University of Wisconsin-La Crosse

Graduate Studies

Implementing the Exercise Buddy App with Middle and High School Students with ASD in Physical Education

A Critical Analysis Project Submitted in Partial Fulfillment of the Requirements for the Master of Science in Exercise and Sport Science- Physical Education Teaching Adapted Physical Education Teaching Concentration

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ADAPTED PHYSICAL EDUCATION
CRITICAL ANALYSIS PROJECT
FINAL APPROVAL FORM

Candidate: Ian Harned

We recommend acceptance of this Critical Analysis Project in partial fulfillment of the candidate's requirements for the degree:

Master of Science in Exercise and Sport Science-Physical Education Teaching: Adapted Physical Education Teaching Concentration

This candidate has completed the oral defense of the critical analysis project.

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ABSTRACT

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Autism spectrum disorder (ASD) is one of the fastest rising developmental disabilities among children, with rates around 1 in 68 individuals. Obesity rates in youth with ASD have reached 17% or about 12.7 million adolescents. Adolescents with ASD have shown low motor abilities, and difficulties with the physical education setting because of the overwhelming number of sensory challenges. Students with ASD are also frequently recognized for their difficulty understanding verbal information and are able to process visual supports more easily. Visual supports are needed for students with ASD to be successful in physical education; one common support is assistive technology. Many teachers, or paraprofessionals, don't know how to utilize technology in physical education to provide the same supports for students with disabilities (SWD) that they receive in the special education (SPED) classroom. The Exercise Buddy app is designed specifically for students with ASD to provide the support they need to be successful in physical education. The purpose of this project was to create an instructional video utilizing EB for middle and secondary-aged students with ASD. The video was developed for general and APE teachers, special education teachers, paraprofessionals, and parents of students with ASD to provide them with the evidence-based practices incorporated into the app to be successful in physical education. Key features of this video and accompanying materials include: An overview of ASD, evidence-based practices, and how to use and implement the Exercise Buddy app. This video can be found on the website for the Center on Disability Health and Adapted Physical Activity at the University of Wisconsin-La Crosse.

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CHAPTER I

INTRODUCTION

Autism spectrum disorder (ASD) is one of the fastest rising developmental disabilities among children (Colombo-Dougovito, 2015). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines ASD as persistent deficits in social communication and social interaction, restricted or repetitive patterns of behavior, interests, or activities causing clinically significant impairment in social, occupational, or other important areas of current functioning (American Psychiatric Publishing, 2014). Estimates from the Centers for Disease Control and Prevention, Autism and Developmental Disabilities Monitoring Network (2016) found that about 1 in every 59 children are diagnosed with ASD. In addition, youth with ASD are less physically active, and their fitness levels appear to be lower than the general population, resulting in a higher body fat percentage compared to children without disabilities (Cai & Kornspan, 2012).

Research has shown very low motor abilities and difficulties with the physical education setting for school-aged students with ASD. These students can often face an overwhelming number of simultaneous sensory challenges in physical education. In physical education class, students with ASD are often left wandering and wondering. "The unsensory friendly environment, the variety of learning styles, and lack of visual supports have made the typical physical education class a missed opportunity. Instead of using exercise to increase the child's focus, self-esteem, and relationships, this well intended attempt to exercise results in more frustration, failure, and ridicule" (Geslak, 2016). In regard to class organization, the task itself, or the equipment being used, the

physical education environment is constantly changing (i.e., small groups, large groups, or partners). This environment can be chaotic for a student with ASD, causing withdrawal and disruptive or self-stimulatory behaviors (Fittipaldi-Wert & Mowling, 2009).

Since physical education is a required service for students in special education, including those with ASD, teachers must adapt to their needs. Physical education can be one of the most positive times of the day for students with ASD if appropriate strategies are implemented to meet their physical, cognitive, emotional, and sensory needs. To make sure these needs are met, the IEP team should determine what accommodations the student is receiving and benefits from during other parts of the school day. The IEP team can then determine how the same or similar accommodations can be given to that student in physical education. For example, using social stories, timers, visual supports, or peer tutors may be used if the student is benefiting from one of those during other instructional lessons. Keeping accommodations or supports consistent throughout the day will allow the student to experience consistency and predictability, thus preventing frustration and meltdowns (Menear & Smith, 2011).

Individuals with ASD are recognized frequently for their difficulty in understanding, recalling, and using verbal information. Research indicates that individuals with ASD can process two or three-dimensional visual supports more easily than transient input, such as auditory stimuli (Dettmer, Simpson, Myles, & Ganz, 2000). Practitioners should not rely on auditory channels for disseminating information. Visual supports are often used to maintain attention, understand spoken language, and sequence and organize their environments (Dettmer et al., 2000). A visual support commonly used

by teachers is the Picture Exchange Communication System (PECS) for teaching functional communication and creating independence and decision making (Pyramid Educational Consultants, 2017).

Students with ASD have difficulty comprehending social situations or the expectations of others in those social situations with. One support tool that a student with ASD can use to develop these skills is social stories. This is a resource commonly used in the general education classroom, but it is showing positive outcomes in the physical education setting. Research has found that children who receive a social story intervention were able to maintain the appropriate targeted behavior after intervention withdrawal. As a result, students are more likely to engage in appropriate play during free-play sessions and to make independent choices (Sandt, 2008). Social stories are an effective tool for communication between the physical educator and a student with ASD. Social stories allow for students with ASD to learn appropriate responses and new behaviors in physical education (Sandt, 2008).

Assistive technology (AT) is becoming an increasingly popular support tool for students with ASD, such as iPads or screen-based technology. Stated in P.L. 108-446, in section 118 Stat. 2668, is the use of technology by children with disabilities to enhance learning. AT assists to maximize accessibility to the general education curriculum for children with disabilities. This includes using technology with universal design principles and AT devices. “Technology offers consistent and clearly defined tasks and visually cued instructions that can reduce misunderstanding caused by multiple verbal instructions” (Grynszpan, Weiss, Perez-Diaz, & Gal, 2014). Technology can also be used as a support tool to accommodate social and behavioral challenges that adolescents with

ASD exhibit. The use of screen-based technology by all students can reduce social stigmas and increase the acceptability of AT based interventions for adolescents with ASD who are increasingly educated in general education. Technology can also reduce the social difficulties experienced by adolescents with ASD (Hedges, Odom, Hume, Able, Fletcher-Watson, Mesibov, & Simeonsson, 2017).

The time children spend watching television, playing electronic games, and using computers have been associated with an increased risk of obesity (Lanningham-Foster, Foster, McCrady, Jensen, Mitre, & Levine, 2009). "In today's technology driven society, children and their families are spending large portions of their days in front of screens for televisions, computers, and video games. If this sedentary screen time can be converted into active screen time, children and families could burn more calories while at the same time engaging in fun activities in the safety and comfort of their homes" (Lanningham-Foster et al., 2009). A new generation of active video games (AVG) might provide a novel opportunity to turn a traditionally sedentary behavior into a physically active one.

AVG's could be a solution to low physical activity (PA) and the need for supports by addressing common barriers to physical activity for youth with disabilities. There have been many efforts in the workplace, school, and home to increase daily physical activity, all with the goal improving health through weight management (Lanningham-Foster et al., 2009). Video games are widely utilized by youth today, and often attract children with ASD (Anderson-Hanley, Tureck, & Schneiderman, 2011). Research has found that AVG's elicit increase in energy expenditure (EE), heart rate, and perceived exertion that are similar to, or even higher than moderate intensity walking (Graf, Pratt, Hester, & Short, 2009).

AVGs, also called “exergames,” refer to a category of video games involving movement, or in which movement is encouraged by the game controller that could involve motion sensing cameras or handheld versions, mats, or boards (Rowland, Malone, Fidopiastis, Padalabalanarayanan, Thirumalai, & Rimmer, 2016). Common applications such as Dance Dance Revolution (DDR), EyeToy, and the Nintendo Wii are becoming increasingly popular, having users’ bodily movements controlling the video game (Kraft, Russell, Bowman, Selsor, & Foster, 2010). EyeToy games use a USB camera to put the players onscreen in sport based activities such as football, boxing, dancing, and kung fu (Maddison et al., 2007). DDR uses dance pads adapted from arcade games, where a student stands on the dance pad connected to a console, responding by stepping on a corresponding series of arrows and symbols that scroll up the screen in time to fast music (Maddison et al., 2007).

There are numerous treatments and therapies for ASD that are considered evidence based, one of which is exercise (Geslak, 2017). One unique physical activity app that has been developed for ASD is Exercise Buddy (EB) (Geslak, 2017). The EB app is available on Apple and Android platforms and is based on a visual exercise system for persons with ASD. The app was developed to provide physical activity and exercise training techniques for teachers and parents of individuals with ASD, integrating evidence-based practices such as video modeling. EB contains over 180 exercise videos of varying duration. The EB app also integrates social narratives, visual supports, tech-aided instruction, and exercise to ensure success for students during physical activity. Students with ASD benefit from structure to be the most successful in class. The

evidence-based practices incorporated into EB provide the structure and support that are often needed in the educational setting including physical education.

There is currently little research on the use of EB. A pilot study by Bittner, Rigby, Silliman-French, Nichols, and Dillon (2017) sought to determine the effectiveness of EB in facilitating increased psychological responses to physical activity by continuous measurement of EE and heart rate versus practice style teaching methods in children with ASD. The study showed that the app might be a viable tool for facilitating PA, including higher intensity PA levels. Additionally, teachers, family members, and other peers who may not have the background in teaching PA, may use the EB app to communicate appropriate exercise instruction (Bittner et al., 2017). It would be beneficial for many others to now use this app to enhance PA for students with ASD.

Need for Project

It is clear that the current way of way of teaching physical education to students with ASD could be improved upon. Often students with ASD aren't receiving the supports in physical education that they are receiving in the classroom. Additionally, parents, physical educators, and paraprofessionals don't know how to utilize technology to enhance learning, and maximize accessibility to the general education curriculum for students with ASD. Giving physical education teachers and paraeducators a resource making the environment more sensory friendly can help prevent meltdowns and frustration, and keep their day at school consistently routine oriented. EB is an effective tool to give a student with ASD a structured workout routine that uses the evidence-based practices.

