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Abstract

College students with autism spectrum disorder (ASD) engage in physical activity in many different ways. The literature review shows that most of the studies focused on younger children and that there were fewer studies on adolescents and young adults. This study sought to investigate the physical activity beliefs and exercise habits of college students in Western Michigan University's Autism Services Center. This study answered three research questions: In what types of physical activity do individuals with ASD participate? How often do individuals with ASD participate in physical activity? What beliefs do individuals with ASD have about physical activity? A ten-question survey was distributed to students in the ASC program asking questions relating to demographics, frequency of exercise, and difficulty of exercise. Questions were either multiple choice or Likert scale questions. Results indicated that students engaged in many different types of exercise. There was a roughly even split between participation in weightlifting, running, sports, and other. Additionally, most students exercised "under 20 minutes" or "over 60 minutes" per week. They also believed that exercise was hard to learn. Potential limitations to this study include a small sample size of participants and a lack of variation of survey question types.

An Evaluation of Physical Activity Methods of College Students with Autism Spectrum Disorder

Autism is a disorder characterized by challenges with social skills, repetitive behaviors, speech and nonverbal communication (Autism Speaks, 2017). Each year, this disorder affects 1 in 68 children (Centers for Disease Control and Prevention, 2016). Because autism is so prevalent, it is important that research be conducted on the disorder's many effects on everyday life. This report will examine the relationship between autism and physical activity. Physical activity is an important topic to study because half of all children with autism are overweight or at risk of being overweight (Dawson & Rosanoff, 2009).

A primary concern among educators is increasing the physical activity levels of students with autism spectrum disorder (ASD). Due to ASD, students shy away from physical activity at higher rates than typically developing teens (Stanish et al., 2015). Exercise can be difficult for students with ASD because they often experience diminished motor skills. Additionally, it was found that students with ASD perceive physical activity as too difficult to learn. In addition, they do not see physical activity as a way of making friends. These barriers can result in isolation for autistic students and diminish their participation in various activities. Diminished participation in physical activity can lead to both mental and physical health problems (Salamon, 2014).

Due to these problems, it is important that this study examine the effects of physical activity on college students with ASD. To do this, 10 individuals at the WMU Autism Services Center will be surveyed through Qualtrics. The survey will closely follow the study of Stanish and colleagues (2015). In combination with taking questions from Stanish and colleagues' survey, a few additional questions will be designed by the student investigator. This study will help to fill the gaps of research by examining the physical activity choices of college students because there are few studies on adolescents and young adults.

This study will examine three research questions about the physical activity choices of college students with ASD: In what types of physical activity do individuals with ASD participate? How often do individuals with ASD participate in physical activity? What beliefs do individuals with ASD have about physical activity?

Literature Review

Before research is conducted, it is necessary to review literature from current and relevant journals and theses. This review will look at four different areas of research: research instruments, types of physical activities, physical education, and physical activity in adolescents. After the literature has been summarized, this review will discuss the findings and its relevance to this study.

Research Instruments

Two of the common instruments used in the research of autism and physical activity are fitness trackers and surveys. This information was discovered through the collection of the literature. Fitbits and pedometers were found to be the predominant fitness trackers while surveys included questionnaires and interviews. This section will further examine fitness trackers and surveys through the review of specific studies.

Researchers from Boston established a soccer camp where they hoped to improve each participant's soccer related skills, while also providing a fun and exciting method for children to exercise (Hayward et al., 2016). A Fitbit recorded each participant's steps in the 30-yard dash and 15-yard agility drill. Another prominent study on autistic girls' physical activity featured a pedometer (Guest et al., 2017). A multi-sport camp was established to improve the girls' motor skills, physical activity levels, and physical self-perception. A pedometer was attached to each girls' right hip and their steps were then tracked for seven days. Data were included if there were

between 1,000 and 30,000 steps per day for a minimum of three to seven days. These were two of the many studies utilizing fitness trackers. According to Jeong, a University of Michigan doctoral student, fitness trackers were a more popular option in research studies when compared with self-reported measures or direct observation of subjects (2012).

