lifestyle habits that include diet, physical activity, and sleep patterns (Racette et al., 2005). Overall, this study’s primary goal is to ascertain how well SDT constructs can predict physical activity in a healthy college student population. More specifically, the purpose of the present study is to assess how well autonomy, competency and relatedness scores, along with motivation regulations predict students whom achieved the CDC’s physical activity recommendations and those who did not. The three subscales (autonomy, competency and relatedness) are scored separately. Although this analysis is the primary goal, there are several other important aspects that will to be investigated. Thus, a secondary purpose

of the present study involves a comparison of motivation regulations between males and females. Furthermore, in looking at participants whom achieved and did not achieve physical activity recommendations, relationships will be examined between the three basic psychological needs (competency, autonomy, and relatedness). Finally, in examining participants whom achieved and did not achieve physical activity recommendations, the present study will assess the relationships among the five motivation regulations (amotivation, external, introjected, identified and intrinsic).

Specific Aims

Specific Aim #1 is designed investigate any relationships between the five motivational regulations (BREQ-2) and basic psychological need (PNSE) within each group (achieved or did not achieve CDC recommendations). It is hypothesized that participants who achieve CDC recommendations will be highly correlated with higher basic psychological needs and more self-regulated and autonomous motivations (intrinsic/identified). On the contrary, those who do not achieve CDC recommendations will be correlated to lower basic psychological need scores, as well as less self-regulated and less autonomous motivation regulations (introjected/external).

Specific Aim #2 is designed to assess how accurately SDT constructs (PNSE & BREQ-2) can predict students who achieved CDC physical activity recommendations and students who did not. It is hypothesized that the participants who have their basic psychological needs met (PNSE), as well as are intrinsic/identified motivational regulation will be more likely accomplish the CDC physical activity recommendations.

Specific Aim #3 is designed to assess gender comparisons of motivational regulations (BREQ-2) and basic psychological needs (PNSE). Although Wilson, Rodgers, Fraser and Murray

(2004) found minor gender differences, there has been little other research on gender differences. This aim is to either corroborate or object to their findings.

Specific Aim #4 is designed to investigate differences of basic psychological needs (PNSE) and motivational regulations (BREQ-2) with participants who did achieve CDC recommendations with those who did not. It is hypothesized that those participants who accomplish the CDC recommendations will have significantly higher basic psychological needs than those who do not accomplish the CDC recommendations. It is hypothesized that participants who accomplish the CDC recommendations will have significantly higher motivational regulation scores than those who do not accomplish the CDC recommendations.

CHAPTER 2

Methods

Based on suggestions by Wilson and Rogers (2008), this study used accelerometers to collect physical activity data, as well as used a sample population that is not strictly exercise-based to investigate motivation regulations and basic psychological needs. An important aspect of this study was that all analyses compared participants who achieved the CDC's physical activity recommendations and those who did not.

Participants

Data was collected from 87 undergraduates at a mid-sized university in the southeast region of the United States. Participants were male ($n = 32$) and female ($n = 55$) from undergraduate health classes with ages ranging from 18-30 ($M = 19.38$, $SD = 1.73$). Freshman ($n = 63$), sophomores ($n = 16$), juniors ($n = 6$) and seniors ($n = 2$) were represented in the sample. These classes were selected because all students at the institution must take this class as part of their graduation requirement, therefore the data was collected from the general population of students, not just one group in particular. Participants ethnicities were Caucasian ($n = 54$), African American ($n = 24$) and other ($n = 8$).

Measures

Health Questionnaire and Demographic. This questionnaire addressed information on demographics and any physical activity restrictions placed on participants by a doctor. This questionnaire can be found in Appendix E.

Height, Weight, and Body Mass Index. Height and weight measurements were taken using a standard hospital balance beam scale and stadiometer. Height was measured to the nearest quarter inch and weight was measured to the nearest tenth pound. BMI was calculated using the standard formula endorsed by the CDC: $(\text{lbs}/\text{inches}^2) \times 703$ (CDC, 2011).

Behavioral Regulation in Exercise Questionnaire –2 (BREQ-2). This questionnaire is the modified version (Markland & Tobin, 2004) of the original BREQ (Mullan, Markland, & Ingledew, 1997), and used to measure the continuum of self-determination constructs. The BREQ-2 has 19 items that measures amotivation, external, introjected, identified, and intrinsic regulation. Originally, Mullan, Markland and Ingledew (1997) found it was not possible to distinguish between integrated and identified regulations, thus they did not include integrated into the questionnaire. For the same reason, Markland and Tobin (2004) did not include integrated regulation either. The questionnaire has a 5 point Likert-type scale, with anchors of 0 (not true for me), and 4 (very true for me). Cronbach's alpha for each subscale found by Markland and Tobin (2004) are as follows: Amotivation = .83, External = .79, Introjected = .80, Identified = .73, Intrinsic = .86. The questionnaire items can be found in Appendix F.

Psychological Need Satisfaction in Exercise. The PNSE is an 18-item self-report questionnaire that is used to look at need satisfaction in exercise contexts (Wilson, Rogers, Rodgers, & Wild, 2006). There are three subscales (competence, autonomy, and relatedness) that have six items each used to assess participants' perceptions during a typical exercise session. This study utilizes a 6-point Likert-type scale, with anchors of 1 (false) and 6 (true), with respect to how they feel usually while they exercise. Subscales are found by taking the mean of the six-item scores. This questionnaire was initially found (Wilson, Rogers, Rodgers, & Wild, 2006) to

have good internal consistency for competence (.90), autonomy (.90), and relatedness (.91). This questionnaire can be found in Appendix G.

Accelerometer. The ActiGraph GT3X+ (Pensacola, FL.) accelerometer was used for this study. It was used to monitor physical activity, as well as energy expenditure, steps taken, activity intensity levels and MET's. Additionally, it can identify when the device has been removed from the participants. It is a reliable measure of physical activity (Carr & Mahar, 2012; Santos-Lozano, et al., 2012; Rowland & Stiles, 2012).