Purpose of Project

The purpose of this project was to show teachers, paraprofessionals, and parents how to implement the EB app for middle school and secondary students with ASD. With obesity rates effecting 31.8% of students with ASD (Bittner et al., 2017), it is clear that more PA is needed by this population. EB could be used in physical education to enhance PA levels by giving students to support they need to be successful in physical education.

Definition of Terms

Active Video Gaming (AVG): Refers to a category of video games involving movement, or in which movement is encouraged by the game controller that could involve motion sensing cameras or handheld versions, mats, or boards (Rowland, Malone, Fidopiastis, Padalabalanarayanan, Thirumalai, & Rimmer, 2016).

Assistive Technology (AT): According to IDEA 2004, AT is any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities (Individuals with Disabilities Education Act, 2004). The EB app is an example of AT for students with ASD that can increase, maintain, and improve functional capabilities in the physical fitness and motor skill areas. EB also meets the definition of AT by Laughlin, Murata, Gonnelli, & Larranaga, (2018) since it supports learning, independence, self-esteem, and quality of life in the area of adapted physical activity.

Exergaming: Combines physical and mental exercise simultaneously by linking physical activity movements to video game control and may yield better compliance with exercise (Anderson-Hanley et al., 2011).

Exercise Buddy (EB): The EB app provides training techniques for teachers and parents of individuals with ASD, integrating evidence-based practices such as video modeling and contains over 180 exercise videos (Bittner et al., 2017).

Summary

Students with ASD have the same daily physical activity needs as those without disabilities, but they are often not receiving the support to achieve this goal. This includes using AT to maximize accessibility to the general education curriculum for children with ASD. Adapted and general physical education teachers and others may use the information provided in this project, as well as the instructional video, to incorporate technology into physical education to increase physical activity and EE in students with ASD. The video resource was created using current research and best practices on active video gaming, and implementing a commercially available application (Exercise Buddy) into physical education.

Chapter II

Review of Related Literature

Introduction

With the growing rate of students with autism spectrum disorder (ASD), and increased technology use by students and teachers, it is important to find better ways to utilize technology in physical education to benefit all students. Estimates from Centers for Disease Control and Prevention (CDC) Autism and Developmental Disabilities Monitoring Network found that about 1 in 59 children have been identified with ASD (CDC, 2018). There is substantial evidence showing that screen-based media use can have detrimental effects on outcomes among typically developing youth, and SWD particularly in the areas of academic performance, social engagement, behavioral regulation, and health. This is significant for individuals with ASD because solitary screen-based media use represents a primary and preferred activity for large percentage of this population (Mazurek, Shattuck, Wagner, & Cooper, 2012).

This literature review examines research studies and practical teaching literature about low levels of physical activity (PA) and motor skills among students with ASD, the use of technology and active video games (AVG) to enhance PA among students with and without disabilities, and implementing the Exercise Buddy (EB) app into physical education for students with ASD.

Low Levels of Physical Activity and Motor Skills Among Students with ASD

According to the Centers for Disease Control and Prevention (2015), obesity rates in adolescents with ASD is 31.8% compared to their typically developing peers at 13.1%. These high rates of obesity put vulnerable adolescents at risk for lifelong health

conditions. In addition, high rates of obesity and ASD have been associated with increased health problems including asthma, migraine headaches, anxiety, depression and sleep problems. The Society of Health and Physical Educators (SHAPE America, 2017) recommends school-age children accumulate at least 60 minutes and up to several hours of PA per day while avoiding prolonged period of inactivity. Studies suggest that adolescents with ASD engage in sedentary behaviors more frequently, possibly due to social skill impairments, sensory challenges, or secondary conditions (Corvey, Menear, Preskitt, Goldfarb, & Menachemi, 2016).

Pan and Frey (2006) examined age related PA patterns in youth with ASD. Thirty youth ages 10-19 years were studied. Recruitment was restricted to participants rated as high-functioning on the autism spectrum, according to parent reports. All but six subjects manifested associated conditions including anxiety, obsessive compulsive disorder, mental health problems, attention-deficit disorder, and many other multiple occurring conditions. Two assessment methods were used to increase measurement accuracy: an accelerometer and a questionnaire. The accelerometers were programmed to collect data in 1 minute intervals, calculating total movement counts, counts per minute, and time spent in light, moderate, vigorous, and very vigorous PA using age specific count cutoffs corresponding to each specified intensity level. The questionnaire was designed to measure daily PA activity, specifically to qualify activity patterns rather than as an assessment tool because of the inherent difficulties associated with self-reports in youth (Pan & Frey, 2006).

The results revealed that 47% of youth accumulated at least 60 minutes of daily moderate to vigorous physical activity (MVPA). When analyzed by grade level, 78% of

elementary school and 67% of middle school student's youth accumulated recommended MVPA, while only .08% of high school youth met this guideline. No group met the recommendation of engaging in 20 minute bouts of continuous MVPA at least three times a week. The study also showed that elementary school students were more active overall than those in high school and middle school. All participants were more active after school, but engaged in more MVPA during school. The results indicated that youth with ASD were less active than students without disabilities, however other aspects of PA behavior were similar to those observed in youth without disabilities. PA declines with school level, some youth with ASD accumulate recommended amounts of MVPA, and this population does not regularly engage in continuous MVPA (Pan & Frey, 2006).

The observed PA behaviors of youth with ASD in this study can be partially described by the social model of disability, meaning that low levels of PA in this population are due to society's failure to provide appropriate services and adequately ensure the needs of youth with ASD are fully taken into account (Pan & Frey, 2006). Youth with ASD are disadvantaged because of societal treatment, and lack of societal acceptance and support might limit access to community and education PA opportunities. Additionally, many children with ASD received physical education from special education teachers or classroom aides, neither of which were qualified to provide appropriate instruction in this area.

Physical activity interventions for students with ASD should focus on promoting individual or dual activities that require fewer societal supports. These interventions are important because fewer people are needed, fewer social demands are needed, these activities are easily continued into adulthood and performed using family resources, and

the rhythmic nature of many individual activities are conducive to repetitive traits often associated with ASD (Pan & Frey, 2016). Utilizing technology in physical education, a common support tool that SWD use in the special education classroom, could potentially lead to fewer societal supports, and increase acceptance from their typically developing peers.

A similar study by Corvey et al., (2016) examined obesity, overweight, PA, and sedentary behavior among children with and without ASD. This study used recently collected nationally representative data to examine several outcomes including obesity/overweight, sedentary behaviors, and PA among children and youth with and without ASD, as well as the severity of ASD. Data were from the 2011-2012 National Survey of Children's Health (NSCH). Surveys were conducted by telephone based on parent report, and a total of 95,677 phone surveys were conducted between February 2011 and June 2012 (Corvey et al., 2016).

Results showed no relationship between being overweight and having ASD diagnosis, however obesity rates were higher among those with an ASD diagnosis compared to those with no ASD (16.4 to 9.9%). The results also showed those with severe ASD reported significantly higher rates of sedentary behavior (65.1 vs. 50.9% with mild severity and 37.3% of children with moderate severity ASD). The results indicate that ASD is not independently related to obesity once other secondary conditions and medications are taken into account. Medications taken by individuals with these diagnoses, and irregular or suboptimal dietary pattern contribute to weight gain (Corvey et al., 2016). No significant associations were found between ASD presence or severity and PA. Sedentary behavior differed by ASD severity whereby individuals with moderate

ASD were less likely to be sedentary compared to those with mild ASD, however these findings were no longer observed after controlling for secondary diagnoses or conditions and medication use. Also, the results indicated increased screen time usage by individuals with ASD, but previous studies used smaller sample sizes and less generalizable geographic locations and age groups (Corvey et al, 2016).

A study by MacDonald, Esposito, and Ulrich (2011) explored the PA patterns of 72 children with ASD as they aged. Following bouts of PA, children with ASD experienced decreases in negative behavior like stereotypes and increased positive behaviors like time on task. The participants consisted of 72 participants with ASD between the ages of 9-18 years, recruited as a part of an adapted PA intervention study (MacDonald et al., 2011).

Physical activity was measured using the Actical accelerometer over a 7 day period during a typical week and prior to the adapted PA intervention. Two subtests were administered (the vocabulary and matrix reasoning subtests), using the Weshsler Abbreviated Scale of Intelligence (WASI). The WASI was administered by a clinician or graduate student, with experience in cognitive assessment. The Social Responsiveness Scale questionnaire was completed by the parents or guardians, measuring the five areas of social development: social awareness, social information processing, capacity for reciprocal social communication, social anxiety or avoidance, and autistic traits. Actical monitors were worn by participants for different amounts of total time, and analysis of covariance was used with the time spent wearing the monitor as the co-variate (MacDonald et al., 2011).

The results of this study revealed declines in PA as children with ASD age. This pattern is evident in decreased moderate to vigorous PA patterns as well as increased patterns of sedentary PA. The observed age-related declines shed light on the lack of PA demonstrated in older children with ASD. Similar to Pan and Frey's (2006) study, these results highlight a need more PA, including extracurricular after school programs. Physical activity programs have shown both social and physical health related benefits (MacDonald et al., 2011). A new PA strategy that has shown increases in EE and PA, is the use of technology and active video game use in physical educaton.

Use of Technology and Active Video Games to Enhance Physical Activity Among Students with and without Disabilities

Physical activity is known to prevent obesity, thus indicating that sedentary leisure activities could be a factor in increased rates in obesity. In today's society, families spend large portions of their days in front of screens with televisions, computers, and video games. This sedentary screen time could be converted into active screen time, where children and families could burn more calories (Lanningham-Foster, Foster, McCrady, Jensen, Mitre & Levine, 2009). Active video games (AVG) are a popular alternative way to play video games by having people standing up and physically active, and there have been many studies examining the effects AVG's have on PA (Davis, 2017).

