

THE INFLUENCE OF ASSISTANCE IN HOME-BASED EXERCISE PROGRAMS
FOR INDIVIDUALS WITH INTELLECTUAL DISABILITIES

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Kyra L. Noerr

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Regular physical activity decreases the risk of co-morbidities associated with a sedentary lifestyle for individuals with intellectual disabilities (ID). Individuals with ID are more sedentary than their non-disabled peers and have additional barriers that may prevent physical activity including access, proper instruction, and support. At-home physical activity programming provides a feasible alternative for exercise promotion and long-term adherence. Determining the most influential components related to adherence may provide opportunities to increase the behavior change towards regular physical activity for individuals with an ID. The combined constructs of the Social Cognitive Theory, specifically observational learning, and Family Systems Framework were used to support the research. Objectives: The aims of the study were to determine (i) the extent to which an at-home DVD program affects physical activity adherence and (ii) the extent to which care-giver support influences physical activity adherence for adults with ID. Methods: Thirty-one subjects were randomized into a DVD or music group exercise intervention. The study used a (i) two-way repeated measures MANOVA and (ii) multiple regression to analyze the data. Additionally, exploratory analyses were conducted to further understand the effects of the intervention. Results: (i) The two-way repeated measures MANOVA demonstrated the intervention DVD group was statistically significant compared to the music group with a large effect size in physical activity minutes ($p = .014$, $\eta^2 = .236$) and rate of perceived exertion ($p = .002$, $\eta^2 = .342$) compared to the music group. Support did not have a statistically significant influence on

physical activity minutes or rate of perceived exertion. (ii) Multiple regression demonstrated support had a null effect on physical activity adherence. Discussion: (i) The findings demonstrate the use of an adapted DVD increases physical activity minutes and rate of perceived exertion without high levels of caregiver support.

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Chapter 1: Introduction to the Study

Introduction

Intellectual disability (ID) is considered a high-incidence disability affecting approximately 1.2 million adults in America (Brault, 2012). Diagnosed before the age of 18, ID is characterized by poor intellectual functioning, difficulty with adaptive behaviors, and problems with activities of daily living. Adaptive behaviors include practical, social and conceptual skills. Individuals with ID may lack the ability to personally care for themselves, self-direct and display naïve decision-making capabilities. Activities of daily living, such as maintaining one's health, are influenced by poor adaptive behaviors. Between the years of 1997 and 2008, the prevalence of developmental disabilities, including ID, has increased 2.2% and while there is research dedicated to determining the risk factors causing ID, there is a continued need to research adaptive behavior management (Boyle et al., 2011).

Current research in adaptive behavior focuses on determining best practices in order to help adults with ID thrive in schools, the workplace, home, and in the community. Adaptive behaviors related to healthcare, self-direction, and personal care still continue to be an area of adversity for the population and research on prevalence of healthcare-related problems are growing (Ervin & Merrick, 2014). Health concerns increase with the severity of the ID as well as age (Moss et al., 1993; Schrojenstein et al., 1997). Over 40% of adults with ID will develop four or more chronic diseases with an increase in age (Hsieh, Rimmer, & Heller, 2012).

In the typical population, there is a plethora of evidence demonstrating that regular physical activity (PA) reduces the risk for chronic diseases, specifically all-cause

mortality, colon and breast cancer, hypertension, cardiovascular disease, obesity, and depression (American College of Sports Medicine, 2013). However, the number of adults with ID participating in regular PA is considerably lower than the typical population. This lack of participation increases individual risk for secondary health conditions. With diminished capabilities in adaptive behaviors, there are significant issues that affect this population's ability for self-care and independence in health-related care. Additionally, there are limited opportunities for individuals to take steps to improve his or her ability for self-care. Improving the availability of quality instruction for PA and adherence may increase overall PA and reduce incidence and prevalence of chronic disease in adults with ID.

Background of the Problem

The health of adults with ID has been a growing concern from a public health perspective for the past three decades (Carmona, Giannini, Bergmark, & Cabe, 2010; Evenhuis, Henderson, Beange, Lennox, & Chicoine, 2001). Adults with ID have a higher risk of developing chronic conditions, such as cardiovascular or metabolic diseases, due to an increase in sedentary lifestyle. While it is known that regular PA decreases the risk of co-morbidities, only 6% of adults with disabilities are meeting the recommended weekly amount of PA to maintain health (Dixon-Ibarra, Lee, & Dugala, 2013; Pate et al., 1995). Additionally, many existing fitness facilities or community centers lack appropriate programming, supports and/or trained personnel compounding ability to access regular PA for this population.

Another challenge to regular participation in PA lies within the population's attributes. Characteristically, adults with ID experience delays in cognitive development

that may impede their social and communication abilities. Such difficulties may limit opportunities for PA in social environments (e.g., group fitness) and may impact desire to pursue activity outside their home environment. Adults with ID may also lack the skills to exercise independently (Heller & Sorensen, 2013) and restrictive interests of adults with ID compound the issue of regular PA (Cuccaro et al., 2003). Despite the challenges, there are several activity modalities that appear to increase activity participation.

Emerging data suggests peer and caregivers/parents support can facilitate PA adherence (McCurdy & Cole, 2013; Stanish & Temple, 2012; Lopez-Dicastillo, O., Grande, G., & Callery, P., 2010). However, it is still unclear which support modalities increase adherence, or the continued PA participation for the population and limited research has been conducted regarding actual efficacy of caregiver and parental intervention (Stanish & Temple, 2012; Heller, Hsieh, & Rimmer, 2003). While the parental or caregiver support is likely an important component to adherence for the population of interest, adherence is a complex issue and further understanding is needed to encourage long-term PA changes and ultimately, improvements in health.

Exercise adherence is a complicated issue for the general population. Dishman (1998) found the components of exercise adherence are multifaceted. Continued adherence to PA requires general adults to have a) activity access, b) maintain a desire to be active, c.) and have the necessary discipline to maintain activity. These components are in conflict with what is known about adults with ID and their ability to maintain activity. To understand how to increase PA for individuals with ID, there needs to be continued research on which of Dishman's three requirements for adherence most directly impact the population of interest. Studies have shown that interventions can

increase adherence but research identifying specific factors to promote adherence to PA in the population are lacking (Stanish, Temple, & Frey, 2006). Peer demonstration and at-home programs using care-givers have demonstrated successful increases in PA adherence (Mahy, Shields, Taylor, & Dodd, 2010). Emerging data also suggests peer support can decrease negative behaviors and increase positive exercise behaviors for adults with ID (McCurdy & Cole, 2014) which could be a reflection of Dishman's desire to maintain activity. Caregivers or parents have also been identified as being a facilitator to increase adherence to PA (Mahy, Shields, Taylor, & Dodd, 2010). The lack of knowledge regarding the dangers of a sedentary lifestyle prevent parents or caregivers from more strongly encouraging PA engagement of their child (Lopez-Dicastillo, Grande, & Callery, 2010). While studies support parent or caregiver motivation in health behavior change in young adolescents, limited research has been conducted within the adult population. Determining the most influential components and investigating family support components related to assistance may provide opportunities to increase overall behavior change to regular PA for adults with an ID.