Procedures

After signing the informed consent form, participants filled out the questionnaire packet. This packet included demographic and health questions, the BREQ-2 and PNSE questionnaires. After participants finished filling out the questionnaire packet, height and weight was taken. Following this, they were given an accelerometer to wear for one week. Participants were instructed to wear their accelerometers all day, from the point that they wake up until they went to bed at night. Additionally, they were instructed to not wear it when they slept at night, took a bath or swam in a pool. Each accelerometer and packet were numbered to correspond with each other. After one week, students returned their accelerometers. After filling out all questionnaires and returning the accelerometers, they were debriefed and granted their extra credit for the class.

Data Analysis

SPSS v. 18.0 was used for data analysis. A p -value of 0.05 (two-tailed) was adopted for all analyses. Assumptions for the various statistical tests were met, except homogeneity of covariances. This was due to a low number of male participants who achieved the CDC physical activity recommendations. To address specific aim 1, correlations were run to investigate any relationships

between the five motivational regulations (BREQ-2) and basic psychological need (PNSE) within each group (achieved or did not achieve CDC recommendations). Specific aim 2 used a logistic regression to assess how well SDT constructs (PNSE & BREQ-2) predicted students who achieved CDC physical activity recommendations and students who did not. Additionally, for specific aims 3 and 4, two 2-Way MANOVA's were performed. To assess specific aim 3, a 2-way MANOVA (Gender X achieved CDC recommendations for physical activity) was run for motivational regulations (BREQ-2). Finally, specific aim 4 utilized another 2-way MANOVA (Gender X achieved CDC recommendations for physical activity) to investigate differences of basic psychological needs (PNSE).

CHAPTER 3

Results

Descriptive Statistics

See Table 3 and 4 for all demographic data, behavioral regulation scores and psychological need scores. Cronbach alphas were conducted to test for reliability for the five behavioral regulations (BREQ-2 subscales), as well as three psychological needs (PNSE subscales). They are as follows: Amotivation (.74), External Regulation (.82), Introjected Regulation (.80), Identified Regulation (.76), and Intrinsic Regulation (.90). Psychological needs are as follows: Autonomy (.47), Competence (.92) and Relatedness (.92). However, after further review of autonomy, it became apparent that one question was typed incorrectly. With the removal of this question the reliability of autonomy improves drastically (.90). Because of this discrepancy, all autonomy tests were executed with the one question removed.

There were 85 participants that completed accelerometer data. Of these individuals, 36 participant did not meet the CDC recommendations while 49 did achieve CDC physical activity recommendations. All participants completed strength training data, of which 4 achieved CDC strength training recommendations, while 83 did not achieve these recommendations. Finally, based on CDC BMI cutoff points, there were 5 underweight (less than 18.50), 46 normal weight (18.5-24.99), 21 of overweight (25.00-29.99) and 15 obese (greater than 30.00) participants.

Correlations

Results of the point-biserial correlations revealed several statistically significant associations between physical activity groups (achieved vs not achieved CDC recommendations), behavioral regulations (BREQ-2) and psychological needs (PNSE). Physical

activity achievement and gender were significantly and negatively correlated, $r(85) = -.234, p = .031$. Physical activity achievement and BMI were significantly negatively correlated as well, $r(85) = -.251, p = .02$. Additionally, there were several correlations between physical activity achievement and four behavioral regulations. Physical activity achievement and BREQ external regulations were significantly correlated, $r(85) = .217, p = .009$. Physical activity achievement and introjected regulations were significantly correlated, $r(85) = .217, p = .046$. Physical activity achievement and identified regulations were significantly correlated, $r(83) = .274, p = .011$. Finally, physical activity achievement and intrinsic regulations were significantly correlated, $r(85) = .235, p = .032$. However, there were no correlations between physical activity achievement and psychological needs. All significant correlations were included in the logistic regression.

Logistic Regression

A logistic regression was conducted to assess whether the six predictor variables (gender, BMI, external regulation, introjected regulation, identified regulation, and intrinsic regulation) significantly predicted whether or not a person achieved the CDC physical activity recommendations. When these six variables are considered, they produced a model that significantly predicted whether or not a participant achieved or did not achieve the CDC physical activity recommendations, $\chi^2 = 28.92, df = 6, N = 83, p < .001$. This model predicted 74.7% of the responses accurately. The Cox and Snell R^2 indicated that 29.4% of the variance was due the variables in the equation. Of the six variables, 3 were significant to the best fit equation; Gender ($p = .005, \beta = 1.845$), BMI ($p = .01, \beta = -.134$), and External Regulation ($p = .016, \beta = .981$). This means that males are more likely to achieve than females (OR = .158, CI = .044 - .567, Wald $\chi^2 = 8.00$). As BMI increases, the likelihood of achieving the PA recommendations

decreases, (OR = .874, CI = .789 - .969, Wald $\chi^2 = 6.62$). The more externally regulated the person is, the higher likelihood that they will achieve the PA recommendations, (OR = 2.67, CI = 1.20 – 5.92, Wald $\chi^2 = 5.82$).