A simpler method of collecting information is the survey. While fitness trackers require instruments such as pedometers and training for researchers, surveys can be as simple as an email to potential study participants. Hayward and colleagues distributed a survey to the parents of program participants (2016). Two of the questions asked demographic questions such as age and diagnosis. There were five 5-point Likert questions that asked about each child's behavior, mood, attention, relationship with siblings, and soccer knowledge. Two other questions asked about program satisfaction. Finally, there were four open-ended questions related to the child's fitness, the program's highlights, and suggestions for improvements.

Stanish and colleagues (2015) also used a survey to examine the physical activity beliefs and barriers of autistic and typically developing teens. Thirty-three questions were verbally administered to both autistic teens and typically developing teens. Some of the questions included "How much do you like to go for a walk?" and "How much do you like participating in gym class at school?" There were significant differences in how the two groups perceived team sports and physical education. More adolescents with ASD compared to typically developing teens shied away from engaging in physical activity in their free time because they believed that physical activity was too difficult to learn. The questions administered by Stanish and colleagues (2015) closely relate to the survey administered by this study.

Types of Physical Activities

Most studies saw improvements in physical activity levels and ASD symptoms. Three common activities in those studies were swimming, horseback riding, and cycling. Each of these activities benefited autistic individuals in different ways. For example, Lawson and Little examined swimming's effect on sleeping conditions when they created a swimming program for children on the spectrum (2017). They discovered that the program improved sleep in children with decreased autism severity. The program ran for eight-weeks and featured social opportunities such as songs and games. The lessons were individualized with 60% of parents noticing improved sleep in their children.

Another study that benefited autistic individuals was a simulated horse riding program for children with ASD. Wuang and colleagues (2010) conducted a 20-week study that included three sessions. The first session focused on increasing participants' flexibility and motivation for learning. Second, the children improved their coordination and awareness by riding Joba (simulated horse). Finally, participants improved their cognitive and sensory integrative skills through games played while on the horse's back. Children who engaged in horse riding improved their motor proficiency and sensory integrative functions. The therapeutic effect appeared to have been sustained for 24 weeks.

The final major activity found to influence physical activity in autistic individuals was cycling. A study designed by Hauk and colleagues (2017) found that pedaling improved leg extension, flexion strength, and balance while also decreasing body mass index. Twenty-five children and adolescents rode specially designed bicycles for three to five days. While all 25 of the participants couldn't ride bicycles before the program, 16 had learned the skills needed to

ride independently. Those that learned how to ride experienced more strength gains than those who didn't acquire the bicycle riding skills.

Physical Education

Autism can be a difficult disorder for teachers to understand. Many educators suggest that autistic students be introduced to team sports as a way of improving communication skills and promoting positive behavior. Lamb and colleagues found that team sports can provide an enjoyable sensory high to students on the autism spectrum (2014). Explicit and to-the-point rules help autistic students who struggle with language interpretation problems. However, team sports did feature some negatives. Autistic students noted that locker rooms produced stress due to their informal nature and reduced privacy. They also tended to dislike large games because of the decreased opportunity to contribute to the outcome of the game.

Konukman and colleagues echoed the statements of Lamb and colleagues by also theorizing that sports can improve autistic students' condition (2017). The study stated that team sports can help by organizing and structuring the events, space, and time of physical activity. Organizing and structuring events means that teachers should establish a clear start and stop to reduce sensory overload. With organizing and structuring space, teachers should explain exactly where the activities will take place and where the equipment is located. Finally, organizing and structuring events in time means that daily activities should be posted to the board and then erased when they have been completed.

Autistic students being integrated into mainstream physical education classes is another major theme in special education. Maher conducted interviews with 12 learning support assistants (LSA) and 12 special education needs coordinators (SENCO) to determine how physical activity can be better incorporated into special education (2016). Through the interviews, he discovered

that while physical education was an inclusive subject, finding physical education opportunities that met the needs of both typically developing students and students with ASD was a challenge.

