

ABSTRACT

THE EFFECT OF ACTIVE VIDEO GAMING ON PHYSICAL ACTIVITY LEVELS OF STUDENTS WITH DEVELOPMENTAL DISABILITIES

by

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The purpose was to examine differences in physical activity levels of children ($N = 24$) with developmental disabilities in traditional adapted physical education activities compared with Nintendo Wii Fit active video gaming activities. Students' physical activity levels were monitored for one adapted physical education practicum session. Physical activity was measured via ActiGraph GT3X+ accelerometer. An dependent groups t -test was used to compare mean accelerometer activity counts per minute between the traditional adapted physical education activities condition and the Nintendo Wii Fit active video gaming condition. Cohen's delta (d) was calculated to provide an estimate of the size of the difference between groups. The difference between physical activity levels of children in traditional adapted physical education activities ($8,958 \pm 3,580$ activity counts per minute) and active video gaming activities ($8,834 \pm 3,609$ activity counts per minute) was not statistically significant ($p > 0.05$), and the size of the difference was small ($d = 0.03$).

THE EFFECT OF ACTIVE VIDEO GAMING ON PHYSICAL ACTIVITY LEVELS OF
STUDENTS WITH DEVELOPMENTAL DISABILITIES

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CHAPTER I: INTRODUCTION

Introduction

Regular physical activity, sports participation, and active recreation are recommended for the prevention of disease, promotion of health, and maintenance of functional independence (Burgeson, Wechsler, Brener, Young, & Spain, 2001). According to the Physical Activity Guidelines for Americans, regular physical activity can help youth with disabilities control weight, improve cardiorespiratory and muscular fitness, reduce feelings of depression, and improve psychological well-being and quality of life by increasing their ability to perform activities of daily living (Centers for Disease Control and Prevention, 1996). Zick, Smith, Brown, Fan, and Kowaleski-Jones (2007) stated that childhood and adolescence are critical periods when youth develop self-concept, attitudes, and behaviors that will likely transfer into adulthood.

Despite the known health benefits of being physically active, youth and adolescents with disabilities are not achieving recommended levels of daily activity (Fernhall & Unnithan, 2002; Sattelmair et al., 2011). According to Steele et al. (1996), individuals with disabilities are less likely to engage in physical activity compared to their peers without disabilities. The consequences of being physically inactive include reduced cardiorespiratory fitness, osteoporosis, impaired circulation, and diminished self-concept resulting from greater dependence on others for daily living (Durstine et al., 2000). Sedentary behaviors are believed to track into adulthood and manifest into higher rates of chronic health conditions (Fowler et al., 2005). Liou, Pi-Sunyer, and Laferrere (2005) found that higher rates of inactivity during childhood are associated with an increased risk of obesity during adulthood.

Steele et al. (1996) speculated that barriers imposed on youth with disabilities might be a primary cause for the lack of participation in physical activity by individuals with disabilities. Youth with disabilities have fewer opportunities to obtain routine physical activity levels during formal play, active transportation, and sports and recreation programs compared to their peers without disabilities (Kodish, Kulinna, Martin, Pangrazzi, & Darst, 2006). Rimmer, Riley, Wang, Rauworth, and Jurkowski (2004) stated that access to physical activity venues by people with disabilities is a complex, multifaceted issue. In a cross-sectional study that evaluated barriers to physical activity, Rimmer et al. found that physical, social, psychological, and equipment-based barriers all limit the participation of people with disabilities in physical activity programming.

Physical education has become an influential societal institution for the development of physical skills and the provision of physical activity in children and adolescents (Sallis, Prochaska, & Taylor, 2000). However, it is not uncommon for school-based physical educators and physical activity supervisors to limit opportunities for students with disabilities who are mainstreamed into their classrooms (Rimmer & Rowland, 2008). Schreiber, Marchetti, and Crytzer (2004) stated that physical activity instruction and equipment must be modifiable and adapt to accommodate the needs associated with various disabling conditions.

Physical activity programs prepare children and adolescents for physical activity throughout life. The way health professionals present physical activity programs to children and adolescents can greatly influence their levels of physical activity participation (Corbin & Pangrazi, 1998). Programs designed to promote physical activity among youth should provide individualized instruction to meet the needs of children and adolescents whose abilities vary, offer a variety of learning experiences in fitness and sport, include all children and adolescents in meaningful and challenging learning experiences, and not engage in grouping practices that

embarrass or discriminate against particular children or adolescents (Centers for Disease Control and Prevention, 1997). Adapted activities, like active video gaming, utilize modified equipment and exercises to facilitate the needs of students with disabilities. Active video games represent a potential alternative to traditional adapted physical education that could improve perceptions of exercise among students with disabilities and increase their participation in physical activity.

Individuals with disabilities are in need of effective physical activity interventions. The aim of this study was to compare the effect of active video game-based exercise with traditional adapted physical education programming on level of physical activity among children with developmental disabilities.

Research Question

Will there be a significant difference in physical activity levels during participation in a Nintendo Wii Fit based activity program and physical activity levels during traditional adapted physical education in children with developmental disabilities within the practicum setting?

Research Hypothesis

It was hypothesized that physical activity levels during participation in the Nintendo Wii Fit condition would be significantly higher than physical activity levels in during the traditional adapted physical education condition in children with developmental disabilities.

Limitations

For the purpose of this study, the following limitations were recognized.

1. A small sample size makes generalization of results difficult.
2. There was no ability to control subjects' school attendance.

Delimitations

For the purpose of this study, the following delimitations were recognized.

1. All participants were ambulatory.
2. Participants were elementary public school students.
3. Participants attended school in one of the elementary schools contracted with East

Carolina University's adaptive physical education practicum.

Definitions

For the purpose of this study the following definitions were employed.

DISABILITY: The Americans with Disabilities Act (ADA) has a three-part definition of disability. Under ADA, an individual with a disability is a person who

1. has a physical or mental impairment that substantially limits one or more major life activities; OR
2. has a record of such an impairment; OR
3. is regarded as having such an impairment.

According to the ADA, a physical impairment is defined as any physiological disorder or condition, cosmetic disfigurement, or anatomical loss affecting one or more of the following systems: neurological, musculoskeletal, special sense organs, respiratory, cardiovascular, reproductive, digestive, genitourinary, hemic and lymphatic, skin, and endocrine (National Center for Learning Disabilities, 2012).

EXERCISE: Exercise is a subcategory of physical activity that is planned, structured, repetitive, and purposive in the sense that the improvement or maintenance of one or more components of physical fitness is the objective (U.S. Department of Health and Human Services, 2008).

PHYSICAL ACTIVITY: Physical activity is bodily movement produced by skeletal muscles that requires energy expenditure at a level to produce healthy benefits (Howley, & Franks, 1997).

PHYSICAL FITNESS: Physical fitness is the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and respond to emergencies. Physical fitness includes a number of components consisting of cardiorespiratory endurance, skeletal muscle endurance, skeletal muscle strength, skeletal muscle power, flexibility, balance, speed of movement, reaction time, and body composition (U.S. Department of Health and Human Services, 2008).

CHAPTER II: LITERATURE REVIEW

Introduction

Maintaining appropriate levels of physical activity is beneficial to the health of children with and without disabilities. Physical activity levels can be influenced by various factors, such as environmental contexts, public perceptions, motivation, and access to recreation facilities. Proper levels of physical activity can promote the social, psychological, and physical development of children with developmental disabilities (Centers for Disease Control and Prevention, 1996).

The prevalence of physical inactivity among youth with disabilities is a concerning public health issue. Many physical activity programs and recreational facilities exclude people with disabilities because they are not adapted properly to allow people with disabling conditions access. The inability to offer this population the same access to activity promotion resources has contributed to the widespread prevalence of physical inactivity and sedentary behaviors among youth with disabilities (Rimmer et al., 2004).