MANOVA

Two 2-Way MANOVA's were also conducted to determine if there were any significant differences between males and females, achieved and not achieved CDC physical activity, as well as to see if there was an interaction between gender and physical activity achievement for behavioral regulations and psychological needs. Results of the 2 X 2 (Gender x PA Achievement) MANOVA indicated no significant interaction between gender and physical activity achievement on behavioral regulations, $F(5, 74) = .634, p = .675$, partial $\eta^2 = .041$. Additionally, there was no main effect of gender on behavioral regulations, $F(5, 74) = 1.76, p = .133$, partial $\eta^2 = .106$. However, after further analysis there was a main effect of physical activity achievement on behavioral regulations, $F(5, 74) = 2.39, p = .046$, partial $\eta^2 = .139$. Participants who achieved the CDC recommendations for physical activity ($M = .74, SD = .86$) had significantly ($p = .021$) higher scores for BREQ external regulation than those who did not ($M = .31, SD = .53$) achieve the CDC recommendations. Additionally, participants who achieved the physical activity recommendations ($M = 1.83, SD = 1.22$) had significantly ($p = .006$) higher BREQ introjected regulation scores than those who did not meet the recommendations ($M = 1.28, SD = .85$). Next, participants who achieved CDC recommendations ($M = 2.80, SD = .85$) had significantly ($p = .012$) higher BREQ identified regulation scores than those who did not achieve the physical activity recommendations ($M = 2.30, SD = .79$). Lastly, participants who achieved physical activity recommendations set for by the CDC ($M = 2.97, SD = .82$) had significantly ($p = .031$) higher BREQ intrinsic regulation scores than those who did not achieve

the physical activity recommendations ($M = 2.51, SD = .91$). Amotivation, did not yield significant ($p = .85$) differences between those who achieved and did not achieve CDC physical activity recommendations.

The second 2-Way MANOVA examined the differences among gender and achievement of the CDC physical activity recommendations on psychological need (PNSE). Results indicated that there was not a significant interaction between gender and physical activity achievement on psychological need, $F(3, 77) = .38, p = .77, \text{partial } \eta^2 = .015$. Additionally, there was no main effect of gender on psychological need, $F(3, 77) = .48, p = .70, \text{partial } \eta^2 = .047$. Finally, there was no main effect of meeting physical activity recommendations on psychological need, $F(3, 77) = 1.26, p = .29, \text{partial } \eta^2 = .018$.

CHAPTER 4

Discussion

This study was aimed at investigating behavioral regulations and psychological needs in a general college population. There were four different aims that would help ascertain how behavioral regulations and psychological needs helped understand physical activity motivations in college students.

The first hypothesis stated that there would be a relationship between achievement of the physical activity recommendations and the behavioral regulations and psychological needs. It was found there was a relationship with four of the five behavioral regulations (external regulations, introjected regulations, identified regulations and intrinsic regulations). However, there were no significant correlations between physical activity achievement and psychological needs. This is very interesting because there have been several studies that have found a positive relationship between psychological need satisfaction and intrinsic motivation (Pelletier, Fortier, Vallerand & Briere, 2001). Additionally, Mullan and Markland (1997) found that participants in later stages of change had more self-determined behavior (identified or intrinsic), and the later the stage of change the more self-determined. Finally, Wilson and Rogers (2008) found that all three psychological needs and behavioral regulations were important in understanding exercise motivations of participants in aerobic exercise classes.

Previous studies indicate a connection between behavioral regulations and psychological needs. However, these studies were either assessing perceptions of a coach's support (Pelletier, Fortier, Vallerand & Briere, 2001), stages of change and behavioral regulation (Mullan & Markland, 1997), or aerobic exercise classes at a university (Wilson & Rogers, 2008). It is

important to note the context in which these psychological needs and behavioral regulations were being investigated. The previous studies assessed very specific situations, where the current study assessed general population physical activity motivations and psychological needs for every day physical activity, with no particular activity in mind. If participants did not have a specific exercise class that they go to, or a friend to workout with, these psychological needs may not be as important as they would be to a person who attends exercise classes or an athlete who plays on a team. With the lack of research regarding general physical activity on psychological need, this discovery is surprising but cannot corroborate or refute previous research since there has not been any on a sample of this type.

It was also hypothesized that psychological needs and behavioral regulations would be able to predict those who achieved and did not achieve the physical activity recommendations. The results partially supported this hypothesis. Since there were no relationships between achieving CDC recommendations and psychological needs, these three subscales (autonomy, competence and relatedness) were not included in the logistic regression. However, four of the five behavioral regulations were correlated. They were included in the logistic regression along with BMI and gender. These six variables were able to significantly predict if a person would achieve the CDC's physical activity recommendations. The hypothesis was correct in saying that behavioral regulations would significantly predict if a person would achieve or not achieve these recommendations.

The logistic regression can be explained as knowing a student's behavioral regulation score, their gender and BMI, this model would be able to correctly predict whether a person achieved or did not achieve the CDC's recommendations 74.7% of the time. This result supports much of the previous research (Pelletier, Fortier, Vallerand & Briere, 2001; Mullan & Markland,

1997; Wilson & Rogers, 2008). The goal of this research was to understand motivations for physical activity, making this model important. Results from this study show potential for behavioral regulations and BMI to be considered in the planning of future physical activity interventions. However, without knowing what scores are necessary in order to achieve these physical activity recommendations, further research is necessary. The next two specific aims shed some light on what scores are necessary to have a better chance at achieving the CDC's physical activity recommendations.

The third specific aim was designed to investigate if there were any gender differences, without making a hypothesis. It was found that there was no significant difference between gender and the behavioral regulations, or psychological needs. Although Wilson, Rodgers, Fraser and Murray (2004), found minor gender differences, this study found no significant differences between genders. Although previous research found some differences, some of the discrepancies between previous data and the current study can be explained by the different populations. Most of the previous studies (Pelletier, Fortier, Vallerand & Briere, 2001; Mullan & Markland, 1997; Wilson & Rogers, 2008; Wilson, Rodgers, Fraser, & Murray, 2004) look at exercise specific populations. The target of this study was to investigate a general population of college students, so it was not necessarily conflicting results with previous research since a different population was investigated. This will add to the literature as there were no gender differences in a general population of college students for this study.

The final hypothesis which predicted differences for behavioral regulations and psychological needs between those who achieved CDC recommendations and those who did not was partially correct once again. As with much of the previous findings, there was no significant difference between those who achieved and those did not and psychological needs. This refutes

past research. However, there were significant differences between those who achieved and those who did not and behavioral regulations. Those who achieved CDC physical activity recommendations had significantly higher scores on external regulation, introjected regulation, identified regulation and intrinsic regulations than those who did not achieve physical activity recommendations. This supports much of the previous research on behavioral regulations. Interestingly, the more self-regulated the behavioral regulation became (i.e. from external to intrinsic), the means of those achieved became larger, almost as if they followed the self-regulation continuum as well.

