

PERCEIVED VARIETY, BASIC PSYCHOLOGICAL NEEDS, AND EXERCISE
MOTIVATION: A SELF-DETERMINATION THEORY PERSPECTIVE

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ABSTRACT

PERCEIVED VARIETY, BASIC PSYCHOLOGICAL NEEDS, AND EXERCISE MOTIVATION: A SELF-DETERMINATION THEORY PERSPECTIVE

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Previous support exists for interventions designed to support participant basic needs in group fitness settings, as well as the development of self-determined motivation (Chatzisarantis & Hagger, 2008; Edmunds et al., 2008; Standage et al., 2008). An area of research recently studied is the impact of perceived variety in relation to basic needs satisfaction, motivation, and physical activity participation. Perceived variety has been shown to impact exercise related well-being and psychological needs satisfaction (Sylvester et al., 2014a) as well as exercise adherence (Sylvester et al., 2016). The purpose of this study was to examine the relationship of perceived variety and experience seeking with basic psychological needs satisfaction, motivation, and intentions to adhere to a future program. A secondary purpose of this study was to conduct an exploratory analysis examining the relationship of perceived variety and physical activity participation on basic needs satisfaction, motivation, and intention to adhere to a future program. Seven Basic Instructional Program courses were selected for participant recruitment. Data was collected at one time point, 7 weeks into the academic semester. It is predicted that higher perceptions of variety and experience seeking would predict enhanced basic needs satisfaction, more self-determined forms of motivation, and greater intention to adhere to a future exercise program. Overall, the majority of our predictions were supported. Results revealed that perceived variety predicted basic needs satisfaction, and self-determined motivation, but not intentions to continue exercising. Experience seeking did not predict any of the outcome variables. PA level and perceived variety predicted basic needs satisfaction and self-determined motivation.

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KEY TO ABBREVIATIONS

SDT	Self-Determination Theory
OIT	Organismic Integration Theory
BPNT	Basic Psychological Needs Theory
PA Level	Physical Activity Level
PVE	Perceived Variety in Exercise
ES	Experience Seeking
Aut	Autonomy
Com	Competence
Rel	Relatedness
Amot	Amotivation
Ext	External Regulation
Intoj	Introjected Regulation
Ident	Identified Regulation
Integ	Integrated Regulation
IM	Intrinsic Motivation
Int-C	Intention to complete the course
Int-A	Intention to adhere to a future program
PA	Physical Activity

Introduction

The physical inactivity of American citizens is a recognized as a major health problem in the United States. A recent statement by the National Center for Health Surveys (NCHS) reported that 1 in 5 adults (20.9%) currently meet the 2008 physical activity guidelines (NCHS, 2016) for 150 minutes a week minimum of moderate to vigorous physical activity, with 2 days of resistance training per week (DHHS, 2008). Even fewer are meeting the 300 minutes a week guideline for obtaining health benefits as well as weight management (NCHS, 2016). The American Heart Association (AHA) reports that 1 in 3 adults in the U.S do not engage in any leisure time physical activity (AHA, 2017). Participation in physical activity that sufficiently meets the ACSM/AHA guidelines (2009) has been shown to significantly reduce the risk of developing a wide range of chronic diseases later in life, as well as maintaining quality of life and ability to perform activities of daily living.

The obesity epidemic in America has created rising costs for the public as a whole. With over 70% of the American population now either overweight or obese, insurance premiums, transportation costs, as well as other costs are rising (NCHS, 2016). Obesity and physical inactivity are highly correlated to the incidence of chronic diseases, and evidence continues to accumulate for the inverse relationship between physical activity and chronic diseases such as cardiovascular, pulmonary, and metabolic diseases, as well as decreasing cognitive function and functional health (Physical Activity Guidelines Advisory Committee Report, 2008). Over the past decade, the incidence of cardiovascular and chronic diseases has increased, with cardiovascular disease (CVD) accounting for 1 out of every 3 deaths in the United States alone (AHA 2017). Cardiovascular diseases alone accounted for \$316 billion in costs to the American public, including health expenditures and lost productivity due to disease recovery time (AHA,

2017). Overall, chronic diseases are a burden on society, both from a financial and ecological standpoint, and a human centered approach. Not only do these diseases prove to be costly to the American public, but they also prove to be costly in the amount of human suffering they cause. Millions of Americans have lost a loved one to some form of chronic disease, and millions more are currently suffering from CVD.

Physical activity has been shown to be beneficial for not only the physical health status of individuals, but also their mental health and well-being (Ryan & Deci, 2000a). Even with the mounting evidence that physical activity is beneficial for the overall health and well-being of individuals, many Americans still struggle to maintain a long-term exercise program. Reports state that 50% of people who begin an exercise program will discontinue involvement at 6 months (Dishman, 1988). Human motivation is more complex than most people realize, making it particularly difficult for fitness professionals to design effective exercise classes and programs. It is no surprise then, that theories of motivation and behavioral intentions are among the resources available for practitioners seeking to deconstruct the psychological mechanisms and behavioral antecedents associated with long-term program adherence and sustained behavior change. Helping clients stay motivated to continue a rehabilitation or exercise program can be difficult at times. Professionals who provide clients with a program should be prepared to give them one rooted in sound theory and practice in their field of expertise.

One macro theory that explains the motivational processes behind lasting human motivation and internalization of behavior is Self Determination Theory (Ryan & Deci, 2000a). This theory identifies the antecedents of motivation, as well as the conditions that promote motivation, internalization of behavior, and optimal human engagement, growth and development (Ryan & Deci, 2000a).

Self-Determination Theory

Self Determination Theory arose from the field of research examining the effects of rewards on intrinsic motivation. The theory seeks to understand and describe human motivation and behavior, with regard to individual differences in motivational orientations, interpersonal perceptions, and contextual influences on motivation (Deci 1975; Deci & Ryan, 1985, 2002; Ryan and Deci, 2000a; 2008a; 2017). SDT assumes that all humans are growth oriented organisms, and that all humans actively seek out new experiences and optimal challenges to master (Ryan and Deci, 2000a; 2017). The theory itself has five sub-theories: Cognitive Evaluation Theory, Organismic Integration Theory, Basic Needs Theory, Causality Orientations Theory, and Goal Content Theory. Each of the sub-theories describes a different aspect of human motivation and behavior, and the impact of the different personal, interpersonal, and environmental factors upon the individual's motivational processes. For the purpose of this proposed study, Organismic Integration Theory and Basic Needs Theory will be primarily focused upon.

Organismic Integration Theory (OIT), a sub-theory of SDT, describes how individuals integrate externally controlled behaviors into their own repertoire of self-determined behaviors and their personal belief system (Ryan, Connell, & Deci, 1985a). OIT conceptualizes human motivation along a graded continuum of motivational styles or regulations (Ryan et al., 1985). Rather than a bipolar distinction of motivational style, like that explained in the CET sub-theory, there are six categories of regulation along this spectrum. On one end of the spectrum are more controlling forms of motivation (amotivation, external regulation, introjected regulation). On the opposite end exists the more self-determined or autonomous forms of motivation (identified regulation, integrated regulation, intrinsic motivation).

The first category of regulation represented in OIT is amotivation. Amotivation represents a complete lack of intention to perform a behavior (Ryan & Deci, 2000a; 2017). An amotivated individual will simply not participate in any aspect of a behavior (i.e. an exercise class), nor will they express a desire to continue attending. The next category of regulation, external regulation, characterizes performance of behavior to avoid punishment or to gain an external reward (Ryan & Deci, 2000a; 2017). This category of motivation, as well as amotivation, is associated with decreased psychological well-being, exercise adherence, and higher markers of ill-being (Ryan & Deci, 2000a; 2017). Obtaining monetary compensation for attending an exercise class is an example of behavior from a person that is externally motivated. Introjected regulation, the next category of regulation, is characterized by performance of a behavior to avoid affective states such as guilt or shame, or in pursuit of contingent self-worth. This type of regulation arises out of self-induced contingencies or punishments (Ryan & Deci, 2000a; 2017), such as those seen when an individual guilt-trips themselves into going for a run that day. This category of regulation is associated with differing levels of exercise adherence, and decreased levels of psychological well-being (Ryan & Deci, 2000a; 2017).

The last three categories of behavioral regulation represented in OIT resemble more autonomous forms of motivation (identified and integrated regulation) and intrinsic motivation, the exemplar of all human motivation. Identified regulation describes performance of a behavior for reasons that are seen as personally important or valued (Ryan & Deci, 2000a; 2017). People in this category of regulation often perform behaviors to help them accomplish a highly valued or important outcome. Identified regulation is associated with higher levels of psychological well-being, exercise adherence, and decreased levels of ill-being (Ryan & Deci, 2000a; 2017). Integrated regulation is described as performance of behavior for a personally valued reason that

is integrated into the individual's sense of self, and their other values and needs (Ryan & Deci, 2000a; 2017). For example, an individual in this category of motivation will exhibit enhanced psychological well-being, vitality, and exercise adherence (Ryan & Deci, 2000a; 2017). Intrinsic motivation, the last category of motivation, is performance of a behavior for the enjoyment of the behavior itself, with no external contingency present. For instance, an exerciser in this category is based purely on interest and requires no internalization of behavior into the individual's repertoire of behaviors (Deci, 1975; Ryan & Deci, 2000a; 2017).

The next sub-theory of SDT is Basic Psychological Needs Theory (BPNT) (Ryan & Deci, 2000b; 2017). This theory hypothesizes that each person has three basic needs that are essential for positive growth and functioning: the need for autonomy, competence, and relatedness. The need for autonomy describes the feeling of control over one's choices and actions; a feeling that behavior is self-referenced and initiated by the actor, not those around them (Ryan & Deci, 2000b; 2017). For example, when an exerciser takes part in planning their own fitness plan in conjunction with a personal trainer, their need for autonomy will be fulfilled. Satisfying the need for competence is accomplished by giving rationales for performance of behavior, increasing one's skill knowledge, and enhancing domain specific knowledge so the individual feels efficacious in that arena (Ryan & Deci, 2000b; 2017). For example, an exerciser who is given a rationale for why exercising is good for their physical and psychological health will have their need for competence supported. The need for relatedness is described as feeling connected to important others in a setting, feeling connected to one's social environment, and developing and maintaining meaningful relationships with important others (Ryan & Deci, 2000b; 2017). This would occur when fitness class participants interact with one another in the class and form friendships as a result of these interactions. The three needs are assumed to be fundamental to all

humans, and they form the origin of all self-determined motivation due to an individual's innate desire to satisfy these basic needs (Deci & Ryan, 2000a; 2017). When an individual perceives a behavior to satisfy her needs, she will approach it with an inherent desire to extend and enhance her capabilities (Deci & Ryan 2000b; 2017). Over time, the innate desire to learn and discover new challenges will lead to development of autonomous motivation (Ryan & Deci, 2000b; 2017). Research supports the idea that satisfaction of basic needs will increase autonomous motivation for exercise, thereby increasing exercise adherence, psychological well-being, and exercise intentions (Edmunds et al., 2006; 2007; 2008; Fortier et al., 2007; 2012).

The distinction must be made, however, that intrinsic motivation does not require any internalization of externally controlled behavior, as intrinsic motivation is the exemplar of human motivation and development (Ryan & Deci, 2000a; 2017). Ryan and Deci (2000a) state that behaviors that are intrinsically motivated originate from the inherent enjoyment of performing an activity. However, most behaviors in the exercise setting are not participated in for purely intrinsic reasons; most have some aspect of external control (Ryan & Deci, 2000a; 2017). In order to have full internalization of exercise behavior, there must be satisfaction of all three basic psychological needs (Ryan & Deci, 2008). When all three needs are satisfied in an environment perceived to be autonomy supportive, more volitional motivation will result, as well as adaptive functioning, and positive outcomes associated with well-being (Ryan & Deci, 2000a; 2000b; 2008; 2017). However, if these needs are not satisfied, the opposite outcomes will occur: ill-being, controlled motivation, and maladaptive functioning (Ryan & Deci, 2008; 2017).