Adaptive video games, such as the Nintendo Wii, are frequently mentioned among physical educators and other fitness professionals to supplement traditional activity programming. Adaptive video games have been shown to make exercise more enjoyable and keep youth with disabilities engaged (Graves et al., 2010). They are capable of being modified in order to allow students with disabilities the opportunity to participate in additional physical activity programming. The low cost, accessible, and motivational aspects of adaptive gaming make it a promising resource to help increase physical activity among youth with disabilities.

This review of literature will discuss our current understanding of the relationship between physical activity and personal health. Additionally, consideration of physical activity for adults

and children with disabilities will be addressed. Finally, a review of current practices surrounding the measurement of physical activity will be discussed as well as the impact that active video gaming interventions may have to motivate children with disabilities to become physically active on a regular basis.

The Relationship between Physical Activity and Health

The importance of regular physical activity is well established. Research has shown that physical activity is beneficial to the health and development of children with and without disabilities (Centers for Disease Control and Prevention, 2010). Positive effects of regular physical activity include an improvement in cardiovascular and respiratory muscle function, and a reduction in coronary artery disease risks factors such as elevated blood pressure and abnormal lipid profiles (Franklin, Whaley, & Howley, 2000).

In a literature review of one longitudinal study and 17 cross-sectional studies, Bar-Or and Baronowski (1994) examined the relationship between physical activity and adiposity, and physical activity and obesity in 191 three or four year old children. Adiposity refers to the amount of body fat. Obesity is the state above normal adiposity at which health problems are likely to occur. The majority of studies in this review supported an inverse relationship between physical activity and obesity. However, some researchers did not find a significant relationship between physical activity and obesity. Bar-Or and Baronowski blamed this discrepancy on how physical activity was measured. If the appropriate correction for body mass would have been done, the relationship may have been different. Flaws in experimental design, small sample sizes, and weak assessments of physical activity contributed to other results that did not show a relationship between physical activity and obesity.

Blair et al. (1989) completed a longitudinal study that examined the relationship between physical fitness and all-cause mortality. The subjects were 10,244 men and 3,120 women. All subjects received a complete medical examination. Physical fitness was measured by a maximal incremental treadmill test. Participants were assigned to physical fitness groups based on their age, sex, and maximal treadmill time. A mortality follow up was conducted on the subjects 8 years after the initial visit. During this time, 283 participants died. Of these deaths, 240 were men and 43 were women. The hypothesis was that a low level of physical fitness is an important risk factor for all-cause mortality in both men and women. The results of the study supported the hypothesis. An inverse relationship was found between physical fitness and all-cause mortality in both men and women. Blair et al. stated that individuals who were at low levels of physical fitness could reduce their risk of disease by increasing their level of fitness.

Physical Activity in Adults and Children with Disabilities

The Surgeon General's Report on Physical Activity and Health (Centers for Disease Control and Prevention, 1996) concluded that people with physical and mental disabilities will greatly benefit from regular physical activity. People with disabilities who participate in regular physical activity can reduce the risk of dying from coronary heart disease and developing high blood pressure, colon cancer, and diabetes. Regular physical activity helps to improve muscular strength and stamina. Regular physical activity also helps to reduce symptoms of anxiety and depression, improves mood, and promotes general feelings of well-being (Centers for Disease Control and Prevention, 1996). The report by the CDC also showed that individuals with disabilities, like individuals without disabilities, do not have to participate in strenuous activity to receive benefits from regular physical activity.

Physical activity for individuals with disabilities has been shown to improve many aspects of well-being. Conroy, Fincham, and Agard-Evans (1988) demonstrated that involvement in a comprehensive activity program significantly improved cognitive abilities for demented patients as measured on the Clifton Cognitive Ability Assessment. Other studies have shown that physical activity programs reduce depression and improve mental well-being (Fry, 1983; Francis & Munjas, 1988). In a quasi-experimental study with adults with developmental disabilities, Santiago, Coyle, and Troup (1991) found that depressive symptoms were reduced by 59.3% in the experimental group that took part in a 12-week aerobic program in comparison to a 2% increase of depressive symptoms in the control group which did not participate in regular physical activity. Also, a study by Greenwood, Dzewattowski, and French (1990) demonstrated that lifetime sport and recreation participation can reduce depression among individuals with disabilities. For this study, Greenwood et al. compared wheelchair tennis participants to wheelchair non-tennis participants in areas of self-efficacy and psychological well-being. From results of the Profile of Mood States Scale, the tennis participants had higher scores of well-being and demonstrated lower tension, anger, and depression when compared to the non-tennis participants.

Levinson and Reid (1993) studied the effects of the intensity of exercise on individuals with autism who demonstrated “stereotypic Autistic behaviors”. Although violent and vocal/oral outbursts are typical disruptive behaviors exhibited by students with autism, a number of other common disabilities exhibit the same or very similar behaviors and the research can be applied to other disabilities as well. Levinson and Reid had two groups of students involved in their study. One group participated in a mild program of 15 minutes of jogging, once a day, every day of the week. The other group participated in a vigorous program of 45 minutes of various aerobic

exercises, once a day, every day of the week. Results showed that the subjects of the mild exercise group had an initial decrease of stereotypic behaviors following treatment, but experienced sharp increases in their levels of stereotypic behaviors after 10 minutes. The jogging was successful in reducing disruptive behaviors, however, the results were short-lived. In contrast, the group that was assigned a vigorous exercise plan showed treatment effects that were still evident 90 minutes following the exercise regimen. Based on the results of the study, Levinson and Reid (1993) concluded that vigorous exercise treatment is a practical and effective method of reducing disruptive behaviors in persons with disabilities because it provides sensory input and decreases motor behaviors in order to decrease stereotypic disruptive behaviors in individuals.

Durstine et al. (2000) demonstrated that exercise intensity varied depending upon the student and the specific disabling condition. In many cases individuals who have disabilities such as spina bifida, cerebral palsy, or traumatic brain injuries are limited in mobility and therefore limited in workout intensity as well. Mobility and intensity limitations differ depending on the specific disabling condition and safety or injury is a greater consideration when implementing an exercise program. Durstine et al. suggested that the threshold intensity for aerobic exercise for an individual with a mobility issue probably lies between 40% and 60% in order to yield results. The authors hypothesized individuals with fewer mobility issues can endure more intense workouts with a threshold between 60% and 80% to yield results. According to this study, it may be possible to permit a decrease in intensity that can be partially or totally compensated for by increased frequency and duration.

Various studies have been conducted on the effects of workout frequency and the effect it has on individuals with disabilities. McGimsey and Favell (1988) studied the effects of

frequency of exercise adherence on the disruptive behavior of persons with disabilities. The researchers had two groups of adults, aged 17-22 years, with mental disabilities. Each group was assigned the same exercise plan. The first group participated in the workouts twice a week, while the second group participated in the workouts five times a week. The results showed that aggression and hyperactivity were reduced for both groups. However, when comparing the results of the two groups, McGimsey and Favell (1989) found that the group that performed exercises five times per week had fewer disruptive behaviors compared to the group that exercised twice per week. They concluded that increased exercise frequency leads to decreased levels of disruptive behavior in moderately to severe mentally retarded adolescents.

The Physical Activity Guidelines for Americans (U.S. Department of Health and Human Services, 1996) recommend that children and adolescents complete 60 minutes or more of daily activity that is age appropriate, enjoyable, and that offers variety. Despite the abundance of evidence supporting the health benefits of regular physical activity, research shows that youth with disabilities are not achieving the recommended levels of daily physical activity and are significantly less active than their non-disabled peers (Durstine et al., 2000; Steele et al., 1996).