Physical Activity in Adolescents

While most recent studies focus on children with autism, a few examined the effects of the disorder on teens and young adults. One of the most notable studies occurred at Western Michigan University (LaLonde, 2015). Two experiments featured students at the Young Adult Program for disabled adults in Kalamazoo, MI. The first experiment focused on steps taken while at school while the second focused on steps taken on weekends at home. A Fitbit was used to track the number of steps taken by each student until everybody was walking 10,000 steps per day. Setting goals for the students and rewarding them for reaching those goals increased the number of steps taken.

Now that it has been discussed that goal setting advances adolescent exercise, what type of physical activity should they pursue? Magnusson and colleagues answered this question through a program focused on cardio and resistance training (2012). Teens and pre-teens were recruited from local schools, a specialized hospital youth unit, an autistic community group, and the University exercise rehabilitation group. Participants engaged in core activities such as box jumps, box step up with medicine ball throws, press ups, and curl ups. The findings of this study indicated that a high-intensity exercise program was an effective technique to improve autism specific-issues in adolescents. Issues such as academic performance, attention to task, and positive participation in physical activity all improved substantially.

It was also found that the communication skills of autistic adolescents could be improved through physical activity. Three middle school aged teens were recruited to participate in a study at a fitness center in southern New Jersey (Fox, 2015). They participated in games and

competitions such as ball tag, freeze dancing, and cone soccer. They participated in 12 sessions of group activities that focused on improving communication skills. All three participants increased their communication skills. It was demonstrated that all the participants learned how to respond to questions and make more comments. However, the participants' ability to engage in more conversations remained low.

There is a large gap in research on the levels of participation in physical activity for high school and college students with autism. One noteworthy exception was an article about a 20-year-old runner on the cross-country team at Orchard Park High School in New York (Miller, 2014). David Gorczynski was going to be forced off the team through a New York state education regulation because he was over 18. His parents filed a law suit and Orchard Lake teammates and runners from other schools assisted him by signing an online petition. Fortunately for David, State Supreme Court Justice John L. Michalski filed an injunction that allowed David to run. As of the publication of this article, the State Education Department was expected to pass an amendment to allow for additional waivers for the age limit.

Discussion of Literature Findings

This literature review examines four areas of research on autism spectrum disorder: research instruments, types of physical activities, physical education, and physical activity in adolescents. The most relevant of these areas to this thesis is adolescent physical activity. It is the most relevant section since this study examines the physical activity choices of college students in their teens and early twenties. This study will distribute a survey to students at Western Michigan University's Autism Services Center, so it is important to understand research on similar topics. It was also noted that there was a lack of literature on scholastic sports. This thesis

hopes to bridge these gaps by asking survey participants questions about their opinions of high school and college sports.

Methods

Participants

This study surveyed 10 students from the Western Michigan University Autism Services Center. The students were over 18 years old and have either a medical or educational diagnosis of ASD. This inclusionary criterion is necessary because this study focuses on the physical activity choices of young adults on the autism spectrum. To do this, it is necessary to only recruit students with ASD.

Setting

The study took place at Western Michigan University. Data collection occurred online through Qualtrics and data analysis occurredon the campus of Western Michigan University.

Procedures

This study utilized a ten-question survey on the physical activity choices of college students with ASD. The survey was sent to students through the Autism Services Center (ASC) Coordinator's email contained a discussion on the purpose of the survey, information on confidentiality, and other items of informed consent. Students interested in learning more about the survey were instructed to contact the student investigator via email. Two follow-up emails were sent to participants reminding them to take the survey and thanking them for their participation in the survey. No rewards were given for participating in this survey.

Instrumentation and Design

Participants were invited to fill out a survey on Qualtrics. Qualtrics is a web-based survey generator that is utilized to conduct research. An informed consent form was included on the first page of the survey. If the participants continued with the survey, they were providing consent for

the answers that they provided. W-Exchange (the WMU email server) was used to send emails to members of the WMU Autism Services Center.