As exercise science professionals, our goals should be to help our participants develop more autonomous forms of motivation for exercise. In order to see lasting behavior change and adherence to an exercise program, we should aim to satisfy our participants' basic psychological

needs. This will lead to more internalization of behavior that may not be inherently interesting or enjoyable at first glance. There is sufficient evidence for long-term adherence to an exercise program and the many health benefits it provides individuals that short-term adherence cannot. If we are to help enhance the health of our communities, we should aim to promote lasting adherence and internalization of behaviors. Previous research on SDT in an exercise setting has found that satisfaction of basic psychological needs does in fact lead to more autonomous motivation and continued adherence to exercise (Ng, Ntoumanis, Thøgersen-Ntoumani, Deci, Ryan, Duda & Williams, 2012).

Research in Self-Determination Theory

Empirical studies analyzing Self Determination Theory in enhancement of participant motivation to exercise have become more prevalent in recent years, especially as calls to increase physical activity of the American population have increased. Descriptive studies have indicated that there is support for greater satisfaction of basic psychological needs and enhancement of self-determined motivation, indices of well-being, participation in physical activity, and intentions to adhere to exercise (Brunet & Sabiston, 2009; Edmunds, Duda & Ntoumanis, 2006; 2007; Gillison, Standage & Skevington, 2006; Puente & Anshel, 2010; Standage, Duda & Ntoumanis, 2005; 2006; Standage, Sebire & Loney, 2008; Thøgersen-Ntoumani & Ntoumanis, 2005; Vierling, Standage & Treasure, 2007; Vlachopoulos, Kaperoni & Moustaka, 2011). A portion of these studies were interventions that focused on satisfaction of basic psychological needs in a climate perceived to be autonomy supportive (Chazisarakis & Hagger, 2009; Duda, Williams, Ntoumanis, Daley, Eves, Mutrie, Rouse, et al., 2014; Edmunds, Ntoumanis, & Duda, 2008; Friederichs, Bolman, Oenema & Lechner, 2015; Fortier, Sweet, O'Sullivan & Williams, 2007; Fortier, Duda, Guerin & Teixeira, 2012; Kinnaefick, Thøgersen-Ntoumani, Duda & Taylor,

2014; Silva, Viera, Coutinho, Minderico, Matos, Sardinha, & Teixeira, 2010; Tessier, Sarrazin & Ntoumanis, 2010; Wilson, Rodgers, Blanchard & Gessell, 2003). A review of these studies follows.

Descriptive studies seeking to examine the link between need satisfaction and adaptive motivational outcomes described in SDT are numerous, with many describing the processes at work behind internalization of behaviors that lead to enhanced autonomous motivation. For instance, many descriptive studies analyzing satisfaction of basic psychological needs have shown that greater satisfaction of the needs is correlated more specifically with enhanced self-determined forms of motivation, exercise adherence, and intentions to adhere to future programs (Edmunds et al., 2006; 2007; Puente & Anshel, 2010; Standage et al., 2005; 2006; 2008; Vierling et al., 2007). Higher satisfaction of basic needs in fitness and PE settings through either instructor or parent support leads to more adaptive motivational outcomes. For example, studies by Edmunds and colleagues analyzed the link between satisfaction of psychological needs, motivational regulation and exercise behavior in a fitness setting (2006), and obese individual's adherence to an exercise program (2007). Both studies reveal a correlation between enhanced needs satisfaction and self-determined forms of motivation, exercise adherence, and PA participation.

Puente and Anshel (2010) also examined the relationship between a fitness instructor's interacting style and students' motivation to exercise. Perceived autonomy support from the instructor correlated with more frequent PA participation, greater positive affect and more enjoyment of exercise. Needs support was found to mediate the relationship between interaction style and self-determined motivation (Puente & Anshel, 2010). Standage and colleagues (2005, 2006) conducted a series of studies in school physical education classes that show support for the

aforementioned mechanisms as well. Their 2005 study revealed support for the relationship between higher needs satisfaction and higher levels of self-determined motivation on the part of the students, and in 2006 they added to these results by showing that greater needs satisfaction benefitted teachers as well. Teachers of the needs supportive PE classes showed greater effort and persistence in their instruction of the classes. In 2008, Standage and colleagues expanded on their previous results by showing that increased participation in moderate intensity physical activity was sufficient enough to meet ACSM/AHA guidelines.

While these results appear to be consistent in multiple settings, they have also been replicated in “at-risk” minority youth samples as well (Vierling et al., 2007). Higher needs satisfaction from both parents and teachers was found to increase self-determined forms of motivation, greater participation in PA, and more positive attitudes toward physical activity (Vierling et al., 2007). Further studies have added on to the mechanisms behind development of self-determined motivation and psychological well-being, analyzing the effect of needs support on social physique anxiety (Brunet & Sabiston, 2009), adolescents’ goals for exercise (Gillison et al., 2006), physical self-worth and exercise behavior (Thogersen-Ntoumani & Ntoumanis, 2005), and maintenance of an exercise identity (Vlachopoulos et al., 2011). Greater needs satisfaction and its subsequent impact on self-determined forms of motivation have been proposed as the mediating mechanism behind social physique anxiety and participation in physical activity (Brunet & Sabiston, 2009). It was noted that needs satisfaction and motivation to exercise can explain some of the relation between individual levels of SPA and participation in exercise, based on their level of needs satisfaction underlined in basic needs theory in SDT, and which category of regulation they are in; specifically, introjected and external regulations (Brunet & Sabiston, 2009). Thogersen-Ntoumani and Ntoumanis (2005) expanded these results by analyzing the

effect of amotivation, self-determined motivation and controlling forms of motivation on exercise behaviors, relapses from exercise, physical self-worth and social physique anxiety in a population of exercisers in a gym setting. Results from this study reveal that self-determined motivation was correlated with more adaptive cognitive, behavioral and motivational outcomes, whereas controlling motivation and amotivation were not. Introjected regulation was associated with both adaptive and maladaptive outcomes (Thogersen-Notumani & Ntoumanis, 2005). This result is not surprising, as introjected regulation is associated with participation in behavior to avoid negative emotions, such as guilt or shame (Sabiston et al., 2014), as well as to reinforce contingent self-worth (Ryan & Deci, 2000a).

Gillison, Standage, and Skevington examined the link between adolescents' exercise related goals and motivation to exercise (2006). They found that adolescents who perceived themselves to be overweight or felt pressure to lose weight held more extrinsically oriented goals for exercise, and those who did not perceive themselves this way held more intrinsically oriented goals for exercise. It was also found that intrinsic goals had a positive relationship with self-determined forms of motivation, quality of life and exercise behavior, whereas extrinsic goals had a negative relationship with the aforementioned factors (Gillison et al., 2006). Lastly, maintenance of an exercise identity, assumed to be crucial to program adherence, was found to be enhanced by basic needs satisfaction, and correlated with both the exercise role identity and the exercise beliefs components of exercise identity (Vlachopoulos et al., 2011).

Taken together, then, the previous descriptive work on how satisfaction of basic needs leads to development of self-determined motivation and greater participation in physical activity has shown consistent evidence for the psychological mechanisms at work in SDT. From this body of knowledge, we can conclude that adherence to an exercise program can be influenced by

satisfaction of basic needs. However, there is an additional avenue of research in SDT that allows us to draw conclusions on the exact processes that may influence satisfaction of basic needs.

Exercise interventions targeting enhancement of motivation to exercise and adhere to a program have revealed significant support for the effect of needs satisfaction and motivation to exercise.

Interventions Based in Self-Determination Theory

Physical activity interventions aiming to enhance participant motivation for physical activity and intentions to adhere to a specific exercise program have become more prevalent in recent years. Over the past decades, there has been an influx of research on exercise interventions and their efficacy at producing adaptive motivational outcomes described in SDT. Many of these interventions describe higher satisfaction of basic needs as the driving mechanism behind enhanced self-determined motivation, psychological well-being, decreased ill-being, exercise adherence, and PA participation in a range of settings and programs (Wilson et al., 2003; Chatzisarantis & Hagger, 2009; Edmunds et al., 2008; Fortier et al., 2007; 2012; Silva et al., 2010; Tessier et al., 2010; Kinnaefick et al., 2014; Duda et al., 2015; Freiderichs et al., 2015).

Studies in school PE settings show that when compared to classes with no needs support from the instructor, classes with students that receive autonomy support show higher levels of self-determined motivation, classroom engagement, and participation in classroom activities (Chatzisarantis & Hagger, 2009; Tessier et al., 2010). These results have also been replicated in counseling style interventions designed to promote physical activity participation (Fortier et al., 2007), and adopt healthier lifestyles (Fortier et al., 2012). Results from these studies reveal that counseling interventions grounded in SDT that are designed to promote needs satisfaction through a healthcare provider or counselor are effective, and lend support to the effectiveness of interventions based in different cultures (Fortier et al., 2007; 2012).

An array of fitness interventions show support for satisfaction of basic needs leading to enhanced self-determined motivation, greater PA participation, enhanced psychological well-being, and decreased experiences of ill-being as well (Wilson et al., 2003; Edmunds et al., 2008; Silva et al., 2010; Kinnafock et al., 2014; Duda et al., 2015; Freiderichs et al., 2015). An early study by Wilson and colleagues (2003) revealed that satisfaction of the needs for autonomy and competence were the strongest predictors in development of autonomous motivation, increases in exercise behavior and subsequent physical fitness. Exercise behavior was found to mediate the relationship between needs satisfaction and physical fitness (Wilson et al., 2003). Edmunds and colleagues (2008) further replicated their previous findings with a 10 week SDT based intervention in two group fitness classes. The same instructor taught both classes, one with SDT-based teaching, the other a control condition. At the end of the study, it was found that those who were in the SDT-based class showed better attendance and greater intention to sign up for another class than those in the control condition. They also reported that participants in the need supportive condition exhibited greater levels of psychological well-being. Based on these results, we can conclude that there is support for SDT based interventions in fitness settings (Edmunds et al., 2008).

Needs satisfaction in broader interventions designed to promote health behaviors in community adults have been shown to be efficacious as well. All interventions that follow were efficacious in enhancing basic needs satisfaction, motivation to exercise, and participation in healthy behaviors such as physical activity. When compared to a control condition, overweight adults were more likely to experience success in losing weight and achieving more adaptive motivational outcomes when in an SDT-based intervention than a general health education program (Silva et al., 2010). Physically inactive adults were also more likely to maintain a 16-

week lunchtime walking program when the program and walk-leader were both grounded in SDT (Kinnafick et al., 2014). Further, Duda and colleagues revealed that exercise referral schemes in the UK were more efficacious at reducing the experience of psychological ill-being (measured by anxiety and depression scores), than simple exercise referral schemes. It was noted in this study that both referral schemes were efficacious at increasing physical fitness and developing healthy behaviors (Duda et al., 2015). Lastly, Freiderichs and colleagues (2015) showed that autonomous motivation was more associated with positive outcomes than controlling motivation or amotivation. Three clusters emerged from the *I Move* trial data in the UK, revealing support for the aforementioned mechanisms.

From this body of work, it can be concluded that there is sufficient support for exercise interventions based in self-determination theory that aim to increase motivation to exercise, psychological well-being, and participation in exercise. Exercise interventions have been associated with a wide range of positive outcomes, including reduced body fat percentage, reduced feelings of anxiety and depression, and increased physical fitness. Further associations have been found for satisfaction of basic needs and the development of self-determined motivation, participation in exercise and intentions to adhere to an exercise program. Not only does need satisfaction link to participation in physical activity, but this subsequent participation in physical activity is sufficient to improve the health and well-being of individuals. Improvements in body fat percentage, physical fitness levels and mental health outcomes have been seen as a result of interventions based in satisfaction of basic psychological needs.

With the wide array of studies providing support for the psychological mechanisms described in SDT, one may wonder what else may be added to an exercise intervention that has not been described already? However, there is a new avenue of research in self-determination

theory, motivation to exercise, and actual participation in an exercise program that may enhance the experience of needs satisfaction and long-term adherence to exercise; the perception of variety support in an exercise setting.