Steele et al. (1996) used data from a national study conducted in Canada to examine the low physical activity and fitness levels among youth with disabilities. The researchers utilized a WHO cross-national questionnaire to compare the health risk behaviors of 319 adolescents with physical disabilities to a national sample comprised of 7,020 adolescents with no disabilities. The researchers selected the Health Behavior in School-aged Children survey to collect information regarding health and lifestyle behaviors and psychosocial variables. The samples were divided into three groups based on age. Following data analysis, the researchers found that individuals with disabilities had a 4.5-times higher rate of physical inactivity compared to the group of

participants without any disabilities. The same authors reported that adolescents with physical disabilities were twice as likely as their non-disabled counterparts to report watching television for more than four hours per day. The research team hypothesized that barriers imposed on youth with disabilities may be the primary cause for the lack of active participation among that participant group.

A secondary data analysis of the 2005 Youth Risk Behavior Survey (YRBS) found that the number of students engaged in sedentary activities for more than 3 hours per school day was higher for students with disabilities than for those without disabilities (Grunbaum et al., 2001). In contrast, the percentage of students with disabilities who participated on sports teams was significantly lower than the percentage of students without disabilities on sports teams. The researchers stated that students with disabilities may have avoided more physically challenging activities as a result of not being able to compete in sports and recreational programs due to the lack of accessibility and proper programming. This likely led them (i.e., individuals with disabilities) to spend greater amounts of time in sedentary type behaviors.

The prevalence of inactivity is cause for concern. The consequences associated with low levels of daily activity include reduced cardiorespiratory fitness, osteoporosis, impaired circulation, diminished self-concept, a greater dependence upon others for daily living, and reduced ability for normal societal interactions (Durstine et al., 2000). Furthermore, researchers believe that sedentary behaviors generally track into adulthood and result in higher rates of chronic health conditions (Foxhall, 2006; Liou, Pi-Sunyer, & Laferrere, 2005). For example, the study by Foxhall (2006) provided evidence that the underlying causes of stroke and heart disease usually begin to develop during childhood and continue into adulthood where they manifest into chronic conditions like high blood pressure or high cholesterol. Liou et al. (2005) found evidence

that higher rates of inactivity during childhood were a direct factor in the increased risk of obesity during adulthood.

The low level of physical activity among youth with disabilities was addressed by the Council on Children with Disabilities Executive Council of the American Academy of Pediatrics (AAP). The council recommended that the level of physical activity among youth with disabilities be increased by eliminating societal barriers to participation and by encouraging health and fitness professionals to advocate for greater participation in sports and physical activities for all children, including those with disabilities.

Barriers to Exercise for Individuals with Disabilities

Engaging in a healthy lifestyle can be a daunting task for individuals with disabilities. Rimmer et al. (2004) identified various barriers and facilitators associated with participation in fitness and recreation programs among persons with disabilities. Focus groups were conducted in 10 regions across the United States in 2001 and 2002. The team of researchers identified four types of participants for the study: consumers with disabilities, architects, fitness and recreation professionals, and city planners and park district managers. Within each region, four to six individuals were recruited to participate in each of the four focus groups. Participants were told the purpose of the study at the beginning and were instructed to address issues related to four types of fitness or recreation facilities. Focus group facilitators took notes of identified barriers, which were later analyzed using a note-based approach. Sessions were tape recorded and content analyzed to provide an identification of major themes among the focus groups.

After the investigators analyzed the notes and observations, 178 barriers and 130 facilitators were identified. Eight major themes were identified. The many and diverse responses led the researchers to conclude that access to physical activity venues by people with disabilities

is a complex, multifaceted issue. Rimmer et al. (2004) stated that the results prompted the need for future research to identify personal and environmental factors that have the strongest association with physical activity participation.

Schreiber, Marchetti, and Crytzer (2004) described a community-based fitness program developed and implemented for children with disabilities. Several outcome measures were reported for one of the participants in an effort to illustrate the strengths and limitations of the program and to help guide fitness professionals and researchers in developing and evaluating the effectiveness of similar programs. The participant was an 11-year-old girl with a diagnosis of mild mental retardation and hypotonia. The fitness program, named “Off the Couch (OTC)”, was provided in six-week sessions for one hour per week. The program supervisor designed individualized programs for each participant based on a brief screening process conducted at the start of the study. Program effectiveness was evaluated by examining multiple outcome measures, which included the energy expenditure index (EEI), rating of perceived exertion (RPE), maximum running velocity, and the overall daily activity level of the participant and the number of exercise sessions in which the child participated over a two-week time period. Data collection occurred at the beginning and end of an OTC six-week session. A final data collection session occurred approximately 10 months after the start of the first six-week session.

The participant demonstrated a reduction in EEI from a high of 0.96 beats per meter to 0.41 beats per meter at the end of the 36-week period. Running velocity increased slightly, and both maximum heart rate and RPE during this activity decreased. Taken together, the changes in EEI, heart rate, and RPE during the maximal running velocity test suggested to the researchers that the participant was able to complete the tasks with increased efficiency and decreased energy requirements. The participant was able to sustain a high level of activity and consistently

participate in the regular weekly exercise sessions throughout the 10-month duration. Schreiber et al. (2004) suggested that the results indicated that children with disabilities were able to participate in an exercise program and were likely to experience some benefit from that program. The researchers also identified that the study results support that children with disabilities can benefit from a center-based, reoccurring exercise program.

Traditional Adapted Physical Education

Physical education and sport refers to the area of school curriculum concerned with developing students' physical competence and confidence, and improving their ability to use these to perform a range of activities (Bailey et al., 1995). The Individuals with Disabilities Education Act of 1990 (IDEA) mandates that all children with disabilities receive special education, specifically physical education, in the least restrictive environment. As a direct implication of IDEA, adapted physical education (APE) was officially established as a subdiscipline of general physical education. IDEA defines adapted physical education as the development of physical and motor fitness, fundamental motor skills and patterns, and skills in aquatics, dance, individualized and group games and sports including intramurals and lifetime sports. The purpose of APE is to maintain the same objectives as the general physical education program, while utilizing adaptations to regular offerings to meet the needs and abilities of exceptional students (Block & Zeman, 1996).

Schools can provide many opportunities for young people to engage in physical activity and also to motivate them to stay active. National standards for youth physical activity programs have been developed and widely distributed. The National Consortium for Physical Education Recreation for Individuals with Disabilities (NCPERID) published the *Adapted Physical Education National Standards*. The standards for physical education describe what students

should know and be able to do while the standards for coaches and adapted physical education teachers describe the content and skills those individuals need to master.

The School Health Policies and Programs Study (SHPPS) measured physical education and activity policies and programs in elementary, junior high, and senior high schools at the state, district, school, and classroom levels nationwide. State-level data were collected from all 50 states plus the District of Columbia. District-level data were collected from a nationally representative sample of school districts. School-level data were collected from a nationally representative sample of public and private elementary, junior high, and senior high schools. Finally, classroom-level data were collected from teachers of randomly selected classes in elementary schools and randomly selected required physical education courses in junior high and senior high schools.

Burgeson, Wechsler, Brener, Young, and Spain (2001) described findings from SHPPS 2000 regarding physical education for students with disabilities. To meet the physical education needs of students with permanent physical or cognitive disabilities, 82.2% of states and 74.6% of districts require schools to provide adapted physical education as appropriate, 81.8% of states and 76.1% of districts require schools to include physical education in the individualized education plans, and 80.0% of states and 82.3% of districts require schools to mainstream students into regular physical education. In addition, 59.1% of states and 63.5% of districts require schools to provide modified equipment in regular physical education.