The results from this study showed that behavioral regulations predict achievement of physical activity recommendations, in addition to being significantly different between those who achieved and those who did not achieve said recommendations. If this study is any indication of general populations motivations to be physically active, it is possible that having psychological needs met is not as important as it is in group fitness settings. Future research on general populations could be very beneficial to investigate whether having psychological needs met are important.

Overall, the discrepancies that the results of this study (between males and females, as well as psychological needs) had with previous studies can potentially be explained by a difference in population. Most of the previous studies (Pelletier, Fortier, Vallerand & Briere, 2001; Mullan & Markland, 1997; Wilson & Rogers, 2008) look at exercise specific populations. With the obesity epidemic as prolific as it is currently, understanding the motivations of the general population will help with developing creative ways to encourage individuals to be more physically active.

Limitations

There are a few limitations to the current study. First, the results may not be generalizable to the general public or universities that do not share similar characteristics. As part of college tuition and fees, most institutions have recreation facilities to encourage physical activity. This data could be argued as generalizable to mid-sized college populations. Because of the available resources to college-age students, results may differ from the general population. Campus programming allows for a higher level of education on the importance of physical activity. Another limitation was that this study only used physical activity recommendations to determine if a person achieved the CDC recommendations, when in reality there is also a strength training component. This was decided because there were only four participants out of the whole study who met both physical activity and strength training components. Future research is needed to evaluate the strength training component. Next, the autonomy subscale of the PNSE used 5 questions instead of the 6 questions in the full scale. Based on extremely low reliability scores, removing one of the questions improved the reliability tremendously. Additionally, since the participants were not able to wear the accelerometer swimming, the study unfortunately did not follow up on any participants' swimming involvement. Although not projected to affect overall physical activity scores much, future research should follow-up with participants to see if they swam during the week of wearing the accelerometer so researchers can accurately record this data. Finally, there was no question that asked participants if they were currently enrolled in a physical activity course. Physical activity courses are mandatory at this university, and there is a chance that participants were dual enrolled in the physical activity course while simultaneously partaking in the study. Future research should also take this, as well as the other limitations into consideration.

Strengths of Study

Despite the aforementioned limitations, there were several strengths of the current study. First, self-report height and weight has been shown to be not very reliable (Gorber, Tremblay, Moher & Gorber, 2007), with weight and BMI being under-reported and height being over-reported, so the current study weighed and measured each participant in the study, on the same scale by the same investigator. This ensured that all participants had consistent BMI ratings, rather than relying upon self-report data. Additionally, all physical activity was recorded by an accelerometer (GT3X+). Previous studies have shown great discrepancies between subjective (self-report) and objective measures (Prince, Adamo, Hamel, Hardt, Gorber & Tremblay, 2008), and even self-report yielding much higher physical activity than actual physical activity (Bond, Jakicic, Unick, et al., 2010). The current study eliminated any discrepancies that could arise from self-report physical activity, by providing participants with accelerometers to wear. Finally, this current study investigated a population that lacks certain consideration.

Future Studies

Future studies should continue to investigate motivational regulations for general populations. Although previous research suggests that having psychological needs met for individuals in group exercise classes, or on sports teams are important, maybe this is not the case for general population who work out by themselves. Future research should continue to evaluate this idea. If this is true, then maybe it is only important to target self-regulated behavior, and not worry about psychological needs for general adult populations. An intervention that would focus on self-regulated exercise behavior is crucial to further understand this concept. For example, Stadler, Oettingen, and Gollwitzer (2009) found that German women (30-50 years old) who were

given information about physical activity and nutrition, as well as given an intervention to specifically practice these skills were two times more active than those with just the information. Studies like this one are very important to continue with general population participants. This is a very important population to understand and investigate because that is the population that is being most affected by obesity.

Additionally, future research should include measuring body mass in a different manner than BMI. Studies have shown that dual energy x-ray absorptiometry (DEXA) is most complete body composition reading (Bowden et al., 2005). Bowden et al. found that when comparing skin folds, BIA and BMI analyses, skins folds were found to be the most accurate, whereas BMI was the least accurate. It would be recommended for future research to use either skin fold or BIA to analyze body composition. Finally, based on the reliability that was attained from this study in regards to collecting height/weight and using accelerometers for collecting physical activity, it would be recommended that future studies continue to do this as well. Continuing research on motivations for physical activity in general populations is critical in order to fully better understand how to try to prevent the obesity epidemic from continually growing.

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Wilson, P., Rodgers, W., Fraser, S., & Murray, T. (2004). Relationships between exercise regulations and motivational consequences in university students. *Research Quarterly for Exercise & Sport, 75, 81-91.*

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Annotated Bibliography

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

This book was the platform for Deci and Ryan to divulge their theory of Self-Determination. The book gives background on previous theories of motivation, as well as how they conceptualized the idea for this theory. It helped break down each of the four components to the theory of Self-Determination. More specifically, it gave further background on Organismic Integration Theory, Cognitive Evaluation Theory and Causality Orientations Theory. Finally, Deci and Ryan put their theory into application by explaining how it would be seen and useful in many different domains, such as education, therapy, work and sports. Overall, this book was critical in the development of this thesis.

Deci, E., & Moller, A. (2005). The concept of competences: A starting place for understanding intrinsic motivation and self-determined extrinsic motivation. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 579-597). New York: The Guildford Press.

This source was essential in further understanding some of the background into SDT. More specifically, it further explained White's (1959) Drive theory, as well as the different important concepts that came from it, such as "competence." Additionally, they described basic psychological needs and the four extrinsic regulation subtypes. However, what made this source invaluable was that it delved into the concept of internalization, and made it much clearer. It showed what internalization would look like in different social settings. This source may have

only been used a handful of times, however it was essential in further understanding Self-Determination Theory.

