



AN ABSTRACT OF THE DISSERTATION OF

Jessica.L.Hamm for the degree of Doctor of Philosophy in Kinesiology presented on June 27, 2016.

Title: Predictors and Outcomes of Physical Activity for Young Adults with and without Autism Spectrum Disorder

Abstract approved:

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The Office of Disease Prevention and Health Promotion released the Healthy People 2020 plan in 2010 (Office of Disease Prevention and Health Promotion [ODPHP], 2010). The mission of Healthy People 2020 is focused on improving the health of all Americans. One common tool utilized to improve the health of Americans is physical activity (Centers for Disease Control and Prevention [CDC], 2011b). However, many young adults, including individuals with autism spectrum disorders (ASD), engage in low amounts of physical activity (Haskell et al., 2007) and often struggle to achieve an optimal health status (Park, Mulye, Adams, Brindis, & Irwin, 2006). Therefore, more successful health promotion efforts are needed. In order to achieve this goal two separate studies were conducted to help understand the mechanism of how to promote physical activity and the role of physical activity within health outcomes for young adults with and without ASD. The first study (Chapter 2) cross-validated the self-determination theory

for physical activity among young adults with ASD. One-hundred and forty-three young adults with ASD completed a questionnaire pertaining to their basic psychological needs (autonomy, competence, and relatedness), self-determined motivation, and physical activity level. Results from a path analysis revealed an overall adequate model fit ( $\chi^2$  (3,  $N = 143$ ) = 11.99,  $p = .007$ , GFI = .97, NFI = .95, CFI = .96, RMSEA = .15) concerning the self-determination theory for young adults with ASD. The second study (Chapter 3) reported the influence of physical activity and ASD on the multiple domains of health-related quality of life (HRQOL) for young adults. Three-hundred and twenty participants, including young adults with ASD, completed a questionnaire regarding their physical activity level and HRQOL. Results from five separate multiple regressions, based on bias-corrected bootstrapping, suggested that physical activity levels significantly predicted overall HRQOL ( $b = .04$ ; CI = .02, .06), and the four domains, including physical health ( $b = .007$ ; CI = .002, .01), psychological ( $b = .01$ ; CI = .01, .02), environment ( $b = .01$ ; CI = .002, .02), and social relationships ( $b = .01$ ; CI = .00, .02). Additionally, after controlling for physical activity and an individual's sex, status of (having) ASD significantly influenced overall HRQOL ( $b = -7.28$ ; CI = -9.82, -4.70), as well as the physical health domain ( $b = -2.68$ ; CI = -3.39, -1.98), psychological domain ( $b = -2.04$ ; CI = -2.81, -1.33), and the environment domain ( $b = -1.86$ ; CI = -2.51, -1.21). This research supports the importance of physical activity to positively influence HRQOL. Also, results suggest that the self-determination theory is one appropriate conceptual model that practitioners could utilize to increase physical activity among young adults with ASD. Although this research helps to clarify the predictors and outcomes of physical activity for young adults, further research is needed. Future

research should focus on examining specific strategies to improve the perceptions of the basic psychological needs for young adults with ASD. Additionally, researchers could investigate how the physical activity setting (e.g., team sports) influences an individual's HRQOL.

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Predictors and Outcomes of Physical Activity for Young Adults with and without  
Autism Spectrum Disorder

by

Jessica L. Hamm

A DISSERTATION

submitted to

Oregon State University

in partial fulfillment of  
the requirements for the  
degree of

Doctor of Philosophy

Presented June 27, 2016  
Commencement June 2017

Doctor of Philosophy dissertation of Jessica L. Hamm presented on June 27, 2016

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I understand that my dissertation will become part of the permanent collection of Oregon State Universities libraries. My signature below authorizes release of my dissertation to any reader upon request.

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Jessica L. Hamm, Author

## ACKNOWLEDGEMENTS

I would like to thank my adviser, Dr. Joonkoo Yun who has helped me develop as a researcher and a practitioner during the past four years. He has consistently stressed the importance of the “process”, which has helped me improve my critical thinking skills and understanding of kinesiology. He sets a great example on how to conduct research, teach, advise, and how to make a positive contribution to the field. His lessons and stories will continue to positively impact the decisions I make throughout my career.

My committee members, Megan MacDonald, Vicki Ebbeck, and Sheryl Thorburn, and graduate representative, Laurel Kincl, provided guidance and support throughout my time at Oregon State University. Thank you for helping me to think critically about the methods and expected outcome of my dissertation.

My colleagues in the Kinesiology program, friends, and family have all significantly contributed to my success during the past four years. They have helped me live a balanced life and encouraged me to keep moving forward.

Lastly, I would like to thank my mom. Without her, I would have never dreamed a PhD was possible. I am forever grateful that she made the process look “not so bad” and encouraged me to pursue my goals. Her passion for learning, health, and helping others continue to inspire me



## CONTRIBUTION OF AUTHORS

Jessica L. Hamm conceptualized this project, collected data, conducted data analyses, interpreted the findings, and drafted the manuscripts.

Joonkoo Yun, Ph.D., assisted in the project conceptualization, research design, data analysis, and provided editorial comments and suggestions on the final draft.

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## Chapter 1. General Introduction

## Predictors and Outcomes of Physical Activity for Young Adults with and without Autism Spectrum Disorder

Physical activity has been shown to produce numerous benefits (Centers for Disease Control and Prevention [CDC], 2011b). More specifically, physical activity can help individuals decrease their risk of cardiovascular disease, type 2 diabetes, certain cancers (CDC, 2011a), and stroke (Hu et al., 2000). Physical activity can also help people maintain a healthy body weight, strengthen muscles and bones, and improve mental health (CDC, 2011a). Overall when individuals engage in physical activity they are more likely to lower their risk of mortality (Gregg et al., 2003), therefore living a longer and healthier life.

Despite all of the benefits of physical activity, less than 48% of the population is meeting the national physical activity guidelines and some populations (e.g., people with disabilities) are even less likely to meet these recommendations (CDC, 2014a). The Behavioral Risk Factor Surveillance System (BRFSS) collected data on the physical activity participation of individuals in the United States and highlighted a decline in physical activity for both males and females as they age (CDC, 2005). This decline in physical activity is especially apparent in individuals with an autism spectrum disorder (ASD) (Memari et al., 2013), who have been reported to engage in low levels of physical activity (Bandini et al., 2013).

Low physical activity levels for individuals with ASD (Bandini et al., 2013) may contribute to a poor health status for this group. Multiple reports have shown increased rates of depression and anxiety among individuals with ASD (Park, Park, Kim, & Yoo, 2013). Gotham, Brunwasser, and Lord (2015) examined rates of depression and anxiety

within 109 participants with ASD in a longitudinal study from the age of nine until twenty-four. They noted that depression and anxiety became more prominent as the participants aged. Therefore, there is a need to ensure health promotion programs consider the needs of the general population and include young adults with ASD in their efforts.

In addition to the positive physical and mental benefits, physical activity may also contribute to how an individual perceives other aspects of their health. Health-related quality of life (HRQOL) provides a comprehensive way to understand an individual's perception of their health through multiple dimensions (i.e. physical health, psychological, social) (CDC, 2011b). Research supports the notion that physical activity positively influences HRQOL (Anokye, Trueman, Green, Pavey, & Taylor, 2012; Bize, Johnson, & Plotnikoff, 2007; Stuntz & Weiss, 2010), however limitations exist in how well current literature emphasizes the influence of physical activity on multiple domains of HRQOL.

To ensure public health practitioners are implementing effective health programs, a clearer understanding is needed on the outcomes and predictors of physical activity for young adults with and without ASD. Therefore, this research examines 1) the motivation process for physical activity in young adults with ASD and 2) the influence of physical activity and the presence of ASD on HRQOL.

The purpose of the first manuscript (Chapter 2) was to cross-validate the self-determination theory for physical activity among young adults with ASD. The following research question was examined:

- 1) Is the self-determination theory appropriate for understanding the motivation process of physical activity for young adults with ASD?



The purpose of the second manuscript (Chapter 3) was to examine the influence of physical activity on the multiple domains of HRQOL of young adults. Additionally, this study explored the influence of the presence of ASD on HRQOL. The following research questions were examined:

- 1) Does physical activity influence each domain of HRQOL?
- 2) Does ASD influence each domain of HRQOL?

### **Assumptions**

The following assumptions were made in this study.

1. The participants answered all of the items in the questionnaire honestly.
2. Participants' self-reporting of behaviors were accurate.
3. Modifying items to include physical activity participation, as opposed to only exercise, did not influence the internal validity of this study.
4. The relative autonomy index accurately represents participants' self-determined motivation.
5. Homogeneity among participants.

### **Delimitations**

1. This study was delimited to young adults between the ages of 18-35, who self-identified as having a diagnosis related to ASD. This age range was chosen based on its representativeness of individuals who are likely experiencing or will be experiencing a transition to becoming more independent and may have decreased access to physical activity programs.

2. Participants' physical activity behavior was measured using a subjective measure. A subjective measure may be influenced by participant's memory or miscalculation of activity.

### **Limitations**

The following were limitations of the study:

1. Due to the method of survey distribution, a survey return rate is not available. An unknown return rate may threaten the external validity of the study.
2. Data was not collected on comorbidities or secondary conditions that may influence an individual's motivation, physical activity, and HRQOL.

### **Operational Definitions**

The following operational definitions are used within this study.

1. Physical Activity: Activities that make the heart beat rapidly are considered to be strenuous activities. Activities that are not exhausting are considered to be moderately intense activities, and activities that involve minimal effort are considered to be mildly intense physical activities (Godin & Shephard, 1997).
2. Autonomy: Feelings of having a choice and self-governance (Ryan & Deci, 2002).
3. Competency: Feelings of effectiveness while engaging in optimally challenging tasks (Ryan & Deci, 2002).
4. Relatedness: Feelings of meaningful connection or belonging with important others (Ryan & Deci, 2002).
5. Motivation: Refers to what moves a person do something (Ryan & Deci, 2000a).
6. Amotivation: Having little intrinsic or extrinsic motivation (Deci & Ryan, 2008).

7. External Motivation: Doing a behavior because it leads to a separate consequence (Deci & Ryan, 2008).
8. Internal Motivation: Doing a behavior because the activity itself is rewarding (Deci & Ryan, 2008).
9. Health Related Quality of Life (HRQOL): A multidimensional and subjective measure to explain an individual's overall well-being. HRQOL is based on four domains including physical health, psychological, environment, and social relationships.
10. Young Adult: An individual between the ages of 18 and 35.

## Chapter 2.

# The Motivational Process for Physical Activity in Young Adults with Autism Spectrum Disorder

### Abstract

This research cross-validates the use of the self-determination theory for physical activity participation among young adults (18-35) with autism spectrum disorders (ASD).

Participants included 144 young adults with ASD who completed a survey pertaining to their motivational process to engage in physical activity, based on self-determination theory variables. Goodness of fit indices reported from a path analysis suggests the current data closely align with the self-determination theory ( $\chi^2 (3, N = 143) 11.99, p > .01, GFI = .97, NFI = .95, CFI = .96, RMSEA = .15$ ). The three basic psychological needs explained 39% of the variance within participants' self-determined motivation, and self-determined motivation explained 8% of the variance in physical activity levels. These findings support utilizing the self-determination theory within health promotion efforts for young adults with ASD. Practitioners should focus on enhancing the perceived basic psychological needs of young adults within physical activity settings.

## The Motivational Process for Physical Activity in Young Adults with Autism Spectrum Disorder

One of the most widely recognized ways to improve a person's health is through participating in physical activity (Brown, Carroll, Workman, Carlson, & Brown, 2014). The current national physical activity guidelines state that adults should engage in at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity aerobic physical activity per week. Aerobic activities should be done in addition to strength training for each major muscle group at least two days of the week (U.S. Department of Health and Human Services, 2008). When individuals meet the physical activity guidelines they are more likely to experience substantial health benefits, such as a decreased risk for cardiovascular disease, certain cancers, and type 2 diabetes. Other benefits include improved weight status, mental health, and life expectancy (Centers for Disease Control and Prevention [CDC], 2011b). However, the majority of individuals are not engaging in enough physical activity to acquire substantial health benefits (Carlson, Fulton, Schoenborn, & Loustalot, 2010).

One population in particular that is considered to be at risk for not engaging in the recommended amount of physical activity is individuals with autism spectrum disorders (ASD) (Bandini et al., 2013; Borremans, Rintala, & McCubbin, 2010; Pan, 2008). Currently, one in sixty-eight American children have a diagnosis of ASD (CDC, 2014). ASD is characterized by deficits in social communication, social interaction, and engagement in restrictive and repetitive behaviors (APA, 2013). This population is also more likely to experience limitations related motor skills (MacDonald, Lord, & Ulrich, 2014) and about 70% are also diagnosed with a mental disorder (APA, 2013). It is

important for practitioners to understand these unique characteristics when considering health promotion efforts for this group.

Although there is inconclusive information on the physical activity levels of young adults with ASD, many studies have reported that youth with ASD engage in low levels of physical activity (Bandini et al., 2013; Borremans et al., 2010). This trend only worsens as individuals with ASD age (MacDonald, Esposito, & Ulrich, 2011; Memari et al., 2013), which is similar to individuals without ASD (Leslie, Fotheringham, Owen, & Bauman, 2000; Zimmermann-Sloutskis, Wanner, Zimmermann, & Martin, 2010). More specifically, young adults may be facing additional barriers, such as a lack of support for meeting the recommended amounts of physical activity as they transition into a new phase of life. For example, Zimmermann-Sloutskis et al., (2010) reported that as young men and women between the ages of 14-24 aged, they were less likely to be involved in a sport club, which was positively correlated with their moderate intensity physical activity participation. A lack of participation in sport clubs and other structured physical activity programs may not only decrease an individual's physical activity, but also their social support related to engaging in physical activity. Based on the available research (Bandini et al., 2013; Borremans et al., 2010; Pan, 2008; Zimmermann-Sloutskis et al., 2010), there is a clear need to improve the physical activity habits of young adults with ASD.

In order to increase physical activity participation among young adults with ASD, health practitioners need to understand how to better facilitate their engagement in physical activity. Theories should guide the systematic process of research and provide direction of the influence of variables (Glanz, Rimer, & Viswanath, 2008). Therefore, it is important to apply theories to help inform and design health promotion efforts. One theory

that has been very promising for explaining the physical activity levels of the general population is the self-determination theory (SDT) (Barbeau, Sweet, & Fortier, 2009; Deci & Ryan, 1985).

The self-determination theory provides direction for understanding the motivational process for behaviors (Deci & Ryan, 1985). Deci and Ryan, (2000) suggest that every individual has three basic psychological needs: autonomy, competence, and relatedness. When these needs are met, people increase their self-determined motivation toward a behavior and thus their engagement in the behavior. Perceived autonomy refers to the amount of choice an individual feels regarding a certain activity (Deci & Ryan, 2002). Perceived competence refers to how an individual perceives their ability to engage in particular tasks (Deci & Ryan, 2002). Lastly, perceived relatedness refers to how connected an individual feels to those around them (Deci & Ryan, 2002). These three needs influence an individual's self-determined motivation. The self-determination theory is based on the belief that motivation lies on a continuum that ranges from amotivation to intrinsic motivation. Amotivation represents no motivation, and intrinsic motivation represents engaging in a behavior for the inherent joy of the activity (Ryan & Deci, 2000b). Ryan and Deci (2000) posit that individuals who have a more self-determined form, or internalized form, of motivation will be more likely to engage in a behavior, such as physical activity. The self-determination theory is applicable for physical activity settings because practitioners can set up an environment that is supportive of the three basic psychological needs (e.g. practitioners can offer extra guidance on how to perform an activity for individuals who have low perceived competence).