At-home and community-based interventions have been research to support PA. One intervention used an exercise DVD created using current research to influence the design of the exercise program. Research suggests observation and peer-modeling as a means to increase adaptive behaviors such as counting money or making a sandwich. The DVD is designed for individuals with ID using three primary programming changes compared to traditional exercise DVDs. Individuals with and without ID demonstrated exercises simultaneously in the exercise DVD. Each exercise is accompanied by a modified version of the exercise as well. All exercises on the DVD were explained and

accompanied by music. Music has been demonstrated to be a positive influence in desire to be physically active as well as an increase in perceived exertion (Karageorghis, C. I., & Terry, P. C., 1997). The exercise selection, intensity, and duration were safe for the intended population. For example, exercises demonstrated avoid neck exercises, static flexibility, and limited cross plane movement (Moore, G., Durstine, J. L., Painter, P., 2009). The exercises were designed for a moderately intense exercise session. The duration of each segment was 15 minutes which is a minimal time to gain health benefits for this population. The control group for the study used an audio CD of the DVD. The CD did not provide the visual observation of the exercises. The audio version contained the music and descriptions of the same exercise selection and was the same in duration.

This project sought to investigate specific factors that encourage PA participation and adherence for adults with ID using an at-home intervention. The specific problem to be investigated is the impact of an at-home exercise DVD program and the influence of the assistance (or lack of) from family members or caregivers on PA adherence. The use of an at-home exercise DVD designed for individuals with ID focused on increasing access and quality instruction of the specific adaptive behavior of PA had not yet been investigated as a possible factor to improve adherence to PA for adults with ID. Coupled with monitoring support from peers or caregivers, this study aims to investigate two of the three requirements according to Dishman's theory of exercise adherence (access and ability to maintain a desire to be active) on individuals with ID.

Significance

The need for increasing adherence to PA for adults with ID is critical to preventing further health complications related to a sedentary lifestyle. The proposed

research offered insight into precise attributes or factors to increase PA for adults with ID. Specifically, attributes or factors for effective at-home PA programs using a developed DVD workout were identified. Results of the proposed research may assist program directors, researchers, families or caregivers of adults with ID to support PA behavior change. Additionally, increasing adherence to PA within the home may promote healthier lifestyles and reduce the incidence of co-morbidities throughout the life course of adults with ID.

The primary goal of this research was to determine the effectiveness of an at-home physical activity program using a self-paced DVD exercise program that combines peer video modeling and monitored care-giver support.

1. Specific Aim I: Determine the extent to which an at-home DVD program specifically designed for adults with intellectual disability affects physical activity adherence for adults with ID.
 - a. Hypothesis 1.1 Physical activity adherence will be better for the individuals with intellectual disability randomized to the DVD group compared to an audio only control group.
 - b. Hypothesis 1.2 Perceived exertion from physical activity will be lower and decrease overtime for individuals with intellectual disability randomized to the DVD group compared to an audio only control group.
2. Specific Aim II: Examine the extent to which care-giver support influences physical activity adherence for adults with intellectual disability.
 - a. Hypothesis 2 Care-giver support will increase physical activity adherence for adults with intellectual disability

The above aims were met by conducting a 12-week, two group, randomized quasi-experimental cohort study to determine the extent to which a specially designed DVD with peer modeling and care-giver/family support affects PA in adults with ID.

Methodology

The purpose of this investigation was to add to existing literature on adherence and PA for adults with ID. Specifically, the investigation will contribute to the literature using a modified DVD exercise program. A control group received a PA consultation and CD with the music from the DVD, but not the DVD itself. The audio CD provides the same music, explanation of exercises, and duration as the DVD. The independent variables of this study include the treatment (DVD or audio CD). Dependent variables include physical activity minutes, rate of perceived exertion, and support during PA.

Rimmer (2006) notes the need for future research to investigate the replication of activity as it relates to exercise prescription principles including frequency, intensity, duration, modality, volume, and progression. Frequency and duration of PA were measured quantitatively through self-report. Data were collected from individuals with ID as well as from individuals who may participate in the exercise sessions with the participant such as a care-giver or family member. Quantitative analysis helped to determine if there is an impact and how large the impact may be through effect size.

Theoretical Framework

One single theory does not fully support the process of exercise adherence for adults with ID therefore concepts of two theories were utilized to frame and guide the research methods. The combined constructs of the Social cognitive theory (SCT) and Family systems framework (FSF) were used to support research questions (Stanton,

1995; Turnbull, Summers, & Brotherson, 1986). The concepts of each theory guided the research process with the centralized effort of improving adherence to PA.

Social cognitive theory. While the SCT has been applied to healthcare and promotion, the theory is not as often used in explaining behavior in adults with ID. The SCT has been used to measure motivators for adults with ID though not specifically behavior. Hutzler and Korensky reviewed 23 articles focused on exercise motivators and determined SCT to be the most commonly used theory in studies investigating exercise motivators in the population of interest (2010). It appears the constructs of self-efficacy, observational learning, emotional arousal, behavioral capabilities and reinforcement aid are most relevant in developing a theory-based approach to better promote PA adherence. Expectations, expectancies, and locus of control are not as useful within the population relating to PA adherence. The proposed intervention specifically incorporated observational learning, self-efficacy, emotional arousal, and behavioral capabilities as theoretical supports for intervention. Modeling by individuals with and without ID on the DVD encouraged observational learning. Self-efficacy, arousal, and behavioral capabilities were monitored via self-report.

Family system framework. FSF is a more recent framework previously used in interventions for adults with disabilities (Turnbull, Summers, Brotherson, 1986; Turnbull, et al., 2015). Four constructs frame and describe how a family copes, supports and facilitates health care related issues pertaining to their child with a disability (Stanton, 1995). The constructs are family characteristics, family functions, family interactions, and family life cycle. Appendix 1 provides a visual representation of the FSF.