Edmunds, J., Ntoumanis, N., & Duda, J. (2006). A test of self-determination theory in the exercise domain. *Journal of Applied Social Psychology, 36*, 2240-265.

This article discusses many concepts that have theorized as the inner-workings of SDT, however, this article shows that these concepts are practical in the exercise domain. The participants (N=369) for the study were recruited from group fitness groups, as well as the community. The study investigated how basic psychological needs related to motivational regulations. They revealed that significant predictors of strenuous, as well as total exercise behaviors, were introjected and identified motivational regulations. Additionally, participants who felt their group exercise leader was autonomy supportive had higher psychological needs satisfaction. This article was important because it further solidified the application of SDT in the domain of exercise.

Edmunds, J., Ntoumanis, N., & Duda, J. (2007). Adherence and well-being in overweight and obese patients referred to an exercise prescription scheme: A self-determination theory perspective. *Psychology of Sport & Exercise, 8*, 722-740.

Edmunds, Ntoumanis and Duda investigated perceived autonomy support, psychological need satisfaction, self-determined motivation, exercise behavior, exercise-related cognitions and general well-being of overweight/obese participants (N=49). They collected questionnaires to assess these variables three different times during a 3-month prescribed exercise program; before program started, 1 month after it started and at the end of the 3 month program. Not surprisingly, they found that those who adhered more to their program showed higher self-efficacy to overcome barriers than those who did not adhere as well. Additionally, they found

that those who adhered more showed an increase in satisfying their basic psychological need of relatedness. Furthermore, higher need satisfaction predicted higher self-determined regulations. This study was important because it showed that relatedness is an important part of basic psychological needs; there are some researchers who believe that relatedness is not important, however, they quantitatively found that this is not the case.

Markland, D. & Tobin, V. (2004). A modification of the behavioral regulation in exercise questionnaire to include an assessment of amotivation. *Journal of Sport and Exercise Psychology*, 26, 191-196.

In line with Self-Determination Theory, Markland and Tobin improved upon Mullan, Markland, and Ingledew (1997) original Behavioral Regulation in Exercise Questionnaire (BREQ) by adding amotivation as a type of motivation regulation. In doing so, they created the BREQ-2, which also included external, introjected, identified and intrinsic regulations. After evaluating participants (N=194), they validated the new regulation. The BREQ-2 has 19 items, based on a 5 point Likert scale, anchored by 0 = “not true for me”, and 4 = “very true for me.” Cronbach’s alpha for each subscale found by Markland and Tobin (2004) are as follows: Amotivation = .83, External = .79, Introjected = .80, Identified = .73, Intrinsic = .86. This is important because it allows others to use it knowing they have a validated study.

Pelletier, L., Fortier, M., Vallerand, R., & Briere, N. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion*, 25, 279-306.

Pelletier, Fortier, Vallerand and Briere investigated autonomy support, motivational regulations and persistence of swimmers (N=369). They collected data at three different time points; initially collected, 10 months after initial collection, and 22 months after initial collection.

They revealed that swimmers who experienced controlling coaches expressed non self-determined regulations like external regulation and amotivation, however, when coaches were more autonomy supportive their swimmers expressed higher levels of self-determined motivations. Additionally, individuals who expressed higher self-determined scores at initial collection also showed higher persistence scores at data collection 2 and 3. As expected, individuals who showed amotivated behavior at initial collection had much higher rates of attrition at data collection 2 and 3, as well as participants who showed external regulations at initial collection did not affect persistence at data collection 2 but did become negatively associated at data collection 3. Once again, although this was theorized by SDT, it was important to be able to quantitatively justify the theory.

Ryan, R., & Deci, E. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54-67.

Ryan and Deci wrote this article as more of a review of their past findings, future directions, as well as define many different terms again. It broke down important aspects of SDT, such as each sub-theory and internalization. Most notably, it delved into the motivational regulations (amotivation, external, introjected, identified, integrated and intrinsic), further explaining each regulation and giving examples. This article was useful because it simplified the definitions that Ryan and Deci (1985) had previously given. Overall, this article was extremely useful in the current study.

Wilson, P., Rodgers, W., Fraser, S., & Murray, T. (2004). Relationships between exercise regulations and motivational consequences in university students. *Research Quarterly for Exercise & Sport, 75*, 81-91.

Wilson, Rodger, Fraser and Murray investigated how SDT constructs function in the exercise domain. They collected data from participants (N=276; n=98 men; n=178 women) who exercised for four months consecutively. This study is important because they investigated differences between men and women. They found that intrinsic and identified regulations had the strongest correlations to autonomous behaviors for both men and women. However, results showed that introjected was more positively correlated to self-regulated motives in women than in men. Lastly, in both men and women, identified regulation was most important factor in the three variables of predicting exercise regulations, their current exercise behavior and behavioral intentions to continue exercising.

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

Wilson and Rogers investigated 291 exercisers that participated in aerobic exercise classes at a Canadian university. After collecting data on motivation regulations (BREQ; Mullan, Markland & Ingledew, 1997), basic psychological needs in exercise (PNSE; Wilson, Rogers, Rodgers & Wild, 2006), and self-reported physical activity, they found that all three psychological needs play an important role in understanding exercise motivations. It was found that autonomy and perceived competence were more satisfied in these exercise classes than relatedness was. Additionally, identified and intrinsic motivation was more strongly felt than were external or introjected exercise regulations. In other words, these participants felt they had control over their exercise. Overall, this study is crucial in the development of the current study.

Appendix A: Research Questions, Assumptions and Delimitations

Research Questions:

1. Assess how well SDT constructs can predict students who did, as well as who did not achieve ACSM physical activities?
2. Assess gender comparisons of motivational regulations?
3. Assess differences of basic psychological needs between those who did achieve and those who did not achieve ACSM physical activity recommendations?
4. Investigate relationship between motivational regulations and basic psychological needs?