Perceived Variety in the Exercise Setting

A recent avenue of research in self-determination theory and psychological well-being is the effect of perceived variety in the exercise setting. Sheldon and colleagues define variety as “the pursuit and experience of diverse activities, behaviors and opportunities in one’s social milieu” (2012). In the past, researchers have explained why and how often individuals vary their chosen activities by using variety-like constructs such as sensation-seeking or experience-seeking (Zuckerman, 1994). These constructs refer to the personality traits inherent in individuals that predispose them to seek out intense, unconventional, and complex experiences, as well as experiences that are varied and novel. More recently, the focus of perceived variety in the exercise setting has been centered on the experience of variety, rather than the pursuit of new experiences (Sylvester, Standage, Dowd, Martin, Sweet, & Beauchamp, 2014a; Sylvester, Standage, Ark, Sweet, Crocker, Zumbo, & Beauchamp, 2014b). The main focus of past studies has been on the perception of variety, objective variety support, and the subsequent impact on indices of well-being and exercise adherence. To clarify, the psychological experience of variety refers to the extent an individual perceives they have experienced (or are currently experiencing) variety (i.e. felt variety), and objective variety refers to the actual opportunities provided within a given setting.

Sheldon and Lyubomirsky (2012) established that perception of variety is conducive to greater feelings of psychological well-being and happiness. Variety directly impacts well-being by prolonging the positive emotions associated with this experience. Dimmock and colleagues tested perceived variety in the exercise setting by having participants in exercise classes hear differing explanations concerning the last half of their session (Dimmock, Jackson, Podlong, & Magaraggia, 2013). In their study, participants in a cycling class were either told that the last half

of their cycling class would utilize the same skills they had previously learned in differing, various ways, or that the last half would not be different than the first. It was found that participants in the variety support condition reported higher ratings of enjoyment, interest, and greater internal locus of causality than those in the control condition. Participants in this study actually participated in the same exercise protocol between the two conditions. This provides support for perceived variety being a particularly important antecedent for exercise related well-being (Dimmock et al., 2013).

Given the empirical support that satisfaction of basic needs and internalization of behavior lead to enhanced well-being and eudemonia, and the link for perceived variety being a particularly important antecedent of well-being, a theoretical link can be seen between perception of variety in an exercise setting and enhancement of psychological well-being through greater satisfaction of basic needs and development of autonomous motivation. This is precisely the theoretical link that Sylvester and colleagues tested in their 2014 study on perceived variety in the exercise setting, using basic needs satisfaction as a potential mediator (Sylvester et al., 2014a).

Sylvester and colleagues first studied the experience of perceived variety in the exercise setting as it related to psychological needs satisfaction and exercise related well-being (2014a). It was their intention in this study to focus primarily on the experience of perceived variety, rather than the conditions in the environment that supported variety (objective variety), or the extent to which individuals sought out new experiences (pursuit). Sylvester and colleagues sought to examine the effects of perceived variety on needs satisfaction and exercise related well-being. Positive and negative experiences, as well as subjective vitality, were measured along with perception of variety and basic needs satisfaction in community adults. Their results show that

greater perceptions of variety in an exercise setting positively predicted indices of psychological well-being and need satisfaction. Perceived variety accounted for an equal amount of variance related to exercise related positive affect when compared to the needs for relatedness and autonomy. Perceived variety accounted for a greater amount of variance related to subjective vitality than competence or relatedness. However, perception of variety accounted for less variance than the need for competence in regards to exercise related positive affect and subjective vitality when combined. Confirmatory factor analysis revealed that perceived variety is distinctly different from, but still related to the three basic psychological needs (Sylvester et al., 2014a). From this study we can conclude the perceived variety is empirically distinct from the three basic psychological needs, but is related to enhanced needs satisfaction. Sylvester and colleagues state that perception of variety may be considered an additional psychological experience that enhances the experience of psychological well-being described in SDT (Sylvester et al., 2014a).

These results were extended by Sylvester and colleagues in a study that assessed the effect of perceived variety on variance in exercise behavior alongside basic psychological need satisfaction after a 6-week period (Sylvester, Standage, Ark, Sweet, Crocker, Zumbo, & Beauchamp, 2014b). This study sought to expand upon the knowledge gained from the 2014a study, using autonomous and controlled motivation as mediating variables for the effect of perceived variety on exercise behavior. A sample of community adults who regularly participated in exercise were asked to fill out questionnaires on variety support, needs satisfaction, and exercise behavior. The mediating variables in this study were autonomous and controlled motivation. Indirect effects for the experience of perceived variety and satisfaction of the needs for competence and relatedness on exercise behavior were found. The need for autonomy

negatively predicted controlled motivation, and perceived variety complemented the experience of need satisfaction in predicting autonomous motivation and exercise behavior (Sylvester et al., 2014a). The results from this study lend support for indirect effects of perceived variety on exercise behavior, with autonomous motivation as a mediator (Sylvester et al., 2014b).

Perceived variety was also found to predict exercise adherence, independent of needs satisfaction in an exercise setting (Sylvester, Standage, McEwan, Wolf, Lubans, Eather, & Kaulius, et al., 2016). In their first experimental study, Sylvester and colleagues tested the effect of objective variety on the experience of perceived variety in a 6-week training program. It was hypothesized that objective variety support would predict experience of perceived variety and exercise adherence, but not perceptions of autonomy, competence or relatedness satisfaction. Basic need satisfaction was not supported in this study, but the trainers involved in the study worked with clients in both a variety condition and a control condition. Participants in the variety condition were given exercise plans that incorporated a variety of exercises that targeted the same muscle groups, whereas participants in the control condition performed the same exercises over the course of the study. At the end of the 6 weeks, participants in the variety condition showed greater attendance and participation than those in the control group (Sylvester et al., 2016). This finding may indicate that objective variety support leads to the experience of perceived variety, and can be influential independent of basic need support (Sylvester et al., 2016).

In 2018, Sylvester and colleagues extended their work by analyzing the interaction of basic needs satisfaction and perceived variety in exercise and the subsequent effect on self-determined motivation and exercise behavior (Sylvester, Curran, Standage, Sabiston, & Beauchamp, 2018). The model they proposed hypothesized that the effects of perceived variety

on exercise behavior would be mediated by self-determined motivation. Further, they hypothesized that the effect of perceived variety on motivation would be moderated by basic needs satisfaction, in a positive direction. A sample of 499 community adults completed an online questionnaire analyzing the study variables. Results of the study revealed that basic needs satisfaction did moderate the mediated relationship, but not in the direction hypothesized (Sylvester et al., 2018). Perceived variety had a stronger effect on self-determined motivation and exercise behavior when basic needs satisfaction was lower than average (Sylvester et al., 2018).

The avenue of research on perceived variety in the exercise setting, although very new, is a promising avenue for researchers to further understand the effects of need satisfaction on exercise adherence, and development of self-determined motivation. Perceived variety appears to be a potential additive psychological experience that can enhance the experience of needs satisfaction, which in turn will lead to enhancement of self-determined forms of motivation, increased participation in exercise, and intentions to adhere to a future exercise program. However, further research is required for there to be significant consensus on this point.

It appears that only the experience of variety in an exercise setting has been studied through the lens of Self-Determination Theory (Sylvester et al., 2014a; Sylvester et al., 2014b; Sylvester et al., 2016; Sylvester et al., 2018). The pursuit of variety, or the extent to which someone seeks out new experiences in an exercise setting, has not yet been studied. Personality researchers have utilized other constructs to describe this specific aspect of variety in the past (Zuckerman, 1994), and the Experience Seeking Subscale of the Sensation Seeking Scale was utilized to help develop the Perceived Variety in Exercise scale (Sylvester et al., 2014a). This investigator argues that in order to better understand both aspects of variety in an exercise setting

(i.e. pursuit and experience), the extent to which variety matters to individuals and the extent to which they seek it out in their exercise routine, should not be ignored. By analyzing both aspects of variety in an exercise setting, we will be able to gain a more complete picture of the effects of perceived variety on basic needs satisfaction, motivation to exercise and intention to adhere to future exercise programs.

Preliminary results are promising, but it is still somewhat unclear to what extent perceived variety shares some conceptual overlap with the needs for autonomy, competence and relatedness, and which aspects are truly separate from the basic needs and can impact motivation, intentions to adhere to a program, and indices of psychological well-being. Sylvester and colleagues (2014a) state that an individual can perceive an exercise session as variety supportive, while feeling that the needs for autonomy, competence and relatedness are unsatisfied. Sheldon and Lyubomirsky (2012) have also stated that the three basic needs may be an incomplete psychological experience, and there may be additional constructs that impact psychological well-being. While there is still clarification needed, this study will add to the base of knowledge we currently have regarding perception of variety support on enhancement of needs satisfaction, self-determined motivation, and participation in physical activity through replication of previous findings.

Purpose of the Study

The purpose of this study was to examine the relationships between perceived variety and the extent to which an individual seeks out new experiences and the degree of basic psychological needs satisfaction, behavioral regulations, and intention to adhere to a future exercise program. A secondary purpose of this study was to examine the relationships between perceived variety and physical activity participation and the degree of basic psychological needs satisfaction, behavioral regulations, and intention to adhere to future exercise program.

Hypotheses

Based on preliminary research analyzing perceived variety in the exercise setting a number of hypotheses are proposed, and outlined below. It is hypothesized that higher levels of perceived variety will:

1. Predict higher degree of basic need satisfaction, self-determined motivation, and intention to adhere to a future exercise program.
2. And experience seeking will predict higher degree of basic need satisfaction, self-determined motivation, and intention to adhere to a future exercise program.
3. And physical activity participation will predict higher degree of basic need satisfaction, self-determined motivation, and intention to adhere to a future exercise program.

Method

Participants & Procedure

177 Participants were recruited from seven Basic Instructional Program (BIP) classes offered by the Department of Kinesiology at Michigan State University (MSU). Participants were primarily college age individuals (18-50 years old), and currently enrolled in one of the seven BIP courses offered by MSU Kinesiology. All individuals in this study were healthy individuals capable of performing the workouts given by the instructor for each class meeting. Three Aerobic Exercise classes and four General Conditioning classes taught by Kinesiology graduate student teaching assistants were selected for participant recruitment. Instructor consent was obtained before participants were recruited from these courses. An a-priori linear regression power analysis using G-Power version 3.1.9.2 was conducted to determine exact sample size needed to attain statistical power of a 0.8 effect size. As a result of this power analysis, it was determined that a sample size of 92 was needed to attain adequate statistical power.

The General Conditioning (GC) and Aerobic Exercise (AE) courses were selected as recruitment sources for this study due to the high inherent variety in the class structure. These two courses have a high range of flexibility for instructors to teach different exercise formats, and incorporate different exercises into their class plans. The specific workouts given to students for each class session can take different formats depending on the skills and resources available to the instructor. For example, a teaching assistant for an Aerobic Exercise course may choose to have each class meeting follow an interval training/circuit training exercise format. Within that specific format, the instructor has a range of options to add variety without having to switch to a different format entirely. They may choose to add new exercises, increase the intensity of workout over time, and vary the combination of exercises shown to students, so one class never

looks the same as the next. Instructors also have the option to incorporate different exercise formats entirely. For example, one teaching assistant for a General Conditioning course assistant may choose to alternate between running workouts, interval training, cardio kickboxing, or weight training.

While there was a wide range of possibilities for these courses to incorporate variety into their structure, many instructors who teach these courses choose to stick primarily with the interval training/circuit training formats, due to their high versatility and popularity in the fitness industry, while adding in their own unique variance every so often. To account for this variability, the Primary investigator spoke with each of these instructors to obtain an overview of their class schedule for the course. The Primary investigator also attended each of these classes two times to observe how the class is run, as well as the different types of workouts employed by the teaching assistant.

Data was collected at one time point 7 weeks into the 17-week academic semester. BIP courses are held in the Spring semester meet for 16 of the 17 weeks, so data collection was conducted at a time point a little over a third of the way through the semester. This time point was chosen to correspond with previous studies on perceived variety (Sylvester et al., 2014a; Sylvester et al., 2014b; Sylvester et al., 2016), as well as to capture any effect that perceived variety may have had past the typical 6-week timeline that has been utilized in previous studies. At this data collection time point, participants were asked to complete quantitative measures assessing the experience of perceived variety, the extent to which they seek out new experiences, basic needs satisfaction, motivation to exercise and reasons why they are taking the class, their intention to adhere to future sessions of physical activity, as well as their regular participation in physical activity. Before data collection, the primary investigator (PI) obtained instructor consent

to recruit participants from their course. Upon receiving instructor consent, the PI visited the class and distributed informed consent documents to students who were interested in participating. Participants were asked to read the informed consent document if they decided to participate. This study was classified as Exempt by MSU's Internal Review Board, and participants only completed the questionnaire packet if they gave their consent to participate.