Family characteristics provide evidence for understanding how a family reacts to a child with a disability (Turnbull et al., 1986, Turnbull et al., 2015). Challenges, such as a child with a disability, mold and alter the family characteristics as a whole. The construct of family function includes the household responsibilities vital to reach the overall needs of the family such as recreation or healthcare needs (Stanton, 1995). Family interactions suggest one interaction or event may impact all members attributed to the family unit. These interactions may be parent-child, sibling-sibling or even relationships external to the intermediate family such as a care-giver. The family life cycle is the location of the family's status on a continuum of life, resources, and needs. The placement of the family on a certain point on the continuum may help to explain low or high support depending on the family's focus at the current moment. For example, a family with a child who is older who appears to have higher health needs, due to a sedentary lifestyle, may be more inclined to support than a family with a younger sedentary individual with lower health concerns. The family life cycle stages may not be relevant in all subjects depending on the specific life stage, but could help to explain the situations necessary to promote adherence. Utilizing these characteristics, specifically

family interactions and family functions, provides insight on the ease and feasibility of adherence to exercise for a family member with an ID.

The use of both theories provides a comprehensive framework to investigate the non-modifiable independent variable (care-giver/family influence), the independent variable (observational learning through the DVD) and the dependent variable (PA adherence). The FSF helps to explain how the families' support of the subjects influence adherence. To better understand adherence, it is necessary to investigate the family's interaction most naturally as a non-modifiable independent variable. The intervention asked the family to support as they view best for the family member and not require any specific level of support. The family interaction and family life cycle contributed to understanding why adherence may increase, decrease, or remain constant during the intervention. The desire for the research was to contribute to literature that may be practically applied. The FSF aids in the research by taking a confounding variable (the family) and turning it into an area of interest by studying it as a non-modified independent variable. Peer video modeling was supported by the SCT, specifically observational learning. Both theories were needed in part to provide a clear understanding of the effectiveness of the intervention by allowing the intervention to be naturally supported by the family.

Scope of Study

Study scope includes an experimental group consisting of apparently healthy, adults with ID including conditions such as Down syndrome (Ds) and Autism Spectrum Disorder (ASD) (if also identified as having ID). Intellectual quotient was not a participatory exclusionary factor. The participant groups were recruited from those

residing in Indiana and randomized into control and experimental groups. The study was a 12-week intervention with a one week follow up on week 13 and took place over a course of time no greater than one year allowing for different beginning dates based on recruitment. Adherence and factors relating to adherence, specifically family involvement, were the variables assessed using self-report. Exploratory measures were also collected included weight, waist circumference, hip circumference, and overall PA outside of the intervention.

Limitations

Several limitations may impact the results of this study. The study was limited to participants who reside in the state of Indiana. Geographical differences in families with adults with ID from Midwest America may result in varying data. Another limitation includes the voluntary basis for participation. In addition, the efficacy of the exercise DVD has not been assessed to determine if it improves health-related fitness. Finally, self-report measures were used to collect data. Currently there is insufficient and contradictory literature on the validity of self-report with relation to health with the population to be studied (Fujiura, 2012).

Definition of Terms

1. Adherence: voluntary commitment to maintain to a specific behavior, such as PA (Dishman, 1988)
2. Exercise: deliberate bodily movement raising metabolic expenditure and focusing on at least one of the health-related components of fitness (cardiovascular, muscular strength, muscular endurance, flexibility, body composition) (American College of Sports Medicine, 2013)

3. Intellectual disability (ID): limitation in intellectual function, typically with an IQ below 70, combined with difficulty in activities of daily living and social skills (Durst, 2009)
4. Physical activity (PA): bodily movement raising metabolic expenditure above basal metabolic level (American College of Sports Medicine, 2013)
5. Peer Model Influence: influence stems from models in the DVD program who were of similar age, disability, and movement patterns to the experimental group

Outline of Dissertation

The dissertation consists of five chapters and an appendix section. Chapter one consists of an introduction to the background and statement of the problem as well as a brief introduction to the methodology and theoretical framework. The review of literature including discussion on PA, PA and ID, adherence, video modeling for adults with ID, SCT and FSF is contained in chapter two. Chapter three contains the research design and description of intervention. Data and results are contained to chapter four. Chapter five includes a discussion of the results, implications, limitations, future research and references. The Appendix includes the student and support workbooks, physical activity questionnaire for adolescents (PAQ-A), and demographic questionnaire.

Chapter 2: Review of the Literature

Introduction

There is considerable evidence regarding the benefits of PA on health-related factors such as weight control, disease prevention, and quality of life. Factors that influence the general population to participate in regular PA include access, inherent motivation, and knowledge. An increase in these factors suggests an increase in the likelihood for adherence. Research regarding people with ID, however, suggests those same factors may deter engagement in PA when intellectually disabled. The following review of literature explores the evolution of PA as a correlate to health and review how PA differs for people with ID.

Benefits of Physical Activity and Health

The impact of PA on cardiovascular health was first studied in 1953 when it was discovered that coronary artery disease was more common in workers who were sedentary compared to more active workers (Morris, Heady, Raffle, Roberts, & Parks, 1953). Since Morris' discovery many non-communicable, chronic diseases have been correlated with an increase in sedentary lifestyles. These diseases, which impact both adults and children, include non-insulin dependent diabetes mellitus, cancers, heart disease, hypertension, and the most recently declared disease, obesity (Frühbeck & Yumuk, 2014; Helmrigh, Ragland, Leung, & Paffenbarger Jr, 1991; Kushi et al., 2006; Morris, Clayton, Everitt, Semmence, & Burgess, 1990; Powell, Thompson, Caspersen, & Kendrick, 1987; Reilly et al., 2006). Evidence is clear to show regular PA reduces the incidence and prevalence of non-communicable diseases (NCD) and promotes additional health benefits. Regular PA reduces all-cause mortality, decreases blood pressure,

increases weight loss, increases bone density, decreases risk for cancers specifically colon and breast, increases blood glucose uptake, reduces depression, reduces stress and increases overall functionality and independence (Ehrman, 2010).

Despite public recommendations for increased PA and the increase in research demonstrating its importance to health, PA in the United States has not significantly increased. In 1990, 24.3% of the population reported reaching the recommended level of PA regularly while in 1998 25.4% of population reached the recommended levels (Control & Prevention, 2001). The portion of the population that indicated no PA has decreased from 30.7% in 1990 to 26.3 in 2013. Though the portion of the population who remain sedentary is decreasing, the overall activity level of the population is not at a high enough duration or frequency to promote any significant changes to the nation's health status. Neither public recommendations nor the knowledge of an increased risk for disease associated with sedentary lifestyles have solicited changes to impact public health on a large scale. The urgent need to drastically increase regular PA is evident by the policy changes within schools and workplaces, the mass media campaigns and interventions such as increases in Healthy People 2020 objectives connected to PA and increases in financial incentives from insurance companies to encourage PA (Crespo, Sallis, Conway, Saelens, & Frank, 2011; Sallis, Carlson, Mignano, Lemes, & Wagner, 2013; Wojcicki & Heyman, 2010).