Although the self-determination theory has been applied to the general population, it has not been widely utilized for young adults with ASD. It is important to examine the appropriateness of utilizing the self-determination theory to inform future efforts of improving the physical activity level of individuals with ASD because they have unique characteristics that may impact their motivational process. Individuals with ASD often have limitations in social communication and interaction as well as restrictive and repetitive behaviors and interests (American Psychiatric Association [APA], 2013). For example, individuals with ASD often prefer strict routines, which may impact the way autonomy influences their motivation. Their symptoms are also related to significant social impairments, which may influence the role of relatedness toward their motivation. Consequently, the motivational process for individuals with ASD may differ from that of individuals without ASD.

Before a theory is utilized, it is important to assess if it is applicable for the attended population. Due to the low reported physical activity levels of individuals with ASD (Bandini et al., 2013; Borremans et al., 2010), it is important to examine if the self-determination theory can be an effective tool to understand the motivation of a young adult with ASD to engage in physical activity. Therefore, the purpose of this research was to cross-validate the self-determination theory for physical activity among young adults with ASD.

## **Methods**

### **Participants**

Participants included 143 young adults with ASD. The mean age of the participants was 25 years (SD= 4.51, range 18-35). All participants met the following

inclusion criteria: (a) currently between the ages of 18-35, (b) self-reported having a diagnosis related to ASD. Thirty five percent of the sample identified as female, 64% identified as male, and 1% chose not to identify their sex. Reported diagnoses included Asperger syndrome (45%), autism (34%), autistic disorder (8%), pervasive developmental disorder – not otherwise specified (2%), and childhood disintegrative disorder (1%). Ten percent of the sample reported that they had received a diagnosis related to ASD, but were not sure of their specific diagnosis. Participants from each region of the United States, including over 23 states, were included in the study.

Recruitment was done through social media, Qualtrics Panels, and support organizations for individuals with ASD such as college support programs. Five percent of the participants were recruited through social media websites (e.g., Facebook), 25% were recruited through organizations for individuals with ASD, and 70% were recruited through Qualtrics Panels. Five one-way ANOVAs were utilized to examine the potential differences between the recruited sources. Results indicated no significant differences between sources regarding their type of diagnosis  $F(3, 130) = .25, p = .86$ , current employment  $F(3, 138) = 1.23, p = .30$ , or highest level of education  $F(3, 139) = 2.39, p = .07$ . Therefore, it is assumed that all participants had similar characteristics, regardless of recruitment.

### **Instruments**

Participants completed an online or paper questionnaire based on the self-determination theory. Sections of the questionnaire included (a) demographics, (b) basic psychological needs, (b) motivational regulation, and (c) physical activity level. Demographic information was assessed through eight items. These included the

participant's age, sex, ethnicity, race, education status, current employment status, Zip Code and self-identified diagnosis related to ASD.

Participant's basic psychological needs were measured using the Psychological Need Satisfaction in Exercise (PNSE) Scale (Wilson, Rogers, Rodgers, & Wild, 2006). The PNSE is an 18-item self-report measure of an individual's perceived autonomy, competence, and relatedness. Each subscale includes six questions, in which participants responded based on a 6-point Likert-type scale. A score of one represents "false" and a score of six represents "true", therefore higher scores are correlated to an individual's increased perception of their basic psychological needs being met. A total score for each need was determined by averaging the scores from six different questions for each need. For the purposes of this study, the PNSE was revised by changing the word exercise to physical activity in order to account for less structured physical activities that may impact the health of an individual. Results from a reliability analysis from this sample revealed good reliability for autonomy ( $\alpha = .91$ ), competence ( $\alpha = .94$ ), and relatedness ( $\alpha = .94$ ).

Participants' self-determined motivation was measured by using the relative autonomy index score from the Exercise Regulation Scale (BREQ-3) (Markland, Tobin, & others, 2004; Wilson, Rodgers, Loitz, & Scime, 2006). The BREQ-3 includes 24 questions that assess an individual's behavioral regulation, which is then used to identify their level of self-determined motivation. The relative autonomy index score is based on an average derived from an individual's perception of their non-regulation, external regulation, introjected regulation, identified regulation, integrated regulation and intrinsic regulation. Participants responded to each question based on a five-point Likert type scale with zero meaning "not true for me" and four meaning "very true for me." A higher relative

autonomy index score corresponds to individuals who experience more self-determined forms of motivation (Markland, 2014). The relative autonomy index score, which is referred to as motivation and self-determined motivation throughout this paper, was determined by averaging the score of four questions for each type of motivational regulation, then multiplying that score by its appropriate weighting, and finally adding each weighted average together to create one score (Markland, 2014). For example, the average score for amotivation was multiplied by negative three and the average score for intrinsic regulation was multiplied by positive three. The negative and positive weightings represent a lower and higher degree of self-determination. Reliability analysis from this study reported a good reliability coefficient for each subscale: amotivation ( $\alpha = .89$ ), extrinsic regulation ( $\alpha = .87$ ), introjected regulation ( $\alpha = .89$ ), identified regulation ( $\alpha = .85$ ), integrated regulation ( $\alpha = .91$ ), and intrinsic regulation ( $\alpha = .93$ ).

Participant's physical activity was measured with the Godin Leisure-Time Exercise Questionnaire (Godin, 1997). The Godin Leisure-Time Exercise Questionnaire is a popular subjective assessment tool to measure physical activity, and has been used in a number of previous studies (e.g. Edmunds, Ntoumanis, & Duda, 2008; Gunnell, Mack, & Wilson, 2011; Joseph, Royse, Benitez, & Pekmezi, 2014; Markland et al., 2004; Sebire, Standage, & Vansteenkiste, 2009). This questionnaire includes three items, which assess the intensity and frequency of physical activity. Items assess how many times during a typical seven-day period an individual engages in mild, moderate, or strenuous physical activity for at least 15 minutes at a time. An individual's self-report of their engagement in mild, moderate, and strenuous physical activity is multiplied by the estimated Metabolic Equivalent of Task (MET) (three, five, and nine respectively) value for each intensity

level. These values are then added together to create a total physical activity score. For example an individual who engaged in strenuous physical activity for at least 15 minutes two different times, in addition to moderate intensity activities for at least fifteen minutes two different times, and mild intensity physical three different times throughout a seven day period would have a total physical activity score of 37.

### **Procedures**

This study used a convenience sampling of young adults with a diagnosis of ASD who lived within the United States. As addressed in the participant section, participants were recruited through three different sources, including: 1) organizations that specifically work with individuals with ASD, 2) social media sites related to ASD, and lastly 3) Qualtrics Panels. Organizations for individuals with ASD, distributed a web-based questionnaire or a paper questionnaire along with an invitation to participate in the study. For the web-based questionnaire, an initial message was sent along with two follow up messages approximately 10 and 20 days after the initial invitation. For the paper survey, participants were sent one follow-up message approximately 10 days after the initial invitation. Questionnaires via social media were posted along with an invitation to participate. Then two follow-up messages were posted approximately 10 days apart. Lastly, the surveys were distributed through Qualtrics Panels, who forwarded an online link to the questionnaire through a specialized questionnaire distribution company to the target population. The questionnaire distribution company sent their own invitation that included the link to the online questionnaire for individuals who identified as having a diagnosis related to ASD. Each person recruited through Qualtrics Panels was only sent the questionnaire link one time. All questionnaires included an attached explanation of

research. Due to the distribution method of the survey, a return rate is unavailable. Testing procedures were approved through the investigator's Institutional Review Board (IRB).

All individuals who completed the questionnaire consented to participate in the study.

### **Data Analysis**

**Preliminary Analysis.** One-hundred and sixty-nine individuals completed the questionnaire, however 26 surveys were deleted from the final analysis. Two individuals who completed the questionnaire did not meet the inclusion criteria for age. Additionally, 24 surveys had more than 10% of missing data. Cases missing 10% or more of data were deleted in order to reduce the risk of bias created by increased missing value replacement. Rubright, Nandakumar, and Glutting, (2014) compared data sets with 10%, 25%, and 50% missing values, and concluded that bias worsened as the missing values increased.

Descriptive data was analyzed on the remaining 143 participants. After deleting 24 questionnaires, 16 questionnaires still contained an average of 5% percent missing values. Little's Missing Completely at Random test (Little, 1988) was run to examine if data were missing in a random manner. The results indicated that data were missing at random,  $\chi^2(22, N = 143) = 20.93, p = .53$ . Therefore, maximum likelihood estimation was used to replace the remaining missing values. Final data analyses were based on 143 participants.

To examine the assumption of the normality, the Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW) test were utilized. Results for each test indicated that the data were not normally distributed for all of the variables except motivation. Values included KS (142) = .10,  $P < .01$ , and SW (142) = 0.94,  $P < .01$  for autonomy, KS (138) = .08,  $P = .02$ , and SW (138) = .95,  $P < .01$  for competence, KS (140) = .09,  $P = .01$  and SW (140) = 0.95,  $P < .01$  for relatedness, and KS (138) = .18,  $P < .01$ , and SW (138) = .73,  $P < .01$ .

01 for physical activity. Motivation was the only construct that indicated the data was normally distributed,  $KS(139) = .08, P = .053$ , and  $SW(139) = .97, P = .17$ . To account for the violation of the normality assumption, when estimating the path coefficients of the primary analysis bootstrapping procedures was employed (Zhu, 1997). Normality tests were done utilizing IBM SPSS Statistics 23 (IBM Corp., 2015).

**Primary Analysis.** The means and standard deviations were calculated for each variable. To address the purpose of the current study, a path analysis was utilized to examine the model fit of the self-determination theory for young adults with ASD. The analysis reported the extent to which an individual's perceived autonomy, competence and relatedness predicted their motivation as well as the extent to which motivation predicted physical activity. Bias-corrected bootstrapping 95% CI for the path coefficient was calculated from 1000 re-samplings and all analyses were conducted using Amos (Arbuckle, 2014). Significance level was set at the .05.

## Results

Descriptive data showed that young adults with ASD ( $n=143$ ) reported that the basic psychological need of autonomy was their highest met need ( $\bar{x}=4.5, SD = 1.16$ ), followed by competence ( $\bar{x}=3.71, SD = 1.43$ ), and then relatedness ( $\bar{x}=3.59, SD = 1.47$ ). On a scale that ranged from -30 representing non-self-determined motivation to +30 representing self-determined motivation, the average self-determined motivation score was 3.48 ( $SD = 7.87$ ). Participant physical activity scores ranged from zero physical activity to 360 units of physical activity. The average total physical activity score was 45.77 ( $SD = 46.77$ ). Table 2.1 shows bivariate correlations for each variable.

Table 2.1

*Bivariate Correlations Among the Basic Needs, Motivation, and Physical Activity*

	Measure	1	2	3	4	5	M	SD
1.	Autonomy	—	0.55**	0.33**	0.55**	0.20*	4.50	1.15
2.	Competence	—	—	0.62**	0.57**	0.36**	3.71	1.42
3.	Relatedness	—	—	—	0.42**	0.29**	3.59	1.47
4.	Motivation	—	—	—	—	0.29**	3.48	7.87
5.	Physical Activity	—	—	—	—	—	45.77	46.77

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

Results from the path analysis revealed an adequate model fit. Because there is no universally accepted criteria for a goodness of fit index (McDonald & Ho, 2002), multiple indices were evaluated. Goodness of fit (GFI) = .97, normed fit index (NFI) = .95, and comparative fit index (CFI) = .96, values represented an acceptable model fit since they were greater than the commonly suggested cut off score of .90 (Kline, 1998). However, chi-square  $\chi^2 (3, N = 143) = 11.99, p = .007$  and the root mean square error of approximation (RMSEA) .15 values did not meet the suggested criteria of a non-significant p-value for chi-square (Kline, 1998) and a value less than less .06 for RMSEA (Hu & Bentler, 1999). Kline, (1998) suggests including chi-square values within the analysis, however also cautions people to be aware of the limitations for interpreting it. There is no upper limit for chi-square, therefore it may not be interpreted in a standardized manner. Additionally chi-square values are affected by sample size, and larger samples are often reported as significant even if the data does not differ too much from the ideal model (Hu & Bentler, 1999; Kline, 1998). Kenny, Kaniskan, and McCoach, (2015) also

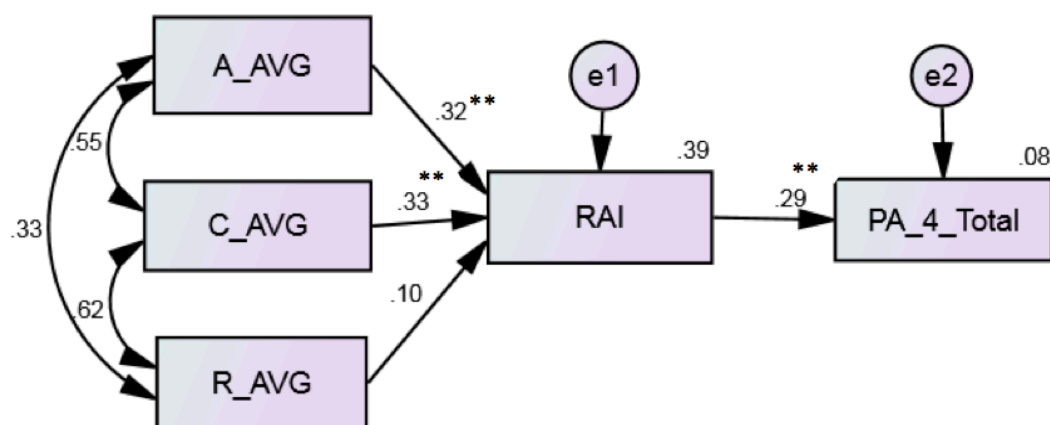


recommended cautious interpretation of RMSEA values, because models with small degrees of freedom often report misleading values and lead to dismissing a possibly satisfactory model. Therefore, it is suggested to consider multiple indices of fit (Kenny et al., 2015).

Thirty-nine percent of self-determined motivation was explained by the three basic psychological needs (autonomy, competence, and relatedness). Autonomy and competence were significantly related to self-determined motivation  $C.R = 4.04, p < .01$  and  $C.R. = 3.43, p < .01$ ; however, relatedness was not significantly related to motivation  $C.R. = 1.16, p = .25$ . Motivation significantly predicted and accounted for 8% of the variance in the participant's total physical activity. Figure 2.1 illustrates standardized regression weights and squared multiple correlations of the model. Table 2.2 includes bias-corrected bootstrap 95% confidence intervals based on the direct effects of the model.

Figure 2.1

*Path Analysis of Self-Determination Theory Constructs*



Note. RAI represents motivation. Values on the black solid arrows represent the beta coefficient for each relationship viewed. Values near the upper right corner of RAI and total PA represent  $R^2$  values. \* $p < .05$ . \*\*  $p < .01$ .