Once informed consent documents were read, the questionnaire packet was distributed to each participant who agreed to participate in the study. In this packet they were asked to complete the demographic sheet with their height, weight, age, gender, and year in school. The remainder of the packet included the Perceived Variety in Exercise (PVE) Questionnaire, the Experience Seeking Subscale of the Sensation Seeking Scale (SSS-V), the Psychological Needs Satisfaction in Exercise (PNSE) Questionnaire, the Behavioral Regulation in Exercise Questionnaire-3 (BREQ-3), a 3 item measure of Intention to continue exercising, developed by the Primary investigator in accordance with guidelines for constructing an Intentions Questionnaire (Ajzen, 2013), and the International Physical Activity Questionnaire Short Form (IPAQ-SF).

In total, participants completed 6 questionnaires, with 68 items in total. The questionnaire packet took about 20-25 minutes to complete. All data was collected by the Primary Investigator (PI) during a class session for each of the academic courses in the population pool. The PI was responsible for cleaning and coding of all data collected.

Questionnaires

Perceived Variety in Exercise scale. Perceived variety in the exercise setting was assessed using the Perceived Variety in Exercise scale (PVE) (Sylvester et al., 2014a). The perceived variety in exercise questionnaire has been shown to be a reliable and valid measure

(Sylvester et al., 2014a), with an alpha of 0.94. While one overall PVE score is obtained the PVE includes 5 items on a 6-point likert type scale that assess the extent to which people feel they are experiencing variety when they exercise. Response options range from a statement of “False” (1) to “True” (6). Items include, “I feel like I engage in a variety of exercises,” and “I feel like I change the types of exercise that I do.”

Psychological Needs Satisfaction in Exercise questionnaire. Satisfaction of basic psychological needs in the exercise setting was assessed using the Psychological Needs Satisfaction in Exercise questionnaire (PNSE)(Wilson, Rogers, Rodgers, & Wild, 2006). The PNSE was chosen to assess need satisfaction due to its high validity and reliability. Its internal consistency (Cronbach’s alpha = 0.93) is high. It has also been repeatedly used in previous studies assessing needs satisfaction in an exercise setting (Wilson et al., 2006, Sylvester et al., 2014a; Sylvester et al., 2016). The PNSE assesses satisfaction of basic needs in the exercise setting specifically, with 18 items on a 6 point likert type scale. Response options range from a statement of “False” (1), to “true” (6). Perceived Autonomy (6 items) items include items such as, “I feel free to exercise in my own way,” and “I feel like I have a say in choosing exercise that I do.” Perceived Competence (6 items) items include, “I feel that I am able to complete exercises that are personally challenging,” and “I feel like I am capable of doing even the most challenging exercises.” Perceived Relatedness (6 items) items include items such as the following: “I feel connected to the people I interact with while we exercise together,” and “I feel like I share a common bond with people who are important to me when we exercise together.” The PNSE, then results in an overall score as well as separate scores for the perceived autonomy, perceived competence and perceived relatedness subscales.

Experience Seeking Subscale – Sensation Seeking Scale (SSS-V). The extent to which individuals seek out new experiences in their exercise routines was assessed with the Experience Seeking Subscale of the Sensation Seeking Subscale form V (SSS-V) (Gray & Wilson, 2007). This scale has been shown to be valid and reliable in previous studies (Gray & Wilson, 2007), with an alpha of 0.45. This subscale of the Sensation Seeking Scale has 10 items that assess the extent to which an individual seeks out new experiences, with two choices, A and B to choose from. Participants choose which statement (A or B) is most true of them. Sample items in this subscale include, “A. I like to explore a strange city or section of town by myself, even if it means getting lost. B. I prefer a guide when I am in a place that I don’t know well.” Scores for this questionnaire are calculated by adding up participant responses as dictated by the scoring document. Experience seeking responses dictated by the scoring protocol document are given a value of 1, and non-experience seeking responses are given a value of 0.

Behavioral Regulation to Exercise Questionnaire-3. Motivation to exercise was assessed by the Behavioral Regulation to Exercise Questionnaire -3 (BREQ-3). The BREQ-3 assesses the full continuum of motivation underlined in the organismic integration sub-theory of SDT, from amotivation, through the four categories of external regulation, to intrinsic motivation. Previous versions of this measure have been shown to be efficacious in previous studies, and the only changes made to this measure were the addition of items used to assess integrated regulation (Markland & Tobin, 2004; Markland, 2014; Wilson et al., 2006). It is a reliable scale, with an alpha of 0.86. There are 24 items in the BREQ-3, with 4 items assessing each category of behavioral regulation on a 5 point likert type scale. Response options range from a statement of “Not true” (0) to “Very true for me” (4). Items are not represented in order of category of regulation, but rather intermingled throughout the questionnaire.

Intentions to Continue Exercise. Intentions to continue exercise for the duration of the BIP courses was assessed a three item measure anchored on a 7-point Likert scale where 1 indicates “Highly Likely,” and 7 indicates “Highly Unlikely.” This measure was developed by the Primary Investigator in accordance with guidelines set by Ajzen (2013) on constructing a Theory of Planned Behavior Questionnaire, specifically to measure an individual’s intentions. A reliability analysis was run in SPSS 24.0 for scale reliability, and the analysis revealed the scale was efficacious (Cronbach’s alpha = .72). Sample items include, “I intend to exercise for at least 50 minutes a day, two times a week for the remainder of the BIP class sessions,” or, “I intend to select a new method of exercise upon completion of the BIP course, whether that is exercise on my own or with friends, in a new activity course, or through membership at a gym,” and, “For me to attend the meetings of this BIP course on a regular basis is: highly likely (1) to highly unlikely (7).” For data analysis purposes, the intentions items were reverse scored upon data entry.

Physical Activity Level. Level of physical activity participation was assessed using the short form of the International Physical Activity Questionnaire (IPAQ-Short Form) (Craig, Marshall, Sjoström, Bauman, Booth, Ainsworth... & Oja, 2003). This physical activity questionnaire is a standard questionnaire used to assess physical activity participation in multiple different contexts and international populations (Craig et al., 2003), and is reliable and valid (Spearman’s $\rho = 0.76$). A reliability analysis for this study reported a Cronbach’s alpha of 0.23. Questions in this survey ask participants about how many days, and hours or minutes they spent performing vigorous intensity activity, moderate intensity activity, walking, and in sedentary time over the past week. Once the questionnaire is completed, it is then scored using the IPAQ Scoring Protocol document to classify individuals based on their activity level. Activity

classifications can be either categorical (highly active, moderately active, or sedentary) or continuous ($\text{met}\cdot\text{mins}^{-1}/\text{week}$). For this study, participants were classified as highly active, moderately active, or sedentary.

Data Analysis

SPSS 24.0 was used to analyze all data and conduct statistical tests. Participant demographics (height, weight, age, and gender) were analyzed by descriptive statistics, and are reported in the results section of this paper. Simple Linear regression was used to analyze the predictions made in hypothesis one. Multiple linear regression and canonical correlation analysis were used to analyze the prediction made in hypothesis two. Multiple linear regression was used to analyze the predictions made in hypothesis three.

Results

Data Cleaning

A missing value analysis was run on all variables. Participants were eliminated ($n = 4$) if they had more than 5% of data missing (1 or 2 empty cells missing at random). Missing values of these variables were replaced by the harmonic mean.

The International Physical Activity Questionnaire (I-PAQ short form) was not completed completely by a significant portion of the participants (20.90%). It is suspected that some of the questions may have been confusing, with participants left unsure of which box to write their answer in, resulting in an answer of “Don’t know/not sure,” or leaving the question blank. Thirty seven participants had more than 5% of data missing on solely this questionnaire. As a result, these participants were removed from the multiple linear regression analyses utilizing PA level as a predictor variable only, rather than assigning a value of 0 to all missing data points. A sample of 140 participants was utilized to conduct the analyses on the combined influence of PA level and perceived variety.

Descriptive Statistics

Demographics. One hundred eighty one participants were recruited for this study from the seven BIP courses. However, four participants had more than 5% of data unanswered, resulting in their removal from the analysis, leaving a total of 177 participants whose data were used to conduct all statistical tests. The mean age for participants was 20.81 ($SD = 2.88$) ranging from 18-50 years. Mean height for females was 64.68 inches tall ($SD = 2.40$) and ranged from 60 to 72 inches tall, and mean height for males was 71.25 inches tall ($SD = 3.28$), and ranged from 60 to 79 inches. Average weight in pounds was 138.48 ($SD = 22.46$), ranging from 104 lbs to 247 lbs for females, and 176.85 ($SD = 29.99$), ranging from 120 lbs to 255 lbs for males. Sixty one

males (34.5%) and 116 females (65.5%) participated in the study. The sample was composed of 127 Caucasian (71.8%), 24 African American (13.6%), 12 Asian (6.8%), 2 Chinese (1.1%), 1 Hispanic (0.6%) and 1 Native American (0.6%) participants, with 10 participants identifying as more than one race (5.6%). Thirty three participants were freshmen (18.6%), 35 were sophomores (19.8%), 30 were juniors (26.9%), 64 were seniors (36.2%), 13 were 5th year students (7.3%), and 2 were in their 6th year of school (1.1%).

Perceived variety in exercise values range from 1-6 on a Likert type scale with one signifying low perceived variety and 6 high perceived variety. Overall, the participants in this study were fairly high in their perception of variety ($M = 4.54$, $SD = 1.02$). Basic needs values range from 1 to 6 on a Likert type scale with one signifying low and 6 high satisfaction. Self-reported feelings of autonomy, competence, and relatedness need satisfaction were fairly high as well ($M = 4.43$, $SD = 1.18$, $M = 4.99$, $SD = 0.82$, and $M = 4.94$, $SD = 1.08$, respectively).

Experience seeking gives two options, with absolute values assigned a 1 or 0 in the scoring document. Highest scores on this scale could be 10, lowest scores could be zero. Self-reported levels of experience seeking were moderate ($M = 4.42$, $SD = 1.78$). Self-regulation scores range from 0-4 on a Likert type scale. Amotivation and External Regulation were low ($M = 0.185$, $SD = 0.43$, and $M = 0.93$, $SD = 0.98$ respectively) while introjected regulation was at an average level ($M = 2.56$, $SD = 1.05$). Identified regulation was moderately high ($M = 3.24$, $SD = 0.67$), and integrated regulation and intrinsic motivation were at moderately high levels ($M = 2.65$, $SD = 1.07$, and $M = 2.99$, $SD = 0.77$) respectively. Intention scores ranged from 1-7 on a Likert type scale, originally with 1 indicating a high level of intention and 7 indicating a low level of intention. The item scores were reverse scored in SPSS upon data entry and cleaning. Levels of

intention to complete the course were high ($M = 6.32$, $SD = 1.43$), as well as intention to continue exercising after the course was completed ($M = 5.65$, $SD = 1.61$).

Physical activity measures were self-reported in days, hours and minutes of physical activity. Possible Physical activity scores could range from 0 to 16 hours a day of physical activity, 7 days a week. Using the IPAQ Scoring Protocol document, participants were classified as either highly active, moderately active, or sedentary. To be classified as highly active, participants were required to either meet or exceed $1,500 \text{ met} \cdot \text{mins}^{-1}$ a week of vigorous intensity activity on 3 or more days a week, or $3,000 \text{ met} \cdot \text{mins}^{-1}$ a week of any intensity activity on 7 days a week. To be classified as moderately active, participants had to either meet or exceed 3 days of vigorous intensity activity for at least 20 minutes on each day, 5 days a week of moderate intensity activity and/or walking for 30 minutes a day, or 5 days a week of any combination of activity that met or exceeded $600 \text{ met} \cdot \text{mins}^{-1}$. Participants who did not meet any of these categories were classified as sedentary. For the analyses including all 140 participants, 100 were classified as highly active (71.4%), 35 were classified as moderately active (25.0%), and 5 were classified as sedentary (3.6%). Overall, the sample was mainly moderately to highly active. For a summary of sample characteristics, please see Table 1.1 in the Appendix.

Pearson Correlations.

Pearson correlations for all variables are reported in Table 1.2 in the Appendix, with significance levels reported at the 0.05 and 0.01 levels. An inspection of this table reveals significant correlations between perceived variety and all three basic needs, as well as identified regulation, integrated regulation, and intrinsic motivation. There was no significant relationship between perceived variety and the intentions measures, or between perceived variety and the

controlling dimensions of self-regulation. Experience seeking was not significantly correlated with any of the other study variables.