Professional organizations continue to provide recommendations for PA engagement. The American College of Sports Medicine (ACSM) and American Heart Association (AHA) developed guidelines promoting regular PA. The guidelines recommend a minimum of five days per week of moderate intensity PA or three days a

week of vigorous intensity PA to achieve the health effects. Increased PA specifically to improve health has become a critical issue from a governmental and medical perspective. Physicians are recommending PA as a preventative tool or alternative to pharmaceutical intervention. More recently, the Exercise is Medicine™ initiative is promoting physicians to ask and recommend PA to individuals of all ages who are safely able to perform PA including individuals with ID. (Sallis, 2009). As society proves to be increasingly sedentary and costs related to long-term health issues increase, PA may in fact be the panacea to address much of society's public health concerns.

Physical Activity for Adults with Intellectual Disability

While there is a concern with the general public participating in PA at the frequency and duration needed to prevent NCD; even more so is the concern for adults with ID. ID impacts between 1-3% of the global population and those adults often have a lowered life expectancy and increased risk in comorbidities related to health disparities (Harris, 2006). There are significantly higher health disparities for adults with ID compared to those without ID (Krahn, Hammond, & Turner, 2006). Care-givers and adults with ID have indicated difficulty identifying access to healthcare, lack of training in the healthcare professionals, and a lack of preventative care. These are hurdles this population must overcome in order to maintaining health. Additionally compared to the non-disabled population, there is a heavy reliance on the individual's day worker (e.g., caregiver, parent, social worker) for healthcare needs and communication as an additional barrier (Ali et al., 2013; Robinson, Dauenhauer, Bishop, & Baxter, 2012). Healthcare disparities with the increase number of comorbidities and multi-morbidities are of great concern for those with ID.

Comorbidity and multimorbidity. Approximately 80% of older adults with severe to profound ID have two or more chronic conditions in addition to the disability. Specifically for adults with IDs, 47% have four or more chronic conditions (Hermans & Evenhuis, 2014) such as cancer, hypertension, and cardiovascular disease (Lin, Lin, & Lin, 2010). Adults with ID are at a higher risk for obesity which increases with age. Research suggests that gender (females), independent living status, and intellectual quotient level (i.e., mild to moderate) are factors that contribute to a higher risk for obesity (Melville, Hamilton, Hankey, Miller, & Boyle, 2007; Robertson et al., 2000). While the life expectancy for adults with ID is increasing, it is still lower than general population life expectancy. Individuals with ID are living an average of 9.8 years less than their non-disabled peers (Bittles et al., 2002). Common causes of death were cardiovascular diseases, respiratory diseases, and cancers with an incidence of 33%, 20% and 16%, respectively (Janicki, Dalton, Henderson, & Davidson, 1999). The risk of these causes are decreased with PA but increased with a sedentary lifestyle.

Importance of physical activity. PA has been demonstrated to have a positive influence on the chronic conditions for adults with ID. Systematic PA interventions have shown strong positive effects. What follows is an overview of significant literature demonstrating the efficacy of PA interventions on comorbidities. Review sections are divided by specific categories such as types of intervention, impact on disease control, and barriers and facilitators to PA.

Interventions. Different modes of interventions have been studied within the literature. In the past 30 years, research on specific interventions to increase either participation or adherence to PA have demonstrated the following modalities to be

significant: cardiovascular programs and combined cardiovascular, weight training, and flexibility training programs.

Cardiovascular interventions: Pitetti et al. (2007) explored the benefits of a treadmill walking program and the reduction of BMI for adults with ASD in a residential facility. Pitetti's study included ten adolescents divided into the control group who had free leisure time for 30 minutes three days a week and an experimental group who participated in 15-30 minutes of treadmill walking in similar 30 minute activity sessions three days a week. After nine months, the body weight and BMI was compared using one-tailed pair sample t-tests with results showing significant differences in the BMI ($p = .016$) with a moderate effect size ($ES = .38$). In a study using less supervision in a worksite program, 12 subjects demonstrated small cardiovascular improvements in VO_2 ($p < .05$) using t-test and correlation analysis at the completion of the 16 week training program (Pitetti & Tan, 1991). Unique to this study, subjects were asked three times per week if they wished to take a break from vocational assignments to participate in cardiovascular exercise for 25 minutes. The exercise was not forced and the average weekly frequency was 2.7 days per week. The concern, however, is demonstrated in the adherence in a follow-up measure. Four to eight month follow-up of five participants demonstrated lower cardiovascular fitness than the pre-training testing measures.

Combined cardiovascular and strength training. A study completed at a local fitness facility combined cardiovascular, muscular, and flexibility training with a peer-guided intervention pairing an individual with ID with an individual without ID during exercise (Stanish & Temple, 2012). The cardiovascular and flexibility completion rates were high and resulted in a statistically significant increase in cardiovascular function

using the 6-minute walk test. The peer-guided intervention did not demonstrate improvement in muscular completion rates or muscular fitness in the post-test with exception of the curl-up test measuring abdominal strength

Oviedo et al. (2014) studied the impacts of a combined training that included cardiovascular, strength, and balance. Thirty-seven adults participated in 60 minute activity sessions, three days a week for 14 weeks while the 29 adults in the control group were asked to continue normal daily activity. The compliance measured through attendance was 89% and post test results analyzed through an ANCOVA indicated a significant improvement in body weight ($p = .001$), BMI ($p = .001$), VO_2 peak ($p = .001$), peak workload ($p = .038$), systolic and diastolic blood pressure ($p = .001$), hand grip strength ($p = .001$), leg strength ($p = .001$), flexibility ($p < .001$), and balance using the timed up-and-go test ($p < .001$). The study supported use of a combined mode intervention though this was not evident in the effect size of the data. Most studies in PA comprise the research question around the intervention mode, however, specific outcomes are also important. The following studies focused on specific outcome objectives and reducing co-morbidity risk factors.

Obesity. Rimmer (2006) suggests adults with ID who live in community-based facilities have a lower incidence of obesity compared to peers who live with families supporting the need for more at-home intervention to increase access to PA opportunities. More than 61.8% of the population studied were classified as having a Body Mass Index (BMI) over 30, the classification criteria for obesity. The concern is evident in other industrialized countries as well such as England, Ireland, Australia and Germany (Rimer & Yamaki, 2006). While the prevalence of obesity is increasing in this population,

interventions have been shown to help manage weight loss. Fox (1985) incorporated a buddy system in the subjects' workplace combined with behavior therapy using exercise promotion during weeks 7 and 8 of a 10 week program. This intervention applied to 16 subjects resulted in an average of .78 pounds of weight loss per week. In a similar intervention by Fox, subjects who received support from their parents in helping with health related activity forms demonstrated a significantly higher ($p < .01$) adherence in completing the health activity forms. Completion of the health activity forms were positively correlated to weight loss ($r = .87$) which was 2.92% ($p < .05$) different than those who did not receive support from their parents. Further research in weight loss suggests a health practitioner, specifically kinesiotherapist, was effective in a 12 month intervention using home visits. An exercise training and nutrition education program was implemented by a kinesiotherapist at the subject's home. BMI was significantly different ($p < .05$) from baseline to 6 months as well as baseline to 12 months.