Table 2

*Predictors of Motivation and Physical Activity*

	B	Beta	SE	CR	95% CI
Predictors Motivation					
Autonomy	2.20**	0.32	0.55	4.04	(1.02, 3.48)
Competence	1.82**	0.33	0.53	3.43	(0.66, 3.11)
Relatedness	0.53	0.10	0.46	1.16	(-0.60, 1.98)
Predictors on PA					
Motivation	1.66**	0.29	0.47	3.62	(0.78, 2.55)

*Note.* PA= physical activity. 95% CI represent values from a bias corrected accelerated confidence interval. Upper and lower CI values on the same side of zero represent a significant relationship.  $p < .05$ . \*\*  $p < .01$ .

### Discussion

The purpose of this manuscript was to cross-validate the self-determination theory for physical activity among young adults with ASD. Based on results from the path analysis, the self-determination theory is an appropriate model for understanding the motivation process of physical activity in young adults with ASD. These results concur with multiple studies that have identified the self-determination theory to be appropriate for understanding the motivation process of physical activity within the general population (e.g., Barbeau et al., 2009; Chatzisarantis, Biddle, & Meek, 1997; Gunnell, Crocker, Mack, Wilson, & Zumbo, 2014). Barbeau et al., (2009), conducted a similar study utilizing path analysis to examine the appropriateness of applying self-determination theory to physical activity settings for young adults. Barbeau et al's. (2009), results suggested that the self-determination theory provides an appropriate model for explaining the motivation process of physical activity for young adults. Based on the current study and previous research (e.g., Barbeau et al., 2009), the self-determination theory should be

utilized to guide health promotion efforts focused on improving the physical activity levels of young adults with and without ASD

The first part of the self-determination theory concerns the influence of the three basic psychological needs (autonomy, competence, and relatedness) on an individual's self-determined motivation (Deci & Ryan, 2008a). Results from this study support a positive relationship between the three basic psychological needs and self-determined motivation for young adults with ASD. Overall, the three basic psychological needs explained 39% of the variance in participants' self-determined motivation. However, only autonomy and competence were shown to significantly influence participant's motivation, which contradicts findings from other studies. For example, Barbeau et al., (2009) reported a significant relationship between autonomy, competence, and relatedness to self-determined motivation among individuals without ASD.

Based on the self-determination theory (Deci & Ryan, 2008a), it is surprising that relatedness was not significantly related to participants' self-determined motivation. This may be explained by the deficits that individuals with ASD often experience regarding social communication and social interactions (APA, 2013). These deficits may influence the value young adults with ASD place on relatedness, since it is difficult for them to achieve social connectedness. If an individual consistently has trouble connecting with other people, they may not expect to feel connected to peers during physical activity sessions; therefore their perceived relatedness may not influence their motivation (Whitehouse, Durkin, Jaquet, & Ziatas, 2009). Feelings of connectedness may also be influenced by an individual's deficits within theory of mind. Theory of mind, which many individuals with ASD experience limitations in, refers to a person's ability to infer the

mental state of others or themselves (Baron-Cohen, 2001). Deficits within theory of mind may thereby limit how well individuals with ASD connect with others.

Another possible reason for the non-significant relationship between relatedness and self-determined motivation may be that individuals with ASD do not consider physical activity to be a social activity. Vallerand (2001) explained that relatedness often plays more of a key role during social activities, however it may not be as imperative during activities that are considered to be more individualistic (e.g., an individual lifting weights at home). Although relatedness did not significantly influence participants' motivation to engage in physical activity, previous literature has supported links between relatedness and well-being (Deci & Ryan, 2008b; Ryan & Deci, 2000b). Therefore, additional research is needed to examine the importance of perceived relatedness for young adults with ASD. The current findings suggest that practitioners should focus more effort on improving the autonomy and competence of young adults with ASD, in order to increase their self-determined motivation toward physical activity.

In order to improve an individual's perceptions of their autonomy and competence, it is important to consider the social environment (Fenton, Duda, & Barrett, 2016; George et al., 2013). One way in which practitioners can positively influence the social environment is through their teaching style (Edmunds et al., 2008). Edmunds et al., (2008) examined the differences between two groups of female adults who participated in a 10-week exercise program. One group engaged in exercise classes that were taught based on the self-determination theory, while the control group was led by a typical teacher style. Results showed that when compared to the control group, participants in the self-determination theory based classes had increased perceptions of relatedness and

competence, in addition to a greater overall interpersonal involvement, improved positive affect, and better attendance rates (Edmunds et al., 2008). Practitioners may be able to lead more successful and inclusive physical activity programs by structuring programs based on improving autonomy and competence. Future research should examine specific strategies that practitioners can utilize to increase the autonomy and competence of young adults with ASD (e.g., offer workouts of different intensity levels and skill levels).

The next part of the self-determination theory examines the influence of motivation on a behavior (Deci & Ryan 1985), such as physical activity. As expected, the current model showed motivation to be a significant predictor of physical activity, which is consistent with other studies examining the influence of motivation on physical activity for individuals without ASD (Barbeau et al., 2009; George et al., 2013; Sebire, Jago, Fox, Edwards, & Thompson, 2013). Overall, motivation accounted for 8% of the variance in physical activity. Although an 8% increase in physical activity may be perceived as a small change, it has the potential to lead to significant gains in physical activity, especially for individuals with ASD who need to increase their activity level. Wang and Wang (2015) utilized the theory of planned behavior to examine the association between the variables included in the theory and physical activity levels. They reported that an individual's intention, which is a variable included in the theory of planned behavior, accounted for 9% of the variance in participants' moderate/vigorous physical activity levels, which is similar to the variance in physical activity explained by the current study. Although 8% variance is a positive change, this result supports the need to examine other factors that contribute to physical activity levels. Previous literature has reported that the environment, (Gay, Saunders & Dowda, 2011; Humpel, Owen & Leslie, 2002), social

support (Giles-Corti & Donovan, 2002), and socio-economic status (Giles-Corti & Donovan, 2002) may also contribute to an individual's motivation and physical activity. Therefore, although the self-determination theory is a useful tool for understanding an individual's motivation and physical activity, practitioners and researchers need to consider the influence of other variables.

The current study is not without limitations. Individuals with ASD often experience comorbidities such as mental disorders and ADHD (Association & others, 2003) that may also influence engagement in physical activity. Because people with ASD have been reported to engage in low amounts of physical activity (Pan, 2008), it is imperative to understand the multiple confounders that may influence the activity level of this group. Future research should examine how other comorbidities and secondary conditions such as depression influence the relationship between an individual's three basic psychological needs, motivation, and physical activity level.

### **Conclusion**

Practitioners should utilize the self-determination theory to inform future program planning efforts to improve the physical activity levels of young adults with ASD. Although further experimental research is needed, this cross-sectional study suggests that utilizing the self-determination theory has the potential to improve an individual's self-determined motivation and physical activity level. Therefore, health practitioners should examine ways to implement strategies (e.g., lead activities focused on skill development) that are based on improving an individual's basic psychological needs.

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Chapter 3. Influence of Physical Activity on the Health-Related Quality of Life of Young  
Adults

### Abstract

The purpose of this paper was to examine the influence of physical activity on the multiple domains of health-related quality of life (HRQOL) for young adults. Additionally, this study explores the influence of the presence of autism spectrum disorder (ASD) on HRQOL. Three-hundred and twenty participants, including young adults with ASD, completed a questionnaire about their physical activity and HRQOL. Five multiple regressions revealed physical activity significantly predicted overall HRQOL and each domain: physical health, psychological, environment, and social relationships regardless of the presence of ASD or identified sex. After controlling for physical activity level and participants' sex, the presence of ASD significantly predicted overall HRQOL, the physical health domain, psychological domain, and the environment domain. Results from this study suggest physical activity and the presence of ASD predict multiple domains of HRQOL. Practitioners should recognize the limitations that individuals with ASD may experience regarding their HRQOL, and utilize physical activity as a tool for improving HRQOL.

## Influence of Physical Activity on the Health-Related Quality of Life of Young Adults

Health-related quality of life (HRQOL) has been used within measuring health outcomes to evaluate the effectiveness of services and research (Chen, Li, & Kochen, 2005). HRQOL is a multi-dimensional construct based on an individual's subjective view of their health (i.e. physical, mental, and social well-being) (Office of Disease Prevention and Health Promotion [ODPHP], 2010). Measurements based on HRQOL may help practitioners identify predictors on a person's optimal well-being (CDC, 2013). For example, although an individual may be in great physical condition, they may struggle with psychological issues that influence their mental health and may lead to physical health problems down the road. HRQOL is an important outcome to measure within research and treatment approaches (CDC, 2011) and should be a focus of health promotion interventions.

One population that is in need of interventions focused on improving their overall health and HRQOL is young adults (Park, Mulye, Adams, Brindis, & Irwin, 2006). Young adults often experience deficits in their health, as risky behaviors such as binge drinking, drug use, and sedentary activities often increase in prevalence from adolescence to adulthood (Park, et al., 2006). These new habits, which can lead to negative health outcomes (Park et al., 2006) may be influenced by the transitions that many young adults experience such as moving away from home or starting a new job. Zahran, Zack, Vernon-Smiley, and Hertz (2007) examined health data from the 2003, 2004, and 2005 Behavioral Risk Factor Surveillance System surveys for young adults. Results indicated that young adults perceived their physical health to be poor an average of two days a month and perceived themselves to experience problems related to mental health an average of four

days per month. Additionally, there are inconclusive reports on the effect of an individual's sex on HRQOL. Some research has reported males to have a higher HRQOL (Zahran, Zack, Vernon-Smiley, & Hertz, 2007), while other studies have found no significant differences between males and females at younger ages, but reported an increase in differences as people age (Michel, Bisegger, Fuhr, & Abel, 2009). HRQOL measures may help provide practitioners into some insight on the multiple dimensions that may influence how a young adult perceives their health.

Another group that experiences health disparities (Croen et al., 2015), which may negatively influence their HRQOL, is young adults with autism spectrum disorders (ASD). The prevalence of ASD has substantially increased within the past few decades (CDC, 2016), however research that considers the needs of this group within the general population is lacking. ASD affects an individual's social communication and interactions as well as their patterns of behavior and interests (American Psychiatric Association (APA), 2013). Individuals with ASD are also more likely than their peers to experience increased rates of anxiety (Blumberg et al., 2013; Kim, Szatmari, Bryson, Streiner, & Wilson, 2000), and depression (Whitehouse, Durkin, Jaquet, & Ziatas, 2009). HRQOL measures may be a useful tool for identifying areas of need for young adults with ASD, but current literature shows mixed results regarding the association between ASD and HRQOL (Biggs & Carter, 2016; Kamp-Becker, Schroder, Remschmidt, & Bachmann, 2010; Renty, 2006). For example, Renty and Roeyers (2006) examined the HRQOL of 58 adults with ASD and reported perceived support significantly influenced participants HRQOL, but characteristics specific to the diagnosis of ASD did not. However, Biggs and Carter (2016) examined the HRQOL of adolescents and young adults with ASD, and



reported that characteristics related to ASD did significantly influence participant's HRQOL. Therefore, it is important to control for the impact of other factors, such as physical activity, to gain a better understanding of each HRQOL domain for young adults with ASD.

Promoting HRQOL is the basis for one of the four main goals included in the Healthy People 2020 plan (US DHHS, 2010). Previous studies have linked regular participation of physical activity with improvements in HRQOL (Anokye, Trueman, Green, Pavey, & Taylor, 2012; Bize, Johnson, & Plotnikoff, 2007a). Anokye et al. (2012) examined this relationship utilizing both subjective and objective physical activity measures among 5,537 adults and concluded that increased physical activity levels were associated with higher HRQOL scores. They utilized the EuroQol-5 Dimensions (EQ-5D) HRQOL scale, which includes the five dimensions of mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. However, they only reported an overall HRQOL value that was based on the mean score of each HRQOL dimension combined. Despite their outstanding contribution, Anokye et al.'s (2012) results do not provide the reader on details pertaining to how an individual perceives their mobility, self-care, usual activities, pain/discomfort, or anxiety/depression. Many previous studies (e.g., Brown, Carroll, Workman, Carlson, & Brown, 2014; Brown et al., 2003; Joseph, Royle, Benitez, & Pekmezi, 2014; Kruger, Bowles, Jones, Ainsworth, & Kohl, 2007) view and/or treat HRQOL as unidimensional construct and do not address the multidimensional nature of HRQOL. When only a total score is reported to describe the current status of HRQOL, it may not be representative of each dimension, and therefore may not provide the information practitioners need to understand the deficits that individuals may be

experiencing regarding perceptions of their health. In order to have in-depth understanding on the relationship between physical activity and HRQOL, it is important to examine the multiple dimensions of HRQOL.

Physical activity has been shown to play a key role in enhancing the well-being of young adults, however additional research is needed to observe if physical activity actually predicts each domain of HRQOL. Understanding how different variables predict each domain of HRQOL will help to provide more useful information for enhancing health promotion efforts. Therefore, the purpose of this research was to examine the influence of physical activity on the multiple domains of HRQOL of young adults. Additionally, this study explored the influence of the presence of ASD on the multiple domains of HRQOL.

## **Methods**

### **Participants**

Participants included 320 young adults (177 females, 138 males, and five participants did not disclose their sex) between the ages 18-35. Among the 320 participants, 143 were diagnosed with ASD. The sample included people from over 23 different states, representing each region of the United States. Additional demographic information for young adults with and without ASD is provided in table 3.1. Individuals diagnosed with ASD specified their diagnoses as Asperger syndrome (45%), autism (34%), autistic disorder (8%), pervasive developmental disorder – not otherwise specified (2%), childhood disintegrative disorder (1%), and 10% were unsure of their exact diagnosis. All participants included in data analysis met the inclusion criteria for this

study: (a) between the ages of 18-35, and participants in the ASD group also confirmed that they (b) received a diagnosis related to ASD.

Table 3.1

*Demographic Information*

Characteristic	ASD ( <i>n</i> =143)	Non-ASD ( <i>n</i> =177)
Age	X= 25.39 yrs (SD= 4.5)	X= 24.22 yrs (SD=5.1)
Sex		
Female	35%	72%
Male	64%	26%
Do not wish to disclose	1%	2%
Ethnicity		
Hispanic or Latino	13%	6%
Not Hispanic or Latino	80%	90%
Do not wish to disclose	7%	4%
Race		
American Indian or Alaskan native	1%	1%
Asian	4%	7%
Black, African American	8%	0%
White	81%	85%
Multiracial	5%	4%
Do not wish to disclose	1%	3%
Education Level		
Some high school or less	6%	1%
Graduated high school	36%	13%
Some college	35%	41%
College graduate	23%	45%
Employment Status		
Employed	47%	56%
Out of work	26%	26%
Unable to work	13%	2%
Other	13%	16%

## **Instruments**

Participants completed an online questionnaire based on their (a) demographics, (b) physical activity level and (c) HRQOL. Demographic information was assessed through seven or eight items depending on the presence of ASD. All individuals responded to questions about their age, sex, ethnicity, race, education status, current employment status, and Zip code. Additionally, individuals with ASD were asked to identify their diagnosis related to ASD.