Relationships Between Predictor Variables and Outcome Variables

Hypothesis 1. A simple linear regression analysis was run to analyze the predictions made in hypothesis 1. The relationships between perceived variety and all other dependent variables were first analyzed through simple correlations. These values are reflected in Table 1.2 in the Appendix of this document.

First, the relationships between perceived variety and all three basic needs were analyzed using simple linear regression. The model predicting degree of autonomy satisfaction was significant ($R^2_{adj.} = .103$, $F(1,175) = 21.298$, $p < .001$), with perceived variety significantly predicting higher perceptions of autonomy satisfaction ($t = 4.615$, $p < .001$, $\beta = .329$). The results of the simple linear regression predicting degree of competence satisfaction from perceived variety were also significant ($R^2_{adj.} = .067$, $F(1,175) = 13.631$, $p < .001$), with perceived variety significantly impacting perceptions of competence satisfaction ($t = 3.692$, $p < .001$, $\beta = .269$). Lastly, the model predicting degree of relatedness satisfaction from perceived variety was also significant ($R^2_{adj.} = .083$, $F(1,175) = 16.982$, $p < .001$), with perceived variety significantly predicting higher degree of relatedness satisfaction ($t = 4.121$, $p < .001$, $\beta = .297$).

Next, the relationships between perceived variety and all 6 categories of self-regulation were analyzed. Based on the correlations that emerged between perceived variety and self-determined motivation, these three categories of regulation were analyzed first, followed by the three categories of controlling motivation. The results of the simple linear regression analyzing the relationship between perceived variety and identified regulation revealed a significant model ($R^2_{adj.} = .027$, $F(1,175) = 5.861$, $p < .05$), with perceived variety significantly predicting identified

regulation ($t = 2.421$, $p < .05$, $\beta = .180$). The model predicting integrated regulation from perceived variety was also significant ($R^2_{adj.} = .024$, $F(1,175) = 5.351$, $p < .05$), with higher levels of perceived variety predicting higher reported integrated regulation ($t = 2.313$, $p < .05$, $\beta = .172$). Lastly, the model analyzing the relationship between perceived variety and intrinsic motivation was significant ($R^2_{adj.} = .090$, $F(1,175) = 18.308$, $p < .001$), with perceived variety significantly predicting intrinsic motivation ($t = 4.279$, $p < .001$, $\beta = .308$). None of the models predicting controlling motivation were significant (Amotivation: $R^2_{adj.} = .004$, $F(1,175) = 1.622$, $p = .204$; External Regulation: $R^2_{adj.} = -.006$, $F(1,175) = .027$, $p = .870$; Introjected Regulation: $R^2_{adj.} = -.002$, $F(1,175) = .697$, $p = .405$), therefore no further interpretation of results was conducted.

Lastly, simple linear regression analyses were run predicting participant intention to finish the activity course, and intentions to adhere to a future exercise program. The results of these analyses reveal that neither model was significant (Intention to finish the course: $R^2_{adj.} = -.005$, $F(1,175) = .211$, $p = .646$; Intention to adhere to a future exercise program: $R^2_{adj.} = -.002$, $F(1,175) = .587$, $p = .444$). Because none of the models were significant, no further interpretation of results was conducted. In summary, Hypothesis 1 was partially supported, with perceived variety having positive relationships with all three basic needs, and self-determined motivation only, as well as having no relationship with controlling motivation. There was no relationship with either intentions measure, which was contrary to what was hypothesized.

Hypothesis 2.

Analysis 1: Multiple linear regression. The relationship between experience seeking and perceived variety and each of the three basic needs was analyzed first through simple correlations, taking predictor and criterion variable separately. A significant correlation emerged between perceived variety and autonomy ($r = .329$; $p < .001$), but not experience seeking and

autonomy ($r = .091$; $p = .114$). Upon examining the simple correlations between perceived variety and competence as well as experience seeking and competence, a significant correlation emerged between perceived variety and competence ($r = .269$; $p < .001$), but not experience seeking and competence ($r = -.010$; $p = .445$). Lastly, a significant correlation emerged between perceived variety and relatedness ($r = .297$; $p < .001$), but not for experience seeking and relatedness ($r = .039$; $p = .305$).

A multiple linear regression analysis examined the relationship between experience seeking and perceived variety on each of the basic needs. Looking at the basic need of autonomy, results revealed that the proposed model was significant ($R^2_{adj.} = .108$, $F(2,174) = 11.602$, $p < .001$), with perceived variety accounting for the significant relationship with autonomy ($t = 4.644$, $p < .001$, $\beta = .331$) rather than experience seeking ($t = 1.344$, $p = .181$, $\beta = .096$). When the multiple regression was conducted to examine the relationship of perceived variety and experience seeking to competence the model was found to be significant ($R^2_{adj.} = .062$, $F(2,174) = 6.781$, $p = .001$), with perceived variety variable accounting for the significant impact on levels of reported competence satisfaction ($t = 3.680$; $p < .001$; $\beta = .269$), rather than experience seeking ($t = -.090$; $p = .928$; $\beta = -.007$). Lastly the relationship between experience seeking and perceived variety with the basic need of relatedness was examined. The multiple regression results revealed a significant relationship ($R^2_{adj.} = .080$; $F(2,174) = 8.635$; $p < .001$), with further inspection of the standardized beta weights and univariate analyses revealing that perceived variety accounted for the significant impact on relatedness satisfaction ($t = 4.121$; $p < .001$; $\beta = .298$), rather than experience seeking ($t = .592$; $p = .555$; $\beta = .043$). A visual representation of these results are given in Table 3.1 in the Appendix.

Next, a multiple linear regression analysis was run examining the relationship between experience seeking and perceived variety for each dimension of self-regulation (identified regulation, integrated regulation, and intrinsic motivation). The relationship between perceived variety, experience seeking and identified regulation was analyzed first. A significant correlation emerged between perceived variety and identified regulation ($r = .180$; $p = .008$), but not for experience seeking and identified regulation ($r = .003$; $p = .483$). Additionally, a significant correlation between perceived variety and integrated regulation ($r = .172$; $p = .011$), and not for experience seeking and integrated regulation ($r = .024$; $p = .376$). Lastly, a significant correlation between perceived variety and intrinsic motivation ($r = .308$; $p < .001$), but not between experience seeking and intrinsic motivation ($r = -.059$; $p = .217$).

When a multiple regression analysis was conducted to predict levels of identified regulation from perceived variety and experience seeking, the proposed model trended toward significance ($R^2_{\text{adj.}} = .021$; $F(2,174) = 2.917$; $p = .057$). Upon further examination of the standardized beta weights and univariate correlations, it appears that perceived variety still had a significant relationship with identified regulation ($t = 2.415$; $p = .017$; $\beta = .180$), but experience seeking did not ($t = .078$; $p = .938$; $\beta = .006$). Although the model was not significant, it appears that the previous relationship between perceived variety and identified regulation trended in the predicted direction. Next, the relationship between perceived variety and experience seeking with integrated regulation was examined. Overall, the proposed model for perceived variety and experience seeking predicting changes in integrated regulation was not significant ($R^2_{\text{adj.}} = .019$; $F(2,174) = 2.724$; $p = .068$) and because it failed to reach significance, no follow up analyses were conducted. The relationship between perceived variety, experience seeking and intrinsic motivation was analyzed last, finding the proposed model to be significant ($R^2_{\text{adj.}} = .098$;

$F(2,174) = 9.422$; $p < .001$), with perceived variety having a significant impact on intrinsic motivation ($t = 4.262$; $p < .001$; $\beta = .307$), and experience seeking having no significant impact on intrinsic motivation ($t = -.761$; $p = .447$; $\beta = -.055$). A visual representation of the results of the analyses for identified regulation, integrated regulation, and intrinsic motivation are given in Table 3.2 in the Appendix.

The present findings reveal that only perceived variety was significantly related to the outcome variables for basic needs and the more self-determined forms of regulation. Looking over all the results, there appears to be a consistent, significant relationship between perceived variety and the outcome variables, with perceived variety always accounting for a greater percent of the variance explained by the independent variables than experience seeking.

When a multiple linear regression analysis was run to analyze the relationship between perceived variety and experience seeking and each of the three remaining categories of self-regulation (amotivation, external regulation and introjected regulation), there were no significant correlations (Amotivation and perceived variety: $r = -.096$; $p = .102$. Amotivation and Experience seeking: $r = -.030$; $p = .348$. External regulation and perceived variety: $r = -.012$; $p = .435$. External regulation and experience seeking: $r = .029$; $p = .350$. Introjected regulation and perceived variety: $r = .063$; $p = .202$. Introjected regulation and experience seeking: $r = .022$; $p = .384$). None of the proposed models appeared to be significant, indicating no relationships between perceived variety and experience seeking and any of the three outcome variables: Amotivation ($R^2_{adj.} = -.001$; $F(2,174) = .891$; $p = .412$), External regulation ($R^2_{adj.} = -.010$; $F(2,174) = .086$; $p = .917$), and Introjected regulation ($R^2_{adj.} = -.007$; $F(2,174) = .394$; $p = .675$).

Lastly, a multiple linear regression analysis was run to analyze the relationship between perceived variety, experience seeking and intention to finish the course, as well as intention to continue to exercise after the course was completed. The analysis revealed no significant correlations between perceived variety and experience seeking to either intention measure ((Intention to finish the course and perceived variety: $r = -.035$; $p = .323$. Intention to finish the course and experience seeking: $r = .101$; $p = .090$. Intention to exercise after the course and perceived variety: $r = -.058$; $p = .222$. Intention to exercise after the course and experience seeking: $r = .098$; $p = .098$)). None of the proposed models were significant either. No significant relationships appeared among perceived variety, experience seeking and intention to finish the course ($R^2_{adj.} = .000$; $F(2,174) = 1.003$; $p = .369$), or intention to exercise after the course was completed ($R^2_{adj.} = .001$; $F(2,174) = 1.123$; $p = .328$).

Analysis 2: Canonical correlation. A series of canonical correlation analyses were run using SPSS 24 to analyze the relationship of the two predictor variables (perceived variety and experience seeking) with the three basic needs (autonomy, competence, and relatedness), the six categories of self-regulation (amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation), and each of the intentions dimensions (intention to finish the course, and intention to exercise after the course is completed).

First, the relationship between the predictor variables and the three basic needs was analyzed. The results of the analysis reveal one significant relationship, with the first canonical correlation $R_{c1} = 0.385$ (14.83% of the variance explained) representing a moderate relationship between perceived variety and experience seeking and satisfaction of the three basic psychological needs (Wilk's $\lambda = .846$, $F(6,344) = 5.01$, $p < .001$) (See Table 3.3). The first linear relationship revealed a relationship between perceived variety and experience seeking and basic

psychological needs. A canonical loading of 0.30 was used to define a meaningful contribution to the model (Tabachnick & Fidell, 2007). As a result, it was found that when participants experienced higher levels of perceived variety in an exercise setting, they were more likely to report higher levels of basic needs satisfaction as well, especially with autonomy. The redundancy statistic revealed that 7.38% of the variance in the dependent variables was explained by the canonical variables. The second relationship tested within this analysis was not found to be significant, therefore no further interpretation of its results was conducted.

Next, the relationship between the predictor variables perceived variety and experience seeking and the six categories of self-regulation were analyzed. A significant relationship emerged among the first canonical correlation $R_{c1} = 0.334$ (11.13% of the variance explained), indicating a moderate relationship between the predictor variables and self-regulation (Wilk's $\lambda = .880$, $F(12,338) = 1.85$, $p = .039$). Using the same standard for a meaningful contribution to the model of a canonical loading of 0.30, it appears that when participants reported higher levels of perceived variety, they also reported higher levels of intrinsic motivation (See Table 3.4). The redundancy statistic for this canonical correlation analysis revealed that 5.60% of the variance in self-regulation was explained by the predictor variables. The second canonical loading was not significant.

Lastly, the relationship between perceived variety and experience seeking to a participant's intention to complete the physical activity course, and their intention to continue exercising after the course was completed was analyzed. No significant relationship emerged for either relationship tested ($R_{c1} = .135$; Wilk's $\lambda = .981$, $F(4,346) = .815$, $p = .516$. $R_{c2} = .000$; Wilk's $\lambda = .999$, $F(1,174) = .065$, $p = .799$). The redundancy statistic revealed that 0.92% of the variance in intentions was explained by the predictor variables. It appears that perceived variety

and experience seeking have no significant relationship to participant's intentions to continue exercising. Because no significant relationship emerged between these sets of variables, no further analysis was conducted.