Cardiovascular risk factors. Moss (2009) investigated the heart disease risk factors of 100 individuals in a residential community who participated in an increasing duration PA intervention, 3 days a week for 12 weeks. Descriptive statistics and t-tests demonstrated 85% of the subjects were sedentary, 67% were obese, 23% had high cholesterol, and 28% had high blood glucose levels at baseline with statistically significant ($p < .05$) changes in body fat percentage, systolic and diastolic blood pressures, and physical work capacity at the completion of the study. The study participants who completed 50-70% of the intervention of the time had a higher physical work capacity (36.3% increase) than those who complied more than 70% of the time. The author suggested those who had a higher compliance were already physically active

compared to those who complied 50-70% who were, at baseline, more sedentary. Total cholesterol and blood glucose were not significantly different after 9 months. Calder et al. (2011) also investigated the effects of exercise on adults with ID (2011). In a controlled trial, 70 subjects were recruited from a residential facility and randomized in three groups, control (no exercise training), combined (cardiovascular and strength training), and aerobic (cardiovascular training). Subjects in the experimental groups participated in two sessions a week for 20 weeks. Data was analyzed using a repeated measures ANOVA. Similar to Moss (2009), systolic blood pressure decreased in the combined group ($p = .012$, $ES = 1.2$) and the aerobic group ($p = .024$, $ES = 1.2$) with no significant changes in the control group. Total cholesterol, though, did decrease in the combined group ($p = .01$, $ES = .5$). Moss (2009), Calder (2011) and Rimmer (2006) all used residential facilities to conduct their studies. The residential setting helped to control external variables but limits the practicality of the research implications. The barriers and facilitators of PA are factors that can contribute to the adherence or non-adherence in PA. Barriers and facilitators to physical activity. Barrier and facilitators are terms to describe what prevents or allows engagement in PA. Use of this terminology was first identified by Riley (2008) examining health club accessibility for those physically disabled. Barriers and facilitators to PA for those with ID have also been identified. Temple (2007) examined pedometer steps and reported reasons for lack of activity (e.g., barriers). Those who were least active identified barriers to PA most commonly as “weather” (71.4%), “too lazy” (57.1%), “others stop me” (42.9%), “no one to participate with” (42.9%), and “my health stops me” (42.9%). Those who reached recommended PA levels to maintain health identified the following barriers: “my health stops me” (38.5%), “costs too much”

(30.8%), “too lazy” (30.8%), “weather” (23.1%) and “no one to show me how” (23.1%) (Temple, 2007).

In a review of seven articles exploring barriers, cost and transportation are significant barriers to PA along with lack of support (Bodde & Seo, 2009). Facilitators identified, which are similar to facilitators for adults without ID, include social support. For adults with ID, social support may include more than companionship support. Other types of support included as facilitators include instrumental support and aid in social engineering (Anshel, 2014; Bodde & Seo, 2009). In addition cost and transportation, lack of supports act as a barrier to exercise as well. Lack of supports as a barrier may be exacerbated by the perceptions from the caregivers. If a care-giver does not view PA to be beneficial, the lack of support becomes a greater barrier. Removal of the barriers are suggested to improve frequency of PA specifically for adults with Ds (Heller, Hsieh, & Rimmer, 2003).

Mobily, Mobily and Lane (1994) suggests future interventions be “low-tech” exercise programs that are easily organized and implemented in a community setting. Their recommendation is based on the evidence from an 8 week progressive resistance intervention for older adults with ID. Strength, coordination, agility, flexibility, and dynamic balance of the 15 subjects had statistically significant improvement after the intervention which consisted of 40 minutes of resistance training for three days a week in small group settings at a senior center. Ewing et al. (2004) also recommends natural settings, compared to clinic or hospital type settings, to promote cardiovascular activity. This study combined optional home visits with group sessions. The participants who requested home visits had greater attendance to the group sessions compared to

participants who did not elect for home visits. A case study investigating 11 adults between the ages of 20-69 used a semi-structured group environment at a fitness facility. The subjects participated in 30-60 minutes, three days a week for 6 months and demonstrated positive changes in weight loss, blood pressure, and resting heart rate though the authors did not report statistical significance (Carter et al., 2004).

Fernhall, Borghi-Silva and Babu (2015) discussed the future of general PA research and noted disability research is an area lacking. Additionally, Ogg-Groenendaal, Hermans, and Claessens (2014) indicated the studies that are investigating exercise interventions have a low quality in methodology. Large scale studies have not been conducted to understand health outcomes in PA for individuals with disabilities (Fernhall, 2015). It is assumed the health benefits from study investigating health outcome for non-disable populations are similar to disabled populations but a large-scale study to provide evidence has not yet been conducted. Studies have provided evidence suggesting programs can be used to increase engagement in PA with the assumption it increases fitness and health outcomes. External validity limitations exist including the number of participants studied, follow-up adherence, and program setting (Rimmer et al., 2010). Most research studies include six to 20 subjects. In addition, few studies address adherence after completion of the structured program and lastly, the gap in research does not include a program that can be used in several various settings. Previous studies isolate programs to either community-based locations such as fitness facilities, residential facilities, or home-based. The interventions discussed above limit the subject's choice on what type of exercise mode he or she would be most interested in. Independent selection of exercise mode is non-existent in the above studies. An intervention has not yet been

studied simultaneously in multiple settings nor allowing the subject to have a choice in the type of mode of activity. Additionally, easy-to-use and low tech interventions with optional accountability are supported in the literature.

Adherence

As indicated previously, adherence to exercise is a concern for adults with ID. There is a lack of overall evidence to support adherence persons with ID. Adherence is the voluntary commitment to maintain a specific health behavior, though the operational definition of adherence is often debated (Dishman, 1988). Most supervised programs have around a 50% dropout rate within six months to a year after beginning, and while adherence is a critical part of the exercise program, there is not sufficient evidence to provide best-practices for the general population, let alone the population with ID (Dishman, Sallis, Orenstien, 1985). Olon and Zanna (1982) identified two factors that positively influenced adherence to exercise; 1) strong intention to participation and 2) stronger motivations to comply with requests of others. While these factors are apparent in some of the theoretical frameworks used to evaluate adherence, the frameworks do not sufficiently predict adherence. The psychological model for PA participation developed by Sonstroem (1977) lacked correlational values (Dishman, 1988) between attractiveness to PA, and adherence in follow-up studies. Despite the end product of an intervention with adherence, Sonstroem's research (1977) may still maintain merit in initial enrollment in a PA program. Further adherence research has postulated use of other models such as the health belief model (Mirotznik et al., 1995), theory of reasoned action (Smith & Biddle, 1990), locus of control (McCready & Long, 1985), and variables relating to self.