With the increased time children engage in videogames and other screen-based media, AVG's could be a natural way to incorporate PA into child's daily routines. Foran and Cermak (2013) conducted a study to describe videogame ownership trends among families of youth with ASD to assess patterns of videogame play within this population, and to report relationships between the youths' active and traditional

videogame play and parents' satisfaction with their child's current PA level. Additionally, the characteristics of videogame ownership among families with regard to family size, child age, gender, and diagnosis were examined to better understand ownership trends and play patterns in this population (Foran & Cermak, 2013).

A survey was created to examine the availability of videogame systems in the homes of youth with ASD and to assess the videogame playing habits of those youths. Summary statistics were generated to describe the demographic and clinical characteristics of the families surveyed. Demographic data such as age, gender, and diagnostic category were grouped to form categorical variables for analysis.

Results indicated that 95% of families surveyed owned at least one videogame system or computer and 82% of families owned either an AVG platform, or one that could be upgraded to an AVG platform with the addition of a commercially available device for approximately $100. Additionally, 84% of those youths played traditional seated video games (TSVG) at least 30 minutes per day, and over 52% played AVG's for at least 30 minutes per day. Results also showed a relationship between age and level of assistance needed to play AVG's. In general, participants required more assistance for AVG's versus those playing TSVG's (49 to 34%).

Findings from this study revealed evidence that AVG systems are widely available in the community, and AVG's could be incorporated into the daily lives of SWD's, such as ASD, given the high rate of system ownership reported by parents. AVG's are a promising way to counteract increasing rates of childhood obesity and reduce sedentary behavior, allowing children of all abilities to participate in more PA during childhood (Foran & Cermak, 2013).

A common characteristic of youth with ASD is restricted or repetitive patterns of behavior, interests, and activities (American Psychiatric Association, 2014). Physical exercise has been shown to decrease repetitive behaviors in youth with ASD, and improve cognitive function across the lifespan. Anderson-Hanley, Tureck, and Schneiderman (2011) explored the potential behavioral and cognitive benefits of AVG's for youth with ASD by conducting two pilot studies. Pilot study one consisted of 12 children with ASD completing a control task and an acute bout of Dance Dance Revolution (DDR). Pilot two consisted of an additional 10 youths completing an acute bout of cyber cycling (Anderson-Hanley et al., 2011).

Pilot study one consisted of 12 students recruited by a letter sent to parents by a school administrator. Pilot study two consisted of an additional 10 students recruited from the community by announcements sent to ASD organizations and posted in ASD newsletters. The Gilliam Autism Rating Scale, 2nd Edition (GARS-2) assessed the severity of ASD to provide a standard diagnostic criterion. Parents completed a survey consisting of 42 items pertaining to the observable and measurable behaviors, divided in three subscales of 14 items, each focusing on stereotyped behaviors, communication, or social interaction. Participants were videotaped interacting while playing for 5 minutes before and after the control and exercise tasks to measure change in repetitive behaviors. A Digit Span Forward and Backward were both administered in standardized fashion to measure executive function captured in the backward performance. A Stroop task was also administered in a brief 40-item form to extract from the interference trial a measure of executive function, including inhibition of response (Anderson-Hanley et al., 2011).

Results from pilot study one, playing DDR, showed that repetitive behaviors decreased significantly after AVG's compared with the control condition, while performance on Digits Backwards improved. The time to complete the Stroop C decreased for both the control and exercise condition, with the control condition improving the most which was likely due to the practice effects typically observed with the Stroop. Results from pilot study two, playing cybercycling, showed that repetitive behaviors decreased significantly after cybercycling, while performance on Digits Backwards improved compared with the control condition.

This study shows that AVG's may be a useful treatment for ASD, as it has been found in these pilot studies to decrease repetitive behaviors and increase executive function compared with a control condition. Individuals with ASD participated in two pilot studies in which change in behavioral and cognitive performances increased after playing AVG's (DDR or cybercycling) compared with change in performance after a control condition (watching a video). These results are encouraging since the repetitive behavior characteristics of ASD provide an almost insurmountable barrier to social interaction and community integration. Both AVG's were found to have similar positive effects on repetitive behaviors and executive function and when utilized, they have greater aerobic activity potential compared with other AVG's like Wii, which function primarily in response to hand and arm movements (Anderson-Hanley et al., 2011).

Excessive video game play has been noted as a contributor to childhood obesity, but AVG's have been designed to capitalize on the reinforcing effects of video games to increase PA in children. Active video games may provide a simple, alternative intervention, however it has not yet been evaluated scientifically. A study by Fogel,

Miltenberger, Graves, and Koehler (2010) evaluated the effects of AVG's implemented in a typical physical education classroom with inactive children to determine whether children spent more time engaged in PA in an AVG environment or in the traditional PE environment. Four 5th grade PE students participated in the study, chosen because they were physically inactive in the PE classroom (defined as spending at least 30% of the time available to participate in PA either standing, sitting, or watching others), overweight, had the lowest fitness scores in the class, and had good attendance and behavior records (Fogel et al., 2010)

Data were collected on the total minutes provided for PA and the total minutes engaged in PA during the 30-minute sessions using personal digital assistants programmed for collection of duration data. One data key was used when a participant was engaging in PA, and the other was used when an opportunity for PA was provided. To evaluate the students' and the PE teacher's views of the intervention, three social validity surveys were given. A students' preference ranking survey was administered at the end of the study during PE class, ranking their favorite AVG. A teacher's social validity survey was administered at the end of the study to measure the acceptability of AVG's as a form of PE. Then a teacher's scoring survey was administered to assess the teacher's perceptions of how much time was spent dealing with behavior problems, providing instructions, and practicing PE skills, and how much time the class followed directions across conditions (Fogel et al., 2010).

Results indicated higher levels of PA for all four participants playing AVG's (9-9.6 minutes) than the PE condition (1.4-1.8 minutes). For all four students, the AVG's resulted in higher levels of opportunities, producing a mean of 11.6 minutes, with the

mean of 3.8 produced in the PE condition. The mean percentage of time spent in PA was higher in AVG sessions than the PE condition (78 to 60%). The teacher reported on the social validity survey that AVG's were beneficial to the students, providing opportunities for students to work on skill development, and resulted in a reduction in behavior problems during class time. Additionally, the teacher agreed that time spent in AVG's increased skill acquisition and cardiovascular endurance. AVGs resulted in more student engagement in PA, and the students followed instructions during sessions. On the scoring survey, a 30% reduction in time spent dealing with behavior problems, a 30% increase in students following directions, and a 50% increase in time spent having students practice a PE skill or activity per session across both conditions were reported (Fogel et al., 2010).

Overall, these results indicated that AVG's are a simple, effective, and socially valid intervention for increasing PA. Students were more engaged in PA playing AVG's than the PE condition, resulting in less time to engage in off-task behaviors, therefore time for class management was reduced. Additionally, AVG's require minimal instructions because the AVG condition was the same every session, whereas in the PE condition different activities were presented, thereby requiring more time devoted to instructions.

A similar study was conducted by Davis (2017) examining what effects AVG has on PA and physical fitness of students with intellectual disabilities. Participants completed a Pacer 20m fitness test, and in between the pre and posttest, subjects participated in two 10-minute AVG dance sessions each day for 10 school days. Six students participated in the study, and were required to meet five requirements: did not have a photosensitive form of epilepsy, did not have a pacemaker or other implanted

medical device, was 18 years or older, was able to provide informed consent, and had a moderate intellectual disability (Davis et al., 2017).

The Brockport Physical Fitness Test (BPFT) and the Nintendo Wii AVG system were used to assess during the study. The Pacer 20m was selected as the fitness test, and Just Dance for the Nintendo Wii was selected for this research study. Statistical data were analyzed using the IBM SPSS Statistics 24 software program to investigate what effects the intervention sessions might have on the physical fitness of the participants, and descriptive statistics were generated for participant's data, fitness data, and intervention data.

Results indicated that there was not a high statistical difference in the number of Pacer 20m laps completed from the pretest (M = 16.17, SD = 13.03) to the posttest (M = 14.17, SD = 9.85), concluding that on average the participants competed fewer laps on the posttest as compared to the pretest. Due to small sample size and data collection over a short period of time, it seems as though the Nintendo Wii AVG system using the Just Dance video game does not elicit statistically significant differences in BPFT Pacer 20m fitness test scores (Davis et al., 2017).

When interpreting the data, three limitations were examined. The use of a convenience sampling procedure and the small sample size would impede generalizing the results to the general population, and could affect the results by motivating the participants to do well because they were selected to participate. Lastly, data were collected over a short period of time, which could affect the results by motivating the participants to work harder to do well because they wanted to please the investigator (Davis et al., 2017).

School-based physical education interventions are encouraged as a recommendation to increase MVPA by modifying curricula to allow for more active time in physical education class. Students are technologically savvy, and incorporating a familiar AVG can enhance physical education class participation for all students at all skill levels. A study by Quinn (2013) incorporated a AVG as a fitness activity into a traditional PE class to enhance the curriculum and increase student participation and active time. The sample consisted of 86 sixth grade students at a pilot middle school, with all participants of the 8th- and 9th-period physical education class. A modified PAQ-A questionnaire was administered to all sixth grade students during the first week of school, and then only the participants in the 8th- and 9th-period physical education class were surveyed during their final physical education class of the rotation (Quinn, 2013).

The most significant finding from this study was the percentage of students using Just Dance before and after the intervention (11.6 to 25.6%). Similar findings were noted for DDR (10.5 to 19.8%). The results did not indicate a significant difference in home activity compared to before the intervention but students were significantly more active in PE class after the intervention than before (Quinn, 2013).

The study by Quinn (2013) demonstrated that school-based interventions proved to be effective in modeling behaviors for young adolescents to increase their level of activity, but does active video gaming increase EE. A study by Maddison, Mhurchu, Jull, Jiang, Prapavessis, and Rodgers (2007) sought to quantify the EE and PA associated with playing AVG and nonactive console-based video games to determine if active games have potential as an appealing strategy to increase PA in children. Twenty-one children, ages 10-14 years, participated in the study using various EyeToy and dance simulation

games. The participants were recruited via community advertisements, direct contact with local schools, and word of mouth.