There were ten multiple-choice and Likert scale questions that focus on the physical activity behaviors of college students. This study's survey questions closely followed a study completed by Stanish and colleagues (2015). Some of the questions were copied from the survey including "Do you think that sports and exercise are a way to make friends?"; "Are you ever bothered by how you look while doing sports and exercise"; and "Do you think sports and exercise are too hard to learn?" Because this study focuses on college students, some of the questions were modified. Additionally, a few questions were included that were not included in any study.

Duration of the Study

It is estimated that the survey will take each participant less than five minutes to complete. The requested length of approval for the research project was two months. This included the period of time from the first emails to potential participants to the analyzation of data.

Analysis

It was not possible to use descriptive statistical tests to analyze the data due to the use of multiple choice and Likert scale questions. Because of this, analysis will be made qualitatively and quantitatively. This means that general trends in the data will be observed and recorded. This study will examine themes such as frequency of exercise, types of activity, and the social aspect of exercise. Additionally, correlation between class standing and these themes will be noted.

Confidentiality of Data

Each student will remain anonymous throughout the survey. Additionally, students will be reminded of their rights to withdraw from the survey or skip questions that they do not want to answer. Files will be kept in a locked cabinet in the Disability Services for Students Building on the campus of Western Michigan University. This study was approved by the Institutional Review Board at WMU on March 5, 2018.

Results

The survey responses were collected from 10 participants in the WMU Autism Services Center. Nine out of 10 students answered all 10 of the questions in this survey. These results aim to raise awareness on this topic for parents and professionals so that they can better help those in the ASD community.

The students varied greatly in class standing. In the survey, five students identified themselves as “freshmen,” two considered themselves “juniors,” and three recorded “senior.” Six students selected “no” when asked “Have you ever played on a high school or college sports team?” while four selected “yes”. When separated by class standing, it was discovered that only two of the five freshmen played school sports. Additionally, none of the juniors and two of the seniors participated in scholastic sports.

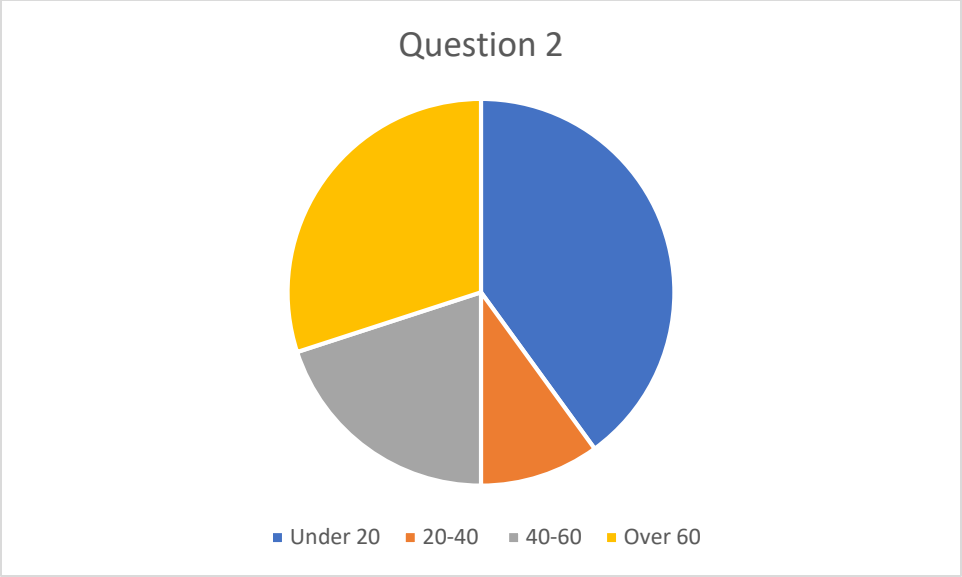

Figure 1: A pie chart for the number of minutes spent in vigorous exercise per week.