The struggle with adherence research is that there is a lack of complete and explanatory theoretical framework for the general population. While theoretical frameworks have been examined, theories fall short of providing a clear and effective framework to examine adherence. There have been, however, factors associated with a relationship to increased adherence. Those factors appear to be attitude, perceived competence, self-efficacy and locus of control, similar to some components of the SCT. Additionally, although difficult to measure due to personal preferences, intrinsic enjoyment of the program is also associated with more long-term adherence.

Adherence is often studied in a static state (an individual is either adhering or not adhering) whereas Dishman proposes investigating adherence as a process or in various dynamic states (1988b). Dishman's Lifespan Interactional Model for Exercise Adherence suggests as psychological determinants (e.g, beliefs, attitudes, intentions, and self-regulatory skills) decrease, social-environmental determinants (e.g. access to facility, family support, and education) must increase to maintain adherence. Determinates strongly influencing dropout of exercise adhere included biological, environment, self-regulatory, and competence determinants. For example, biological determinants may include health history or current physical fitness. An individual is less likely to adhere to exercise if his/her current fitness level is poor. Environmental determinants may include access to safe or financially feasible areas to exercise and social norms. The most influential self-regulatory determinants are self-efficacy, ability to create goals by self, and the feedback loop associated with decision making. Lastly, examples of competence determinants include knowledge about exercise and also include self-efficacy. While the model provides insight into the complexity of exercise adherence, it has not yet been

tested for usability or application. (Biddle & Mutrie, 2007; Sallis, 1990). As adherence is studied more as a process versus as a state, studies have shown adherence is likely a much more complex sociological and psychological phenomenon than previously thought.

Aside from the theoretical perspective, there are additional concerns with research methodology. Since Dishman's first book on exercise adherence in 1988 which included a call for more research, a review of the literature in 1994 noted that little research has been conducted and even more so, limited validated measures. Self-report has been the most widely used measurement tool. Though not common in the literature, Dishman (1988) recommends verifying the self-report with a family member thus reducing the potential to falsely report data towards preferable social norms. There are other potentials in an intervention that may decrease or increase adherence measures. An increase in perceived exertion and/or intensity is negatively correlated to adherence to PA. Alternately, low cost, cost-benefit ratio, and ease of access increase the potential for adherence to PA.

Dishman's (1988) work on adherence is focused on the general population. The barriers for individuals with ID are similar to the psychological determinants that Dishman suggests may decrease adherence. To counteract the decrease in the psychological determinants, the social-environments determinants (e.g. access, support, education) must significantly increase to improve adherence. This research study aimed to increase access to PA by providing an at-home program, monitor support provided, and uses fitness professionals to teach appropriate exercises in the exercise DVD and audio CD. Self-report by the subject and support person were used to measure adherence.

To conclude, exercise adherence has been demonstrated as a difficult variable to assess. Despite the difficulty, it does not lessen the need for more research in this area. The above concerns noted by Dishman (1988) are addressed in the methods of the research by increasing access, managing perceived exertion, and incorporating an easy to use reporting system that is commonly used in adherence research.

Theoretical Framework

Social cognitive theory. The SCT has been applied to many aspects of behavior outcome explanation in fields such as organizational management, communication, moral thought development, and within the medical field. Bandura has specifically noted how the SCT can impact health promotion. The SCT has contributed to transitioning from a disease model to a health model. In the disease model, focus is on curing the disease. In a health model focus remains on prevention and staying functional (Bandura, 1998), which includes the efforts of increasing adherence to PA as a behavior.

The SCT is a behavioral model using a triad of influences to understand the impact on performance outcomes. The triad includes behavioral, personal, and environmental factors (Hayden, 2009; Moore & Tschannen-Moran, 2009). The constructs that support SCT include self-efficacy, observational learning, expectations, expectancies, emotional arousal, behavioral capability, reinforcement and locus of control. One assumption to the SCT that is the foundation for this research is that learning can occur through observation. The constructs impact the triad through a fluid, cognitive approach. One change in a construct, either a positive, neutral or negative alteration, will likely impact all factors of the triad.

For example, if a child observes an older sibling practicing a sport in order to make an athletic team, the child may assume practice will lead to making the team. The child views the older sibling as a role model and will place certain expectations on the idea of practicing. He/she may assume practicing will lead to the outcome (making the team). The child may observe praise from the parents towards the older sibling and expect similar reinforcements for practicing. The non-occurrence of an expected reinforcement may have an influence in the learning and behavior acquisition. If the praise or other observed reinforcements are not given to the child, the child may stop practicing. The child may not have the same natural genetic tendencies (personal factor) or prior experiences (behavioral factor) to produce the same outcome as the child observed with the older sibling. The social atmosphere and physical surroundings (environmental factors) may internalize the locus of control and support the outcome but may produce different expectations than the child observed with the older sibling. Additionally, observation may not lead to immediate learning. The child may begin practicing immediately after watching the older sibling, it may occur later after processes, or it may never occur. The child may observe the older sibling, process the outcomes, and engage in practicing later in life when there is a similar goal and the child can implement the step he/she observed in the older sibling. Each construct of the SCT may have the ability to impact one or more components of the triad differently but ultimately impacting the acquisition or non-acquisition of a behavior.

The SCT assumes that processing may occur internally and may or may not lead to a behavior change. This research proposal is ultimately investigating influences to

encourage behavior change specifically by looking at family support and peer video modeling through the SCT construct of observational learning.

Observational learning. Observational learning is the primary construct supporting the research proposal. Learning by watching another individual is a construct of SCT. The ability for one to observe as an individual models the action increases learning. Observational learning becomes more significant if the action is important to learn or is performed by a person in an authoritative, respected role to the observer, or similar to the individual (Hayden, 2009). Whether with live or video modeling, it is suggested that four processes must be present to promote observational learning: attention, retention, production, and motivation. For this research study, the intervention includes movements and music attractive to the subject population and increase attention (Hayden, 2009). Additionally, there were individuals in the DVD that have similar ID to the subjects in the study and may place an authoritative value on the exercisers on the DVD because they were on TV/video screen. Literature in video modeling suggests retention is increased when the subject has the ability to watch a skill repetitiously. Data were gathered on production and motivation (family support). The other constructs of the SCT, self-efficacy, expectations, expectancies, emotional arousal, behavioral capability, reinforcement, and locus of control, may have an influence in the research but were not being studied as part of this research. The SCT was originally developed to understand how people without disability learned behaviors and was not designed specifically for disability research. Individuals with ID may not have a similar response to the above constructs as the general population. Without current literature to support use of the other

constructs, or theory as a whole, only observational learning is included in the theoretical framework to be assessed in the research.