Evaluation of physical education on the school level revealed that 61.9% of schools have students with permanent physical or cognitive disabilities. Among schools that had students with disabilities who participated in physical education, 84.5% had some students who only participated in regular physical education, 37.7% had some students who participated in both

regular and adapted physical education, and 27.5% had some students who participated only in adapted physical education. In 83.4% of schools that have students with disabilities who participated in required physical education, a regular physical education teacher was responsible for teaching the students. Adapted physical education specialists were only available in 23.5% of schools.

Approximately one-third (31.2%) of required physical education courses included students with disabilities. However, only 46.0% of the physical education teachers coordinated activities with a special education teacher or related professional for the students with disabilities. When the physical education teachers were teaching students with disabilities, 87.1% of the examined courses used simplified instructional context (Burgeson et al., 2001). The researchers concluded that in order to strengthen physical education in public schools, health and education professionals must work together to increase the number of schools that provide the recommended amount of physical education for all students and teachers that develop individualized physical activity plans for students with disabilities.

Active Video Gaming Technology and Physical Activity

Due to the specific challenges presented by individuals with disabilities, programs that provide only exercise routines or remedial-type instructions are not sufficiently motivating (Gignac, 2003). When developing physical activity interventions intended to induce activity among individuals with disabilities, a broader perspective must be applied, that takes into account the person's social, emotional, and cognitive development as well as his or her areas of interest (Temple, 2007). Therefore, the implementation of exercise programs that incorporate motivational factors is highly recommended (Lotan, Isakov, Kessel, & Merrick, 2004)

Although relatively new, the popularity of active video games (AVGs) has substantially increased among fitness professionals and recreational facilities as a supplement to traditional physical education due to their ability to simulate real-life environments (Holden, Schwamm, & Bizzi, 2005). AVG-based interventions provide the opportunity for users to practice a range of physical tasks in a safe and controlled environment, which may motivate individuals with disabilities to become more physically active (Rosenburg et al., 2010).

Active video games (AVGs) have been shown to make treatment and exercise more fun compared to traditional treatments because they allow players to physically interact with a virtual environment (Mears & Hansen, 2009). Kato's (2010) research demonstrated that the entertaining nature of the games available for AVG consoles boosts motivation by distracting the participant from mundane, frustrating, or painful exercises. He also proposed that gameplay's attributes of being voluntary, intrinsically motivating, and actively involved, help improve psychosocial functioning amongst children.

The active component of using arm, leg, or whole-body movements to participate in a variety of activities replaces sedentary behaviors related to traditional video games and watching TV with light to moderate activity (Matthew, McCormick, Shawis, Impson, & Griffen, 2011). The motions that are learned while playing AVGs like the Nintendo Wii are motions that the participants can apply to situations outside of the classroom or therapy setting and into the real world (McDonald, 2002). According to Deutsch et al. (2011), auditory, visual, and tactile senses are stimulated by the Wii. The information enters the brain from all available circuits, just like it would in real life situations. Researchers believe that may make the skills learned while playing more easily generalized from game to real life.

The Nintendo Wii has shown to be effective in increasing physical activity and mild to

moderate energy expenditure in various age groups with specific Wii video games, such as Wii Fit. Longitudinal studies have found that the use of technology could theoretically provide access to physical activity interventions and may be the most efficient technique for promoting and implementing future home-based interventions (Dunn & Leitshuh, 1998). Researchers have begun to examine the use of technology as a physical activity tool, for example, the use of the Nintendo Wii gaming console has shown promising results. In a cross-sectional study by Graves et al. (2010) compared the physiological cost and enjoyment of active video gaming on Wii Fit with aerobic exercises in three populations. Fourteen adolescents, aged 11-17 years, 15 young adults, aged 21-38 years, and 13 older adults, aged 45-70 years, were involved in the study. The participants cardiorespiratory and enjoyment measurements were compared during handheld inactive video gaming, Wii Fit activities (yoga, muscle conditioning, balance, aerobics), and brisk treadmill walking and jogging. Participants were fitted with the MetaMax 3B and performed each of the following activities for 10 minutes, in the order listed, with 5 minutes seated rest in between: handheld inactive video gaming, Wii yoga, Wii muscle conditioning, Wii balance, Wii aerobics, treadmill walking, and treadmill jogging. The portable MetaMax 3B measured oxygen consumption (VO_2) and heart rate throughout the trial by indirect calorimetry which was recorded using MetaMax software. A modified physical activity enjoyment scale (PACES) determined enjoyment while undertaking the activities, with 5 items from the original 18 items being included in the study. The items used were selected to reflect the study aims. Participants rated the extent to which they agreed with each item on a 7-point Likert-type scale. For each participant, total responses were summed to give a score ranging from 5 to 35 and a percentage enjoyment score was calculated.

For all groups, energy expenditure and heart rate of Wii Fit activities were greater than handheld gaming activities but lower than treadmill exercise. Wii aerobics prompted moderate intensity activity in adolescents, young adults, and older adults with respective mean metabolic equivalents of 3.2, 3.6, and 3.2. The group mean PACES enjoyment rating percentage score for Wii balance, 84.3, and Wii aerobics, 90.4, was greater than treadmill walking, 65.5, and jogging, 59.8, for all age groups. For the adolescent participants, the handheld gaming and all of the Wii gaming conditions had higher PACES enjoyment rating scores compared to treadmill walking and jogging.

Active video games can significantly increase heart rate, step counts, and have positive benefits on overall health. Maddison et al. (2007) sought to quantify the energy expenditure and physical activity associated with playing active versus non-active video games in 21 children, 11 males and 10 females, ages 10-14 years. The participants for this study were not disabled. The Sony EyeToy was selected as the active video game to be tested. A familiarization period of 20 minutes was permitted to allow participants time to practice any of the games that they were not comfortable with. Following a 5-minute rest period, the children were fitted with a heart rate monitor and an accelerometer. The MetaMax3B indirect calorimetry gas-exchange analysis system measured oxygen uptake and was used to assess energy expenditure. Each participant was measured under seven conditions: resting, inactive video game, and playing while playing five different active video games chosen to represent a broad spectrum of energy expenditure. To standardize game play, the researchers ensured that all participants started at the easiest level and progressed through increasing levels of difficulty at their own pace and the same routine was chosen for all children.

The study demonstrated that active video gaming resulted in significantly greater heart rate and activity levels compared to non-active gaming and rest. Compared to baseline measures, heart rate increased 43-84% and energy expenditure increased 129-400% when playing active video games. The energy expenditure was significantly higher in the active video games than during rest and inactive gaming (Maddison et al., 2007).

Joo et al. (2010) evaluated the practicability of utilizing the Nintendo Wii gaming systems as a supplement to traditional activity interventions for post-stroke patients with upper extremity weakness. According to the authors, the repetitive movements of motor retraining are critical to successful functional progress in rehabilitation therapies, but provide no stimulation or social interaction with other patients. The researchers stated that the Nintendo Wii gaming console's motion-sensitive controller and the interactive Wii video games required body movements similar to conventional therapies. The authors concluded that the virtual reality based Nintendo Wii video gaming technology is a potential alternative to the monotonous repetition of traditional forms of physical exercises.