All participants were fitted with a Polar Accurex heart rate monitor and a Actigraph Accelerometer. Heart rate, $VO_{2,}$ minute ventilation, and respiratory exchange ratio were monitored continuously, and the mean readings during the final minutes of game playing were taken as the steady state for each variable. Additionally, oxygen uptake during rest and the video game conditions were measured using the MetaMax3B portable indirect calorimetry, allowing the participant to perform physical activities unrestricted. Each participant was measured at seven time points: resting, inactive video game, and playing each of the following active video games: EyeToy Knockout (boxing), Homerun (baseball), Groove (dancing upper buddy), AntiGrav (hover-board), and Playstation 2 Dance UK (dance pad). These games were chosen to represent a broad spectrum of EE (Maddison et al., 2007).

Results indicate that EE was significantly greater in the AVG compared with nonactive gaming conditions. Active video games resulted in significantly greater heart rate and activity counts compared with the nonactive and resting condition. Additionally, the study resulted in moderate to high EE in children of similar magnitude to other PA such as brisk walking, skipping, jogging, and stair climbing. Data suggest that substituting periods of inactivity (nonactive video game playing) with sustained AVG could have a measurable impact on body weight. Active video gaming could increase daily PA, and have the potential to spillover effects for other forms of PA. Increasing interest in being active for children who are inactive might be mediated by increased enjoyment (Maddison et al., 2007).

Video games appeal to young adults, and their use is increasing. A study by O'Donovan and Hussey (2012) examined the EE and heart rate response while playing AVG, and the effect of gaming experience on EE. Twenty-eight young adults (mean age 22 years) were recruited. Participants were divided into a Wii Sports group and a Wii Fit group, with all simulations played at the basic level. The study calculated METs, and data were analyzed for normality using the Kolmogorov-Smirnov test. JMP Version 7.0.1 (SAS Institute Inc. North Carolina, USA) was used to analyze the results.

Results indicated that mean %HRmax reached playing baseball, tennis and boxing were significantly lower than the accepted description for MVPA that participants reached while jogging. The mean MET levels reached during tennis and baseball was in the very-light-intensity range, while the MET level during boxing was in the light-intensity range. This was the first study to examine the energy requirements of a self-paced Wii game without transition periods, and whether gaming experience affects EE while playing Wii games. The results did not show the Wii games reaching levels of MVPA, but it may be useful to encourage sedentary adults who enjoy playing video games to become more active.

A study by Evans (2014) compared which AVG console, XBOX Kinect or Nintendo Wii, would elicit more MVPA in youth with ASD. Fifteen male youth (12 to 21.3 years of age) were recruited. The participants played the XBOX Kinec Boxingt and Nintendo Wii Boxing on the gaming consoles individually. All participants' MVPA levels were monitored using GT3X+ accelerometers worn on the left hip, right hip, left wrist, and right wrist. In addition, an HJ-720IT pedometer was worn on the right hip.

All data, including MVPA percentage for left hip, right hip, left wrist, right wrist, as well as steps accumulated were recorded using SPSS statistical software. A repeated measures analysis of variance was performed to compare MVPA percentage between the two AVG consoles and within the four accelerometer locations. A one-tailed paired t-test was used to compare mean step counts between the two AVG consoles.

Results indicated no significant difference within accelerometer locations, and no significant difference in time spent in MVPA between consoles. Wrist accelerometers worn achieved higher MVPA than hip worn accelerometers. There was also no significant interaction effect within accelerometer and game consoles, and no difference between locations left to right. The results indicated that AVG can be used for MVPA attainment amongst male students with ASD using the XBOX Kinect or Nintendo Wii console. All players achieved MVPA while playing Boxing on both consoles, and there were not significant PA attainment differences between the XBOX Kinect or Nintendo Wii.

The Exercise Buddy iPad App for Students with ASD

The Exercise Buddy app (Geslak, 2017) is relatively new to the market, so there is little research on the effects that the EB app has on EE and PA working with students with ASD. A pilot study was conducted by Bittner, Rigby, Silliman-French, Nichols, and Dillon (2017) to determine the effectiveness of EB in facilitating increased physiologic responses to PA via a continuous measurement of EE and heart rate versus practice-style teaching methods. Six children, 5 to 10 years of age, diagnosed with ASD from a university outreach program were recruited using purposive sampling. The parents completed a medical health questionnaire, with inclusion criteria including chronological

age of 5 to 10 years, a diagnosis of ASD, a severity level rating of 1 or 2, and at least a total raw score of '2' on the Test of Gross Motor Development-2 (TGMD-2), administered by the researches to all participants. Participants wore the Actiheart monitor, and the accompanying surface electrodes, to measure EE and heart rate throughout the duration of physical activity. Participants were asked to perform their motor tasks for that day's activity session, including a motor task (i.e., object control, locomotor) and performing a protocol including a teaching method (i.e., practice-style, EB app). The duration of the session was 12 minutes, with each participant asked to perform 5 locomotor skills or 5 object control skills, each performed for 2 minutes, with the additional minutes used for instruction or viewing the video clips from the EB app. A Friedman's test was performed to assess and differences across all four conditions (i.e., practice-style and locomotor; practice-style and object control, EB app and locomotor; EB app and object control), and a follow up Wilcoxon signed-rank test was performed to assess any differences between the teaching methods and the motor tasks (Bittner et al., 2017).

The results of this study found that the EB app elicited greater peak EE from the participants versus practice-style instruction while performing locomotor skills, but there was no difference between the teaching methods while performing object control skills. In regard to locomotor skills, the EB app also elicited a greater peak heart rate response from the participants versus practice-style instruction, though this was not true for object control skills. The EB app may be used to communicate appropriate exercise instruction for individuals that may not have a background in teaching physical activity like teachers, family members, or other peers. Promoting short, moderate to vigorous PA bouts using

the EB app could improve health by preventing the onset of chronic diseases later in adolescence and adulthood (Bittner et al., 2017).

Summary

Research has shown that the use of technology increases independence, enhances social opportunities, and relieves anxiety and stress of adolescents with ASD (Hedges et al., 2017). In the technology driven world we live in, AVG's are a new frontier to promoting PA rather than the already appealing sedentary screen time options (Maloney et al., 2007). There are many studies showing increased EE and PA while playing AVG's, while still not substituting real sports or activities. Additionally, The Exercise Buddy app is a visual exercise system, integrating the evidence-based practices such as video modeling, containing over 180 exercise videos of varying duration, showing greater peak EE from all participants (Bittner et al., 2017). The EB app incorporates first-then boards, visual supports, social stories, and video modeling, all of which have been proven effective with students with ASD in the classroom as well as in physical education. This project was designed to create an instructional video showing teachers, paraprofessionals, and parents how to implement the EB app for middle school and secondary students with ASD.

CHAPTER III

Critical Analysis

Introduction

With the continued growth of students with autism spectrum disorder (ASD) and obesity rates among this population, it is increasingly important to provide effective supports for students with ASD to be successful in physical education. Just as parents are overwhelmed, so are schools and teachers with the dramatic rise in children with ASD (Geslak, 2016). For a student with ASD, physical education can be chaotic, unorganized, and more overwhelming than their other classes. In order for more students with ASD to become physically active, physical educators should provide the same evidence-based practices used in the special education classroom like social stories, first then boards, and visual supports.

One common support for students with ASD is assistive technology (AT) such as iPads or screen-based technology. Laughlin, Murata, Gonnelli, and Larranga (2018) define assistive technology as any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.

This chapter presents instructional strategies to provide the supports needed for students with ASD to be more active in physical education. Exercise Buddy uses evidence-based practices to provide students with ASD the support they need to be successful in physical education. Additionally, this chapter describes a video resource which presents each of the teaching strategies, and an instructional video about how to use EB for students with ASD. It also has websites, journal articles, YouTube videos, and

books that can be used to better understand what ASD is, and how to provide evidence-based practices to keep students with ASD active for a lifetime. APE and GPE teachers can use these resources to implement technology or EB in physical education for their students with ASD in a variety of settings. Finally, recommendations for future research studies and critical analysis projects are discussed.

Teaching Strategies for Students with ASD

In physical education, students with ASD are often left wondering and wandering. "This unsensory-friendly environment, variety of learning styles, and lack of visual supports have made the typical physical education class a missed opportunity" (Geslak, 2016). Instead of using exercise in physical education to increase the child's focus, exercise results in more frustration, failure, and ridicule.

The following evidence-based instructional strategies have been compiled based on related research for teaching students with ASD (Dettmer, Simpson, Myles, & Ganz, 2000; Kim, Blair, & Lim, 2014; Menear & Smith, 2011). These strategies are recommended to increase engagement and physical activity, and provide the supports for students to be safe and successful in physical education.

Visual Supports

Visual supports are tools presented to a student as they move throughout the day, and are used across multiple settings, including social stories, picture schedules, timelines, and scripts. Visual supports provide students with ASD clear expectations, a predictable schedule of events, promote independent transitions, and indicate changes that may occur throughout the day.

Visual supports create predictability, order, and consistency which all students with ASD need and want (Fittipaldi-Wert & Mowling, 2009). An article by Krause and Taliaferro (2015) discusses how visual schedules can be used to communicate schedules and routines in either pictures or written format. This allows students with ASD to more easily transition between tasks. "Such supports target a number of behavior skills including engagement, social interaction, skill development, and transitions" (Krause & Taliaferro, 2015).

In addition, the use of assistive technology for visual supports for students with ASD has many benefits over traditional low-technology options including enhancing receptive communication, more timely delivery of instructions, providing a clearer understanding of the task at hand, reducing instructional wait time, and increasing time on task. Two examples of apps that can be used for picture schedules individually for students include My Video Schedule and First Then Visual Schedule. These allow the teacher to take custom images and pictures of scenes or equipment used in their class, and organize them into a picture schedule of the routine for class. If class time is cut short, the teacher is able to quickly modify the schedule by removing one of the stations from the student's visual schedule (Krause & Taliaferro, 2015).