Family systems framework. While the SCT construct of observational learning provides a foundation, because of the nature of this study, the FSF will investigate some components not well understood through the SCT. The FSF is not as popular as the SCT, but was developed specifically for families with member(s) who have ID. The FSF was developed by Ann and H.R. Turnbull during the 1980's. The theory is very connected to the Bronfenbrenner's social ecological model as it looks at the family as an organizational structure containing different levels of systems. The family is a unit and the FSF in health-related literature suggests there is a family-centered approach in health decisions. Turnbull suggests in order to investigate the health decisions of an individual with ID, the family as a system must also be included (2015). There is a gap in the literature to determine if a family-centered approach effects the preventative healthcare efforts, specifically PA, in adults with ID.

Family characteristics. The family characteristics, or previously termed "resources," are the components of family and specifics of the individual with disability. The components of the disability that may influence family characteristics include the type of disability, level of severity, health status, and how functional the individual is. The family components may consist of geographical location, economical status, how many family members comprise the central family unit, and cultural background. The family characteristics may also include coping strategies and the decision-making perspective of the family. The family characteristics are considered "inputs" that influence the family interactions and family life cycle. For example, family interactions

may change in a family if there is a member with significant physical limitations. As the member with disability ages and grows, caring for the individual may become more difficult and the family interactions may adjust to accommodate.

Family interactions. The family interactions focus on the level of cohesion or how the family interacts within itself; it is considered the process portion of the FSF along with family life cycle. Independence and reliability within the group is a needed balance. Turnbull et al. (2015, 2017) suggests there are four different relationships, or subsystems, within a family unit. The subsystems include marital, parental, sibling, and extended family. Families may contain all the subsystems but there are families who do not have specific subsystems due to the family makeup such as single parent homes. The family with a member with a disability may interact very differently than a family without members with disability. Within each family unit, each family member has the ability to impact other members or other subsystems. Disability may have a unique influence on the family. Caregivers are often considered extended family or there may be greater dependence on siblings compared to families without members with disability. The subunits adapt as the inputs change over time. Elaborating on the above example, if a member grows too heavy in weight for a parent to care for solely, an additional member of the family, such as a sibling, may be required to help thus the family interactions change. Some families may make efforts to equalize how much each family member feels he/she is contributing. Other family interactions will be unequal and the primary responsibility of one or two from the family unit.

Family life cycle. The family life cycle may have the greatest influence on the above constructs of the FSF. There are set life stages though the exact number is

disputable (Turnbull et al., 2015). Any event will likely impact the family in some way possibly the family characters, the family interaction, the family functions or any combination of the constructs and some stages will place more tension on the family than others. The focus of the family is often determined by life events or the continuum of life such as developments. The family's focus may change due to the birth of a child with a disability. As the child's life progresses, the focus of the family will change as well to health concerns, education, adolescence, and the progression to adulthood. The functions, interactions and characteristics change with the shifts in the life cycle stages.

Family functions. Every family has specific needs and the measures the family takes to address the needs are considered the family functions, these are the “outputs” of the FSF. As the family strives to address needs, the needs manifest within the following outputs: affection, daily care, economics, education, recreation, self-esteem, spiritual, and socialization. Each family member has specific levels of each of the needs and the family creates different ways to address the needs for each specific member as well as for the family as a whole. For example, if a member with disability has significant health concerns and requires daily care, the priority this function is placed above other functions. The life cycle can influence family functions. Family functions can influence but can also be influenced by family interactions. The main focus of the family is typically to adapt to a new balance with each change in either life cycle, functions, interactions, or characteristics.

In conclusion, the family has a significant impact on the member with disability. It is difficult to research an at-home program without investigating the natural influence of the family on the individual and the priorities of the family. Turnbull notes the families

may be supported by professionals who recognize individual family systems, understand the value of family quality of life, and accept the family life cycle's influence on decision-making. The FSF is a theory that suggests recognizing and respecting a family's natural development. In research, imposing an intervention that negates the importance of family characteristics, functions, interactions, and life cycle would undermine the quality of life for the family and member with ID.

Currently, there is no research investigating the natural influence of family on exercise adherence. The study recorded family interactions with the member (e.g. if a member participates in the PA, who that family member or care-giver is) and family functions (e.g. adherence to PA for the subject). The FSF helped in the analysis of the data to further understand family influence.

Summary

While adherence literature supports use of attitude, attractiveness to PA, self-efficacy, and locus of control to predict adherence, these factors may not be relevant for adults with ID. There is a clear need for exploring the factors related to adherence in the studied population. The gap between adherence research for adults without ID compared to those with ID support the need to use a unique theoretical framework that takes into consideration some of the difficulties adults with ID experience. For this study the SCT was used, and the FSF helped to fill in the gaps in explanation (i.e., understanding how family supports adherence).

Stanish's study (2001) supports use of video to maintain exercise engagement even without a leader physically present during the exercise. The intervention used in this study includes peer modeling and the use of background music that is supported by

Owlia's (1995) research of audio reinforcers. The intervention was created using the ACSM recommendations for exercise for adults with ID and as previously noted current literature supports the different aspects of the intervention. While the variables in the intervention were supported separately through the literature, the combined effort was measured in a pragmatic approach to investigate adherence, as well as influences of family on that adherence.

Chapter 3: Methods

Introduction

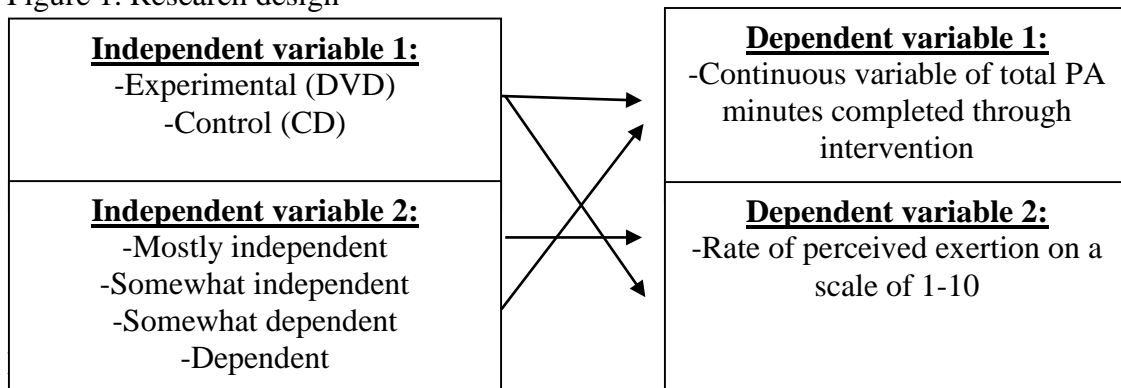
This study aimed to further understand PA adherence and influencers of adherence. Chapter II outlined the current literature to support a need for research in this area. The foundation of the research design is the SCT and FSF. To date, a study has not been conducted investigating the effects of a DVD exercise program on adherence. The review of the literature supports the following design.