Assumptions

1. The participants answered each question honestly and to the best of their ability.
2. The questions that were asked are valid and reliable.
3. Accelerometers correctly record exercise data.
4. There is no social desirability for participants to conform and modify their answers.

Limitations

1. Biases of the researcher could have gotten through even with the bracketing interview and pilot study.
2. The participants' answers were taken as truthful.
3. There is a chance the information that is collected may not be generalizable to other college students.

Delimitations

1. Participants chosen are from Georgia Southern Health classes.
2. Participants are college age.

Appendix B: Definition of Terms

Motivational Regulations:

Amotivation: Lack of intention of an activity (Ryan, 1995),

External Regulation: Partake in activity to obtain external rewards or to avoid punishment.

Introjected Regulation: Individual feels that they are regulating the behavior in order to relieve feelings of guilt or anxiety, as well as to accomplish something for the ego or pride.

Identified Regulation: Characterized by the individual not only deciding to partake in the behavior, but to also see the benefit of task at hand; the task might not be interesting or fun, but there is some perceived personal importance to achieve the task, thus identifying with the behavior.

Integrated Regulation: Characterized by regulations being completely conformed to the self, and included in self-evaluations and beliefs of personal needs.

Intrinsic Regulation: Characterized by being an innate motivation, and fully self-determined; participating in an activity for the satisfaction of activity and for no other reason; there is no separable consequence.

Basic Psychological Need:

Autonomy: Characterized by a person believes that they are deciding to do the activity or are involved in the planning process of the activity, as opposed to having someone else force their decisions or events on them. The behavior is self-determined and not strictly determined by someone else.

Competence: Characterized by the need to achieve a certain amount of effectiveness at a task or in a certain environment or situation

Relatedness: Relatedness is the need to establish bonds with people, connecting them emotionally and interpersonally to people in relationships of warm and caring bonds.

Health

Good Health: Characterized by not having any significant chronic or acute health problems that keeps someone from physically exercising. Can be determined by answering Health Questionnaire (Appendix C).

Appendix C: Informed Consent

College of Health and Human Sciences

Department of Health and Kinesiology

INFORMED CONSENT

Hello. You are being asked to participate in a study being conducted by Mr. Tyler McDaniel from Georgia Southern University. Tyler is a graduate student, pursuing a master's in Sport Psychology from Georgia Southern University. The researcher is interested in understanding motivations for physical activity in college students.

The purpose of this study is to assess the relationship between physical activity and motivation. Participation in this research will include having to wear an accelerometer over the course of 7 days as well as complete five questionnaires. An accelerometer is a device that is worn around the waist that collects data on all physical activity in real time for extended periods of time, such as a week. The questionnaires should take no longer than 10 minutes to complete. Altogether, participation within the study will last 7 days. The researchers will recover and analyze the data from the accelerometers and questionnaires once the collection period has ended. The researchers will be the only people with access to the data from the accelerometers and completed questionnaires. The results of this study may help with the development and implementation of health education and physical activity programs within the university setting.

Outside of wearing a belt with an accelerometer attached, there are no anticipated risks associated with participation. Extra credit will also be offered to those who agree to participate within the study and then an additional extra credit will also be offered to those who successfully complete the research study. However, for those students who do not wish to participate, the course instructor will provide alternate opportunities, such as lectures, projects, and assignments, for obtaining extra credit.

Your participation will be voluntary. The information that you provide in the study will be handled confidentially. Following the completion of the study, any information you provide will be kept in a secure location, only the researcher, Ms. Lauren Bigham, and faculty advisor Dr. Harris will have access to the data. All data will be saved on a password protected external hard drive for 3 years, then discarded of appropriately. All data will under a participant ID number, and only the previous named individuals will have access to these ID codes. No printed information will be thrown away, but rather all printed documents will be shredded.

You have the right to withdraw from the study at any time without penalty. If you decide to withdraw after data has been collected then contact the researcher who will destroy the data collected. You have the right to ask questions and have those questions answered. If you have questions about this study, please contact the researcher named above. For questions concerning your rights as a research participant, contact Georgia Southern University Office of Research Services and Sponsored Programs at 912-681-0843.

You must be 18 years of age or older to consent to participate in this research study. If you consent to participate in this research study and to the terms above, please sign your name on the back of this form and indicate the date below.

You will be given a copy of this consent form to keep for your records. This project has been reviewed and approved by the GSU Institutional Review Board under tracking number H12298.

Title of Project: Utilizing Self-Determination Theory to Assist in Understanding College Students' Motivation to Achieve National Recommendations for Exercise.

Principal Investigator: Mr. Tyler McDaniel, PO Box 8076 Statesboro GA 30460, 740-590-1745, tm02713@georgiasouthern.edu

Faculty Advisor: Dr. Brandonn Harris, PO Box 8076 Statesboro GA 30460, 912-478-7900,
bharris@georgiasouthern.edu

Participant Signature

Date

I, the undersigned, verify that the above informed consent procedure has been followed.

Investigator Signature

Date

Appendix D: Participant Contact Information

Participant Contact Information
--

Name _____ ID # _____

Address _____

City _____ State _____ Zip _____

Phone number _____

Age _____

Height _____

Weight _____

Accelerometer Number _____

Appendix E: Demographic & Health Questionnaire

Directions: Please answer honestly and to the best of your ability.

1. Do you have any health conditions that would prevent you **from normal daily activities** (walking to class, grocery shopping, doing laundry)
 no
 yes
If yes, please list: _____
2. Do have any health conditions that would **prevent you from regular exercise** (doctor restricted exercise: physical disability or chronic disease)
 no
 yes
If yes, please list: _____
3. Do you smoke?
 no (never)
 sometimes (occasionally)
 yes (daily)
4. Year in College:
 Freshman
 Sophomore
 Junior
 Senior
5. Sex:
 Male
 Female
6. Age: _____
7. Height: _____ ft _____ in
8. Weight in pounds _____
9. Ethnicity:
 White (Non-Hispanic origin)
 Hispanic
 Black or African American
 Other, please specify: _____

Appendix F: Behavioral Regulation in Exercise Questionnaire – Version 2

Behavioral Regulation in Exercise Questionnaire – Version 2

Using the scale below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers and no trick questions. We simply want to know how you personally feel about exercise. Your responses will be held in confidence and only used for our research.