Students with ASD use visual schedules throughout the day, but rarely when attending physical education. Roth (2013) explains that the structure of visual supports can produce positive outcomes for students with and without disabilities. Using apps allows students to check off tasks they complete, providing closure and assisting with transitions to a new task. There are several benefits for using visual supports for students with ASD. They attract and hold a student's attention, enable the student to stay on task

and reduce anxiety, and they also make abstract concepts more concrete for the student (Geslak, 2016). Visual supports give students confidence and provide educators with the tools they need to introduce exercise and make physical education successful for students with ASD (Geslak, 2016).

Another option for a visual support is a social story. Sandt (2008) defines social stories as a way to provide students with ASD the social information (social cues and other people's perspectives) that the student lacks. For example, for students with ASD who struggle when entering a loud gym containing many objects and visual distractions, a mat can be used to serve as an entry tunnel. Social stories are designed to show the student what they are doing during the day first, and then they do the activity presented in the social story. The student can be presented a social story on the iPad, while adjusting to the auditory stimulation in the gym before they walk in. The gradual introduction to the environment, along with a visual representation of the lesson for the day, often gives students with ASD the structure or preparation they need to succeed. Sandt (2008) has shown that children who receive a social story intervention were able to maintain the appropriate targeted behavior after intervention withdrawal and were more likely to engage in appropriate play during free-play sessions to make independent choices. Social stories are an effective intervention for students with ASD, and a valuable communication tool in physical education. Through social stories, students with ASD may learn appropriate responses and appropriate behaviors in physical education, which may ultimately facilitate their physical activity participation (Sandt, 2008).

The Exercise Buddy app has been preprogrammed with over 200 visuals to help students make the exercise connection. All of the exercises created have a picture,

helping the student understand what to do. The majority of the exercises also have a video demonstrating the exercise that can be watched before the workout starts, or during the workout so the student can see what the exercise looks like. Exercises can also be created by the user to customize familiar surroundings, or games played that the student is familiar with. Pictures can be taken of the exact equipment being used, reducing the anxiety of a student with ASD, and making it more personal.

Included in the EB app are examples of social stories, found in the teaching tools section on the home screen. These can be shown to your student prior to the activity, preparing them for what activity they are doing, muscles engaged, and different ways they can do the exercises. Examples have been created for abdominal, body image, cardio, muscular fitness, playing sports, posture, and yoga.

Video Modeling

There have been several strategies used to reduce stereotypic behaviors and increasing social interaction in children with ASD. Evidence-based practices have demonstrated success with school-age children, different severity levels of ASD, and within various classrooms and settings. Colombo-Dougovito (2015) analyzed five evidence-based practices, including video modeling, which is used in the EB app. Video modeling is the occurrence of a behavior by an observer that is similar to the behavior that is shown by a model on a video. There are several types of video modeling including basic video modeling, video self-modeling, and point-of-view modeling.

Basic video modeling is when a student watches a video of a peer or adult completing a specific behavior or skill. The video is watched by the student prior to the opportunity to complete the behavior themselves. A goal is for the student to imitate the

behavior in the video at the appropriate time. Video self-modeling is similar to video modeling, with the exception that the appropriate behavior in the video is modeled by the student. In other words, a video is made of the student completing the behavior. Point-of-view modeling is a video made of a task or steps of a behavior or event, with the video showing what the student will see when completing the task. The video is of the recorded steps in the skill process from the vantage point of the person completing the task, allowing the student to see how to complete a task.

Individuals with ASD are visually oriented, making the use of video modeling very motivating and interesting for the student. With the increasing amount of technology used within classrooms, video modeling is becoming a strategy that can be used for students with and without disabilities. This has demonstrated to improve task performance and an effective tool in rapid behavior response and a generalization across skills (Colombo-Dougovito, 2015).

Weng, Savage, and Bouck (2014) discuss strategies for implementing video-based instruction using iPads. This can be used to teach a variety of skills, including social communication and behavioral and functional skills. Video-based instruction has many advantages such as increased student independence, decreased reliance on adult assistance, consistent instruction for students, and minimal training for adults who assist with video-based instruction. Video-based instruction can be used in conjunction with other teaching strategies such as most-to-least, least-to-most prompts, or video error correction. In physical education when using video-based instruction, teachers start out by giving guidance using video modeling, instructional cues, as well as physical demonstrations. Once a student has mastered a target task, teachers should consider

fading back their reliance on video-based instruction (Weng et al., 2014). This can be done by showing your student the exercise along with the demonstration on EB, and letting them follow along with minimal, if not any, directions from the instructor. Video modeling is an effective tool that can be used in an exercise setting, showing evidence of positive gains in social-communicative skills, functional skills, perspective-taking skills, and problem behaviors (Geslak, 2016).

Exercise

Exercise is an effective evidence-based practice for students with ASD. In addition to the health-related benefits of physical activity, exercise can decrease stereotypical and self-stimulating behaviors. These are the two most common behavioral improvements following physical activity for children with autism (Geslak, 2016). Physical activity can present an overwhelming number of simultaneous sensory challenges for students with ASD. An article by Menear and Smith (2011) discusses three solutions for sensory challenges that often appear during physical education, that help set up students with ASD for success upon initial inclusion in physical education.

The first consideration is to collaborate with the IEP team to determine which accommodations the student benefits from during other parts of the school day. Then, determine how the student can be given the same or similar accommodations in physical education. For example, a visual support, timer, or a social story may be used if the student is benefiting from one of those during another instructional lesson. Students with ASD are very routine oriented. Keeping the accommodations the same or similar across the school day will keep the students experiences consistent and predictable, which helps prevent frustration and meltdowns (Menear & Smith, 2011). For example, a start/finish

board could be used in the classroom to prepare a student with ASD about when they will transition to physical education, allowing to cross off things from their day. A similar start/finish board could be implemented in physical education as well to prepare them for what is happening during that class. This can include where to sit when they come into the gym, what activities you are doing during the lesson, and the exit criteria for the day. This gives a student with ASD a clear understanding of what is going to happen, and also allowing them to be able to move an activity to the other side of the board indicating that it is complete.

The second consideration is changing the students sense of time during physical education. "Try to create and maintain a structured routine during physical education by starting and ending class the same way every day to give the student expectations, predictability, and an idea as to what is next" (Menear & Smith, 2011). This can be done by giving a student a stopwatch, or hanging a wall clock where the student can see it and teaching the student to read it or marking it with an arrow according to what time class will end. Students with ASD can have trouble tracking time during physical education because the curriculum and related activities result in variations to how long activities within a lesson last, where the lesson is taught, and the group sizes for the lesson. Not knowing how much time is left in class can be a stressor for some students (Menear & Smith, 2011).

This can be accomplished by making a clock with labeled segments with the structure of events in your physical education class. For example, the clock would be divided into 10 minute sections. The first section would be the warm-up, the second section would be skill development, and the final section would be a small sided game

including the closure. A student with ASD would understand what they are doing in class based on the segment, and recognize when the activity would end. Implementing this strategy adds more predictability and expectations to the routine of a student with ASD.

The third consideration is determining the appropriateness of group physical activities and individual physical activities for students. "Given the deficits in socialization that students on the autism spectrum have, group activities should be meaningful, provide maximum participation, and not provide negative stimulation. Individual activities are often more appropriate for students with ASD" (Menear & Smith, 2011). Teaching should be tailored to meet the specific diagnosis and the student's individual variation within the specific diagnosis (Menear & Smith, 2011). Students with ASD aren't always able to receive the instruction they need to be successful in an inclusive, or large group environment. Sometimes it is necessary to provide instruction in a small group or one on one setting to promote maximum participation and meaningful instruction.

As educators working with students with ASD, creating an environment that is consistent throughout the day can reduce anxiety and hopefully encourage them to be more active in physical education. A challenge that continues to face students is using screen-based technology in and out of school, reducing the amount of time that they are physically active.

Physical inactivity among children is a serious public health problem. High levels of screen time are contributing factors that encourage sedentary lifestyles in young people. One tool that can be effective to increase the physical activity levels in students with ASD is through the use of exergaming and interactive video games. An article by

Daley (2009) found that exergaming can provide children with the opportunity to try a range of activities, some of which they may not otherwise have been exposed to during the course of their lives like boxing or kung fu. Exergaming uses significantly more energy than sedentary activities, and their use could capitalize on children's preexisting motivation to play video games. Exergaming exposes children to low-intensity exercise, but even low levels of activity can contribute toward total daily levels of EE and have positive benefits of health (Daley, 2009).

One of the more common exergaming systems is the Nintendo Wii. Cai and Kornspan (2012) describe the benefits of exergaming, how Nintendo Wii Tennis can be used for students with ASD, and how these interactive video games could be implemented in an adapted physical education setting. Exergaming can be helpful in various ways, giving a student with ASD the ability to participate in sports and physical activities using interactive video games that they might not participate in while in a traditional setting. Exergaming allows for the development of psychomotor skills, and helps the student obtain cognitive understanding of different sports or activities. The Wii, for example, requires students to visually perceive the ball coming toward them and then decide whether to hit a forehand or backhand. The student has to understand the game of tennis, and perform the simulated skills in order to be successful by performing the actual movements in a virtual environment. In addition to the motor skills required, the student is also improving their tactical understanding of the sport of tennis. The Wii can be an effective tool for students with ASD because it provides a teaching tool which allows interaction with each student. This increases the levels of attention and teaches the

technical skills of the game, allowing them to move through a transition phase from learning the game on the Wii to the actual game of tennis (Cai & Kornspan, 2012).

Exergaming consoles, like a Nintendo Wii can be used in physical education to teach the concepts or strategies of a game. Using a Nintendo Wii to play tennis for example could be used in physical education to teach the technical aspect of the game like how to serve, the scoring process, and to position yourself to hit the ball. This can be done without as much energy exertion to teach these skills to a student that is lower on the autism spectrum that tires out easier.

Exercise Buddy uses the evidence-based practices discussed in this chapter to provide students with ASD an exercise-specific visual support system. After introducing the Visual Exercise System (VES) in 2012, Geslak and his colleagues have seen children understanding the requests, sports, and activities many physical educators, therapists, and special educators teach. "Using evidence-based practices of the use of visual supports such as First-Then Boards and Start-Finish Schedule and Stories, VES gives the students confidence and provides educators the tools they need to introduce exercise and make a difference" (Geslak, 2016). By using these evidence-based practices to teach exercise in physical education, it can become an integral part of the daily routines of those with ASD in physical education to keep them active for a lifetime.