Relative to Hypothesis 2, the current findings partially support the stated hypothesis. Perceived variety predicted greater basic needs satisfaction, self-determined motivation, and again had no relationship with controlling motivation. However, experience seeking did not predict any of the outcome variables in the study, contrary to what we predicted in the second hypothesis. There was also no relationship between perceived variety and experience seeking and participant's intentions, which was contrary to our hypothesis.

Relationships Between PVE and PA Levels to Outcome Variables

Hypothesis 3. Due to previous preliminary work on self-reported perceived variety and levels of physical activity participation (Sylvester et al., 2016; Sylvester et al., 2018), a set of exploratory analyses were conducted to examine what effect a participant's level of physical activity and perceived variety may have on predicting basic needs satisfaction, motivation for exercise, and intention to continue exercising. The first analysis conducted was a multiple linear regression examining the relationship between the predictor variables perceived variety and physical activity level to each outcome variable, taken separately. Results from this analysis are reported in the following sections.

First, the relationship between perceived variety, physical activity level (PA level), and each of the three basic needs was analyzed. Significant correlations emerged between perceived variety and the basic need of autonomy ($r = .363$; $p < .001$), as well as between PA level and autonomy ($r = .218$; $p < .01$). The relationship between perceived variety and PA level was significant as well ($r = .233$; $p < .01$). The multiple linear regression analysis examining the

relationship of perceived variety and PA level with autonomy indicated that the proposed model was significant ($R^2_{adj.} = .138$; $F(2,137) = 12.157$; $p < .001$). Consistent with previous results, perceived variety accounted for a significant prediction of degree of autonomy satisfaction ($t = 4.079$; $p < .001$; $\beta = 0.330$), rather than PA level ($t = 1.746$; $p = .083$; $\beta = .141$).

The relationship between perceived variety, PA level and competence was analyzed next. First, the univariate correlations were examined, revealing significant relationships between perceived variety and competence ($r = .305$; $p < .001$), and between PA level and competence ($r = .157$; $p = .032$). The proposed model examining the relationship of perceived variety and PA level with competence was significant ($R^2_{adj.} = .088$; $F(2,137) = 7.692$; $p = .001$), with perceived variety again significantly predicting degree of competence satisfaction ($t = 3.411$; $p = .001$; $\beta = .284$), rather than PA level ($t = 1.089$; $p = .278$; $\beta = .091$).

Lastly, the relationships between perceived variety, PA level and the basic need for relatedness were examined. Significant relationships emerged between perceived variety and relatedness ($r = .299$; $p < .001$), as well as for PA level and relatedness ($r = .229$; $p < .01$). The results of the multiple regression analysis revealed the proposed model examining the relationship of perceived variety and PA level with relatedness was significant ($R^2_{adj.} = .103$; $F(2,137) = 9.019$; $p < .001$), with further inspection of the standardized beta weights and univariate statistics revealing that perceived variety ($t = 3.152$; $p < .01$; $\beta = .260$), as well as PA level ($t = 2.035$; $p < .05$; $\beta = .168$) significantly predicted degree of relatedness satisfaction. This result is inconsistent with previous results in this study, being the first time PA level had a significant impact on satisfaction of a basic need when combined with another predictor variable. A visual representation of the results for autonomy, competence, and relatedness are given in Table 4.1 in the Appendix.

Secondly, the relationships between perceived variety and PA level with each category of self-regulation were analyzed. First, the categories of controlling motivation were analyzed separately (Amotivation, External Regulation, and Introjected Regulation). No significant relationship emerged between PA level and amotivation ($r = .061$; $p = .237$), however there was a significant, inverse relationship between perceived variety and amotivation ($r = -.166$; $p < .05$). This result is surprising, as perceived variety had no relationship with amotivation in any of the aforementioned analyses. Upon examining the proposed model examining the relationship of perceived variety and PA level with amotivation, it was found that the model was not significant ($R^2_{adj.} = .024$; $F(2,137) = 2.705$; $p = .070$). As a result, no further analyses were conducted.

Next, the relationship between perceived variety and PA level to external regulation was analyzed. No significant relationship existed between perceived variety and external regulation ($r = -.071$; $p = .202$), however, there was a significant relationship between PA level and external regulation ($r = .158$; $p < .05$). This result was unexpected, but not surprising, as PA level may have a relationship with participation in physical activity. The proposed model examining the relationship of perceived variety and PA level on external regulation was not significant ($R^2_{adj.} = .023$; $F(2,137) = 2.651$; $p = .074$). As a result, no further analyses were conducted on this relationship.

Lastly, the relationship between the predictor variables and introjected regulation was analyzed. Consistent with the results presented on the previous two categories of motivation, the relationship between perceived variety and introjected regulation was not significant ($r = .024$; $p = .387$). However, the relationship between PA level and introjected regulation was significant ($r = .188$; $p < .05$). The results from the multiple regression analysis reveal that the proposed model examining the relationship of perceived variety and PA level to introjected regulation was not

significant ($R^2_{adj.} = .022$; $F(2,137) = 2.531$; $p = .083$). As a result, no further analyses were conducted.

The next set of multiple regression analyses conducted examined the relationships between perceived variety and PA level and the three categories of motivation associated with markers of well-being (identified regulation, integrated regulation, and intrinsic motivation). A separate regression analysis was conducted for each of the three outcome variables. First, the relationship between perceived variety and PA level with identified regulation was conducted. Significant relationships emerged between perceived variety and identified regulation ($r = .247$; $p < .01$), as well as PA level and identified regulation ($r = .255$; $p = .001$). The results of the multiple regression analysis reveal the proposed model was significant ($R^2_{adj.} = .089$; $F(2,137) = 7.792$; $p = .001$). Upon further examination, it was discovered that both perceived variety and PA level significantly predicted identified regulation (perceived variety: $t = 2.383$; $p < .05$; $\beta = .198$; PA level: $t = 2.506$, $p < .05$; $\beta = .209$).

Next, the relationship between perceived variety and PA level and integrated regulation was analyzed. Significant relationships exist between perceived variety and integrated regulation ($r = .215$; $p < .01$), as well as between PA level and integrated regulation ($r = .235$; $p < .01$). When the relationship between the predictor variables and integrated regulation was analyzed through multiple regression, the proposed model was significant ($R^2_{adj.} = .069$; $F(2,137) = 6.161$; $p < .01$). Further examination revealed that perceived variety and PA level significantly predicted integrated regulation (perceived variety: $t = 2.017$; $p < .05$; $\beta = .170$; PA level: $t = 2.324$; $p < .05$; $\beta = .196$).

Finally, the relationship between the predictor variables and intrinsic motivation was analyzed through multiple linear regression. First, the simple correlations were analyzed,

revealing a significant relationship between perceived variety and intrinsic motivation ($r = .381$; $p < .001$), and between PA level and intrinsic motivation ($r = .250$; $p = .001$). The proposed model looking at relationship of perceived variety and PA level to intrinsic motivation was significant ($R^2_{adj.} = .160$; $F(2,137) = 14.267$; $p < .001$), with both PA level and perceived variety accounting for the significant prediction of intrinsic motivation (perceived variety: $t = 4.269$; $p < .001$; $\beta = .341$; PA level: $t = 2.129$; $p < .05$; $\beta = .170$). A visual representation of the results for the three forms of self-determined motivation is given in Table 4.2 in the Appendix.

Finally, a multiple regression analysis was conducted for the influence of perceived variety and PA level on each dimension of a participant's intention to continue exercising. First, the relationship between perceived variety and PA level with intention to finish the activity course was analyzed. No significant relationships emerged between either perceived variety or intention to finish the course ($r = .095$; $p = .133$), or PA level and intention to finish the course ($r = .043$; $p = .233$). The model examining the relationship of the predictor variables to intention to finish the activity course was not significant ($R^2_{adj.} = -.005$; $F(2,137) = .652$; $p = .522$), and therefore, no further analyses were conducted.

The final multiple regression analysis was conducted to analyze the relationship between perceived variety and PA level with intention to continue exercising after the activity course was completed. First, the simple correlations were analyzed, revealing significant relationships between perceived variety and intention ($r = .157$; $p < .05$), and PA level and intention ($r = .216$; $p < .01$). The proposed model examining the relationship of perceived variety and PA level with the outcome variable was significant ($R^2_{adj.} = .045$; $F(2,137) = 4.290$; $p < .05$), with the significant prediction of levels of intention coming from PA level ($t = 2.229$; $p < .05$; $\beta = .190$), and not

perceived variety ($t = 1.329$; $p = .186$; $\beta = .113$). A visual representation of the results for both measures of intention is given in Table 4.3 in the Appendix.

In summary Hypothesis 3 was partially supported with PA level having significant relationships with relatedness, self-determined motivation, as well as participant intentions to continue exercising after the course was completed. Inconsistent with our predictions, PA level also had significant relationships, albeit in non-significant models, with external regulation and introjected regulation. PA level did not have a relationship to either autonomy or competence, or amotivation and intention to complete the physical activity course. PA level having no relationship to amotivation was expected, however the results concerning autonomy, competence and intention to complete the course was inconsistent with our predictions. Perceived variety continued to have significant relationships with all three basic needs, self-determined motivation, as predicted, and an inverse relationship with amotivation, surprisingly. Perceived variety continued to have no relationship with either external regulation, introjected regulation, or either measure of participant intentions, consistent with previous analyses.

Discussion

This study was designed to explore the relationship of perceived variety in exercise and experience seeking behavior on basic need satisfaction, motivation to exercise, and intention to continue exercising. An exploratory analysis of the influence of physical activity level and perceived variety on each of the outcome variables was also conducted. Three different hypotheses were tested, and the results from each will be discussed separately, in comparison to recent research on the topic. Discussion of broader implications for study findings and study limitations will follow.

Overall, the results from this study revealed that portions of the hypothesized relationships were supported, while other portions were not. Specifically, perceived variety had significant linear relationships with all three basic needs, and self-determined motivation, but not participant intentions to continue exercising. Experience seeking did not have any significant linear relationships with any of the outcome variables when analyzed with perceived variety as a model predictor. PA level had a significant relationship with the basic need of relatedness, while perceived variety had a significant relationship with greater satisfaction of all three basic needs.

The models testing the influence of perceived variety and PA level on amotivation, external regulation, and introjected regulation were all non-significant. All of the proposed models regressing both perceived variety and physical activity level onto identified regulation, integrated regulation, and intrinsic motivation were significant, with both perceived variety and physical activity level significantly predicting the outcome variables. The model testing the relationship of perceived variety and PA level on participant intentions to finish the activity course was not significant, however the model testing their influence on participant intentions to

continue exercising was significant, with PA level significantly predicting intentions. Most of these results are consistent with previous research, while others were unexpected. Each of the hypotheses will now be discussed.

Hypothesis 1

Perceived variety was significantly correlated with all three of the basic needs (autonomy, competence and relatedness), as well as self-determined motivation (identified regulation, integrated regulation, and intrinsic motivation), but not intentions to continue exercising. The significant correlations between perceived variety and basic needs satisfaction, as well as perceived variety and self-determined motivation are in line with the predictions made in Hypothesis 1. These results are consistent with previous research on perceived variety in exercise, specifically that perceived variety correlates with basic needs satisfaction and self-determined motivation (Sylvester et al., 2014a; 2014b; 2016; 2018). The non-significant correlation between perceived variety and controlling forms of motivation is also supported by previous research (Sylvester et al., 2014b).

Not in line with Hypothesis 1 is the non-significant correlation between perceived variety and intentions to continue exercising. Currently there is no empirical evidence to link perceived variety in exercise to intentions to continue exercising. However, there are numerous studies based on self-determination theory that have found a theoretical link between basic needs satisfaction, self-determined motivation, and intentions (Biddle, Soos, & Chatzisarantis, 1999; Chatzisarantis & Hagger, 2009). This portion of our first hypothesis was an extension of research on perceived variety in an exercise setting. Because previous research established relationships between perceived variety, basic needs satisfaction, and self-determined motivation, as well as

basic needs, self-determined motivation and intentions, it made theoretical sense for a relationship between perceived variety and intentions to exist as well.