Question three, "How many minutes per week do you participate in vigorous physical activity?", illustrated that there was a wide range in time. Four students answered, "under 20 minutes," one student answered "20-40 minutes", two students answered "40-60 minutes", and three students selected "over 60 minutes". There were few intermediate values with seven out of the ten college students either participating at the lowest or highest values.

Question four, "Are you ever afraid of getting hurt doing sports and exercise?", tended to produce more "sometimes" answers than "not at all" or "all of the time." Five of the students selected "sometimes" while three students selected "not at all." Additionally, two of the students selected "all of the time." There was consistency in the seniors as all three chose "sometimes."

The fifth question, "Do you think that sports and exercise are hard to learn", led eight of the students to select "sometimes." Two students, who were both freshmen, selected "not at all." Additionally, none of the students selected "all of the time." This shows that there is a belief in WMU ASC students that exercise is somewhat hard to learn.

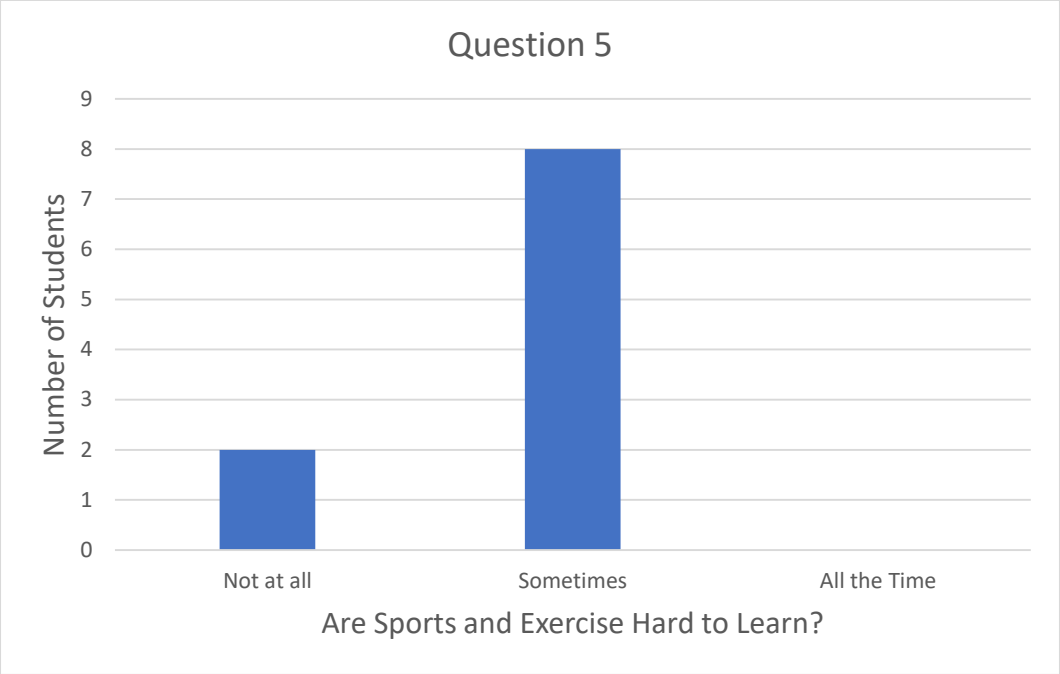

Figure 2: A bar graph showing students' opinions on the difficulty of exercise.

Most of the students preferred to participate in outside activities such as reading, video games, and watching television. When asked to "Select all of the activities outside of physical activity that you participate in?", five of the students selected "video games, reading, and watching television." Additionally, two students selected "reading and watching television." Only one student selected "video games and watching television," "watching television," or "reading."

A major discovery from the survey was that many students believed that sports and exercise were ways to make friends. Six students selected "yes" when asked "Do you think that sports and exercise are a way to make friends?" Four students selected "maybe" while zero students selected "no." When broken down by class standing, it was discovered that more upperclassmen saw that exercise helped them socially as four out of five juniors and seniors selected "yes" compared to only two out of five freshmen selecting the same value.