Health-related quality of life was measured using the United States version of the WHOQOL-BREF (WHO, 1997). The WHOQOL-Bref includes items concerning four different domains including physical health, psychological, environment, and social relationships. Each domain was based on a different number of questions. The physical health domain includes seven items, the psychological domain includes six items, the environment domain includes eight items, and the social relationships domain includes three items. Because of the different number of items in each domain a raw total score does not take each domain into equal consideration, therefore WHO (1997) recommends using transformed scores. Transformed scores are based on converting the sum of raw scores for each domain and placing them on a scale from 0-20, with a higher score representing better perceived health. The overall HRQOL score was calculated by combining the transformed score of each domain. Reliability analyses reported adequate scores for total HRQOL ( $\alpha = .82$ ), and each HRQOL domain physical health ( $\alpha = .81$ ), psychological ( $\alpha = .78$ ), environment ( $\alpha = .81$ ), and social relationships ( $\alpha = .75$ ).

Physical activity was measured with the Godin Leisure-Time Exercise Questionnaire (Godin, 1997). This questionnaire, which includes three items, measures the

intensity and frequency of physical activity. The Godin Leisure-Time Exercise Questionnaire has been used by many of previous studies to measure physical activity (e.g., Barbeau et al., 2009; Edmunds, Ntoumanis, & Duda, 2008; Gunnell, Mack, & Wilson, 2011; Joseph et al., 2014; Markland, Tobin, & others, 2004; Sebire, Standage, & Vansteenkiste, 2009). This scale multiplies the number of times an individual engages in each intensity level (mild, moderate, and strenuous) of exercise by the corresponding Metabolic Equivalent of Task (MET) value (three, five, and nine respectively). For example, if an individual engages in a moderate physical activity three times during a seven day period for at least 15 minutes each time, they would have a total leisure-time activity score of 15. An individual who engaged in strenuous activities five times for at least 15 minutes during a seven day period and an individual who participated in light intensity activities 15 different times for at least 15 minutes during the week would both have a total physical activity score of 45 (Godin, 2011). The total physical activity score utilized for this study was determined following the recommendations for calculating a weekly leisure activity score from Godin & Shephard (1997).

### **Procedures**

Participants were recruited through multiple strategies. Participants with ASD were recruited through three different methods, including: 1) organizations that specifically work with individuals with ASD, 2) social media sites related to ASD, and lastly 3) Qualtrics Panels. Five percent of the participants with ASD were recruited through social media (Facebook) sites, 25% were recruited through organizations for individuals with ASD, and 70% were recruited through Qualtrics Panels. Three separate one-way ANOVAs were utilized to compare differences between the participants with

ASD that were recruited from each source and no significant differences were found regarding type of diagnosis  $F(3, 130) = .25, p = .86$ , current employment  $F(3, 138) = 1.23, p = .30$ , or highest level of education  $F(3, 139) = 2.39, p = .07$ .

Participants without ASD were recruited through two different methods, including physical activity courses at a large university in the Northwest region of the U.S. and social media. Sixty-six percent of the participants without ASD were recruited through the physical activity courses, and 34% were recruited through social media. Two separate one-way ANOVAs were used to compare differences between the participants recruited through the physical activity courses and social media. The results indicated significant differences between the two groups regarding current employment  $F(1, 174) = 74.69, p > .01$ , and highest level of education  $F(1, 174) = 13.04, p > .01$ . This was expected since participants recruited through the physical activity courses were current students.

Data collection methods, except for collection through Qualtrics Panels, followed similar procedures. As addressed in the participant section, participants were recruited through four different sources, including: 1) ASD organizations, 2) Qualtrics Panels 3) social media, 4) physical activity classes at the large university in the Northwest region of the United States. ASD organizations distributed an invitation to participate in the questionnaire and a web-based or a paper version of the questionnaire. After the web-based questionnaire was sent the first time, two follow up invitations were sent approximately 10 and 20 days later. For the paper survey, participants were sent one follow-up invitation approximately 10 days following the initial invitation. Qualtrics Panels partnered with a specialized questionnaire distribution company to forward a link to the web-based questionnaire. The questionnaire distribution company sent one

invitation that included the link to the web-based questionnaire for young adults who identified as having a diagnosis related to ASD. Additionally, invitations, which included a link to the web-based questionnaire, were posted on the social media pages of various organizations focused on young adults with and without ASD. Two follow-up invitations were posted on each organization's social media page approximately 10 days apart. Lastly, the questionnaires were distributed one time through a listerv for individuals enrolled in physical activity classes at the large university in the Northwest region of the U.S. All questionnaires included an attached explanation of research. A return rate is unavailable because it is unknown how many individuals received an invitation to participate in the study from the listed sources. All individuals who completed the questionnaire consented to participate in the study. Testing procedures were approved through the investigator's Institutional Review Board (IRB).

### **Data Analysis**

**Preliminary Analysis.** A total of 422 (169 participants with ASD, 253 participants without ASD) surveys were returned. Based on creating possible bias, participants who were missing 10% or more of responses were deleted (Rubright, Nandakumar, & Glutting, 2014). This resulted in the removal of 100 surveys (24 participants with ASD, 76 participants without ASD) from the data analysis. Additionally, two surveys were removed because two participants with ASD did not meet the inclusion criteria for age. Final data analyses included a total of 320 participants (143 participants with ASD and 177 without ASD). Descriptive statistics were analyzed to describe the physical activity and HRQOL levels of the participants. After deleting 102 surveys, 38 surveys still contained an average of 4% percent missing values. Listwise deletion is often used to

handle missing data, however this may lead to a reduction in power, and potentially an increase in standard errors (Rubright et al., 2014). Therefore, maximum likelihood, which replaces missing data based on values that are most likely to occur (Rubright et al., 2014), was used to replace the remaining missing data. Prior to replacing the remaining missing values, Little Missing Completely at Random's test (Little, 1988) was conducted. The results indicated that data was missing at random  $\chi^2(24, N=320) = 22.96, \text{Sig.} = .53$ .

To determine the normality of the data, the Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW) test were utilized. Results for each test indicated that the data was not normally distributed. Results for total physical activity were KS (313) = .13,  $P < .01$ , and SW (313) = .80,  $P < .01$ , physical health: KS (317) = .12,  $P < .01$ , and SW (317) = .94,  $P < .01$ , KS (319) = .18,  $P < .01$ , and SW (319) = .93,  $P < .01$ , environment, KS (319) = .16,  $P > .01$ , and SW (319) = .95,  $P > .01$ , and social relationships KS (314) = .13,  $P > .01$ , and SW (314) = .956,  $P > .01$ . Since the assumption of normality was violated, bias-corrected bootstrapping test was employed during the primary analysis (Zhu, 1997).

**Primary Analysis.** The current study utilized five separate multiple regressions using bias-correct bootstrapping technique from 1,000 re-samples. The same three independent variables, total physical activity level, presence of ASD, and participant's sex, were used for each analysis. The dependent variable for the first multiple regression was overall HRQOL, followed by each domain of HRQOL (physical health, psychological, environment, and social relationships). All analyses were done utilizing IBM SPSS Statistics 23 (IBM Corp., 2015). Significance level was set at .05.



## Results

Participants spent the majority of their time in mild intensity physical activities ( $\bar{x}$ =4.32, SD= 4.74), followed by moderate ( $\bar{x}$ = 3.66, SD= 4.49), and strenuous activities ( $\bar{x}$ =2.58, SD= 2.51). Examples of physical activities included, but were not limited to yoga, golf, and easing walking for mild intensity activities; tennis, easy bicycling, and skiing for moderate intensity physical activities; and running, soccer, and vigorous swimming for strenuous intensity physical activities. Young adults with ASD reported that they engaged in mild intensity activities an average of 3.55 (S.D. = 3.65) times per week, followed by moderate intensity activities 2.88, S.D. = 3.78 times, and strenuous activities 1.99 (S.D. = 2.55) times during a typical seven-day period. Based on the same scale, the reported averages for young adults without ASD included 4.94 (S.D. = 5.43) times for mild intensity activities, 4.27 (S.D. = 4.90) times for moderate intensity activities, and 3.10 (S.D. = 2.37) times for strenuous intensity activities. Light, moderate, and strenuous activities were each multiplied by their respective MET value and then combined to create the total physical activity score seen in table 3.2.

In order to identify influences on the multiple dimensions of HRQOL, each domain was examined independently. Young adults with ASD rated the environment domain ( $\bar{x}$ =14.20) as their highest met HRQOL domain, followed by social relationships ( $\bar{x}$ =13.45), physical health ( $\bar{x}$ =13.41), and lastly the psychological domain ( $\bar{x}$ =12.58). Results for young adults without ASD differed, as physical health ( $\bar{x}$ = 16.08) was the highest met domain, followed by perceptions of the environment ( $\bar{x}$ =16.05), psychological well-being ( $\bar{x}$ = 14.64), and social relationships ( $\bar{x}$ = 14.61). Mean HRQOL scores for young adults with and without ASD are also presented in Table 3.2.

Table 3.2

*Physical Activity and Health-Related Quality of Life Status of Young Adults*

Variable	ASD	NON-ASD
	M (SD)	M(SD)
Total PA	45.80 (46.78)	64.10 (42.27)
Total HRQOL	54.54 (11.40)	61.35 (7.78)
Physical health	13.41 (3.01)	16.08 (2.49)
Psychological	12.58 (3.42)	14.64 (2.49)
Environmental	14.20 (3.12)	16.05 (1.99)
Social relationships	13.45 (4.21)	14.61 (3.23)

Note. Total PA= Number of times per week an individual engages in light, moderate, and strenuous activities, multiplied by the corresponding MET values for the intensity of the activity. Each mean HRQOL domain score is based on a scale of 0-20, with 20 representing better-perceived health.

The results indicated that physical activity, presence of ASD, and an individual's sex accounted for approximately 17% of their overall HRQOL ( $R=0.43$ ,  $P<.01$ ). Also it revealed that physical activity and ASD status significantly predicted overall HRQOL,  $t(315) = 3.31$ ,  $p = .001$  and  $t(315) = -6.32$ ,  $p<.001$ , respectively. Bias-corrected bootstrap CI also indicated that physical activity and ASD status were significant predictors of HRQOL. Confidence intervals were above zero (95% CI: .02 to .06) for physical activity and below zero (95% CI -9.82 to -4.70) for ASD status, indicating significant relationships. Table 3.3 provides additional details.

Table 3.3

*Predictors of Overall HRQOL*

Variable	Overall HRQOL	
	B	95% CI
Constant	67.38	60.78, 73.37
PA	0.04**	0.02, 0.06
Disability	-7.28**	-9.82, -4.70
Ind. Sex	-0.72	-3.04, 1.80
R <sup>2</sup>	0.17	
F	22.73**	

Note. N= 320. CI= Bias corrected accelerated confidence interval. \* p<05. \*\*p<.01. BCa CI represents a significant relationship when the upper and lower CI are on the same side of zero.

The main purpose of this study was to examine if different variables predict each dimension of HRQOL. Twenty percent of the physical health HRQOL domain (R=0.45, P=<. 01), was explained participants' physical activity level, presence of ASD, and participants' sex. The results also indicated that physical activity  $t(315) = 2.00$ ,  $p = .046$  and ASD status  $t(315) = -7.98$ ,  $p < .01$  significantly related to the physical health domain. Participants' physical activity level, ASD status, and sex explained 15% of the psychological domain of HRQOL (R=0.40, P= <. 01). Physical activity and ASD status were significant predictors of the psychological domain of HRQOL,  $t(315) = 3.38$ ,  $p = .001$  and ASD status  $t(315) = -5.73$ ,  $p < .01$ , respectively. Approximately, 15% of the environment HRQOL domain (R=0.39, P= <. 01) was explained by participants' physical activity level, ASD status, and sex. Physical activity  $t(315) = 2.95$ ,  $p = .003$  and ASD status  $t(315) = -5.98$ ,  $p < .01$  were significant predictors of the environment domain of

HRQOL. Lastly, approximately five percent of the social relationships domain ( $R = 0.23$ ,  $P = .002$ ) was explained by participants' physical activity level, ASD status, and sex.

However, only physical activity  $t(3) = 2.24$ ,  $p = .03$  were significantly related to the social relationships domain. Multiple regression values based on bias-corrected bootstrapping are provided in Table 3.4.

Table 3.4

*Predictors of HRQOL Domains*

Variable	Physical Health		Psychological		Environment		Social Relationships	
	B	95% CI	B	95% CI	B	95% CI	B	95% CI
Constant	19.01	17.15 20.76	16.86	15.20 18.70	18.13	16.52 19.66	13.39	11.17 15.51
PA	0.007*	0.002 0.01	0.01**	0.01 0.02	0.01**	0.002 0.02	0.01*	0.00 0.02
ASD	-2.68**	-3.39 -1.98	-2.04**	-2.81 -1.33	-1.86**	-2.51 -1.21	-0.69	-1.76 0.35
Ind. Sex	-0.40	-1.02 0.25	-0.56	-1.30 0.16	-0.47	-1.11 0.23	0.71	-0.22 1.67
R <sup>2</sup>	.20		.15		.15		.05	
F	26.83**		17.97**		17.93**		5.21**	

Note.  $N = 320$ . 95% CI represent values from a bias corrected accelerated confidence interval. Upper and lower CI values on the same side of zero indicate a significant relationship.  $p < .05$ . \*\*  $p < 0.01$ .

## Discussion

The main purpose of this paper was to examine the influence of physical activity on the multiple domains of HRQOL of young adults. The results of this study indicate that physical activity positively influences each domain of HRQOL that is recognized by the World Health Organization (WHO, 1997). As expected, the overall HRQOL score was also positively predicted by physical activity. Previous studies (e.g., Anokye et al., 2012; Kruger et al., 2007) support the finding that physical activity is linked to a person's overall

HRQOL. This study adds evidence that physical activity interventions may play an important role in addressing multiple health concerns of young adults. This information is useful for health practitioners who may want to develop domain specific programming to positively influence person's health.

Based on the results from this study, health practitioners should focus on improving the physical activity level of young adults. Physical activity may not only lead to improvements in an individual's perception of their health, but it may positively contribute to their actual health status as well (e.g. decreased risk for cardiovascular disease and depression) (CDC, 2011). Although these results do not explain how the relationship between physical activity and each HRQOL domain occurs, there are many possible mediators. Previous research (Cohen et al., 2013; Saelens & Handy, 2008) has highlighted an association between the environment and an individual's physical activity level, which supports the findings from the current study that show an association between physical activity and an individual's perception of the HRQOL environment domain. For example, an individual who is physically active may be more likely to bike or hike around their community, which may positively influence how they view their environment (Saelens & Handy, 2008). Physical activity may also provide the opportunity for people to develop friendships (Smith, 2003), build self-esteem (Tremblay, Inman, & Willms, 2000), and improve their ability to perform everyday tasks (Davis, Ross, Preston, Nevitt, & Wasnich, 1998), which can increase perceptions of the social relationships domain, psychological domain, and physical health domain of HRQOL.