	Not True for me		Sometimes True for me		Very true for me
I exercise because other people say I should	0	1	2	3	4
I feel guilty when I don't exercise	0	1	2	3	4
I value the benefits of exercise	0	1	2	3	4
I exercise because it's fun	0	1	2	3	4
I don't see why I should have to exercise	0	1	2	3	4
I take part in exercise because my friends/family/partner say I should	0	1	2	3	4
I feel ashamed when I miss an exercise session	0	1	2	3	4
It's important to me to exercise regularly	0	1	2	3	4
I can't see why I should bother exercising	0	1	2	3	4
I enjoy my exercise sessions	0	1	2	3	4
I exercise because others will not be pleased with me if I don't	0	1	2	3	4
I don't see the point in exercising	0	1	2	3	4
I feel like a failure when I haven't exercised in a while	0	1	2	3	4
I think it is important to make the effort to exercise regularly	0	1	2	3	4
I find exercise a pleasurable activity	0	1	2	3	4
I feel under pressure from my friends/family to exercise	0	1	2	3	4
I get restless if I don't exercise regularly	0	1	2	3	4
I get pleasure and satisfaction from participating in exercise	0	1	2	3	4
I think exercising is a waste of time	0	1	2	3	4

Appendix G: Psychological Need Satisfaction in Exercise Scale

Psychological Need Satisfaction in Exercise Scale

The following statements represent different experiences people have when they exercise. Please answer the following questions by considering how YOU TYPICALLY feel while you are exercising.

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

Appendix H: Physical Activity Questionnaire

Physical Activity Questionnaire

1. During a **typical 7-Day period** (a week), how many times on average do you do the following kinds of exercise for more than 15 minutes during your free time (write on each line the appropriate number):

A. Strenuous Exercise (Heart beats rapidly) _____
(e.g. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

B. Moderate Exercise (Not exhausting) _____
(e.g. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

C. Mild Exercise (Minimal Effort) _____
(e.g. yoga, archery, fishing, bowling, horseshoes, golf, snow-mobiling, easy walking)

2. During a typical 7-Day period (a week), in your leisure time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)? Please mark best answer.

Often: _____ Sometimes: _____ Never/Rarely: _____

Aerobic Exercise:

3. During the past 7 days, did you do aerobic exercise? Yes: _____ No: _____

4. If yes, how many of the last 7 days did you do aerobic exercise? Please circle:

1 2 3 4 5 6 7

5. Please describe your aerobic exercise. (example: running, jogging, biking, swimming, etc.)

Strength Training:

6. During the past 7 days, did you do strength training? Yes: _____ No: _____

7. If yes, how many of the last 7 days did you do strength training? Please circle:

1 2 3 4 5 6 7

8. If you strength trained during the last 7 days, how many muscle groups did you target per workout? Please circle:

1 2 3 4 5 6 7 8 9 10 11+

9. Please describe your strength training exercise. (example: bench press, squatting, other forms of weight lifting)

Figure 1. Behavioral Regulations

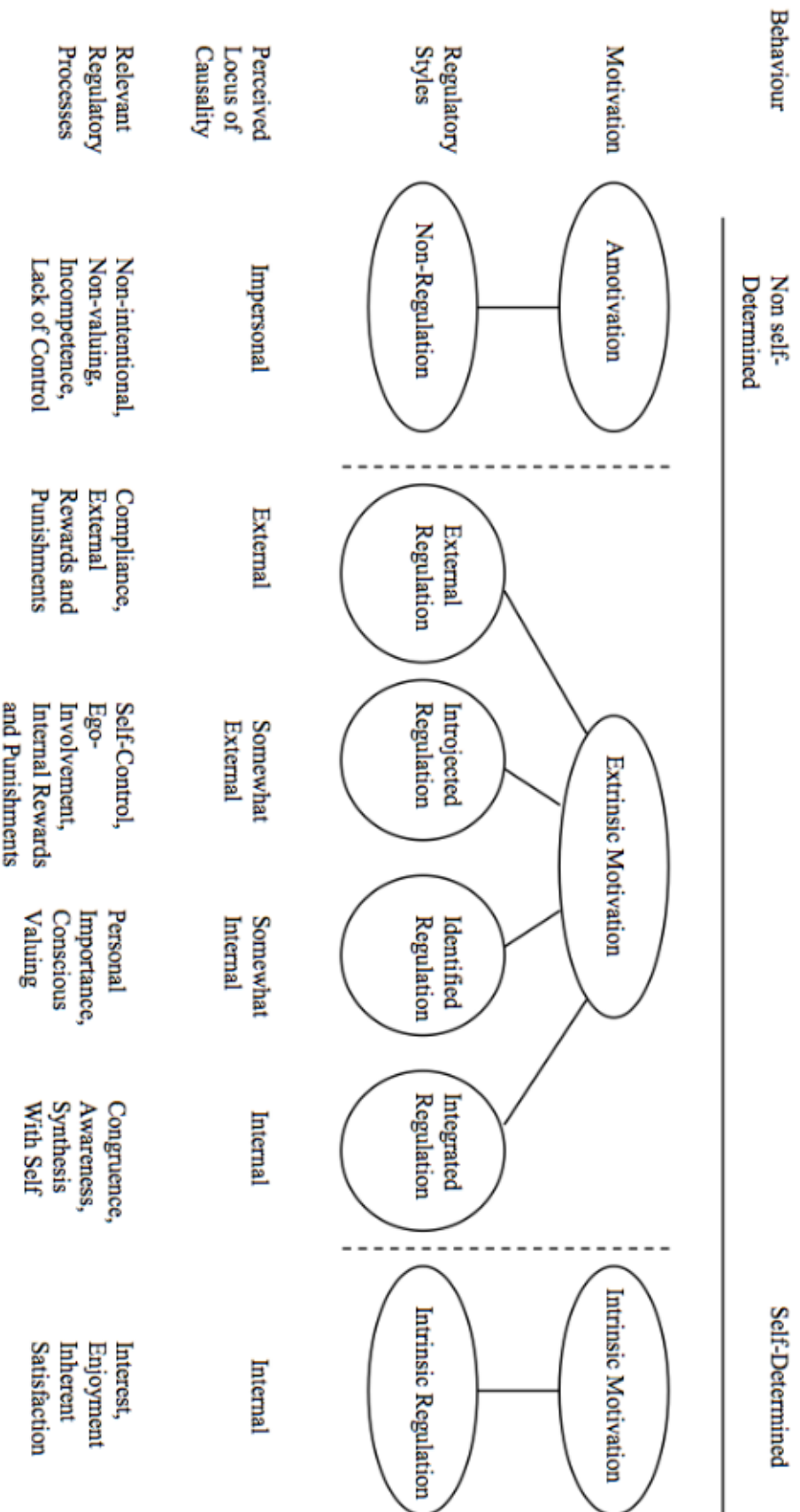


Table 1
Descriptive Statistics and Correlations among Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Achieved CDC PA Recommendations	---													
2. Year in college	.01	---												
3. Gender	-.23*	.12	---											
4. Age	-.15	.42**	.00	---										
5. BMI	-.25*	.01	-.14	.15	---									
6. Ethnicity	-.26*	.08	-.04	-.03	.31**	---								
7. BREQ Amotivation	-.02	.05	-.12	-.11	.01	.32**	---							
8. BREQ External Regulation	.28**	.19	-.03	-.01	.16	.10	.38**	---						
9. BREQ Introject Regulation	.22*	.10	.20	-.07	.02	-.15	-.17	.35**	---					
10. BREQ Identified Regulation	.27*	.17	.05	-.07	-.10	-.13	-.25*	.27*	.69	---				
11. BREQ Intrinsic Regulation	.24*	-.07	.02	-.17	-.27*	-.09	-.27*	.03	.43**	.70**	---			
12. PNSE Competence	.13	.02	-.01	-.16	-.12	-.15	-.19	.14	.33**	.52**	.55**	---		
13. PNSE Relatedness	.16	.02	.10	-.27*	-.11	.00	-.15	.31**	.33**	.35**	.32**	.52**	---	
14. PNSE Autonomy	.02	-.06	-.04	-.25*	-.24*	-.10	-.12	-.03	.03	.10	.11	.41**	.33**	--
Mean	.58	.39	.63	9.38	25.25	.84	.27	.56	1.53	2.53	2.69	27.84	25.16	25.72
Standard Deviation	.50	.72	.49	1.73	6.30	1.13	.48	.79	1.11	.88	.96	6.24	7.32	4.46

Note. * $p < .05$, ** $p < .01$

Table 2

Binary Logistic Regression Predicting Achievement of CDC recommendations for Physical Activity

Predictor	β	SE β	Wald's χ^2	df	p	Odds Ratio
Constant	1.14	1.62	.49	1	.48	3.11
External Regulation	.98	.41	5.82	1	.02	2.67
Introjected Regulation	.52	.38	1.83	1	.18	1.68
Identified Regulation	.14	.53	.07	1	.80	1.15
Intrinsic Regulation	.09	.44	.04	1	.84	1.09
Gender	1.85	.65	8.01	1	.01	6.33
BMI	-.13	.05	6.62	1	.01	.87
<hr/>						
Test			χ^2	df	p	
<hr/>						
Overall Model Evaluation						
Likelihood Ratio Test			28.92	6	< .001	
Goodness-of-fit test						
Hosmer & Lemeshow			4.38	8	.82	
<hr/>						

Table 3

Variation in Participants Who Achieved and Did Not Achieve CDC Physical Activity Recommendations

Variable	Achieved				Did not Achieve			
	Male (n = 22)		Female (n = 27)		Male (n = 8)		Female (n = 28)	
	M	SD	M	SD	M	SD	M	SD
BREQ-2								
Amotivation	.35	.53	.18	.45	.19	.29	.29	.41
External	.74	.80	.78	.97	.28	.56	.32	.53
Introjected	1.5	1.14	1.96	1.30	.71	.45	1.44	.87
Identified	2.73	.66	2.81	1.00	2.19	.96	2.33	.76
Intrinsic	2.94	.76	2.92	.94	2.47	.99	2.51	.91
PNSE								
Autonomy	25.86	3.96	25.59	5.09	25.50	4.47	25.57	4.49
Competence	28.95	4.78	28.59	6.13	27.62	9.55	27.00	6.04
Relatedness	26.50	5.97	26.58	5.98	22.25	9.29	24.96	7.33

Table 4

Frequencies and Percentiles of Demographic Characteristics of Participants (N=85)

Variable	N	(%)	N	(%)	
Achieved PA Recommendations (n=49)			Non-Physical Activity Passport (n=36)		
Gender			Gender		
Male	22	44.9	Male	8	22.2
Female	27	55.1	Female	28	77.8
Race			Race		
Caucasian	35	71.4	Caucasian	17	47.2
African American	10	20.4	African American	14	38.9
Other	3	6.1	Other	5	13.9
Year			Year		
Freshman	37	75.5	Freshman	24	66.7
Sophomore	6	12.2	Sophomore	10	27.8
Junior	4	8.2	Junior	2	5.6
Senior	2	4.1	Senior	0	0.0
BMI Classification			BMI Classification		
Underweight	2	4.1	Underweight	3	8.3
Normal	32	65.3	Normal	14	38.9
Overweight	11	22.4	Overweight	8	22.2
Obese	4	8.2	Obese	11	30.6