Preliminary evidence shows that AVGs like the Nintendo Wii may be an effective resource to improve student's perceptions of exercise and increase physical activity levels among children in physical education programming. May et al. (2012) examined the efficacy of incorporating exergaming into physical education lessons among children. The researchers also evaluated AVGs potential to influence behaviors towards physical activity. A six-week study was conducted that centered on a 2 (exergaming: physical education lesson with Wii vs. PE lesson without Wii) x 2 (age group: 10 years old vs. 12 years old) factorial design. The study randomly assigned 1,112 participants to condition. Participants completed a survey consisting of measures from the theory of planned behavior (TPB). The results showed that exergaming

significantly influenced physical activity, intention to be active, and strenuous exercise behavior. Participants in the Wii-incorporated PE lesson were more likely to emerge with more positive beliefs and behaviors. The researchers concluded that incorporating exergaming into PE lessons may be more effective than regular PE in enhancing physical activity beliefs and behaviors, particularly among young children.

Conclusion

The lack of regular activity in youth with disabilities is a public health concern that increases the risk of developing chronic health conditions. Despite the known consequences of being physically inactive, the prevalence of physical inactivity among youth with disabilities is high and is disproportionately higher than the prevalence of physical inactivity in people without disabilities.

Many barriers affect students with disabilities in schools. Lack of access, limited adaptable equipment, and not having knowledgeable professionals are all examples of barriers to people with disabilities participating in physical activity programming. Students with disabilities are excluded from school-based physical activity programming. As a result, the number of students with disabilities who are inactive and participate in sedentary type behaviors is high.

Preliminary findings indicate that the Nintendo Wii games may increase the levels of physical activity in non-disabled youth and the elderly. These studies demonstrate efficacy and give reason to believe that the same increase in activity levels may be translated to the population of disabled youth. Active video games can be an innovative component of any physical education curriculum. Exposing children to active video games can help facilitate the concept that “physical activity can be fun” and provide a new and expanding gateway to lifelong physical activity (Mears et al., 2009).

CHAPTER III: METHODS

Introduction

The following methods were used to assess the levels of physical activity of students with disabilities during traditional adapted physical activities and while using active gaming devices within an adapted physical education on-campus practicum setting. This study, involving human subjects with no more than minimal risk involved, was approved by East Carolina University's University and Medical Center Institutional Review Board before any research was conducted.

Participants

Participants were students in Pitt County Public Schools exceptional children's classes. Permission from the Pitt County School System was obtained prior to any measurements (see APPENDIX A). The classes were those scheduled to participate in East Carolina University's on-campus adapted physical education practicum. Approximately 25 students with developmental disabilities were asked to participate in the study. All participants were between the ages of 8-13 years. The participants were from a variety of ethnic backgrounds with Caucasians being the most dominant.

Eligibility for participation in the study was based on the participant's desire to participate in traditional practicum activities and Nintendo Wii Fit gaming activities. Exclusion criteria for participation included those who could not stand for the duration of activity programs, were unable to see the visual gaming prompts on the gameplay screen, were unable to move their torso or any of their limbs, or were not capable of holding the Wii gaming control.

Materials and Equipment

The equipment used for this study included a Nintendo Wii video game console, including two Wii Remotes, sensor bar, and all of the activity games included on the

Nintendo Wii Fit Plus Package software. The participants who chose to participate in the study utilized the Wii nunchuk attachment, which plugged into the Wii remote. The Nintendo Wii console was connected to a projector, stationed on a rolling cart, which was set up in a classroom at East Carolina University during intervention sessions. The gameplay screen was projected onto a 5-ft x 5-ft display located at the front of the classroom.

Physical activity levels were measured using unobtrusive activity monitors (ActiGraph GT3X+ accelerometer, ActiGraph, Pensacola, FL) that were suitable for use with individuals of all ages and conditions. The principal investigator equipped the monitors to the participants at the beginning of each practicum session, and collected them at the end of the session. The accelerometers were programmed to record movement in 1-second epochs. Demographic data were also collected, including age, gender, ethnicity, height, and weight. Physical activity measurements were taken from two participants per practicum session. Informed Consent forms were sent to the parent(s)/guardian(s) of each participant by the classroom teacher (see APPENDIX C).

The ActiGraph GT3X+ activity monitor (APPENDIX D) was used to measure activity of participants. The activity monitor, in conjunction with the ActiLife analysis software, produced activity counts per time period as the outcome measure. The monitor was small (4.6cm x 3.3cm x 1.5 cm) and light weight (19 grams) and was worn on the participant's wrist. It emitted no sounds or signals, and did not impair the movements of its wearer in any way. The ActiGraph GT3X+ has been utilized successfully in studies with children with developmental disabilities (Gunnhidur et al., 2013). It was expected that after a few minutes, participants would not even be aware of its presence.

The major function of accelerometers is that the sensor converts movements into electrical signals expressed as physical activity counts for the monitoring period (Berlin, Storti, & Brach, 2006). These counts are a measure of the frequency and intensity of movement acceleration and decelerations. Because the accelerometer has an internal clock, the physical activity counts are time stamped, summed over a specific period of time (epoch), and stored. This allows the investigator to establish patterns of physical activity. Furthermore, because accelerometers time stamp physical activity and record intensity, it is possible to obtain a reliable measure of time spent in various levels of physical activity intensity.

Procedures

Two practicum sessions were conducted once per week for approximately 50 minutes for a total duration of six weeks. Throughout each practicum session, physical activity data were collected from two participants for the duration of the period. Following a five-minute period to warm up, the first participant completed 15 minutes of traditional adapted physical education programming. After the same five-minute warm up period, the second participant began with 15 minutes of playing Nintendo Wii Fit gaming activities. At the completion of the initial 15-minute segment, the two participants switched activity-programming types. In order to be included in the study, the participant was required to wear the activity monitor for a minimum time requirement of 50 minutes. The time requirement was selected because it allowed both activity interventions to be recorded.

The activities planned were designed based on the unique needs and level of physical ability for each participant. No participant was required to complete an activity that could have potentially injured him or her. Through consultation with each participant's classroom teacher and the adapted physical education specialist in Pitt County, the design of all activities, including

playing the Nintendo Wii, were made to ensure that each participant was comfortable and safe throughout the entire practicum session.

Traditional Adapted Physical Education Activity Program. The Pitt County students were paired with East Carolina University undergraduate and graduate students majoring in physical education, recreational therapy, kinesiology, special education, and other related fields in a controlled and supervised environment. The practica were organized so that after identification of their assigned child, the practicum instructors plan and implement 30- to 35-minute individualized adapted physical activity lessons. A broad spectrum of physical activities was available during the practica in both the Developmental Motor Lab and Williams Arena, located at East Carolina University. A station approach was employed providing areas for such activities as balance, fitness, throwing and catching, as well as striking and kicking. Research assistants were responsible for developing weekly individualized lesson plans for their assigned student. The aim of this lesson plan was to identify the specific activities in which the student would participate. For each activity, the research assistant was required to state the goal of the activity (e.g., throw a baseball a distance of 10 yards without hitting the ground), define the participant's present level of performance (e.g., the student can complete the appropriate throwing motion but struggles to throw a ball long distances), and describe the activity progression (e.g., the student will throw the ball a distance 5 yards for 10 trials and then attempt to throw the ball 10 yards for 10 trials).

Wii Fit Active Video Gaming Activity Program. Utilizing the Nintendo Wii video gaming console, the exergaming intervention included basic fitness components seen in typical exercise classes and consisted mainly of aerobic, balance, and strength exercises using the Nintendo Wii Fit Plus package software. Training on how to use the gaming system, gaming instructions, and

proper body mechanics during gameplay were provided to the participants before and throughout the study by verbal and nonverbal cues from the researcher and other practicum instructors.

Prior to the start of the intervention, research assistants were provided a brief familiarization period on safety precautions and the basic fundamentals of using the console and the associated games. All participants were required to use the wrist strap at all times in order to anchor the remote control to the user's wrist and prevent the potential possibility of it being unintentionally thrown or dropped.