Question eight asked the participants “Are you ever bothered by how you look while doing sports and exercise?” Five of the students chose “sometimes” while three students chose “never.” The fewest picked answer was “all of the time” at two students. It is important that society changes stereotypes about exercise so that all students feel included when working out.

Results also showed that working out with a friend increased the likelihood of exercise. When asked “Does exercising with another person increase the likelihood of working out?”, seven students selected “yes.” Additionally, four students selected “maybe” while zero students selected “no.” Based on this data, individuals with ASD should find a friend to help them to facilitate exercise.

The tenth question asked the students to “select all of the types of exercise that you engage in.” There were four possible answers: weightlifting, sports, running, and other. This led to eight different combinations picked by the students. Two students chose “other” and “weightlifting, running, and sports.” Additionally, one student each chose “sports and other,” “weightlifting and sports,” “weightlifting, running, sports, and other,” “weightlifting,” and “running.” One student didn’t select any answer.

Discussion

This study aimed to investigate three research questions relating to autistic college students and physical activity. After gathering the survey responses, it has become possible to draw conclusions about these research questions. This section will provide a brief overview of those research questions while also examining limitations to this study and potential future research projects.

Research Question One

The first research question asked, “In what types of physical activity do individuals with ASD participate?” The tenth survey question examined this research question. In the tenth question, four students selected “weightlifting,” “running,” and “sports” while three selected “other.” This shows that college students with ASD participate in a broad range of activities and aren’t restricting themselves to just one or two activities.

Research Question Two

Research question two asked, “How often do individuals with ASD participate in physical activity?” Based on the survey, there was a variation in time spent participating in vigorous exercise. Most of the students either selected “under 20 minutes” or “over 60 minutes” of exercise. There was little middle-ground as only three of the seven students participated in vigorous exercise in values other than these two. Those participating under 20 minutes should be encouraged to spend more time exercising as it has been proven to improve both physical and mental health.

Research Question Three

The final research question expanded on the first two to ask, “What beliefs do individuals with ASD have about physical activity.” Students had varying beliefs about physical activity. One consensus on the topic came in question five on the topic of sports and exercise being hard to learn. Eight students said that exercise was sometimes hard to learn which showed that most WMU ASC students had some hesitancy towards physical activity. It might make sense to try to introduce simpler workouts to facilitate more students with ASD exercising. Another major finding on physical activity beliefs occurred in question nine which asked, “Does exercising with

another person increase the likelihood of working out?" All of the participants either selected "yes" or "maybe" indicating that exercising with a friend is important.

Limitations

This study had several limitations impacting its success. While this research will be useful to many professionals and parents of children with ASD, it could have been even more relevant if a few improvements were made. First, the number of participants for this study were quite small. The WMU ASC program includes sixteen students and only ten of those responded to the survey. If further research were to be conducted, it would be important to get a much larger sample size of college students living with ASD. Second, this study failed to capture the thoughts and beliefs of autistic WMU students outside of the ASC program. With an enrollment of more than 23,000 students, there are many autistic students in the university who aren't a part of the ASC program. To get an accurate view of physical activity and autism, it would be important to include students outside of the ASC program. Finally, this study only used multiple choice and Likert scale questions in the survey which rendered descriptive tests impossible. Future studies should include a larger variety of question types so that standard deviations, means, and medians can all be discovered.

Suggestions of Future Studies

While this study will serve as an effective technique for improving physical activity in college students with ASD, more research should be implemented on the subject. Future studies should expand on the results of this survey and explore the issue through experiments and focus groups. By following autistic students in more detail, more information can be gathered on effective exercise techniques. It is suggested that future studies institute a program using Fitbits and pedometers to track steps in real time. While surveys provide valuable information, they also

rely on the opinions and sentiments of participants. Exercise trackers such as Fitbits and pedometers can take the ambiguity out of the results by providing an absolute answer.

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