While this research provides evidence that higher physical activity levels are associated with better HRQOL scores, more specific research is needed. One potential

future study may be to examine the effects of the intensity of physical activity on specific domains of HRQOL. The current physical activity guidelines state that individuals should engage in at least 150 minutes of moderate intensity physical activity or 75 minutes of vigorous intensity physical activity each week in order to gain substantial health benefits. These guidelines do not include recommendations for light/mild intensity physical activity (U.S. Department of Health and Human Services, 2008), but Healthy People 2020 (ODPHP, 2010) specifies that any increase in physical activity will produce health benefits. Multiple studies have reported that individuals who engage in increased moderate or vigorous intensity physical activities are more likely to rate their HRQOL to be high (Brown et al., 2003; Vuillemin et al., 2005). However, these conclusions are often based on comparing people who engage in moderate and vigorous activities to people that are not regularly active or are considered to be inactive (Vuillemin et al., 2005). Lustyk, Widman, Paschane, and Olson (2004) addressed the lack of information on mild intensity physical activity and compared the correlations between strenuous, moderate, and mild physical activities and quality of life. Results suggested participation of mild intensity physical activities with higher frequencies had the strongest influence on quality of life, but the study was based on an overall quality of life score. Therefore, it is still unclear how the intensity level of physical activity contributes to each domain of HRQOL.

Additionally, the current study highlighted the importance of examining each domain of HRQOL. Consistent with the majority of findings on HRQOL and ASD (Kamp-Becker et al., 2010; Khanna, Jariwala-Parikh, West-Strum, & Mahababeleshwarkar, 2014), ASD status was found to significantly and negatively predict participants overall HRQOL. However, the current results suggest that the presence of

ASD does not affect all dimensions of HRQOL, which supports the need to consider the multiple dimensionality of HRQOL. ASD did not significantly predict the social relationships HRQOL domain. This suggested that only utilizing the overall score to describe the HRQOL may be inappropriate. Examining each domain of HRQOL will better inform practitioners of the strengths and limitations that individuals face in regards to their HRQOL.

As the results show, a diagnosis of ASD significantly predicted participants' overall HRQOL, physical health, psychological domain, and the environment domain. Past studies have provided multiple explanations for the observed low HRQOL scores for this population. Staples and Reid (2010) highlighted movement skill impairments in individuals with ASD, which may negatively influence their ability to engage in certain activities and therefore their ability to improve their physical health or their perceived competence in successfully utilizing the environment. Additionally, young adults with ASD are more likely to experience depression (Whitehouse et al., 2009) and anxiety (Park, Park, Kim, & Yoo, 2013), which may decrease psychological well-being.

Surprisingly, ASD did not predict participants' perceptions of their social relationships. This finding was unexpected since individuals with ASD experience deficits in social communication (American Psychiatric Association (APA), 2013), and literature has emphasized the poor quality of social relationships within this group (Whitehouse et al., 2009). One potential explanation for why ASD did not influence participants' perception of social relationships is that the deficits that individuals with ASD have regarding social communication (APA, 2013), may limit the importance they place on social interactions. For example, Bauminger, Shulman, and Agam (2004) compared how

children with and without ASD viewed images of friendship. Children with ASD were able to identify pictures of friendship, but did not attribute affective characteristics to the picture. A child without ASD was more likely to describe two friends sitting down as “two friends that were very happy”, while a child with ASD was more likely to describe the situation as “two people sitting” (Bauminger et al., 2004). Another possible reason for the lack of significance is that the HRQOL instrument was not sensitive enough for individuals with ASD. However, this sample’s specific reliabilities indicate adequate internal consistency for each domain (Nunnally, 1975), including the social relationships domain ( $\alpha = .75$ ). Further research is needed to understand why ASD did not predict an individual’s perception of their social relationships.

Based on the results that highlighted that the presence of ASD predicted multiple HRQOL domains, it is essential for practitioners to focus interventions on improving perceptions of physical health, psychological well-being, and the environment for young adults with ASD. Results revealed that when the presence of ASD and an individual’s sex were controlled for, physical activity positively predicted each domain of HRQOL. This information is beneficial to public health programs that aim to be inclusive of young adults with and without ASD. Health promotion programs focused on physical activity may be an important step for increasing HRQOL. However, since ASD had such a significant impact on participants’ perceptions of physical health, psychological well-being, and environment, extra efforts may be needed.

A limitation of this study may be that the possible bi-directional relationship between physical activity and HRQOL was not examined. For example, an individual who feels more confident about their physical health and sleeps for the recommended amount



of time may be more likely to have the energy to engage in an activity. Intervention studies that include a control group are needed to provide further information about the relationship between physical activity and HRQOL. The majority of studies done on this topic are based on cross-sectional analyses (Bize et al., 2007), and provide limited information on how HRQOL may influence physical activity.

### **Conclusion**

Physical activity may provide a cost-effective approach for public health efforts aimed at improving the multiple domains of HRQOL of young adults (e.g., physical health, psychological health, satisfaction with environment, and social relationships). Physical activity interventions should be implemented into community settings for young adults with and without ASD. Because the presence of ASD was shown to predict HRQOL, it is especially important to aim further research efforts at improving the multiple domains HRQOL of young adults with ASD.

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## Chapter 4. General Conclusion

The research presented makes a unique contribution toward identifying variables that can be utilized to improve the physical activity level and overall perceived health of young adults with and without autism spectrum disorder (ASD). Currently, one in 68 American youth have a diagnosis of ASD (CDC, 2014). As these children become young adults and experience transitions, such as graduating from school, they may face increased risks toward achieving positive health outcomes (e.g., increased sedentary behavior, lack of available supports) (Memari et al., 2013). Therefore, it is imperative to include individuals with ASD in health based research efforts and programs. Utilizing a more inclusive approach to research and program planning will help improve public health efforts concerning decreasing health disparities. The overall goal of this research was to examine the predictors and outcomes of physical activity for young adults. Results of this research are presented in two separate manuscripts.

The purpose of the first manuscript was to cross-validate the self-determination theory for physical activity among young adults with ASD. Furthermore, this study examined the specific relationships within the model (e.g., the influence of autonomy on motivation). The results from the path analysis revealed an adequate model fit ( $\chi^2(3, N = 143) = 11.99, p = .007, GFI = .97, NFI = .95, CFI = .96, RMSEA = .15$ ). Participants' perceptions of competence, autonomy, and relatedness explained 39% of their physical activity motivation. However, based on the results from bias-corrected bootstrapping, only autonomy ( $b = 2.20, p < .01, CI = 1.02, 3.48$ ) and competence ( $b = 1.82, p < 0.01, CI = .66, 3.11$ ) were shown to significantly influence an individual's motivation. Results also revealed that motivation explained 8% of the sample's total physical activity level. Based on these findings, it is recommended that the self-determination theory be utilized for

interventions including young adults with ASD. More specifically, it is recommended that physical activity practitioners focus on improving the perceived autonomy and competence of young adults with ASD.

The purpose of the second manuscript was to examine the influence of physical activity on the multiple domains of health-related quality of life (HRQOL) of young adults. Additionally, this study explored the influence of ASD on the multiple domains of HRQOL. The results from multiple regression, suggest that physical activity significantly influences the physical health domain ( $b = 0.007$ ,  $p < 0.05$ ,  $CI = .002, 0.01$ ), psychological domain ( $b = 0.01$ ,  $p < 0.01$ ,  $CI = 0.01, 0.02$ ), environment domain ( $b = 0.01$ ,  $p < 0.01$ ,  $CI = 0.002, 0.01$ ), social relationships domain ( $b = 0.01$ ,  $p < .001$ ,  $CI = 0.00, 0.02$ ), and overall HRQOL ( $b = 0.04$ ;  $p < 0.01$ ,  $CI = 0.002, 0.06$ ), for young adults regardless of their disability (ASD) status or their sex. After controlling for physical activity level and an individual's sex, ASD negatively influenced the physical health domain ( $b = -2.68$ ;  $p < 0.01$ ,  $CI = -3.39, -1.98$ ), psychological domain ( $b = -2.04$ ;  $p < 0.05$ ,  $CI = -2.81, -1.33$ ), environment domain ( $b = -1.86$ ;  $p < 0.01$ ,  $CI = -2.51, -1.21$ ), and total HRQOL ( $b = -7.28$ ,  $p < 0.01$ ,  $CI = -9.82, -4.70$ ). There was no significant relationship between ASD and the social relationships domain ( $b = 0.69$ ;  $p > 0.05$ ,  $CI = -0.22, 1.67$ ). Based on these results, it is suggested that physical activity programs should be implemented to improve the multiple domains of HRQOL for young adults.

In order to increase reported physical activity levels among young adults with ASD, community-based practitioners should provide young adults with a variety of physical activity choices and skill development opportunities to improve their perceived autonomy and relatedness. Future research should continue to explore the variables

examined in this study (autonomy, competence, motivation, physical activity), within a practical setting. For example, do physical activity community based programs lead to positive changes in physical health, psychological well-being, social relationships, and an individual's perception of their environment when individuals increase their physical activity level? Overall, it is important that practitioners recognize the multiple factors that contribute to an individual's health.

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APPENDIX A  
Review of Literature

The purpose of this literature review is to provide the reader with information on the topics of autism spectrum disorder (ASD), self-determination theory, physical activity (PA), and health-related quality of life (HRQOL). This information provides background and rationale for examining predictors of the overall health status for young adults with and without ASD.

### **Autism Spectrum Disorder**

ASD is categorized as a neurodevelopment disorder in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) (American Psychiatric Association [APA], 2013). Individuals with ASD experience deficits in social communication and social interaction as well as restricted and repetitive patterns of behaviors, interests, and activities. The level of impairment an individual experiences is associated with their severity level. There are three different levels of severity: Level 1 “requiring support, level 2 “requiring substantial support”, and level 3 “requiring very substantial support.” (APA, 2013). Individuals, who are considered to be at a higher level, are often referred to as higher functioning, since they are more likely to be independent regarding everyday tasks.

#### *Autism Spectrum Disorder Diagnosis*

In order to improve the accuracy of diagnoses (Autism Speaks, 2015), the fifth edition of Diagnostic and Statistical Manual of Mental Disorders included major revisions to their classifications of ASD. (DSM-V) (APA, 2013). Prior to the 2013 modifications, individuals were diagnosed as having pervasive developmental disorder (PDD), pervasive developmental disorders- not otherwise specified (PDD-NOS), autistic disorder, or

Asperger's Syndrome. However, the DSM-V now currently categorizes all of these labels under the diagnosis of ASD. Other changes from the DSM-IV (1994) and the DSM-IV TR (2000) to the DSM-V included the diagnostic criteria. The new criteria for ASD combined the information from three domains focused on the characteristics of autism symptoms and narrowed it down to two.

Diagnosis by an expert is often based on early indicators such as the child not responding to their own name, difficulties keeping eye contact, lack of oral communication, and a general lack of social responsiveness including smiling. Signs later in life include difficulty engaging in imaginative and social play, lack of flexibility in changing routines, difficulty making friends, and a general difficulty of initiating and maintaining conversations with others (National Institute of Neurological Disorders and Stroke, 2014). Another criteria for diagnosing an individual with ASD is that symptoms are present during a child's early developmental period (APA, 2013). Early identification and evaluation of ASD has been shown to have a multitude of benefits such as improving IQ, language skills, adaptive behavior, (Peters-Scheffer, Didden, Korzilius, & Sturmey, 2011) the prevention of secondary conditions, and a decrease in parental stress and financial concerns (Koegel, Koegel, Ashbaugh, & Bradshaw, 2014). In order to diagnose children at an earlier age, the American Academy of Pediatrics set forth new recommendations for screening all children for ASD. These recommendations include screening every child during their regular doctor visits at least twice before their second birthday (Johnson & Myers, 2007). Lastly, the DSM-V specifies that an individual's symptoms must cause a clinically significant impairment within important areas of

functioning and that the characteristics of the individuals are not better explained by a different diagnosis.

#### *Comorbidities Associated with Autism*

As with most other disabilities, comorbidities are very common among individuals with ASD. Common comorbidities include intellectual and language impairments (APA, 2013). Other common characteristics of individuals with ASD include deficits in motor skills and adaptive functioning as well as challenging behaviors (APA, 2013). Although some individuals with ASD view their unique characteristics as challenging, others believe that their condition has helped them experience life in a more creative way (Griffith, Totsika, Nash, & Hastings, 2012).

Psychiatric comorbidities are often reported for individuals with ASD. White, Oswald, Ollendick, and Scahill (2009) reviewed thirty-eight articles focused on anxiety and children with autism spectrum disorders. The studies included in the review provided ranges of 11% to 84% of children with ASD also having anxiety. This wide range in the prevalence of anxiety may be due to the differences that exist in individuals with ASD, such as their specific diagnosis, and their cognitive and social functioning (White et al., 2009). Many individuals with ASD also have specific anxiety disorders such as generalized anxiety disorder, obsessive-compulsive disorder, separation anxiety disorder, and social phobia (White et al., 2009). Anxiety disorders, especially social phobia may lead to difficulties in creating a supportive social network and building quality relationships. Low quality friendships have been shown to lead to feelings of social isolation, which can lead to depressive symptoms in adolescents with ASD (Whitehouse et al., 2009). Park et al., (2013) found a positive correlation between anxiety, depressive

symptoms, and an individual's IQ. Individuals with less severe Autism, who often have higher IQ scores, are more likely to experience anxiety and depression. It is important for practitioners and researchers to be aware of the common comorbidities individuals with ASD face, and to understand the interrelatedness between the different conditions these individuals may experience.

### *Theory of Mind*

Theory of mind refers to a person's ability to predict another person's behavior based on their mental state (Baron-Cohen, 2001). Individuals with ASD are often identified as having difficulties with theory of mind tasks compared to their peers without a diagnosis of ASD (Baron-Cohen, 2001; Colle, Baron-Cohen, & Hill, 2007). However, this conclusion is often based on examining the theory of mind for individuals with ASD who are less independent or lower functioning (Montgomery, Stoesz, & McCrimmon, 2013). Scheeren, de Rosnay, Koot, and Begeer, (2013) compared individuals with and without ASD on five advanced theory of mind tasks and found no significant differences between the two groups. They did however find that age, verbal abilities, and general reasoning correlated with theory of mind task scores. Further interpretation of the data showed that verbal abilities were the strongest predictor of an individual's theory of mind abilities, which may explain some of the limitations seen within other reports for individuals with ASD. Baron-Cohen, Jolliffe, Mortimore, and Robertson (1997) also compared adults with a diagnosis autism of Asperger Syndrome who had a normal or above average IQ to adults without a diagnosis related to ASD on tasks related to theory of mind. Results revealed that adults with a diagnosis related to ASD experienced significant impairments in some tasks (i.e. describing a person's mental state based on



their picture), but no substantial impairments in other tasks (i.e. recognizing an individual's basic emotion while looking at their face). This study may have been limited since it did not examine the impact of an individual's verbal ability on their theory or mind test scores (Baron-Cohen et al., 1997). Based on current literature, researchers and practitioners should be aware of the possible limitations some individuals with ASD may face regarding the way they understand the world around them.