The Nintendo Wii Fit exergaming sessions consisted of various gaming activities ranging from low to moderate intensity stretching, aerobic, strength, and balance training exercises. The intervention incorporated whole-body movements coupled with dynamic standing activities that required weight shifting, stepping, and reaching tasks while participants engaged in an interactive Wii Fit videogame via the Nintendo Wii. The Wii Fit activity program consisted of the student playing a total of four Nintendo Wii Fit Plus games that covered balance-, aerobic-, and strength-based exercises in a predetermined order for four to six minutes each. The predetermined order was that the first game was balance-based, the next two games were aerobic-based, and the final game was strength-based. For each of the four games, the student was provided two different types of gaming activities within the same exercise-based grouping to choose from. The list of Nintendo Wii Fit Plus games were selected based on research describing the Nintendo Wii Games that have been shown to be most effective at increasing physical activity levels among children. Based on their selections, the students participated in the series of Wii Fit activities while sitting or standing, with or without the use of an assistive device, throughout the 15-minute duration.

Statistical Analysis

The total activity counts from the ActiGraph GT3X+ accelerometer for the 15-minute monitoring period was calculated. The independent variable was the program type (traditional adapted physical education vs. Nintendo Wii Fit Active Video Gaming) and the dependent variable was the average activity counts per minute.

A dependent groups *t*-test was used to compare mean activity counts between traditional adapted physical education activities and the Nintendo Wii Fit activities. Statistical significance was set at $p < .05$. The size of the difference between means for the traditional adapted physical education condition and Nintendo Wii Fit condition was estimated with Cohen's delta (Cohen, 1988).

CHAPTER IV: RESULTS

Introduction

The results are presented in the following sections: (a) participants, (b) physical activity measures, (c) dependent groups *t*-test, (d) counts per minute, (e) effect size, and (f) research hypothesis.

Participants

Twenty-four individuals participated in this study. The youngest participant was 8 years old, the oldest was 13 years old, and the mean \pm SD was 10.6 ± 1.3 years. Fifteen boys and nine girls participated in the study. All participants were enrolled full-time in public school in a special education classroom. The participant profile (see Table 1) displays further information about the participants.

Table 1

Participant Profile

Variable	<u>Boys</u>		<u>Girls</u>	
	M	SD	M	SD
Age (years)	10.4	1.4	10.8	1.2
Height (inches)	50.2	7.7	44.2	4.3
Weight (pounds)	69.4	18.8	60.4	12.6

Physical Activity Measures

Physical activity was monitored by use of an ActiGraph GT3X+ accelerometer. Participants were monitored for the length of one adapted physical education session. Six scores

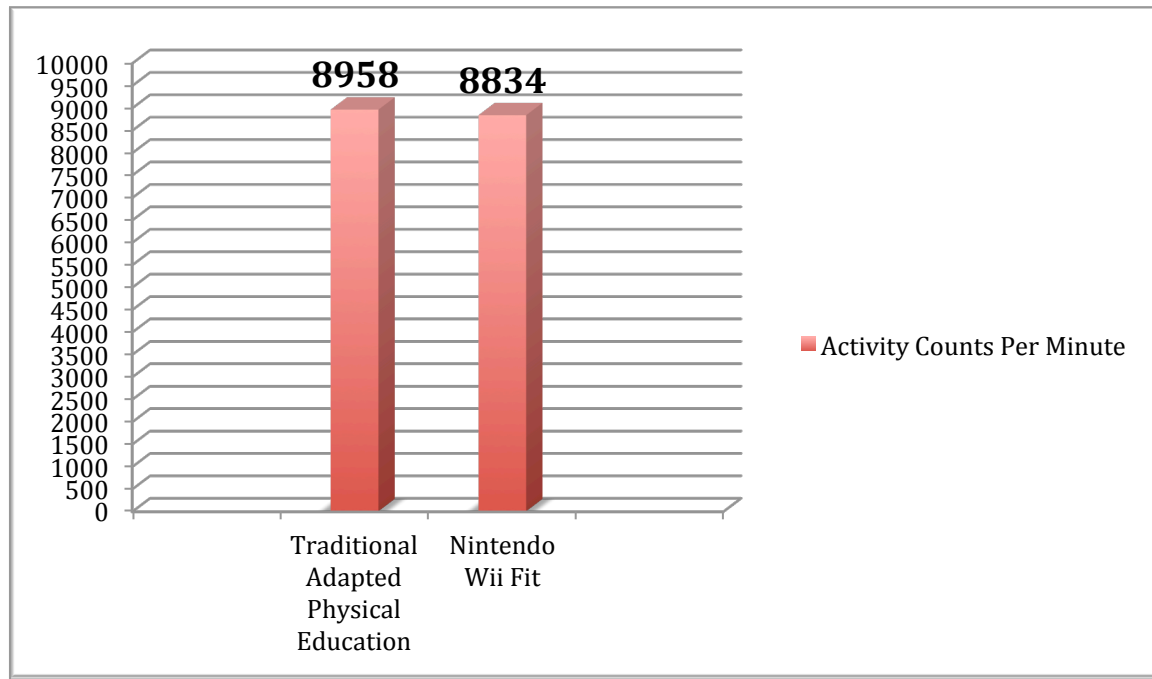
of six different participants were excluded due to the fact that the accelerometer was not worn for the minimum time requirement (i.e., 50 minutes).

Dependent Groups *t*-test

A dependent groups *t*-test was used to determine the significance of the difference between the two conditions on activity counts per minute. The participants' mean activity counts per minute were calculated by dividing the number of counts per activity intervention by the number of minutes monitored. The mean number of activity counts per minute for the traditional adapted physical education condition was $8,958 \pm 3,580$. The mean activity counts per minute for the Wii Fit active video gaming condition was $8,834 \pm 3,609$ (see Figure 1). The results of the *t*-test show no statistically significant difference in activity counts per minute between groups ($p = .90$)

Figure 1

Activity Counts Per Minute



Effect Size

Cohen's delta is an estimate of the size of the difference between means expressed in standard deviation units. The effect size estimate for the difference between the traditional adapted physical education condition and the Wii Fit active video gaming condition was $d = 0.03$. This represents a small effect size (Cohen, 1988). Nine participants had a higher average activity count score in the traditional adapted physical education condition and nine participants had a higher average activity count in the Nintendo Wii Fit condition.

Research Hypothesis

The research hypothesis employed in this study was that physical activity levels during participation in the Nintendo Wii Fit condition would be significantly higher than physical activity levels in during the traditional adapted physical education condition in children with developmental disabilities. However, results from an dependent groups *t*-test indicated no significant difference between the mean counts per minute of participants in Nintendo Wii Fit activity programming and traditional adapted physical education programming. Therefore, the researcher failed to reject the null hypothesis.

CHAPTER V: DISCUSSION

Introduction

This study examined the relationship between physical activity level and type of activity intervention within an adapted physical education practicum setting. Research has shown that physical activity is an important indicator of an individual's health. All individuals, regardless of disability status, can receive benefits from adequate amounts of physical activity (Centers for Disease Control and Prevention, 1996). Failure to obtain adequate amounts of physical activity has been identified as a health risk factor that can lead to coronary heart disease (Fletcher et al., 1992). Various researchers (Bar-Or et al., 1994; Durstine et al., 2000) have examined the health benefits associated with physical activity. Maintaining proper levels of physical activity is critical to the overall health of individuals with and without disabilities.