An additional result that was not part of our original hypothesis, but still of importance, was the correlations between experience seeking basic needs, motivation, and intentions to continue exercising. No significant correlations were found between experience seeking and basic needs, motivation, or intentions to continue exercising. This result is surprising in some ways, while also making theoretical sense in others. Original work on the construct of variety, that formed the basis of the work on perceived variety in exercise, suggested that there were two dimensions to variety: (1) the pursuit of variety; and (2) the experience of variety (Sheldon & Lyubomirsky, 2012). The specific construct of perceived variety in exercise encompasses solely the experience dimension of variety, not the pursuit of it (Sylvester et al., 2014a). There was no rationale given for why only the experience dimension of variety was chosen, while the pursuit of variety was not studied along with it. Both dimensions may be equally important in the study of exercise and physical activity participation, especially when describing the origins of motivation to exercise. This suggests that individuals who have a desire to experience greater variety in their exercise routines may also engage in high variety pursuit behavior, and as a result may be attracted to classes with high variety. This was the rationale leading the researcher to investigate the dimension of variety pursuit using the experience seeking subscale of the sensation seeking scale. It was also noted in the original article on perceived variety in exercise, that this specific subscale was used to develop the perceived variety questionnaire (Sylvester et al., 2014a). However, the lack of significant linear relationships to the outcome variables in this study leads us to question whether the pursuit dimension of variety is important in the study of physical activity motivation, or if this subscale was the correct scale to measure the construct the

investigator was trying to analyze. Of equal importance, is the consideration that the pursuit dimension of variety may have a moderated relationship with physical activity motivation through the experience of perceived variety. At this point in time, it cannot be discerned which one of these statements are true. Further research is needed before there can be a consensus on this topic.

Hypothesis 2

As predicted, the models testing the linear relationships between both perceived variety and experience seeking to each of the basic needs and the self-determined forms of motivation were significant. The models testing the relationships between perceived variety and experience seeking to the controlling forms of motivation were not significant. Not in line with the hypothesized prediction was the absence of any significant prediction of experience seeking on basic needs, all forms of self-regulation, and intentions to continue exercising. Perceived variety also did not significantly predict intentions to continue exercising.

Previous research on perceived variety in an exercise class has established a relationship between perceived variety and basic needs satisfaction and self-determined forms of motivation (Sylvester et al., 2014b; 2016; 2018). These results were again supported in the present study, indicating that when participants perceived higher variety in their exercise class, they were more likely to report higher levels of basic psychological needs satisfaction and more self-determined forms of motivation. As was found in past studies, perceived variety appears to have no relationship to controlling forms of motivation. These results offer additional support that perceived variety is a supplemental experience alongside basic needs satisfaction and uniquely predicts self-determined motivation rather than controlling motivation. Why perceived variety

has no impact on controlling motivation has yet to be analyzed (Sylvester et al., 2014b) and should be the subject of further investigation.

Concerning the absence of a linear relationship between perceived variety and participant intentions, it appears there is no evidence for perceived variety having a direct effect on intentions to continue exercising. To date, the relationship between perceived variety and intentions to continue exercising has not been studied. Given the previously discussed relationship between intentions and basic need satisfaction and self-regulation, there was an empirical rationale for testing this relationship (Biddle et al., 1999; Chatzisarantis & Hagger, 2009). However, with the lack of significant finding, it appears that these predictors have no direct effect on participant intentions. A more in depth discussion of this point will occur later in our discussion section when the third hypothesis surrounding physical activity participation and perceived variety in an exercise class is discussed.

Canonical Correlations. The results of the canonical correlation analysis support the findings of the multiple linear regression analyses conducted. When each of the relationships between perceived variety and experience seeking and basic needs, motivation, and intentions were analyzed, only the models containing both perceived variety and experience seeking were significant. When experience seeking was tested as the lone predictor in the model, no significant results emerged. These results provide further evidence that experience seeking is not a significant predictor of basic need satisfaction, motivation to exercise, or intentions to continue exercising. This point was discussed in depth earlier, but a brief review of this literature is warranted.

As previously discussed, the extent an individual seeks out varied exercise experiences is important in understanding the individual, contextual, and environmental factors that impact long

term motivation to exercise. However, the specific construct of experience seeking may not have been the best choice to analyze this construct. As we currently understand perceived variety in exercise, we have focused solely on the experience of variety in this setting, but not pursuit of variety. If both the pursuit and experience of variety are important in other life contexts, why would this not also be true in the exercise setting? Ignoring the pursuit of varied exercise experiences in favor of solely focusing on the experience of variety is incorrect. Investigators should work to better understand this other aspect of variety as it pertains to exercise motivation. There is no doubt that a better fitting construct and operational definition should be used in the study of variety pursuit. The traditional experience seeking construct was shown to have no relationship to any of the outcome variables in this study, but this does not mean we should cease to study variety pursuit entirely. I suggest that investigators should work to develop an operational definition of the pursuit of variety in exercise, and use this to inform our understanding of what motivates people to continue to exercise in addition to basic needs satisfaction, the experience of variety, and self-determined motivation.

Hypothesis 3

Results of the exploratory analysis that examined the relationship of physical activity level and perceived variety yielded a few interesting findings that were not expected, and results that are consistent with previous research. When analyzed with physical activity level, it appears perceived variety solely accounted for the significant influence on basic needs satisfaction. However, when we examined the model for relatedness satisfaction, both perceived variety and physical activity level had a significant influence on degree of satisfaction of this basic need. This result is not entirely surprising, as the activity courses the sample was drawn from were group based, with instructors constructing activities to promote connections between students.

Some of these activities were based on in-class, small group presentations, where students were put into groups of two to four and asked to lead part of the class. They were building relationships with each other while improving their physical fitness, which may explain the significant impact from each of the independent variables. Another source of relatedness satisfaction may come from the social nature of the exercise class. When teaching these classes, instructors promote relationship building and rapport among themselves and students by promoting interaction through instructor-led partner workouts, and ice breaker activities at the beginning of the semester to help students get to know one another. Combined with their attendance and participation in this course, students may associate a large part of their relatedness satisfaction specifically to relationship building through physical activity participation. A more thorough discussion on the nature of variety in these courses and its implications will appear later in our discussion.

Perceived variety and PA level both had a significant relationship with identified regulation, integrated regulation, and intrinsic motivation. In previous research (Sylvester et al., 2016; 2018) perceived variety has been found to predict exercise behavior as an outcome variable, through the multi-mediated pathway of basic need satisfaction and autonomous motivation. However, physical activity level has not been studied as an additional predictor variable alongside perceived variety. It has been shown in previous research that higher levels of self-determined motivation predict greater participation in physical activity (Sylvester et al., 2016; 2018), so the linear relationship between physical activity level and self-determined motivation seen in the study results may be the result of our conceptualization of PA level as a predictor variable, instead of an outcome variable. For example, instead of perceived variety only predicting self-determined motivation, which then predicts exercise behavior in a mediated

pathway, PA level and perceived variety together are predicting self-determined motivation. Due to conceptualization of PA level as a predictor versus an outcome variable, the linear relationship found from the multiple linear regression analysis makes sense. Most likely, the relationship that has been typically studied where autonomous motivation predicts physical activity behavior is occurring here (Sylvester et al., 2016; 2018).

Lastly, the linear relationship of perceived variety and PA level had no significant impact on participant intentions to complete the activity course. However, when the two predictor variables were regressed on to participant intentions to continue exercising, the model was significant, with PA level having a significant impact on the dependent variable. These results may have occurred for a few different reasons. First, the activity courses where the sample was drawn from are participation based courses that have a mandatory attendance requirement. If students fail to meet this requirement, they fail the course, and receive “No Credit” on their academic transcript. Because this requirement exists, any influence from perceived variety or PA level may be masked by student’s desire to pass the course, rather than elective attendance like that seen in other contexts. If the sample were drawn from a different type of activity course, there may have been a chance to see a significant impact from perceived variety or physical activity level. Secondly, perceived variety may not have a linear relationship to intentions, as was previously discussed in the discussion section of this paper.

These relationships may have emerged for a few different reasons. First, there were lower percentages of individuals in this sample that reported higher levels of controlling motivation, as participants reported higher levels of self-determined motivation more than controlling motivation. If there are low numbers of individuals who fall into these categories of motivation, we may not have a big enough sub-sample to see a real effect. Future research would benefit

from having a relatively even distribution across categories of self-regulation. Additionally, individuals who are either amotivated or externally regulated to physical activity may be less likely to participate in physical activity or take a physical activity course altogether. Individuals who stay in these categories tend to discontinue participation in physical activity early on in a program, leading to lower levels of physical activity as well as basic need satisfaction (Edmunds et al., 2006; 2007). As a result, they do not receive the same benefits from physical activity participation or from experiencing their preferred level of perceived variety that lead to outcome associated with well-being, and eventual transition from controlling forms of motivation to self-determined forms of motivation (Edmunds et al., 2006; 2007).

Overall, the majority of the proposed hypotheses were supported, with most results consistent with previous research. As was shown in three past studies, perceived variety predicted basic need satisfaction and self-determined motivation (Sylvester et al., 2014b, 2016; 2018). The influence of perceived variety on exercise motivation originated from a statement by Sheldon and colleagues (2012) that the experience of basic needs satisfaction may be incomplete, and the perception of variety may enhance this experience. The first investigation of perceived variety in exercise indicated that not only was perceived variety a separate construct from the basic needs, but it predicted levels of needs satisfaction and self-determined motivation in a unique way (Sylvester et al., 2014a). Sylvester and colleagues (2014b) extended this investigation by confirming that higher perceptions of variety predicted basic needs satisfaction, self-determined motivation, psychological well-being, and exercise behavior, providing initial support for the claim that basic needs satisfaction may be enhanced through higher perceptions of variety. In 2016, another study on perceived variety showed that exercise behavior may still be enhanced through higher levels of perceived variety, without basic needs satisfaction (Sylvester

et al., 2016). The results of this study enabled researchers to conclude that basic needs may not always have to be satisfied to experience increased motivation to exercise, and subsequent exercise participation. Finally, in 2018, Sylvester and colleagues explored the impact of perceived variety on needs satisfaction, motivation to exercise, and exercise behavior. In this study, basic needs were proposed to moderate the mediated relationship between perceived variety, motivation and exercise behavior. In total, the model was supported, with basic needs moderating the relationship, and perceived variety having a stronger impact on exercise behavior when needs satisfaction levels were lower (Sylvester et al., 2018). The current study provides additional support for perceived variety predicting needs satisfaction and self-determined motivation, as well as having no relationship with controlling motivation.

Until recently, the relationship between perceived variety, basic needs, self-determined motivation and exercise behavior was somewhat unclear. There was evidence for a relationship between these variables; however the exact structure of the relationship remained undefined. With the addition of the newest study on perceived variety in exercise, the model has been more clearly outlined, setting perceived variety as a positive compensatory experience when satisfaction of basic needs are low, or non-existent (Sylvester et al., 2018). Previously, it was assumed that satisfaction of basic needs was the primary reason for positive outcomes associated with wellbeing and development, and that it was a complete experience (Ryan & Deci, 2002). However, variance in outcomes still existed that was not accounted for by basic needs satisfaction. This led to proposals that there were additional experiences aiding in the experience of positive outcomes associated with wellbeing. These positive compensatory experiences were proposed to operate either alongside the basic needs, or in their absence (Ryan & Deci, 2002; 2017).

It is important to note here that participants in this study perceived high variety in their classes, which limits the extent to which we can extend conclusions to other samples that may not have as high perceptions of variety. The classes the sample was drawn from were structured to support high inherent variety. The teaching assistants who taught the classes incorporated workouts that were very different from week to week. Most of the classes incorporated some form of interval training in their plans, of which there were many formats utilized. No interval training workout was the same, either incorporating new exercises into the same format used, or combining new exercises with different work to rest ratios to create different exercise segments. Instructors would also incorporate workouts that had students walking or running outside, as well as game days that incorporated basketball or badminton.