#### *Physical Activity Behaviors of Individuals with Autism*

Although there are some mixed results, the majority of research highlights that individuals with ASD engage in less physical activity (PA) when compared to their typically developing peers (Bandini et al., 2013; Pan, 2008). Bandini et al. (2013) used accelerometers to compare the PA levels of typically developing children and children with ASD, and their analysis showed that typically developing children engaged in significantly more moderate intensity PA. However, when age and gender were not controlled for, there was no difference in the total activity counts for time spent in light, moderate, and vigorous PA between individuals with and without ASD (Bandini et al., 2013). This study also utilized a questionnaire in which parents were asked to complete a PA checklist that included the number of times that their child participated in a variety of structured and unstructured PA. Results from the analysis of the questionnaires showed that parents of children with ASD reported that their children engaged in significantly fewer types of PA compared to typically developing children, and that both parents of children with ASD and typically developing children reported that older children engaged in less PA compared to younger children (Bandini et al., 2013).

Although PA is important, recent research has also shown that even when individuals engage in the recommended amount of PA, sedentary behaviors can still negatively influence their health (Owen, Sparling, Healy, Dunstan, & Matthews, 2010). Individuals with ASD have been found to spend over five hours during the weekdays engaging in sedentary behaviors, compared to their typically developing peers who are only sedentary for a little over four hours (Must et al., 2014). The sedentary behavior of individuals with ASD has been significantly correlated with their BMI (Must et al., 2014), and a high BMI may put them at risk for additional health problems such as Type 2 Diabetes and Asthma (Must & Anderson, 2003).

Understanding the multiple influences of PA participation among individuals with ASD will help researchers and practitioners to provide more holistic approaches to working towards increasing participation of this group. It is important to understand perceptions related to the advantages and disadvantages as well as the facilitators and barriers of PA. Obrusnikova and Miccinello (2012) examined 103 parents of children with autism on their perceptions of the different factors that influence their child's after-school PA. Factors such as increased fitness, weight management, and increased motor control were considered to be the most common physical advantages of PA while increased fatigue and physical discomfort were the most common disadvantages (Obrusnikova & Miccinello, 2012). Advantages related to an individual's psychosocial health included increased socialization opportunities, confidence, self-esteem, mental health, and social skills. However, parents also reported some disadvantages of PA to their child's psychosocial health such as decreased enjoyment, engagement, teasing, and bullying (Obrusnikova & Miccinello, 2012). The most common intrapersonal facilitator was

emphasizing the enjoyment of PA, and the most common intrapersonal barrier was a lack of motivation or interest in PA. Lack of parental time and energy was the most common interpersonal barrier, while supportive peers were the most common interpersonal facilitator. Inclement weather conditions were the largest physical barrier, while appropriate resources around the house were the greatest physical facilitator. Individuals with ASD experience many benefits and barriers regarding their PA that should be considered within health promotion programs.

Physical and recreational activities often require a social component, which has been shown to influence the PA experience of individuals with ASD (Obrusnikova & Miccinello, 2012). The social environment involved in PA participation may be an important predictor as to why individuals with ASD often engage in less PA than their peers (Little, Sideris, Ausderau, & Baranek, 2014). Therefore, when practitioners consider ways to increase PA participation of individuals with ASD, they should consider the influence of the individual's social skills. This may involve providing programs that promote PA that can be done independently, or helping individuals develop the social skills they need to feel comfortable in a social PA setting.

### **Self-Determination Theory**

Theories provide a systematic way to help understand interrelated concepts and how they influence one another (National Institute of Health, 2015). For example, Deci and Ryan (1985) have proposed the use of the self-determination theory to help understand an individual's motivation to engage in certain behaviors. Although this theory is most commonly referred to as a motivational framework it also examines how

environmental factors may influence an individual's social functioning and well-being (Ryan & Deci, 2000b).

Ryan and Deci have focused much of their work on explaining the importance of the different types of motivation. The self-determination continuum, which is also referred to as a taxonomy of human motivation, explains the different types how different regulation styles influence an individual's self-determined motivation (Deci & Ryan, 2008a; Ryan & Deci, 2000a). The continuum includes three main categories of motivation: 1) Amotivation, 2) External Motivation, and 3) Internal Motivation. Ryan and Deci (2000) specify that there are different regulatory processes that contribute to these types of motivation. Individuals who are amotivated, which means they lack motivation, are considered to have no regulatory processes influencing them. Individuals who are extrinsically motivated, which means they are motivated by outside factors, are considered to have either externally, introjected, identified, or integrated regulation. Lastly, individuals who are intrinsically motivated, which means they are motivated because they find the activity itself rewarding, are considered to have intrinsic regulation (Ryan & Deci, 2000a).

Some research has argued that it is not the type of motivation that is important, but it is the amount. However, many studies have found flaws in this belief and have shown that individuals who are intrinsically motivated are more likely to continue engaging in an activity (Deci & Ryan, 2008a). Sebire, Standage, and Vansteenkiste (2009) used a sample of 410 adults to determine if there was an association between an individual's intrinsic goal content and their cognitive, affective, and behavioral outcomes. Results showed that intrinsic goals positively predicted an individual's feelings of self-worth, exercise

behavior, psychological well-being, and satisfaction of their psychological needs being met. Intrinsic goals were negatively related to exercise anxiety (Sebire et al., 2009).

Although the goal of most practitioners is to increase intrinsic motivation, it is also important to understand the differences within the way an individual may be extrinsically motivated. For example, the lowest type of extrinsic motivation is external regulation. An individual is said to have external regulation towards an activity when they do it for external reasons such as to receive rewards or to avoid punishment (Ryan & Deci, 2000a). The next type regulation included within extrinsic motivation is introjected regulation. An individual has introjected regulation when they engage in an activity because they feel like they should do it, and they often end up doing the activity out of guilt (Ryan & Deci, 2000a). Next, on the continuum is identified regulation. An individual has identified regulation when they engage in an activity or behavior because they value it and find it important for their personal goals (Ryan & Deci, 2000a). Lastly, the type of extrinsic regulation that is closest on the continuum to intrinsic regulation is integrated regulation. An individual has integrated regulation when they see the activity or behavior as important to who they are as a person (Ryan & Deci, 2000a).

#### *Basic Psychological Needs Theory*

The basic psychological needs theory is a mini-theory of the self-determination theory. This theory is based on the belief that individual's have three basic psychological needs for autonomy, competence, and relatedness. The extent to which an individual perceives these needs to be met, predicts their level of self-determined motivation for a certain behavior, as well as their overall wellbeing.

The three basic psychological needs include autonomy, competence, and relatedness. Perceived autonomy is the extent to which an individual feels that they freely made their own choice (Horn, 2008). When individuals feel they have autonomy within a physical activity context, they are more likely to be motivated to engage in activities. Autonomy supportive environments have been widely studied within exercise and sport settings. The majority of studies have shown that autonomy supportive environments, not only increase an individual's motivation to engage in physical activity, but more specifically their intrinsic motivation (Deci & Ryan, 2008a).

Perceived competence is the extent to which an individual views themselves as effectively engaging in a behavior (Horn, 2008). The self-determination theory specifies that individuals who perceive their competence to be high will be more motivated to engage in a specified behavior and will have a more positive well-being (Ryan & Deci, 2000b).

Lastly, perceived relatedness refers to an individual's need to feel connected to others and as if they belong (Horn, 2008). Individuals need relationships in order to feel connected to other individuals (Stuntz & Weiss, 2010). When individuals feel a sense of belonging with other people or groups involved in physical activity, their motivation to engage in activities increases (Stuntz & Weiss, 2010). This may be an area of specific need for individuals with ASD, since relationships are influenced by social interactions, which is a limitation for young adults with ASD.

### **Physical Activity**

Young adults face many barriers to their health (S. Park et al., 2013). For example inactivity levels have been shown to increase as individuals age into young adulthood (Zimmermann-Sloutskis, Wanner, Zimmermann, & Martin, 2010), which may lead to life

threatening conditions (Knight, 2012) and a decreased quality of life (D. W. Brown et al., 2003). Additionally, mental health issues, such as depression, often increase from adolescents to young adulthood (Pratt & Brody, 2008). Based on these barriers, further research is needed to examine factors that may help improve the overall well-being of young adults. More specifically, further research is needed on improving the health of individuals that face increased health disparities, such as young adults with Autism Spectrum Disorder (ASD).

Individuals who have self-determined motivation are more likely to engage in behaviors that are beneficial to their wellbeing, such as PA (Ryan & Deci, 2000b; Stuntz & Weiss, 2010). The World Health Organization defines PA as the skeletal muscles producing movements that require energy expenditure (World Health Organization, n.d.). The benefits of PA are predicted by the type, frequency, intensity and duration (Stuntz & Weiss, 2010). Individuals who engage in PA have been found to have a decreased risk for heart disease, stroke, type 2 diabetes, certain types of cancer, and depression (CDC, 2011b). PA can also improve an individual's mood and mental health (CDC, 2011b).

The 2008 Physical Activity Guidelines for Americans provide recommendations for the frequency, intensity, and duration of physical activities that individuals should engage in (U.S. Department of Health and Human Services, 2008). Adults (individuals between the ages of 18-65) should engage in at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity PA a week. Individuals who want more substantial health benefits should engage in at least 300 minutes of moderate intensity or 150 minutes of vigorous intensity PA a week. In order for activities to count towards total aerobic activity, they must be done continuously for ten minutes (2008 guidelines). However,

activities done for less than ten minutes may still contribute to healthy lifestyle. In addition to the aerobic activity, adults should also engage in muscle strengthening activities for each major muscle group at least two days a week (U.S. Department of Health and Human Services, 2008). The majority of adults are not engaging in enough PA (CDC, 2014). More specifically, The Centers for Disease Control and Prevention report that less than half of adults are meeting the national guidelines (CDC, 2014).

### **Health-Related Quality of Life**

Factors related to an individual's physical, social, and psychological health can often be examined by measuring their health-related quality of life (HRQOL). HRQOL is a subjective concept that provides a multidimensional view of an individual's perceived health (CDC, 2011). Although definitions of HRQOL vary, widely utilized models, such as the one from the World Health Organization, include a focus on the physical, mental, and social health of an individual (The WHOQOL Group, 1995). Understanding HRQOL can help practitioners and researchers focus on the multiple factors that influence an individual's health.

The majority of research has shown that individuals with ASD often perceive their HRQOL to be lower than individuals without ASD (Kamp-Becker et al., 2011; Kamp-Becker, Schroder, Remschmidt, & Bachmann, 2010; Kose et al., 2013; Kuhlthau et al., 2010). More specifically, this group often experiences deficits within their perceived HRQOL related to their social experiences (Jennes-Coussens, Magill-Evans, & Koning, 2006). Jennes-Coussens et al., (2006) interviewed 12 men with Asperger Syndrome in order to better understand the factors that influence their quality of life. When compared to 13 typically developing peers individuals with Asperger Syndrome reported their social



and physical quality of life to be lower. The social supports of the two groups were very similar, with the exception that the individuals with Asperger Syndrome often had professionals, such as teachers or aids, included into their support network (Jennes-Coussens et al., 2006). Kamp-Becker et al., (2010) found similar results regarding the social domain of the HRQOL of young adults with ASD. This sample of young adults with ASD reported the social domain of their HRQOL to be significantly lower compared to typically developing young adults and individuals with psychiatric disorders. However, Kamp-Becker et al., (2010) found that individuals with ASD perceived their physical health to be the highest component of their HRQOL.

Renty and Roeyers (2006) specifically looked at adults with high-functioning ASD and found that support characteristics explained 62% of the variance in quality of life (Renty & Roeyers, 2006). Results showed that there was no significant relationship between received support and quality of life, however there was a significant relationship between perceived support and quality of life. More specifically, individuals with a perceived higher quality of life reported support for accommodations, daytime activities, ASD-specific information, company, and intimate relationships (Renty & Roeyers, 2006).

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APPENDIX B

Institutional Review Board Approval



**EXEMPT  
 DETERMINATION**

Date of Notification	10/01/2015		
Study ID	7067		
Study Title	The Motivational Process for Physical Activity		
Principal Investigator	JoonKoo Yun		
Study Team Members	Jessica Hamm		
Submission Type	Initial Application	Date Acknowledged	10/01/2015
Level	Exempt	Category(ies)	2
Funding Source	None	Proposal #	N/A
PI on Grant or Contract	N/A	Cayuse #	N/A

The above referenced study was reviewed by the OSU Institutional Review Board (IRB) and determined to be exempt from full board review.

**EXPIRATION DATE:** 09/30/2020

*The exemption is valid for 5 years from the date of approval.*

Annual renewals are not required. If the research extends beyond the expiration date, the Investigator must request a new exemption. Investigators should submit a final report to the IRB if the project is completed prior to the 5 year term.

Documents included in this review:

- |  |  |  |
|--|--|--|
| <input checked="" type="checkbox"/> Protocol           | <input checked="" type="checkbox"/> Recruiting tools | <input type="checkbox"/> External IRB approvals        |
| <input checked="" type="checkbox"/> Consent forms      | <input checked="" type="checkbox"/> Test instruments | <input type="checkbox"/> Translated documents          |
| <input type="checkbox"/> Assent forms                  | <input type="checkbox"/> Attachment A: Radiation     | <input type="checkbox"/> Attachment B: Human materials |
| <input type="checkbox"/> Alternative consent           | <input type="checkbox"/> Alternative assent          | <input type="checkbox"/> Other:                        |
| <input checked="" type="checkbox"/> Letters of support | <input type="checkbox"/> Grant/contract              |  |

**Comments:**

**Principal Investigator responsibilities:**

- Certain amendments to this study must be submitted to the IRB for review prior to initiating the change. These amendments may include, but are not limited to, changes in funding, , study population, study instruments, consent documents, recruitment material, sites of research, etc. For more information about the types of changes that require submission of a project revision to the IRB, please see: [http://oregonstate.edu/research/irb/sites/default/files/website\\_guidancedocuments.pdf](http://oregonstate.edu/research/irb/sites/default/files/website_guidancedocuments.pdf)
- All study team members should be kept informed of the status of the research. The Principal Investigator is responsible for ensuring that all study team members have completed the online ethics training requirement, even if they do not need to be added to the study team via project revision.
- Reports of unanticipated problems involving risks to participants or others must be submitted to the IRB within three calendar days.
- The Principal Investigator is required to securely store all study related documents on the OSU campus for a minimum of three years post study termination.

APPENDIX C

Recruitment Materials

## Email for ASD Organizations

Subject: Research Study from Oregon State University

Dear (Organization Name),

Previous studies have shown that individuals who engage in physical activity experience many positive benefits such as maintaining a healthy weight and improved mental health. However, less than 48% of the population is meeting the national physical activity guidelines, and some research has found this number to be even lower among individuals with Autism Spectrum Disorders (ASD). We are conducting a research study to understand the motivational process for young adults with ASD to engage in physical activity.

We are asking for your help to recruit young adults with ASD between the ages of 18-35. We are looking for participants who you feel can complete a questionnaire independently or with little support. Please respond to this email and indicate if you are able to distribute a questionnaire about motivation, physical activity, and perceived overall health via: 1) email, 2) social media, or 3) through a paper survey.

We appreciate your time and thank you for your assistance. If you have any questions regarding the survey, please contact Jessica Hamm at [Jessica.Hamm@oregonstate.edu](mailto:Jessica.Hamm@oregonstate.edu).