A report by the Centers for Disease Control and Prevention (1996) has shown that people with physical and mental disabilities benefit from regular physical activity. However, research has shown that individuals with disabilities are less active than their peers without disabilities (Centers for Disease Control and Prevention, 1996; Sherrill, 1998). According to the report by the CDC, individuals with disabilities, like individuals without disabilities, do not have to participate in strenuous activity to receive benefits from regular physical activity. Regular physical activity reduces symptoms of anxiety and depression, improves mood, and promotes general feelings of well-being (Centers for Disease Control and Prevention, 1996).

Some researchers have examined factors that affect physical activity patterns. Activity programs that provide only exercise routines or remedial type instructions are not effectively motivating (Gignac, 2003). It has also been shown that the environment can be a factor that affects children's physical activity level (Baranowski, Thompson, DuRant, Baranowski, & Puhl,

1994). Physical activity interventions intended to prompt increased levels of physical activity among individuals with disabilities must account for the person's social, emotional, and cognitive development as well as his or her areas of interest (Temple, 2007).

Discussion

The research question asked if there was a difference between physical activity levels of children with development disabilities participating in traditional adapted physical education activities and Nintendo Wii Fit active video gaming activities. This question was addressed by use of accelerometers on children with disabilities participating in East Carolina University's adapted physical education practicum sessions.

The accelerometers worn by the participants recorded the total number of activity counts. The mean number of activity counts per minute was calculated for both activity intervention types (Figure 1). These findings showed that there was no significant or meaningful difference in mean activity counts between students participating in the traditional adapted physical education activity intervention ($8,958 \pm 3,580$ counts/minute) and students participating in the active video gaming intervention ($8,834 \pm 3,609$ counts/minute). The difference between the two groups was not statistically significant. The effect size estimate ($d = 0.03$) suggests that there is no difference in physical activity levels.

The participant's level of familiarity with the type of activity and setting may have impacted the level of physical activity. Students participating in traditional adapted physical education activities continued to go to the normal classroom and completed the usual activities of a typical practicum. The equipment layout and practicum procedures were familiar to the students. The Nintendo Wii Fit active gaming activities were new additions to the usual practicum activities and the activity intervention took place in a classroom away from the usual

practicum setting. The new environment may have made the participants feel uncomfortable and become less likely to engage in the activity intervention. In contrast, the change environment may have prompted increased levels of physical activity because it was a new situation. The deviation from the usual sequence of events may have resulted in the students becoming more energetic towards the active gaming condition.

This researcher hypothesized that there would be a statistically significant physical activity difference between children participating in traditional adapted physical education activities and children participating in Nintendo Wii Fit active video gaming activities. These results, however, indicated that there was no statistically significant difference between children with disabilities participating in traditional adapted physical education activities and Nintendo Wii Fit activity intervention.

The East Carolina University students who served as practicum instructors to the participants maintained an activity time log for the duration of time each subject wore an accelerometer. The practicum activity time log (APPENDIX E) enabled instructors to identify when the participants started and finished each activity intervention. However, upon inspection of the activity log data, the researcher was unable to make a comparison of the daily activity schedules of the two settings. Specifically, vague entries indicated when subjects participated in each type of two activity interventions, but failed to describe the specific types of activities that were completed or when they occurred. It should be noted that a secondary purpose of the activity time logs was to prompt instructors to regularly check the accelerometers for subject tampering. The log served this purpose very well. In fact, no substantial amount of data was lost due to participants tampering with accelerometers, which was somewhat surprising given the distractibility of the subjects involved in the study. This supports the future use of accelerometers

with students with developmental disabilities. It may be that wearing the accelerometer on the wrist with a padded wristband minimized subject reactivity to the accelerometers compared to wearing the monitor on the waist where it would not be in plain sight. Students with disabilities usually are comfortable with routine schedules. Being able to view and examine the new activity monitor throughout the practicum session promoted a greater sense of comfort for the students and reduced potential anxiety that may have resulted from the monitor being out of their line of vision if worn on the waist.

An inherent limitation of this study was the researcher's inability to quantify the participant's levels of disability (e.g. autism, severity/type of developmental disability). While all subjects met the ADA definition of developmental disability, the Pitt County school district utilized slightly different classification systems for severity and type of physical or mental disabilities. Furthermore, school administrators perceived disclosure of the level of developmental disability as potential invasion of privacy. Therefore, the researcher cannot make any generalizations regarding potential differences in the level of developmental disability of the participants. Future researchers should examine the influence of level of developmental disability and physical activity.

Implications of This Study

This study contributed to the literature regarding the effectiveness of traditional adapted physical education activities and Wii Fit active video gaming activities to increase physical activity among youth with developmental disabilities. An implication from this study relates to the findings of numerous adapted physical activity and recreational studies. These studies show that if individuals with disabilities are provided the opportunities to participate in recreational activities, positive effects are likely to occur. Therefore, public school recreational programs

should be made aware of these results and implement a comprehensive adapted program if the need exists. These results are important because they indicate the value of recreational opportunities for youth with developmental disabilities.

This study showed that both types of activity interventions can result in elevated physical activity levels of students with disabilities within an adapted practicum setting. The goal of any adapted recreation facility is to allow individuals with disabilities the opportunity to fully participate in physical activities by providing equipment and resources that can be modified to meet the needs associated with various disabling conditions. The results from this study support that the Nintendo Wii is capable of prompting physical activity levels in students with disabilities similar to the traditional adapted physical education setting. In environments that have limited space or do not have access to the abundance of adaptive equipment contained in the adapted physical education practicum, the Nintendo Wii may offer a viable alternative to increase physical activity levels among individuals with disabilities.

The use of accelerometers to measure physical activity levels of children with developmental disabilities was considered successful. This is important considering the lack of information regarding daily activity levels of youth with disabilities within the school, specifically physical education, setting. Initially, it was anticipated that some participants might react negatively to wearing accelerometers. However, this concern was not realized. While this study was successful in the identification of activity counts during practicum sessions with children with disabilities, it was ineffective in describing the relationship between individual activities and physical activity levels (e.g., throwing and catching activities in the practicum setting vs. throwing and catching activities on Nintendo Wii).

This study indicated that there is no statistically significant difference between physical activity levels of children with developmental disabilities in traditional adapted physical education settings compared to active video gaming settings. However, the data supports that the Nintendo Wii Fit active video gaming intervention prompts physical activity levels that are similar to traditional adapted physical education activity interventions. Therefore, the data suggests that active video gaming interventions like the Nintendo Wii Fit may be a potential resource to incorporate in practicum sessions.

Suggestions for Further Study

Many different factors influence physical activity patterns of children. A study that examined the intensity of physical activity may be beneficial to obtain a better overall understanding of the differences of physical activity levels of students in traditional adapted physical education interventions and active video gaming interventions.

A study of the same population with a larger sample size, random sample selection, and use of a bluetooth wireless triaxial accelerometer and heart rate monitor would help shed more light on the levels of physical of children with disabilities participating in traditional and non-traditional physical activities. The combination of a wireless accelerometer and heart rate monitor would provide added confidence in the activity monitors ability to accurately measure physical activity intensity. However, a drawback to this methodology is the cost and the comfort of the measurement device.

Future studies should more clearly distinguish the activities in which the participants engaged. Specifically, standard categories (throwing activities, catching activities, jumping activities, running activities, etc.) need to be utilized. In this way, future researchers may be able

to draw inferences on the relative activity value of various practicum and active video gaming activities.

A type of comparison study could also be designed to address the physical activity level perceptions of students and teachers in traditional adapted physical education settings and active video gaming settings. These perceptions could be correlated with the physical activity recordings obtained from the accelerometer.

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APPENDIX A: PITT COUNTY PUBLIC SCHOOLS APPROVAL LETTER

REQUEST TO CONDUCT RESEARCH STUDY OR SPECIAL PROJECT

I agree to furnish Pitt County Schools a copy of the results of this research study or special project.