Overall, these classes were consistently incorporating new and novel workouts that students enjoyed, leading to the high perceptions of variety seen in the sample. As a result, we cannot infer much about the effects of perceived variety beyond this sample. Current results may be a result of the homogeneity of sample perceived variety. Therefore, we cannot infer the effects of perceived variety in populations where variety in exercise classes is either not supported, or is not conducive to class success. Therefore, the implications of the results of this study should be extended to other samples where perceived variety is high, not to samples where it is low. We cannot safely generalize the results of this study to those specific populations.

Based on the results of this study and other previous studies (Sylvester et al., 2014a; 2014b; 2016; 2018), we can conclude that perceived variety is a positive compensatory experience operating alongside basic needs satisfaction. As noted in their 2018 paper, basic needs satisfaction moderated the relationship between perceived variety, self-determined motivation, and exercise behavior so that when needs satisfaction was low, perceived variety had a stronger

relationship with the outcome variables. (Sylvester et al., 2018). Future research would benefit from examining the relationships between perceived variety, basic needs, self-determined motivation, and exercise behavior in depth, while also examining additional predictor variables that may interact with perceived variety.

Limitations and Future Research Directions

There are several limitations to this study. First, there was some confusion on how to answer the International Physical Activity Questionnaire. Some students found some of the questions as being worded ambiguously, with participants left confused on how to answer, resulting in either blank answers or answers of “Don’t know/not sure.” As a result, we had a smaller sample size for all analyses including PA level as a predictor variable. Our sample size was still large enough to achieve predictive power; however larger sample sizes are always desired. The author also suspected that those who chose not to answer the physical activity questions may have motivation for exercise oriented toward the controlling end of motivation. Removal of these data points may have biased results toward more self-determined forms of motivation, and future research should seek to have an even distribution across all types of motivation.

Secondly, the use of a cross-sectional design does not allow for interpretation of directionality of the relationships discovered in this study. Based on the results of other studies conducted (Sylvester et al., 2018; 2018), we can conclude that perceived variety influences self-determined motivation through interaction with basic psychological needs, and leads to increased exercise behavior. However, this study does not add to that particular component of research on perceived variety. This study only confirmed that perceived variety predicts needs satisfaction, and motivation to exercise. The fact that we cannot infer directionality of relationships may also explain why PA level predicted some of our outcome measures. Traditionally, the relationship would have been analyzed with exercise behavior as an outcome variable, not a predictor variable.

Thirdly, this study only collected data at one time point during the semester, so it cannot be concluded that the effect of perceived variety beyond seven weeks into the semester. Due to its observational nature, we cannot also extend the interpretation of the impact of perceived variety to other populations, as it is unclear if the results seen in this study are specific to the sample, or if they occur in many different samples.

Finally, the results of this study cannot be generalized to other sample populations, as the nature of the physical activity course is different from group exercise classes and individual workout regimens, due to the mandatory attendance portion of the class. This portion of class may have impacted the results on intention to complete the physical activity course, and some individual responses on motivation to exercise. Group exercise classes and individual workout routines have more elective components, with freedom to attend different classes and modify the workout plan to accommodate for busier schedules and daily workout preferences. In the academic physical activity courses, however, students do not have these opportunities. They are expected to attend class, and have little say in what they do for a workout, as the plans are given by the instructor, most of the time. The only exception to this would be when students have group led class activities for a grade.

Future research on this topic should seek to understand the impact of perceived variety more fully, utilizing the model in Sylvester and colleagues most recent paper (2018) as a guide. Specifically, the role of perceived variety is becoming clearer; however we still do not fully understand its role. Future studies should seek to clarify how much variety can be supported in specific settings, as not all exercise contexts are conducive to objective variety support. Further, clarification on the exact definitions of objective variety support is crucial. We currently understand variety as new, novel, or change experiences that deviate from the individual's

normal routine. However, this definition is too vague, and raises questions on the extent of what constitutes variety. Is variety support simply changing the workout location, or the people you exercise with? Or is it more specific to adding new exercises to your routine, or choosing a different workout format entirely? These questions must be answered, and analysis of the constraints of objective variety that lead to the experience of perceived variety are needed for us to understand the full extent of perceived variety in the exercise setting.

Further, clarification on how much variety support individuals' desire is critical. Researchers should seek to understand the pursuit dimension of variety, and how this dimension interacts with the experience of variety in an exercise class. Individuals differ on the extent they seek out new varieties of exercise. For some, repetition is desired, and these individuals may benefit more from traditional needs satisfaction than variety support. For those who want to experience variety in their favorite classes, adding variety elements will keep them interested, invested, and attending regularly. The pursuit dimension of variety may also be a dispositional characteristic that interacts with motivation for exercise through a moderated pathway of perceived variety. In addition to operationally defining variety pursuit and developing a questionnaire to assess this dimension, future research should test the proposed moderated relationship. Examining this dimension of perceived variety may help researchers better understand how individuals respond to variety in an exercise class, as well as how this impacts their motivation to continue exercising.

Conclusion

In conclusion, this study examined the impact of perceived variety and experience seeking on degree of basic needs satisfaction, motivation to exercise and participant intentions to continue exercising. Additionally, an exploratory analysis was conducted on the impact of perceived variety and PA level on all outcome variables. Portions of the stated hypotheses were supported, and portions were not. Overall, the bulk of our predictions were supported, leading to further clarification on the impact of perceived variety in an exercise setting. This study had a few limitations that were discussed, and future directions for research were identified.

APPENDIX

Table 1.1: Means and Standard Deviations of Sample Characteristics		
	Mean	Standard Deviation
Perceived Variety	4.54	1.02
Autonomy	4.43	1.18
Competence	4.99	0.82
Relatedness	4.94	1.08
Experience Seeking	4.42	1.78
Amotivation	0.18	0.43
External Regulation	0.93	0.98
Introjected Regulation	2.56	1.05
Identified Regulation	3.24	0.67
Integrated Regulation	2.65	1.07
Intrinsic Motivation	2.99	0.77
Intention to Complete the Course	6.32	1.43
Intention to Adhere to Future Program	5.65	1.61
Sample Physical Activity Characteristics (N=140)		
	Sample N	Percentage
Highly Active	100	71.4%
Moderately Active	35	25.0%
Sedentary	5	3.6%

Table 1.2: *Pearson Correlation Matrix Among Study Variables*

	PVE	ES	Aut	Com	Rel	Amot	Ext	Intoj	Ident	Integ	IM	Int-C	Int-A	PA
PVE	.94	-.014	.329‡	.269‡	.297‡	-.096	-.012	.063	.180†	.172†	.308‡	-.035	-.058	.233‡
ES		.45	.091	-.010	.039	-.030	.029	.022	.033	.024	-.059	.101	.098	-.004
Aut			.93	.401‡	.516‡	-.064	.078	.089	.214‡	.182†	.191†	-.164†	-.088	.218‡
Com				.93	.411†	-.213†	.012	.053	.414‡	.355‡	.415‡	-.034	-.320‡	.157†
Rel					.93	-.130	.177†	.237‡	.366‡	.321‡	.332‡	-.086	-.249‡	.229‡
Amot						.86	.326‡	-.204‡	-.460‡	-.269‡	-.363‡	.025	.272‡	.061
Ext							.86	.175†	-.151‡	.016	-.179†	.079	.113	.158†
Intoj								.86	.496‡	.566‡	.385‡	-.049	-.274‡	.188†
Ident									.86	.756‡	.724‡	-.077	-.508‡	.255‡
Integ										.86	.718‡	-.043	-.503‡	.235‡
IM											.86	-.076	-.472‡	.250‡
Int-C												.72	.312‡	.043
Int-A													.72	.216‡
PA														.23

Table 2.1: <i>Basic Needs Satisfaction Predicted by Perceived Variety</i>						
	Autonomy		Competence		Relatedness	
Predictor	$R^2_{adj.}$	β	$R^2_{adj.}$	β	$R^2_{adj.}$	β
Perceived Variety	.103 $\ddagger\ddagger$	.329 $\ddagger\ddagger$	.067 $\ddagger\ddagger$	.269 $\ddagger\ddagger$	.083 $\ddagger\ddagger$	.297 $\ddagger\ddagger$

† = p<.05 ‡ = p<.01 $\ddagger\ddagger$ = p<.001

Table 2.2: <i>Self-Determined Motivation Predicted by Perceived Variety</i>						
	Identified Regulation		Integrated Regulation		Intrinsic Motivation	
Predictor	$R^2_{adj.}$	β	$R^2_{adj.}$	β	$R^2_{adj.}$	β
Perceived Variety	.027†	.180†	.024†	.172†	.090 $\ddagger\ddagger$	.308 $\ddagger\ddagger$

† = p<.05 ‡ = p<.01 $\ddagger\ddagger$ = p<.001

Table 3.1: *Basic Needs Satisfaction Predicted by Perceived Variety and Experience Seeking*

Predictor	Autonomy		Competence		Relatedness	
	$R^2_{adj.}$	β	$R^2_{adj.}$	β	$R^2_{adj.}$	β
Perceived Variety	.108 $\ddagger\ddagger$	.331 $\ddagger\ddagger$	.062 $\ddagger\ddagger$	.269 $\ddagger\ddagger$	.080 $\ddagger\ddagger$	.298 $\ddagger\ddagger$
Experience Seeking		.096		-.007		.043

† = $p < .05$ ‡ = $p < .01$ ‡‡ = $p < .001$

Table 3.2: *Self-Determined Motivation Predicted by Perceived Variety and Experience Seeking*

Predictor	Identified Regulation		Integrated Regulation		Intrinsic Motivation	
	$R^2_{adj.}$	β	$R^2_{adj.}$	β	$R^2_{adj.}$	β
Perceived Variety	.021*	.180†	.019	.173	.098 $\ddagger\ddagger$	.307 $\ddagger\ddagger$
Experience Seeking		.006		.026		-.055

* = $p = .057$ † = $p < .05$ ‡ = $p < .01$ ‡‡ = $p < .001$

Table 3.3: *Canonical Correlations Analysis (3 Basic Psychological Needs Assessed)*

Variables	Loadings 1 st Relationship
Predictor Set	
Perceived Variety	.986*
Experience Seeking	.178
Criterion Set	
Autonomy	.581*
Competence	.305*
Relatedness	.355*

* Variables with canonical loadings $< .30$

Table 3.4: <i>Canonical Correlation Analysis (6 categories of Self-Regulation Assessed)</i>	
Variables	Loadings 1 st Relationship
Predictor Set	.968*
Perceived Variety	.968*
Experience Seeking	-.237
Criterion Set	
Amotivation	-.000
External Regulation	.197
Introjected Regulation	-.153
Identified Regulation	-.096
Integrated Regulation	-.312*
Intrinsic Motivation	1.322*

* Variables with canonical loadings <.30

Table 4.1: *Basic Needs Satisfaction Predicted by Perceived Variety and PA Level*

Predictor	Autonomy		Competence		Relatedness	
	$R^2_{adj.}$	β	$R^2_{adj.}$	β	$R^2_{adj.}$	β
Perceived Variety	.138 $\ddagger\ddagger$	.330 $\ddagger\ddagger$	.088 $\ddagger\ddagger$	.284 $\ddagger\ddagger$	.103 $\ddagger\ddagger$	.260 $\ddagger\ddagger$
PA Level		.141		.091		.168 $\dagger$

$\dagger = p < .05$ $\ddagger = p < .01$ $\ddagger\ddagger = p < .001$

Table 4.2: *Self-Determined Motivation Predicted by Perceived Variety and PA Level*

Predictor	Identified Regulation		Integrated Regulation		Intrinsic Motivation	
	$R^2_{adj.}$	β	$R^2_{adj.}$	β	$R^2_{adj.}$	β
Perceived Variety	.089 $\ddagger\ddagger$	.198 $\dagger$	.069 $\ddagger$	.170 $\dagger$	.160 $\ddagger\ddagger$	.341 $\ddagger\ddagger$
PA Level		.209 $\dagger$		.196 $\dagger$		.170 $\dagger$

$\dagger = p < .05$ $\ddagger = p < .01$ $\ddagger\ddagger = p < .001$

Table 4.3: *Intention to Continue Exercising Predicted by Perceived Variety and PA Level*

Predictor	Identified Regulation		Integrated Regulation	
	$R^2_{adj.}$	β	$R^2_{adj.}$	β
Perceived Variety	-.005	-.090	.045 $\ddagger$	.113
PA Level		-.022		.190 $\dagger$

$\dagger = p < .05$ $\ddagger = p < .01$ $\ddagger\ddagger = p < .001$

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