Sincerely,

**Jessica Hamm, MS**

Kinesiology Program,  
Movement Studies in Disability  
School of Biological & Population Health Sciences  
College of Public Health and Human Sciences  
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[Jessica.hamm@oregonstate.edu](mailto:Jessica.hamm@oregonstate.edu)  
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**Joonkoo Yun, PhD**

Principal Investigator  
Professor  
Kinesiology Program,  
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541-737-8584 | [health.oregonstate.edu/MSD](http://health.oregonstate.edu/MSD)  
[jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu)  
203D Women's Building, Corvallis, OR, 97331

|

## Follow-Up Email for ASD Organizations

Subject: Research Study from Oregon State University

Dear (Organization Name),

We wanted to follow up with a previous email we sent about a research study we are conducting. The goal of this study is to understand the motivational process for young adults with Autism Spectrum Disorders (ASD) regarding physical activity.

We are asking for your help to recruit young adults with ASD between the ages of 18-35. We are looking for participants who you feel can complete a questionnaire independently or with little support. Please respond to this email and indicate if you are able to distribute a questionnaire about motivation, physical activity, and perceived overall health via: 1) email, 2) social media, or 3) through a paper questionnaire.

We appreciate your time and thank you for your assistance. If you have any questions regarding the questionnaire, please contact Jessica Hamm at [Jessica.Hamm@oregonstate.edu](mailto:Jessica.Hamm@oregonstate.edu).

Sincerely,

**Jessica Hamm, MS**  
Kinesiology Program,  
Movement Studies in Disability  
School of Biological & Population Health  
Sciences  
College of Public Health and Human Sciences  
Oregon State University  
[Jessica.hamm@oregonstate.edu](mailto:Jessica.hamm@oregonstate.edu)  
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**Joonkoo Yun, PhD**  
Principal Investigator  
Professor  
Kinesiology Program,  
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541-737-8584 | [health.oregonstate.edu/MSD](http://health.oregonstate.edu/MSD)  
[jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu)  
203D Women's Building, Corvallis, OR, 97331

## Cover Letter for Organizations Distributing Paper Survey



College of Public Health and Human Sciences  
 School of Biological and Population Health Sciences  
 Oregon State University, 203C Women's building, Corvallis, Oregon 97331  
 Tel 541-737-8584 | Fax 541-737-6613

Dear Survey Distributor,

Thank you for your time and effort in helping to distribute the included questionnaires. These questionnaires will help to understand the motivational process for young adults with Autism Spectrum Disorders to engage in physical activity. In this packet you will find a cover letter and an explanation of research attached to each questionnaire. Please advise the individuals who are interested in completing the questionnaires that they should first read the explanation of research form. Next, please instruct the individuals to return the questionnaire to the researchers using the pre-stamped envelope once they have completed it.

We appreciate your time and thank you for your assistance. If you have any questions regarding the survey, please contact Jessica Hamm at [Jessica.Hamm@oregonstate.edu](mailto:Jessica.Hamm@oregonstate.edu).

Sincerely,

<p><b>Jessica Hamm, MS</b>            Kinesiology Program,            Movement Studies in Disability            School of Biological &amp; Population Health            Sciences            College of Public Health and Human Sciences            Oregon State University  <a href="mailto:Jessica.hamm@oregonstate.edu">Jessica.hamm@oregonstate.edu</a>            13 Women's Building, Corvallis, OR, 97331</p>	<p><b>Joongoo Yun, PhD</b>            Principal Investigator            Professor            Kinesiology Program,            Movement Studies in Disability            College of Public Health and Human Sciences            Oregon State University            541-737-8584   <a href="mailto:health.oregonstate.edu/MSD">health.oregonstate.edu/MSD</a>  <a href="mailto:jk.yun@oregonstate.edu">jk.yun@oregonstate.edu</a>            203D Women's Building, Corvallis, OR, 97331</p>
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## Email for Participants Recruited through ASD Organizations

Greetings!

Previous studies have shown that individuals who engage in physical activity experience many positive benefits such as maintaining a healthy weight and improved mental health. However, less than 48% of the population is meeting the national physical activity guidelines, and some research has found this number to be even lower among individuals with Autism Spectrum Disorders. We are conducting a research study to understand the motivational process for young adults to engage in physical activity.

We would like to invite you to complete an online questionnaire if you are between the ages of 18-35. If you decide to participate in this study, you will complete a 15-20 minute questionnaire about your physical activity participation, your motivation towards physical activity, and your physical, mental, and social health. Your answers will help to improve the understanding of the motivational process for young adults to engage in physical activity, and how physical activity influences their overall health.

If you are interested in taking this questionnaire, please click [here](#). Participation in this study is voluntary. The completed questionnaires will be anonymous, and your identity will not be known by anyone. All questionnaires will be password protected. This research project has been reviewed and approved by the Oregon State University Institutional Review Board (IRB) Office.

We appreciate your time and thank you for your assistance. If you have any questions regarding the questionnaire, please contact Jessica Hamm at [Jessica.Hamm@oregonstate.edu](mailto:Jessica.Hamm@oregonstate.edu) or the principal investigator Joonkoo Yun at [jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu). If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office at (541) 737-8008 or by email at [IRB@oregonstate.edu](mailto:IRB@oregonstate.edu).

Sincerely,

**Jessica Hamm**  
 Kinesiology Program,  
 Movement Studies in Disability  
 School of Biological & Population Health Sciences  
 College of Public Health and Human Sciences  
 Oregon State University  
[Jessica.Hamm@oregonstate.edu](mailto:Jessica.Hamm@oregonstate.edu)  
 13 Women's Building, Corvallis, OR, 97331

**Joonkoo Yun, PhD**  
 Principal Investigator  
 Professor  
 Kinesiology  
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 College of Public Health and Human Sciences  
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 541-737-8584 | [jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu)  
[jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu)  
 202 Women's Building, Corvallis, OR, 97331

## Follow-Up Email for Participants Recruited through ASD Organizations

Subject: Research Study from Oregon State University

Greetings!

We just wanted to follow up with you about the online questionnaire we sent out in our previous email. If you decide to participate in this study, you will complete a 15-20 minute survey about your physical activity participation, your motivation towards physical activity, and your physical, mental, and social health.

If you are interested in taking this questionnaire, please click [here](#). Participation in this study is voluntary. The completed surveys will be anonymous, and your identity will not be known by anyone. All surveys will be password protected. This research project has been reviewed and approved by the Oregon State University Institutional Review Board (IRB) Office.

We appreciate your time and thank you for your assistance. If you have any questions regarding the questionnaire, please contact Jessica Hamm at [Jessica.Hamm@oregonstate.edu](mailto:Jessica.Hamm@oregonstate.edu) or the principal investigator Joonkoo Yun at [jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu). If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office at (541) 737-8008 or by email at [IRB@oregonstate.edu](mailto:IRB@oregonstate.edu).

Sincerely,

**Jessica Hamm**  
 Exercise & Sport Science Program,  
 Movement Studies in Disability  
 School of Biological & Population Health Sciences  
 College of Public Health and Human Sciences  
 Oregon State University  
[Jessica.hamm@oregonstate.edu](mailto:Jessica.hamm@oregonstate.edu)  
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 College of Public Health and Human Sciences  
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 541-737-8584 | [jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu)  
[jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu)  
 202 Women's Building, Corvallis, OR, 97331

## Paper Survey Cover Letter for Participants with ASD

Greetings!

Previous studies have shown that individuals who engage in physical activity experience many positive benefits such as maintaining a healthy weight and improved mental health. However, less than 48% of the population is meeting the national physical activity guidelines, and some research has found this number to be even lower among individuals with Autism Spectrum Disorders. We are conducting a research study to understand the motivational process for young adults to engage in physical activity.

We would like to invite you to participate in a research study if you are between the ages of 18-35. If you decide to participate in this study, you will complete a 15-20 minute questionnaire about your physical activity participation, your motivation towards physical activity, and your physical, mental, and social health. Your answers will help to improve the understanding of the motivational process for young adults to engage in physical activity, and how physical activity influences their overall health.

Please read the attached explanation of research before completing the questionnaire.

We appreciate your time and thank you for your assistance.

Sincerely,

**Jessica Hamm**  
 Kinesiology Program,  
 Movement Studies in Disability  
 School of Biological & Population Health Sciences  
 College of Public Health and Human Sciences  
 Oregon State University  
[Jessica.hamm@oregonstate.edu](mailto:Jessica.hamm@oregonstate.edu)  
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 541-737-8584 | [health.oregonstate.edu/MSD](http://health.oregonstate.edu/MSD)  
[jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu)  
 202 Women's Building, Corvallis, OR, 97331



## Social Media Message for ASD Organizations



### **The Motivational Process for Physical Activity**

## **SEEKING VOLUNTEERS FOR A RESEARCH STUDY**

The purpose of this research study is to examine the effectiveness of utilizing the self-determination theory, to understand the motivational process for improving the physical activity of individuals with Autism Spectrum Disorders.

To participate in this research, you must:

- Be between the ages of 18-35
- Have a diagnosis related to Autism Spectrum Disorders

Participation in this study involves:

- A time commitment of 15-20 minutes to complete an online survey

**To begin the online survey, please click [here](#).**

**To find out more information about this study, please contact Jessica Hamm at [Jessica.Hamm@oregonstate.edu](mailto:Jessica.Hamm@oregonstate.edu) or Joonkoo Yun at [jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu).**

*Study Title: The Motivational Process for Physical Activity*  
*Principal Investigator: Joonkoo Yun*

## Email for Participants Recruited through PAC Program

[Subject: Research Study from Oregon State University

Greetings!

Previous studies have shown that individuals who engage in physical activity experience many positive benefits such as maintaining a healthy weight and improved mental health. However, less than 48% of the population is meeting the national physical activity guidelines. Research is needed to examine how to improve the duration, intensity, and variety of physical activities individuals engage in. We are conducting a research study to understand the motivational process for young adults to engage in physical activity.

We would like to invite you to complete an online questionnaire if (a) you are between the ages of 18-35. If you decide to participate in this study, you will complete a 15-20 minute questionnaire about your physical activity participation, your motivation towards physical activity, and your physical, mental, and social health. **Your answers will help to improve the understanding of the motivational process for young adults to engage in physical activity, and how physical activity influences their overall health.**

If you are interested in taking this questionnaire you can click [here](#). Participation in this study is voluntary. The completed questionnaires will be anonymous, and your identity will not be known by anyone. All questionnaires will be password protected. This research project has been reviewed and approved by the Oregon State University Institutional Review Board (IRB) Office.

We appreciate your time and thank you for your assistance. If you have any questions regarding the questionnaire, please contact Jessica Hamm at [Jessica.Hamm@oregonstate.edu](mailto:Jessica.Hamm@oregonstate.edu) or the principal investigator Joonkoo Yun at [jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu). If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office at (541) 737-8008 or by email at [IRB@oregonstate.edu](mailto:IRB@oregonstate.edu).

Sincerely,

**Jessica Hamm**  
Kinesiology Program,  
Movement Studies in Disability  
School of Biological & Population Health Sciences  
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## Social Media Message for Participants without ASD



### **The Motivational Process for Physical Activity**

## **SEEKING VOLUNTEERS FOR A RESEARCH STUDY**

The purpose of this research study is to examine the effectiveness of utilizing the self-determination theory, to understand the motivational process for improving an individual's physical activity.

To participate in this research, you must:

- Be between the ages of 18-35

Participation in this study involves:

- A time commitment of 15-20 minutes to complete an online survey

**To begin the online survey, please click [here](#).**

**To find out more information about this study, please contact Jessica Hamm at [Jessica.Hamm@oregonstate.edu](mailto:Jessica.Hamm@oregonstate.edu) or Joonkoo Yun at [jk.yun@oregonstate.edu](mailto:jk.yun@oregonstate.edu).**

*Study Title: The Motivational Process for Physical Activity*  
*Principal Investigator: Dr. Joonkoo Yun*

APPENDIX D

Questionnaires

## Paper Questionnaire

### Predictors and Outcomes of Physical Activity

**Directions:** Please answer all of the questions/statements based on how you feel and as truthfully as possible. This survey should only be completed one time. Please read each question and answer choice carefully, as the format changes throughout the survey.

**Physical Activity:** This section is based on your regular physical activity patterns (i.e. what you did this past week).

During a typical 7-Day Period (one week), how many times on average do you do the following kinds of exercises for more than 15 minutes during your free time?

Example:	Times per week
<b>STRENUOUS EXERCISE</b> (Running for 30 minutes 2 times a week)	2
<b>MODERATE EXERCISE</b> (Biking for 20 minutes 4 times a week)	4
<b>MILD EXERCISE</b> (Yoga for an hour 2 times a week)	2

Your Turn: Please write the appropriate number in each empty box.	Times per week
1) <b>STRENUOUS EXERCISE</b> (HEART BEATS RAPIDLY) (e.g., running, soccer, cross-country skiing, judo, vigorous swimming, vigorous long distance bicycling).	
2) <b>MODERATE EXERCISE</b> (NOT EXHAUSTING) (e.g., fast walking, tennis, easy bicycling, volleyball, alpine skiing, popular and folk dancing).	
3) <b>MILD EXERCISE</b> (MINIMAL EFFORT) (e.g., yoga, archery, fishing from riverbank, golf without using a cart, easy walking).	

**Health-Related Quality of Life:** This section asks how you feel about your quality of life, health, or other areas of your life. Quality of life represents how you feel about your life, based on a combination of factors such as your physical health, mental health, and social life.

Please answer all of the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response.

During the last two weeks...		Not at all	A little	A moderate amount	Very much	An extreme amount
4)	To what extent do you feel physical pain prevents you from doing what you need to do?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5)	How much do you need any medical treatment to function?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6)	How much do you enjoy life?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7)	To what extent do you feel your life to be meaningful?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Not at all	Slightly	A moderate amount	Very much	Extremely
8)	How well are you able to concentrate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9)	How safe do you feel in your daily life?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10)	How healthy is your physical environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Never	Seldom	Quite often	Very often	Always
11)	How often do you have negative feelings, such as blue mood, despair, anxiety, depression?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



		False	Mostly false	More false than true	More true than false	Mostly true	True
35)	I feel confident in my ability to perform physical activities that personally challenge me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36)	I feel close to my physical activity companions who appreciate how difficult physical activity can be	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37)	I feel free to be physically active in my own way	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38)	I feel free to make my own physical activity program decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39)	I feel capable of completing physical activities that are challenging to me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40)	I feel I am in charge of my own physical activity program decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41)	I feel like I am capable of doing even the most challenging physical activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42)	I feel like I have a say in choosing the physical activities that I do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43)	I feel connected to the people who I interact with while we are physically active together	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44)	I feel good about the way I am able to complete challenging physical activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45)	I feel like I get along well with other people who I interact with while we are physically active together	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46)	I feel free to choose which physical activities I participate in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47)	I feel like I am the one who decides what physical activities I do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Type of Physical Activity Motivation:** Using the scales below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers. **Please read each question in this section and select the answer that best describes how you feel about the question.**

		Not true for me	Sometimes true for me	Very true for me
48)	It's important to me to be physically active regularly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49)	I don't see why I should have to be physically active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50)	I am physically active because it's fun	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51)	I feel guilty when I'm not physically active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52)	I am physically active because it is consistent with my life goals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53)	I am physically active because other people say I should be	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54)	I value the benefits of physical activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55)	I can't see why I should bother being physically active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56)	I enjoy my physical activity sessions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57)	I feel ashamed when I miss a physical activity session	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58)	I consider physical activity part of my identity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59)	I take part in physical activity because my friends/family/partner say I should	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60)	I think it is important to make the effort to be physically active regularly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61)	I don't see the point in engaging in physical activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62)	I find physical activity to be a pleasurable activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63)	I feel like a failure when I haven't been physically active in a while	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64)	I consider physical activity a fundamental part of who I am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65)	I am physically active because others will not be pleased with me if I am not	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66)	I get restless if I don't participate in physical activity regularly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
67)	I think physical activity is a waste of time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68)	I get pleasure and satisfaction from participating in physical activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
69)	I would feel bad about myself if I was not making time to be physically active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70)	I consider physical activity consistent with my values	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
71)	I feel under pressure from my friends/family to participate in physical activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Demographic Information:**

72) What is your current age? \_\_\_\_\_

73) What is your sex? Male  Female  Do not wish to disclose 

74) How would you best describe your ethnicity?