D. Mills
Signature of Person Making Request

10-3-2013
Date

951 East 10th Street
Greenville NC 27834
Address

Stacey R. Altran
Signature of Supervising Professor

East Carolina University
University/College/Organization

(919) 621-5511 / schillo.david@gmail.com
Telephone Number/E-Mail Address

252 328 2973 / altmans@ecu.edu
Telephone Number/E-Mail Address

Jim Decker 252 328-0001
deckerj@ecu.edu

(For Office Use Only)

Project Approved *Robin W. A.* ✓

Project Disapproved _____

Referred to _____

[Signature]
Signature of Superintendent/Designee

10/8/13
Cheryl Dimsted

APPENDIX B: EAST CAROLINA UNIVERSITY, UNIVERSITY IRB APPROVAL LETTER



EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
 4N-70 Brody Medical Sciences Building· Mail Stop 682
 600 Moye Boulevard · Greenville, NC 27834
 Office 252-744-2914 · Fax 252-744-2284 · www.ecu.edu/irb

Notification of Initial Approval: Expedited

From: Social/Behavioral IRB
 To: [David Schillo](#)
 CC: [Jim Decker](#)
 Date: 10/7/2013
 Re: [UMCIRB 13-001581](#)
 The Effects of Active Video Gaming on Physical Activity Levels of Students with Developmental Disabilities

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 10/7/2013 to 10/6/2014. The research study is eligible for review under expedited category #4, 7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
Informed Consent to Participate in Research Form.doc	Consent Forms
Thesis Draft - David Schillo.docx	Study Protocol or Grant Application

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX C: PARENTAL INFORMED CONSENT FORM



Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: The Effects of Active Video Gaming on Physical Activity Levels of Students with Developmental Disabilities

Principal Investigator: David Schillo

Institution/Department or Division: Department of Exercise and Sport Science

Address: Minges Coliseum 100

Telephone #: 919-621-5511

Researchers at East Carolina University (ECU) study problems in society, health problems, environmental problems, behavior problems and the human condition. Our goal is to try to find ways to improve the lives of you and others. To do this, we need the help of volunteers who are willing to take part in research.

The person who is in charge of this research is called the Principal Investigator. The Principal Investigator may have other research staff members who will perform some of the procedures. The person explaining the research to you may be someone other than the principal investigator. For instance, Dr. Jim Decker, Associate Dean of the Department of Exercise and Sport Science, or Lara Brickhouse, Pitt County Adapted Physical Education Teacher, may be asking you to take part in this study.

You may have questions that this form does not answer. If you do, feel free to ask the person explaining the study, as you go along. You may have questions later and you should ask those questions, as you think of them. There is no time limit for asking questions about this research.

You do not have to take part in this research. Take your time and think about the information that is provided. If you want, have a friend or family member go over this form with you before you decide. It is up to you. If you choose to be in the study, then you should sign the form when you are comfortable that you understand the information provided. If you do not wish to take part in the study, you should not sign the form. That decision is yours and it is okay to decide not to volunteer.

Why is this research being done?

The purpose of this research is to assess the levels of physical activity of students with disabilities aged 8 to 12 years using active video gaming devices within an Adapted Physical Education (APE) on-campus practicum setting. The specific aims of the study are to measure the physical activity levels of students with developmental disabilities participating in two conditions: traditional adapted physical education activities (e.g. throwing, catching, running, playing basketball, etc.) and while playing active video games (i.e. Nintendo Wii Fit). The decision to take part in this research is yours to make. By doing this research, we hope to learn if active video games, such as Nintendo Wii Fit, affects the physical activity level of children with developmental disabilities.

Why am I being invited to take part in this research?

You are being invited to take part in this research because they are enrolled in a special education class in Pitt County. Your son/daughter has also participated in the ECU on-campus adapted physical education program. If your son/daughter volunteers to take part in this research, they will be one of approximately 24 people to do so.

Are there reasons I should not take part in this research?

If your child will be leaving their present classroom before the end of November or they will no longer attend the ECU adapted physical education program, they should not participate in this project.

What other choices do I have if I do not take part in this research?

You have the choice of not allowing your child to participate in this research study.

Where is the research going to take place and how long will it last?

The research procedures will be conducted during the ECU adapted physical education program, which will take place in Minges Coliseum. Because the investigators will be measuring your child's physical activity level throughout two different physical education interventions, no changes in their schedule will occur. In other words, your child will not have his school day or activities changed for this study. Your child will participate in the adapted physical education 8 to 10 times. During 1 adapted physical education session, your child will have the opportunity to participate in active video gaming activities such as Basic Run, Hula Hoop, and Torso Twists. The total amount of time your child will be asked to volunteer for this study is approximately 75 minutes.

What will I be asked to do?

Your child will be involved in their regular adapted physical education activities just as they have before. No changes will occur in their schedule or routine. In addition to participating in adapted physical education activities, your child will participate in a Nintendo Wii Fit activity intervention. The Principal Investigator will measure the heart rate and activity counts of your child throughout the practicum sessions using unobtrusive activity monitors that will be worn on the wrist. Again, nothing in your child's routine will be changed for this study.

What possible harms or discomforts might I experience if I take part in the research?

There are always risks (the chance of harm) when taking part in research. It has been determined that the risks associated with this research are no more than what you would experience in a normal life. In fact, the adapted physical education activities and Wii Fit intervention are the same as your child has participated in prior to this study. However, some people react to things differently so it is important for you to tell us as quickly as possible if your experience any negative feelings, as a result of participating in this study.

What are the possible benefits I may experience from taking part in this research?

We do not know if you will get any benefits by taking part in this study. This research might help us learn more about the effects active video games, such as Nintendo Wii Fit, have on physical activity levels of students with developmental disabilities. There may be no personal benefit from your participation but the information gained by doing this research may help others in the future.

Will I be paid for taking part in this research?

There is no payment involved for participating in this study.

What will it cost me to take part in this research?

It will not cost you or your child any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?

To do this research, David Schillo, Jim Decker, and Lara Brickhouse will know that your child took part in this research.

How will you keep the information you collect about me secure? How long will you keep it?

Once you allow your child to participate in this study, they will be assigned a participant number (i.e. Participant One). No records will be kept with your child's name or other identifying information. Data recorded in this study will be kept in a locked file cabinet in the ECU campus office of Dr. Jim Decker. After three years, all data sheets will be destroyed.

What if I decide I do not want to continue in this research?

If you decide you no longer want to be in this research after it has already started, you may stop at any time. You will not be penalized or criticized for stopping. You will not lose any benefits that you should normally receive.

Who should I contact if I have questions?

The people conducting this study will be available to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at 919-621-5511, Monday through Friday between 8:00 AM and 5:00 PM.

If you have questions about your rights as someone taking part in research, you may call the UMCIRB Office at phone number 252-744-2914 (days, 8:00am-5:00pm). If you would like to report a complaint or concern about this research study, you may call the Director of UMCIRB Office at 252-744-1971.

I have decided I want to take part in this research. What should I do now?

The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

Participant's Name (PRINT)	Signature	Date
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Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person's questions about the research.

Person Obtaining Consent (PRINT)	Signature	Date
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Principal Investigator (PRINT)	Signature	Date
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APPENDIX D: ACTIGRAPH GT3X ACCELEROMETER



APPENDIX E: PRACTICUM ACTIVITY TIME LOG

Adapted Practicum Activity Time Log

Participant Name: _____

Date: _____

Actigraph Model # _____

Activity Intervention Type 1: _____

Start Time: _____ Finish Time: _____

Actigraph Counts: _____

Activity Intervention Type 2: _____

Start Time: _____ Finish Time: _____

Actigraph Counts: _____