Description of Instructional Video Content

The video produced for this project is entitled *Implementing the Exercise Buddy App for Middle and High School Students with ASD.* This in-depth instructional video provides an overview of ASD, and using the EB app that incorporates evidence-based practices to provide students with ASD the support to be successful in physical education.

Content in this video include: an overview of ASD, evidence-based practices, and how to use the EB App. This resource shows how to use EB in multiple settings to promote more physical activity in students with ASD. See the end of the document for the video script. The video and this document are posted on the website for the University of Wisconsin-La Crosse Center on Disability Health and Adapted Physical Activity.

Resources for Physical Education for Students with ASD

Many resources were used in developing this instructional video and should be used by others for further professional development. Using the following resources can further improve the quality of physical education services for students with ASD.

Books

1. Geslak, D., & Shore, S. (2014). *Autism fitness handbook: An exercise program to boost body image, motor skills, posture and confidence in children and teens with autism spectrum disorder*. London: Jessica Kingsley Publishers.

This resource shares over 50 exercises that have been successfully taught to children and adults in homes and at schools. With a step-by-step approach and a visual support for each exercise, your children and students can achieve the exercise connection. The visual exercise system helps parents and professionals to better introduce exercise to their children and students.

2. Alexander, M., & Schwager, S. (2012). *Meeting the physical education needs of children with autism spectrum disorder*. Reston, VA: National Association for Sport and Physical Education.

This text provides, characteristics of children with ASD, instructional strategies for enhancing communication, and managing sensory perception. It also provides physical education curriculum models, their implication for students with ASD, proactive and reactive strategies for behavior management. The purpose of this book is to provide

physical education professionals with information and resources to help accommodate the instructional and programmatic needs of students with ASD both in self-contained and inclusive class settings.

3. Cohen, S. (2006). *Targeting autism: What we know, don't know, and can do to help young children with autism spectrum disorders*. Berkeley: University of California Press.

This text reaches out to everyone who lives with or cares about a young child with ASD. This book highlights what we know, what we don't know, what can we do, what controversies exist, and what promising leads may help us achieve the goals of understanding autism, and eliminating its devastating effects on the development of children. This edition provides specifics about the new developments that have modified the map of the world of ASD or that may do so in the near future.

4. Grenier, M. (Ed). (2014). *Physical education for students with autism spectrum disorders: A comprehensive approach*. Champaign, IL: Human Kinetics.

Using these resource teachers can learn to support student's skills, abilities, and learning interests, and develop solutions for appropriate programming. Teachers will also learn to teach students with ASD the skills they need to learn through natural supports, social learning tools, and engaging activities. This text provides numerous small-group games and activities that teachers can choose from that enhance lifelong learning and motor skill development for students with ASD.

Book Chapters

1. Block, M., Healy S. (2016). Autism spectrum disorder. In Block, M (Eds.), *A teachers guide to adapted physical education: Including students with disabilities in sports and recreation* (pp. 187-201). Baltimore, Maryland: Paul H. Brookes Publishing Co.

This chapter discusses the characteristics and causes of ASD, and how to prepare the environment for the inclusion of students with ASD. There are instructional strategies, and how to manage behaviors of students with ASD like using a token economy system. Additionally, this chapter discusses how to adapt activities for students with ASD.

2. Hodge, S., Liberman, L., Murata, N. (2012). Autism spectrum disorders. *Essentials of teaching adapted physical education; diversity, culture, and inclusion* (pp. 309-325). Scottsdale, Arizona: Holcomb Hathaway.

ASD is an umbrella term used to describe a group of disabilities characterized by difficulties in social interactions and communication. Reviewed in the chapter are attributes of each disability falling within this category, and provide a general background of the ASD spectrum. Also discussed are strategies in education and physical education for working with children on the autism spectrum.

3. Houston-Wilson, C. (2017). Autism spectrum and social communication disorders. In Winnick, J., & Porretta, D (Eds.), *Adapted physical education and sport* (pp. 197-214). Champaign, IL: Human Kinetics.

Provided in this chapter is an overview of ASD, and implications for physical education. There is a review of approaches such as ABA, and the TEACCH program, as well as social stories and comic strips that can be implemented. Specific information on teaching strategies for students with ASD and behavior management strategies are also discussed.

4. Roth, K., Zittel, L., Pyfer J., Auxter, D. (2017). Autism spectrum Disorder. *Principles and methods of adapted physical education and recreation.* Burlington, MA: Jones and Bartlett Learning.

This chapter describes the definition of ASD, the incidence rates, as well as the causes. In addition, the cognitive, motor, physical, behavioral, and psychological characters are discussed, and teaching strategies for students with ASD. These strategies include exercise, modeling, peer-mediated instruction and prevention, and the picture exchange communication system.

Journal Articles

1. Bittner, M., Rigby, B., Silliman-French, L., Nichols, D., & Dillon, S. (2017). Use of technology to facilitate physical activity in children with autism spectrum disorders: A pilot study. *Physiology & Behavior, 177*, 242-246.

This article is the first pilot study analyzing the effectiveness of the Exercise Buddy app. EE and heart rate were measured continuously during a 12-hour session. The results of the study suggest that the app may allow for a greater peak physiological response during dynamic movements. EB appears to be viable tool for facilitating physical activity, inclusive of higher intensity physical activity levels.

2. Breslin, C., & Liu, T. (2015). Do you know what I'm saying? Strategies to assess motor skills for children with autism spectrum disorder. *Journal of Physical Education, Recreation, and Dance, 86*(1), 10-15.

This article provides strategies and guidelines for physical educators to conduct reliable assessments to evaluate the motor performance of children with ASD. Assessments can be affected by the way the instructions are presented to the student, the individuals conducting the assessments, the tasks included in the assessments, and the environment in which the assessments take place.

3. Case, L., & Yun, J. (2015). Visual practices for children with autism spectrum disorders in physical activity. *PALESTRA, 29*(3), 21.

Presented in this article are two types of visual support systems aimed to guide and inform paraprofessionals that work with children with ASD in physical activity and physical education setting. Practical implications and instructions for interventions for physical activity environments are also provided.

4. Colombo-Dougovito, A., & Block, M. (2016). Make task constraints work for you: teaching object-control skills to students with autism spectrum disorder. *Journal of Physical Education, Recreation, & Dance, 87*(1), 32-37.

Using concepts from dynamic systems theory, and Newell's constraint approach, this article breaks down object-control tasks into teachable components that are easier to achieve. It also uses the Test of Gross Motor Development to demonstrate how a task constraint model can be used to teach these skills to a student with ASD. Through utilization of task constraints, students motor movements are influenced into the correct pattern.

5. Fittipaldi-Wert, J. & Mowling, C. (2009) Using visual supports for students with autism in physical education. J*ournal of Physical Education, Recreation, & Dance*, 80(2), 39-43. DOI: 10.1080/07303084.2009.10598281

Examples of visual supports, and how they can be beneficial in physical education are discussed in this article. Individuals with ASD process visual information more efficiently than auditory input. Therefore, the focus is on teaching strategies that support the learning styles of students with ASD in an inclusive physical education class.

6. Geslak, D. (2016). Exercise, autism, and new possibilities. *PALESTRA, 30*(2).

There are two things we know about autism: These children learn differently, and their parents are desperately looking for help. This article discusses the evidence-based

practices used in the Exercise Buddy app, and the five components of physical fitness for students with ASD. The results speak for themselves, and exercise makes things better.

7. Geslak, D. (2017). Challenging autism with exercise: An opportunity worth stretching for. *ACSM's Health & Fitness Journal, 21*(2), 19-24.

For students with ASD, teaching exercise using visuals and structured routines can create a more successful environment. This article provides a better understanding of ASD, and teaching exercise using visuals, creating structured routines, and establishing the right goals. The article then goes into the five components of physical fitness for children with autism spectrum disorders to help parents and professionals understand where to focus their efforts. By reading this article information can be gained about ASD, and how to help.

8. Krause, J., & Taliaferro, A. (2015). Supporting students with autism spectrum disorders in physical education: There's an app for that! PALESTRA. 29(2), 45-51.

The use of technology devices is physical education is becoming more common, especially in physical education. Apps are providing teachers with easily accessible tools to enhance teaching and learning. This article provides several apps that can be used for a student with ASD including behavior management, social interaction, and communication. This article also discusses an overview of instructional strategies for integrating apps in physical education, and how they facilitate the learning needs of students with ASD.

9. Lee, J., & Haegele, J. (2016). Understanding challenging behaviors of students with autism spectrum disorder in physical education. Journal of Physical Education, Recreation, & Dance, 87(7), 27-30.

This article discusses the challenging behaviors that a student with ASD may present, and how these behaviors can contribute to the emotional burnout of teachers. This can also impact the learning and safety of the student with ASD and their classmates. It also discusses strategies for physical education to minimize these behaviors.

Websites

1. Title: Exercise Connection: exerciseconnection.com
http://exerciseconnection.com

This website provides information of Dave Geslak's background, and the creation of the Exercise Buddy App. Information is also provided on research showing the importance of physical activity, and the importance of using evidence-based practices like visual supports for students with ASD. There is also information to become certified to better engage, educate, and prepare educators to work with children and adults. There are also resources that can be purchased such as books, visual support packages, and DVD's.

2. Title: The Iris Center
https://iris.peabody.vanderbilt.edu/about/who-we-are/

Funded by the U.S. Department of Education's Office of Special Education Programs (OSEP) and headquartered at Vanderbilt University's Peabody College, the IRIS Center creates online resources about evidence-based practices to help improve the learning and behavior outcome of all students, particularly struggling learners and those with disabilities. Developed in collaboration with nationally recognized researchers and

education experts, IRIS Modules, Case Study Units, Classroom Activities, and Fundamental Skill Sheets address instructional and classroom issues of critical importance to today's educators: classroom behavior management, secondary transition, early childhood, Universal Design for Learning (UDL), and many others.