 Hispanic or Latino
  Not Hispanic or Latino
  Do not wish to disclose

75) How would you best describe your race? (check all that apply)

 White
  Black, African American
  American Indian or Alaskan Native
  Do not wish to disclose
  Asian
  Native Hawaiian or Other Pacific Islander
  Multirace

76) What is the highest grade or year of school you completed?

 Some High School or Less
  Graduated high school
  Some College
  College Graduate

77) What is your current employment status?|

 Employed
  Out of Work
  Unable to Work
  Other. Please specify \_\_\_\_\_

78) Did someone help you complete this survey?

Yes  No 

79) Do you identify as having an Autism Spectrum Disorder?

Autism Spectrum Disorder is characterized by persistent deficits in social communication and social interaction as well as restricted and repetitive patterns of behavior, interests, or activities.

Yes  No  I am not sure 

80) Please place a check in the appropriate box if you have been given a diagnosis by a school counselor, psychiatrist, or another type of doctor.

- a. Autism Spectrum Disorder
- b. Autistic Disorder
- c. Pervasive Developmental Disorder-Not Otherwise Specified
- d. Asperger's Disorder
- e. Rett's Disorder
- f. Childhood Disintegrative Disorder

81) Please write your zip code. \_\_\_\_\_

Thank you for completing this survey. We greatly appreciate your time and thoughtful responses. The information you have provided will be used to help understand the motivational process for young adults to engage in physical activity.



## Web-based Questionnaire

Explanation of research for participants recruited from organizations for individuals with ASD:



### EXPLANATION OF RESEARCH

**Project Title:** The motivational process for physical activity in young adults

**Principal Investigator:** Joonkoo Yun, Ph.D.

**Student Researcher:** Jessica Hamm, M.S., M.P.H

**Version Date:** October 1st, 2015

**Purpose:** You are being asked to take part in a research study. The purpose of this study is to examine the effectiveness of utilizing the self-determination theory to understand the motivational process for improving the physical activity of young adults with an Autism Spectrum Disorder.

**Activities:** The study activities include completing a questionnaire.

**Time:** Your participation in this study will last about **15 to 20 minutes**.

**Risks:** There are no foreseeable risks to participating in this study.

**Benefit:** This study is not designed to benefit you directly. However, the findings of this study may help to better understand how to positively influence the physical activity levels and health of young adults.

**Payment:** You will not be paid for being in this research study.

**Confidentiality:** Your participation in this study is confidential. No identifying information will be collected.

**Voluntary:** Participation in this study is voluntary. You may skip any questions that you do not want to answer. If you decide to participate, you are free to withdraw any time before submitting your answers.

**Study contacts:** If you have any questions about this research project, please contact: Jessica Hamm at (541)-737-6919 or Jessica.Hamm@oregonstate.edu or Joonkoo Yun at (541) 737-8584 or jk.yun@oregonstate.edu. If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office, at (541) 737-8008 or by email at IRB@oregonstate.edu.

**Agreement:** Completing this questionnaire indicates that this research study has been explained to you through the above "explanation of research." If you click "I agree to participate in this study" within the answer choices at the bottom of this page you are agreeing to take part in this study. You may print and keep this page for your records.

If you would like to participate in this study, please click "**I agree to participate in this study**" to continue the questionnaire.

- I agree to participate in this study
- I do not wish to participate in this study

>> Forward

Survey Completion  
0%  100%

## Explanation of Research for Participants without ASD:



### EXPLANATION OF RESEARCH

**Project Title:** The motivational process for physical activity in young adults

**Principal Investigator:** Joonkoo Yun, Ph.D.

**Student Researcher:** Jessica Hamm, M.S., M.P.H

**Version Date:** October 1st, 2015

**Purpose:** You are being asked to take part in a research study. The purpose of this study is to examine the effectiveness of utilizing the self-determination theory to understand the motivational process for improving the physical activity of young adults.

**Activities:** The study activities include completing a questionnaire.

**Time:** Your participation in this study will last about **15 to 20 minutes**.

**Risks:** There are no foreseeable risks to participating in this study.

**Benefit:** This study is not designed to benefit you directly. However, the findings of this study may help to better understand how to positively influence the physical activity levels and health of young adults.

**Payment:** You will not be paid for being in this research study.

**Confidentiality:** Your participation in this study is confidential. No identifying information will be collected.

**Voluntary:** Participation in this study is voluntary. You may skip any questions that you do not want to answer. If you decide to participate, you are free to withdraw any time before submitting your answers.

**Study contacts:** If you have any questions about this research project, please contact: Jessica Hamm at (541)-737-6919 or Jessica.Hamm@oregonstate.edu or Joonkoo Yun at (541) 737-8584 or jk.yun@oregonstate.edu. If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office, at (541) 737-8008 or by email at IRB@oregonstate.edu.

**Agreement:** Completing this questionnaire indicates that this research study has been explained to you through the above "explanation of research." If you click "I agree to participate in this study" within the answer choices at the bottom of this page you are agreeing to take part in this study. You may print and keep this page for your records.

If you would like to participate in this study, please click "**I agree to participate in this study**" to continue the questionnaire.

- I agree to participate in this study
- I do not wish to participate in this study

**>> Forward**

Note. Participants recruited from organizations for individuals with ASD had to answer yes to two questions before continuing on with the survey. If they answered no to the question about age or their diagnosis, they were forwarded to end of the questionnaire.



Oregon State UNIVERSITY **OSU** College of Public Health and Human Sciences

Are you at least 18 years of age?

Yes

No

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Survey Completion

0%  100%



Oregon State UNIVERSITY **OSU** College of Public Health and Human Sciences

Have you received a diagnosis of any of the following:

- Autism Spectrum Disorder,
- Autistic Disorder,
- Pervasive Developmental Disorder-Not Otherwise Specified,
- Asperger's Disorder,
- Rett's Disorder, or
- Childhood Disintegrative Disorder?

Yes

No

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Survey Completion

0%  100%

Note. Participants without ASD only had to confirm that they were at least 18 years of age in order to continue the questionnaire.

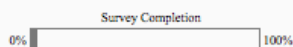


Are you at least 18 years of age?


- Yes
- No

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Note. The remaining pages of the questionnaire were the same for participants with and without ASD.



**Directions:** Please answer all of the questions/statements based on how you feel and as truthfully as possible. This survey should only be completed one time. **Please read each question and answer choice carefully, as the format changes throughout the survey.**

**Physical Activity:** The next few questions are based on your regular physical activity patterns (i.e. what you did this past week). **Please write the appropriate number in each box.**

**Examples:**  
 If you run for 30 minutes 2 times a week, put a # 2 in the answer box for the question that asks about **strenuous** intensity activity.  
 If you bike at a comfortable pace for 20 minutes 4 times a week, put a # 4 in the answer box for the question that asks about **moderate** intensity activity.  
 If you do yoga for an hour 2 times a week, put a #2 in the answer box for the question that asks about **mild** intensity exercise.

1) During a typical 7-Day Period (one week), how many times on average do you do **strenuous physical activities (heart beats rapidly)** for more than 15 minutes during your free time?

**Examples of strenuous physical activities** include running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, and vigorous long distance bicycling.

**Please write the appropriate # of times you did strenuous physical activities in the box below.**



Survey Completion

0%  100%



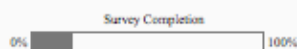
**Type of Physical Activity Motivation:** Using the scales below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers.

Please read each question in this section and select the answer that best describes how you feel about the question.

	Not true for me (0)	(1)	Sometimes true for me (2)	(3)	Very true for me (4)
It is important to me to be physically active regularly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not see why I should have to be physically active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am physically active because it's fun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel guilty when I'm not physically active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am physically active because it is consistent with my life goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am physically active because other people say I should be	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Please read each question in this section and select the answer that best describes how you feel about the question.

	Not true for me (0)	(1)	Sometimes true for me (2)	(3)	Very true for me (4)
I value the benefits of physical activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can't see why I should bother being physically active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoy my physical activity sessions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel ashamed when I miss a physical activity session	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I consider physical activity part of my identity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I take part in physical activity because my friends/family/partner say I should	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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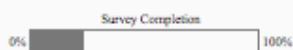


Please read each question in this section and select the answer that best describes how you feel about the question.

	Not true for me (0)	(1)	Sometimes true for me (2)	(3)	Very true for me (4)
I think it is important to make the effort to be physically active regularly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't see the point in engaging in physical activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find physical activity to be a pleasurable activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel like a failure when I haven't been physically active in a while	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I consider physical activity a fundamental part of who I am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am physically active because others will not be pleased with me if I am not	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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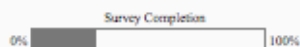


Please read each question in this section and select the answer that best describes how you feel about the question.

	Not true for me (0)	(1)	Sometimes true for me (2)	(3)	Very true for me (4)
I get restless if I don't participate in physical activity regularly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think physical activity is a waste of time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get pleasure and satisfaction from participating in physical activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel bad about myself if I was not making time to fit in physical activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I consider physical activity consistent with my values	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel pressure from my friends/family to participate in physical activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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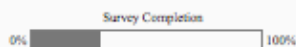
**Motivational Factors for Physical Activity:** The following statements represent different experiences people have when they are physically active.

Please answer the following questions by considering how **YOU TYPICALLY** feel while you are physical active.

	False (1)	Mostly False (2)	More false than true (3)	More true than false (4)	Mostly true (5)	True (6)
I feel that I am able to complete physical activities that are personally challenging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel attached to my physical activity companions because they accept me for who I am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel I share a common bond with people who are important to me when we are physically active together	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel confident I can do even the most challenging physical activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel a sense of friendship with my physical activity companions because we are physically active for the same reasons	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel confident in my ability to perform physical activities that personally challenge me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Please answer the following questions by considering how YOU TYPICALLY feel while you are physical active.

	False (1)	Mostly False (2)	More false than true (3)	More true than false (4)	Mostly true (5)	True (6)
I feel close to my physical activity companions who appreciate how difficult physical activity can be	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel free to be physically active in my own way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel free to make my own physical activity program decisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel capable of completing physical activities that are challenging to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel I am in charge of my own physical program decisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel like I am capable of doing even the most challenging physical activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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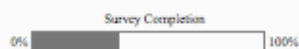


Please answer the following questions by considering how YOU TYPICALLY feel while you are physical active.

	False (1)	Mostly False (2)	More false than true (3)	More true than false (4)	Mostly true (5)	True (6)
I feel like I have a say in choosing the physical activities that I do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel connected to the people who I interact with while we are physically active together	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel good about the way I am able to complete challenging physical activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel like I get along well with other people who I interact with while we are physically active together	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel free to choose which physical activities I participate in	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel like I am the one who decides what physical activities I do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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**Health-Related Quality of Life:** This section asks how you feel about your quality of life, health, or other areas of your life. Quality of life represents how you feel about your life, based on a combination of factors such as your physical health, mental health, and social life.

Please answer all of the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response.

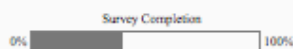
	Very poor	Poor	Neither poor nor good	Good	Very Good
How would you rate your quality of life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please choose the response that appears most appropriate.

	Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
How satisfied are you with your health?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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The following questions ask about how much you have experienced certain things in the last two weeks.

	Not at all	A little	A moderate amount	Very much	An extreme amount
To what extent do you feel that physical pain prevents you from doing what you need to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How much do you need any medical treatment to function in your daily life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How much do you enjoy life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To what extent do you feel your life to be meaningful?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Please choose the response that appears most appropriate.

	Not at all	Slightly	A moderate amount	Very much	Extremely
How well are you able to concentrate?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How safe do you feel in your daily life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How healthy is your physical environment?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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The following questions ask about how completely you experience or were able to do certain things in the last two weeks.

	Not at all	A little	Moderately	Mostly	Completely
Do you have enough energy for everyday life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Are you able to accept your bodily appearance?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you enough money to meet your needs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How available is the information that you need in your day-to-day life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To what extent do you have the opportunity for leisure activities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please choose the response that appears most appropriate.

	Very poor	Poor	Neither poor nor well	Well	Very well
How well are you able to get around?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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The following questions ask you to say how good or satisfied you have felt about various aspects of your life over the last two weeks.

	Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
How satisfied are you with your sleep?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with your ability to perform your daily living activities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with your capacity for work?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with yourself?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with your personal relationships?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with your sex life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with the support you get from your friends?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with the conditions of your living place?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with your access to health services?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with your mode of transportation?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The following question refers to how often you have felt or experienced certain things in the last two weeks.

	Never	Seldom	Quite often	Very often	Always
How often do you have negative feelings, such as blue mood, despair, anxiety, depression?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Survey Completion  
0%  100%

**Demographic Information:**

What is your current age?

What is your sex?

- Male
- Female
- Do not wish to disclose

How would you best describe your ethnicity?

- Hispanic or Latino
- Not Hispanic or Latino
- Do not wish to disclose

How would you best describe your race? (check all that apply)

- White
- Black, African American
- American Indian or Alaskan Native
- Asian
- Native Hawaiian or Other Pacific Islander
- Multirace
- Do not wish to disclose

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What is the highest grade or year of school you completed?

- Some high school or less
- Graduated high school
- Some college
- College graduate

What is your current employment status?

- Employed
- Out of work
- Unable to work
- Other (please specify below)

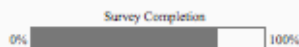
Do you identify as having an Autism Spectrum Disorder?

Autism Spectrum Disorder is characterized by persistent deficits in social communication and social interaction as well as restricted and repetitive patterns of behavior, interests, or activities.

- Yes
- No
- I am not sure

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Did someone help you complete this survey?

- Yes
- No

Please check the appropriate selection if you have been giving a diagnosis by a school counselor, psychiatrist, or another type of doctor.

- Autism Spectrum Disorder
- Autistic Disorder
- Pervasive Developmental Disorder- Not Otherwise Specified
- Asperger's Disorder
- Rett's Disorder
- Childhood Disintegrative Disorder
- I am not sure

Please type in your zip code?

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Survey Completion  
0%  100%



Thank you for completing this survey. We greatly appreciate your time and thoughtful responses. The information you provided will be used to help understand the motivational process for young adults to engage in physical activity.

**Have a great day!**