3. Title: Autism Focused Intervention Resources and Modules (AFIRM)
http://afirm.fpg.unc.edu/node/137

This resource and the modules are designed to help you learn the step by step process of planning for, using, and monitoring learners with ASD from birth to 22 years of age. Supplemental materials are also available for download.

4. Title: National Center on Health, Physical Activity and Disability (NCHPAD)
hhtp://www.nchpad.org/

The National Center on Health, Physical Activity and Disability highlights public health practice and resource dissemination for individuals with disabilities. Similar to the CDC, NCHPAD provides professionals who work with persons with disabilities specific disability implications for health promotion and disease prevention. Included in this resource is *Improving the Lives of Individuals with Autism through Exercise*. This is a video series by Dave Geslak, author and creator of Exercise Buddy, to help parents, caregivers, educators, and therapists introduce exercise to their children on the autism spectrum.

Youtube Videos

1. Title: Assistive Technology: Enabling Dreams
https://www.youtube.com/watch?v=rXxdxck8Gic

From voice-activated software to customized laptops, tech is changing the way disabled students communicate, learn, and play. This resource discusses uses of technology in schools, and for students with disabilities. For many students, assistive

technology is the major foundation for how they get through daily activities. Additionally, it discusses what assistive technology is available in schools, and how we as educators can implement them.

2. Title: Autism and Exercise: The Big 7
https://www.youtube.com/watch?v=b9wsiKR9g-I

Exercise is critical for students with ASD. The video discusses seven reasons why exercise is important for a student with ASD: children's overall health, building confidence, sensory input, relieve stress, activate the brain, sleep, and its fun. It also offers ways that you can implement exercise into a student's busy schedule throughout the day.

3. Title: Creating Social Stories for Children with Autism
https://www.youtube.com/watch?v=BWfxz-_4d48

There are various strategies to help a student with ASD to grow and succeed. This video defines what a social story is, their purpose, and how to structure them the correct way when creating one. It then discusses some benefits of or reasons for developing stories for children with ASD, and tips for parents on how to create social stories to deal with the specific needs of a child under their care.

Recommendations for Future Research Studies

Future research is needed regarding the following topics in order to develop a deeper understanding of students with ASD. Research continues in the implementation of technology into physical education, and the benefits it offers for students with ASD.

1. What are the most popular or frequent physical activities done by students with ASD outside of school?
2. Can EB be used in physical education to increase attention and on-task behaviors?
3. How can EB be used in a general physical education classroom to support students with ASD?
4. Can EB be used as a sensory break to refocus attention back to a physical education lesson?
5. Will students maintain a higher energy expenditure using EB in an inclusive, small group, or large group setting?
6. What types of equipment could be used for a sensory break for a student with ASD that would promote higher energy expenditure?

Recommendations for Future Critical Analysis Projects

Additional critical analysis projects in the following areas would better assist in planning for, and incorporating exercise into the daily lives of students with ASD. Providing GPE and APE teachers with practical resources can improve the quality of services provided to students with ASD. Future critical analysis projects could include:

1. An instructional video on creating visual supports in physical education for students with ASD.
2. An instructional video on strategies for inclusion of students with ASD into general physical education.
3. A video on ways that parents and their children can be physically active in the community and at home.
4. A manual providing examples of social stories for physical education situations like changing in a locker room, how to handle being frustrated in class, or how to overcome with being unsuccessful at a skill.
5. A video on adapted physical education transition services for students with ASD, and settings where they will be most successful.

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Time	Content and Script	Video
0:00-0:30		Title Page: **Implementing the Exercise Buddy App with Middle and High School Students with ASD in Physical Education** An instructional video resource created by Ian Harned University of Wisconsin-La Crosse Adapted Physical Education Graduate Program July, 2018 5 second clip of Tim and Austin doing yoga exercises in the dance studio 5 second clip of Nick and Nate looking at a score report at the end of a workout 5 second clip of Tim and Austin watching a video modeling example in the dance studio 5 second clip of Nick and Nate creating an exercise in the dance studio 5 second clip of Tim and Austin creating

0:30-1:09		a workout in the app
	Hi, my name is Ian Harned, and I'm a graduate student in the Adapted Physical Education Teaching program at the University of Wisconsin-La Crosse.	Me on screen
	The video clips you just saw were a couple of ways that an innovative App called Exercise Buddy can be used in the physical education setting for students with autism spectrum disorder or ASD. Due to the prevalence of ASD, most physical educators will teach students with ASD during their career.	Clip of Nate hitting a ball off a tee. Clip of Austin and Tim looking at a start/finish board
1:14-1:54	The purpose of this video is to show teachers, paraprofessionals, parents, and others how to use the Exercise Buddy app in physical education for middle school and secondary students with ASD.	Title Page: What is Autism Spectrum Disorder
	According to Fittipaldi-Wert and Mowling ASD is the fastest growing developmental disability. According to the Autism and Developmental Disabilities Monitoring Network within the Centers for Disease Control and Prevention about 1 in every 59 children is diagnosed with ASD. The Diagnostic and Statistical Manual of Mental Disorders defines ASD as the persistent deficits in social communication and social interaction, restricted or repetitive patterns of behavior, interests, or activities causing clinically significant impairment in social, occupational, or other important areas of current functioning.	Screenshot of Fittipaldi-Wert and Mowling Article Pic of CDC chart Pic of CDC visual Pic of DSM-5 book cover Pic of DSM-5 open book Pic of ASD definition
1:54-2:23	According to Geslak, author and creator of Exercise Buddy, The "unsensory friendly" environment, the variety of learning styles, and lack of visual supports have made the typical physical education class a missed opportunity to increase focus, self-esteem, and relationships. Instead of using physical education to increase the child's focus, self-esteem, and relationships, this well-intended attempt to often results in more frustration, failure, and ridicule.	Screenshot of Gelak article Clip of MDP in a group setting
2:23-2:50	In regard to class organization, the task itself, or the equipment being used, the physical education environment is constantly changing. This environment	Clip of Austin and Tim in the fitness center

2:50-3:56 3:56-5:01 5:01-6:06	can be chaotic for students with ASD, causing withdrawal and disruptive or self-stimulatory behaviors. Due to deficits in communication, students with ASD have trouble understanding what to do and when to do it, which causes anxiety and confusion. If planned properly, physical education can be one of the most positive times of the day for students with ASD. To make sure students needs are met, the IEP team works together to determine what accommodations the student is benefiting from. The IEP team can then determine how the same, or similar accommodations can be given in physical education. For example, school personnel could work together to create social stories for an easier transition from the classroom to physical education. (Dave Interview) Social stories, timers, visual supports, or peer tutors may be used if the student is benefiting from these strategies in other instructional areas. Keeping accommodations or supports consistent throughout the day will allow the student to experience consistency and predictability, and possibly prevent frustration and meltdowns. Individuals with ASD are frequently recognized for their difficulty in understanding, recalling, and using verbal information. Dettmer found that individuals with ASD can process two or three-dimensional visual supports more easily than temporary input, such as auditory stimuli. Visual supports are often used to maintain attention, help understand spoken language, and sequence and organize the environments for students with ASD. Visual supports provide students with ASD clear expectations, and predictable schedules of events. Visual supports also promote independent transitions, and indicate changes that may occur throughout the day. Pictures, line drawings, visual activity schedules, spots and lines on the floor, written schedules, and specific boundaries are all examples of useful visual supports. These tools appeal to the processing strengths of students with ASD or of any student who processes visual information more effectively. The Exercise Buddy app provides these supports for students in physical education. Research has shown low motor abilities and difficulties	Clip of equipment set up in the gym. Clip of Josh during a lesson Clip of Alex distributing equipment Clip of Nick and Nate doing yoga in the dance studio Pic of cartoon IEP metting Pic of timer Pic of peer buddy example in a class setting Dave on Screen Clip of Maggie giving instruction Screenshot of Dettmer article Clip of Austin and Tim looking at a video modeling example Clip of Nick and Nate watching a video-modeling example.

6:06-6:23 6:23-6:55 6:55-7:06 7:06-8:28	in the physical education setting for students with ASD. Corvey et al. suggested that adolescents with ASD engage in sedentary behaviors more frequently, possibly due to social skill impairments, sensory challenges, or secondary conditions. Students with ASD can face an overwhelming number of simultaneous sensory challenges, and are often left wondering and wandering in the physical education class. Bittner et al. also reported that children with ASD do not exercise at a moderate-to-vigorous level as frequently as their typically developing peers and may be at a greater risk for developing cardiovascular, pulmonary, or metabolic diseases. Additionally, Lawson and Foster found that children with disabilities participate in physical activity at even lower rates than their peers, as much as 4.5 times less active than children without disabilities. Students with ASD are at a higher risk of inactivity, with the risk of obesity as much as 40% greater than their typically developing peers. According to the CDC, obesity rates in adolescents with ASD reaching 31.8% compared to their typically developing peers at 13.1%, puts these already vulnerable adolescents at risk for lifelong health conditions. One common support for students with ASD is the use of assistive technology such as iPads or screen-based devices. Assistive technology includes the use of technology to maximize accessibility to the general education curriculum for students with disabilities. This includes using technology with universal design principles and assistive technology devices in physical education. Technology can also be used as a support tool to address social and behavioral challenges that adolescents with autism exhibit. An app that provides students with ASD support to increase physical activity and provide evidence-based practices in physical education is Exercise Buddy. The Exercise Buddy app was developed to provide physical activity training techniques for teachers and parents of individuals with ASD. The app integrates evidence-based practices such as video modeling,	Pic of Exercise Buddy home screen Clip of Tim practicing dynamic exercises Screenshot of Corvey Article Clip of Josh distracted in MDP Screenshot of Bittner article Clip of Sam exercising in the fitness center Screenshot of Lawson and Foster article Pic of CDC chart Pic of assistive technology buttons Pic of Ipad Pic of Nick and Nate doing yoga exercises in the dance studio Clip of MDP with

8:28-9:14	social narratives, visual supports, tech-aided instruction, and exercise routines to ensure the success of students. Many students with ASD need structure to be successful during the school day. The evidence-based practices incorporated into EB provide the structure and support that are often used in the special education classroom. Teachers, family members, and peers who may not have the background in teaching PA, may use Exercise Buddy to develop and implement appropriate exercise instruction.	smartboard Nick and Nate doing a calming exercise in the dance studio Exercise Buddy app on Screen Dave on screen
9:14-9:35	Incorporated into Exercise Buddy are over 180 exercises, with video examples, that can be used in physical education. There are exercises for relaxation, aquatics, sports-related skills, and test items linked to the Test of Gross Motor Development, The Brockport Physical Fitness Test, and several other physical education content areas.	Clip of Nick and Nate watching a video modeling example Pic of social narrative in the app Pic of workouts in the app
9:35-10:20	To begin using Exercise Buddy, you create a profile for your student. (Click on Create a profile). It will first ask you to enter a name and a birthday, and you are given the option to take a picture as well to further customize the profile. The gender, health conditions, and body measurements can also be recorded to further keep track of your student's progress.	Pic of ipads Pic of first/then workout Pic of PECS ring Pic of social story Pic of first/then board
10:20-11:24	The next step is to familiarize yourself with the features in Exercise Buddy. The first tab on the homepage is the workout section. In here you find "My Workouts", which are the workouts that you have created. "Coach Dave's Workouts" are pre-programmed routines that I recommend using as a reference because they offer a variety of exercises that are used for many reasons like bilateral coordination and calming exercises when a student needs a sensory break. The last tab you see is workout history, for keeping track of your student's workout type, time, reps, and performance. This is a tool to track progress. This information could be shared at IEP meetings. The second tab on the homepage is the Body Systems tool. Starting on the right side you can change the view from front to back, as well as the gender and ethnicity of the student on the screen. The drop down menu on	Dave on screen Dave on screen Pic of exercises in the app Clip of Austin and Tim watching a video modeling example iPad on screen with me talking over it Clip of Nick and Nate playing catch

11:24-11:36 11:36-12:46 12:46-13:02 13:02-13:18 13:18-14:33	the left allows you to change the body system to look at such as muscular, skeletal, or digestive. Once you have selected a body system (I will use the Body) a list of body parts shows underneath the drop down menu from which to select. The body part you pick lights up green on the person, allowing the student to see the body part being discussed. This could allow students to recognize what body parts or muscles they are using during activities in physical education. This is a tool that can be used in the classroom by the teacher to teach body awareness and health concepts that are often taught in physical education. This function could allow students to verbalize what body parts and muscles they are using in each activity, and explain what other activities use the same body parts. The third tab "Browse Exercises", allows you to see what exercises are available, or what exercises could be created to fit the needs of the student using the app. The next tab is "Teaching Tools" which has resources of coloring pages with concepts like how blood flows through the heart. Special education and adapted physical education teachers should work together to incorporate material in both the classroom and in physical education to reinforce these concepts. There are social stories and sample lesson plans for ideas on how to use the exercises, and how to teach the affective and cognitive domain in the process. The special education and adapted physical education teachers could work together to create lesson plans that reinforce the same content or concepts. The other tabs on the bottom row, health history, tips, and about provide information about your student's profile that has been created, articles by Dave Geslak, and stories of his successes working with students with ASD. When creating a workout, there are two options of the exercises the user can use. Workouts can be created using the exercises preloaded on the app, or exercises can be created making them more personal to a specific student or environment.	in the dance studio Pic of profile on the app iPad on screen with me talking over it Clip of Nick and Nate looking at the score report at the end of a workout iPad on screen with me talking over it Pics of Body systems iPad on screen with me talking over it iPad on screen with me talking over it Pics of teaching

14:33-16:10	To create your own exercise go to the browse exercise section. Choose the category on the left side that best describes the exercise being created. For example, if you are creating a soccer activity, choose the sport skill category. Press the button that that says Add Exercise. Name the exercise in the top box. Take a picture and video of yourself or the student doing the activity like the examples preloaded into the app. Most students enjoy seeing themselves on screen, and it's a great visual support to show them what they are doing right, or what you want them to fix. There is no memory limit to how many exercises you can create and store in the app, allowing the user to create or modify any exercise or workout. Once exercises have been created or chosen from the preloaded options On the app's homepage, click on the Workouts tab, and then hit the New Workout button in the upper right hand corner. As you can see on the bottom, there are options for a first-then, start-finish, or circuit workout. I am going to choose a start-finish workout. To add an exercise hit the "Tap to select exercise" icon on the screen. For this workout, up to 12 exercises can be chosen, which can be individualized, based on the child's needs or IEP goals. For this workout I am going to focus on yoga and dynamic flexibility, which could be used as a warm-up activity to start class. After choosing the exercises press the Done icon in the right corner. The next screen allows you to set reps or time for each activity that was chosen. For the yoga poses I will set a time for 15 seconds, and the dynamic flexibility skills will be set to 10. Once the time and reps are set for all exercises the workout can be saved, or started.	tools in the app Dave on screen iPad on screen with me talking over it iPad on screen with me talking over it. Pic of iPad and exercises created Clip of Nick and Nate creating a workout iPad on screen with me talking over it
16:10-18:26	Now it's time to use the workout. To find the workout created go into the "Workouts" Tab, and then open the start-finish workout. To begin the workout, tab the "Start" icon at the bottom of the screen. The first exercise will slide over to the middle of the screen, with a countdown and a go signal to start the exercise. The timer will then start, with the option to either pause, or go to the next option if the student stops doing the exercise because of a behavior issue for example. An excellent evidence-based feature of the app is the video modeling examples for the majority of	Clip of Nick and Nate dribbling through cones with a soccer ball Pic of iPad and naming exercise Pic of iPad and inserting picture and video Clip of Nick and Nate looking at the iPad Dave on screen
18:26-		

18:41	the skills. If at any the point the student is confused about how to do the skill, the exercise can be paused, and a video for that skill can be watched to provide a visual support. At the end of the workout, the option is given to either save the workout or go back to the main menu.	iPad on screen with me talking over it
18:41-19:08	The Exercise Buddy app is very versatile for working with middle and high school students with ASD and other disabilities. Exercise Buddy can be used in a variety of settings depending on the needs of the student in the physical education setting, and also in the classroom.	iPad on screen with me talking over it Clip of Austin and Tim practicing dynamic flexibility exercises in the dance studio
19:08-19:38	Students that are higher functioning on the autism spectrum could learn to use the app independently with support from a teacher or parent. A teacher or parent could work with the student to create workouts, allowing the student to use the app independently on a individualized workout plan. There are several exercises in the fitness room and yoga categories using equipment that can be found in most fitness centers in the community, or exercises that could easily be done at home.	Clip of Nick and Nate looking at the iPad Dave on screen Me on Screen
19:38-20:50	After the workout is completed, the app will record how many times the student is able to perform the skill and with what accuracy. This is also printable information that could be presented at an IEP meeting to show progress of the student to the parents and team members.	Clip of Tim walking to a treadmill in the strength center
20:50-21:14	The middle school students I have worked with were included in the general physical education setting as much as possible, primarily playing team sports. The lessons consist of several activities or skill development, and then a small-sided game, which is a constantly changing environment. Using Exercise Buddy can help make the transitions more successful for that student by having the capability to prepare them for what they are going to do next, as well as the whole class period. Creating a Start/Finish Board for all of the class activities, including transitions, can greatly benefit students in an inclusive general physical education class. The general physical education teacher and APE teachers can work together to create a	Pics of yoga and strength center activities in the app Pic of score report in the app Clip of Austin and Tim looking at the score report Pics of the PDF score report

21:14-23:21	structured schedule to make the environment less stressful, creating more opportunities for success for students with ASD. The special education teacher could also use this app primarily in the classroom using the calming exercises in the workouts when problem behaviors arise, or take stretching or relaxing breaks to help students refocus after long periods of academic work. These exercises can be used in physical education to keep routines consistent in both settings to reduce problem behaviors or meltdowns. Exercise Buddy gives parents, paraeducators, physical and special education teachers, and other professionals the ability to introduce exercise into their students' PE class, classroom, or home by using evidence-based teaching strategies, specially designed visuals, and peer-led video modeling. This app can be used in a variety of settings, from providing a student ASD support to participate in the general physical education classroom, to a high school student independently using the app in a fitness center completing an individualized workout plan. The special education teacher can reinforce the body awareness concepts taught in physical education, or use the same calming exercises to keep the supports consistent in all of the classroom settings for the student. Physical activity is an important strategy to promote overall health, and decrease the incidence of behavior challenges in children with ASD. Exercise Buddy is an excellent way to keep students from wondering and wandering in physical education by using common supports used in the special education classroom for a better transition into physical education.	Dave on screen Clips of a large group in MDP Pic of First/Then board Pic of Start/Finish board Dave on screen Clips of Nick and Nate practicing sensory exercises from the app Me on screen Dave on screen Clip of Nick and Nate playing catch in the dance studio Clip of Tim walking on the treadmill independently Me on screen Clip of Austin and Tim doing dynamic flexibility exercises together in the dance studio Dave on screen
23:21-24:17	I hope the video provided a practical and creative way to incorporate technology to promote health-enhancing physical activity using evidence-based	Me on screen Dave on screen

	practices that have been shown to increase the success of students with ASD in physical education. The use of an iPad, or other assistive technology, with students with disabilities is a continuously growing trend. Communication through technology provides the structure and direct visual contact needed by those individuals, and are easy to use and socially accepted. Exercise Buddy is one of many applications providing many opportunities to meet the needs of students with disabilities in physical education. Students need the structure and evidence-based practices to be successful during physical activity. (Dave interview -11.7) Exercise Buddy is an effective way to provide students with ASD the support to remain physically active for a lifetime. Credits: **Implementing The Exercise Buddy App with Middle and High School Students with ASD in Physical Education** An instructional video resource created by Ian Harned University of Wisconsin-La Crosse Adapted Physical Education Graduate Program July, 2018 **Thank you to my graduate project committee members.** Garth Tymeson Abbie Lee	Me on screen Pic of Exercise Buddy on screen Pic of Austin and Tim looking at an iPad Me on screen Dave on screen Me on screen

Thank you to the adapted physical education students that assisted with my video.
Nick Faulds
Austin Stefanich

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