Research Design

The study design allowed for investigation of PA adherence between the experimental group and the control group. The study used a two group, randomized quasi-experimental cohort study, post-test design to test the likelihood of PA adherence using an at-home exercise DVD and the influence of support. The data was assessed using a two-way repeated measures Multivariate Analysis of Variance (MANOVA). MANOVA and effect size is reported as partial eta squared (η^2). The main purpose of the two-way MANOVA was to test if two or more groups differ from each other significantly in two or more dependent variables. This test helped to reduce the incidence of type I errors. A type I, or α , error is the rejections of a null hypothesis when there is truly a difference between the sample groups. Controlling the analysis for type I errors is critical with the small sample size as larger sample sizes can reduce the incidence of type I errors (Banerjee, A., Chitnis, U. B., Jadhav, S. L., Bhawalkar, J. S., & Chaudhury, S., 2009). Family support, which includes participation alongside of the participant, was not be randomized thus further meeting the criteria for quasi-experimental design.

The dependent variable measurement, PA minutes and perceived exertion, was collected through a self-report technique. To examine PA adherence, the following dependent measures was collected: 1) number of segments completed and 2.) perceived exertion. The subject also recorded if a family member or care-giver participated alongside the subject.

Figure 1. Research design



The primary goal of this research was to determine the effectiveness of an at-home physical activity program using a self-paced DVD exercise program that combines peer video modeling and monitored care-giver support.

1. **Specific Aim I:** Determine the extent to which an at-home DVD program specifically designed for adults with intellectual disability affects physical activity adherence for adults with ID.
 - a. Hypothesis 1.1 Physical activity adherence will increase for individuals with intellectual disability randomized to the DVD group compared to an audio only control group.
 - b. Hypothesis 1.2 Perceived exertion from physical activity will be lower and decreases overtime for individuals with intellectual disability randomized to the DVD group compared to an audio only control group.

2. **Specific Aim II:** Examine the extent to which care-giver support influences physical activity adherence for adults with intellectual disability.
 - a. Hypothesis 2 Care-giver support will increase physical activity adherence for adults with intellectual disability

The above aims were met by conducting a 12-week, two group, randomized quasi-experimental cohort study to determine the extent to which a specially designed DVD with peer modeling and care-giver/family support affects PA in adults with ID.

Population and Sample

Participants. Thirty-one apparently healthy adults with ID between the ages of 14 and 35 years of age participated in the study as the experimental and control groups. Subjects were randomized into the control and experimental groups using a randomization program (randomization.com). Subjects were selected through a purposive sampling and snowball technique. Purposive sampling is a selective sampling technique best used in this study because the population studied represents a small portion of the population limiting availability of potential subjects. Families who have members with ID are often very connected to support organizations and other families whose family members had ID. Many subjects were recruited after hearing about the study from another subject through support groups conversations, physician's recommendations, or newsletters from organizations.

In snowball sampling techniques, subjects were recruited and then asked to share the opportunity to participate in the research with other potential subjects. The snowball technique with this population likely promoted a larger sample size, though not truly random. Subjects were recruited within the state of Indiana. Flyers (Appendix 2), emails

(Appendix 3), social media, and face-to-face recruitment were used to reach potential subjects. Each subject was provided appropriate consent and/or assent prior to participating. The protocol was been approved by the Indiana University Institutional Review Board (Study #1212010195).

In addition to the subjects with ID, the support persons were considered subjects in the study. The support subjects include parents, siblings, extended family, care-givers, or other support persons who may help support verbally or through participative support. All support subjects who assisted the subject with ID in any manner completed an informed consent and would complete the self-report in the support binder if he/she assisted the subject with ID in exercise.

Criteria for experimental and control group. During recruitment, subject eligibility was determined. Inclusion criteria for participation in the experimental group included individuals: (a) who are 14-35 years of age, (b) who had been identified as having an ID, (c) who were willing to consent or whose guardians were willing to assent, (d) who had access to a computer or DVD player and (e) who were willing to participate in 150 minutes of PA each week. Exclusion criteria included (a) not meeting the above criteria, (b) adults who were not willing to participate in 12 weeks of physical activity, (c) adults who had been advised by his/her physician not to participate in physical activity and (d) adults who had not previously participated or are currently participating in activity programs with instructors from the DVD .

Instrumentation

The instrumentation used in data collection included the Physical Activity Questionnaire for Adolescents (PAQ-A) (Kowalski, Crocker, & Donen, 2004;

Richardson D, Cavill N, Ells L, Roberts K, 2011). A Taylor 7209 electronic scale was used to measure body weight. A tension tape measure was used to measure waist circumference and hip circumference. The measure was taken two inches above the navel for waist circumference. Hip circumference was measured at the largest part of the buttock. Two binders were used to gather self-reported adherence, RPE, and support data. One binder was given to each subject with ID for self-reporting DVD-related PA recorded (a) which segments did he/she participate in, (b) how many times did he/she complete segments, (c) the intensity level based on the Children's Omni scale (Appendix 4), (d) who, if accompanied, participated alongside of subject and (e) who did he/she watch most often while exercising with the DVD. A copy of the self-report PA questionnaire can be found in Appendix 5.

The subject's family also received a support binder (Appendix 6). The care-giver or family member who provided supported completed the self-report questions in the support binder. Subjects with ID indicated if an individual exercised with them by checking all applicable boxes. The following options were available: "I am exercising: by myself, with a fitness instructor, with my mom, with my dad, with my brother, with my sister, with a helper, with a friend." Support persons indicated how they supported the subject by checking all that applied. The following options were available: "How did you support? did not assist, participated alongside for all segment, participated for some segments, watched, supported verbally, helped set up DVD, other: _____." If the support person participated, they indicated which segments and the perceived exertion level for self. Pre-addressed, stamped envelopes were included in the binder to allow for self-report PA and support data to be sent to the investigator weekly.

A specially designed adapted exercise DVD was used as a PA intervention mechanism. The DVD includes an introduction educating why exercise is important and the basic impacts on health and safety. The activity portion includes seven PA segments. Segments include warm up, line dancing, Latin dancing, kickboxing, muscle conditioning, yoga and cool down/flexibility. The warm up is 8 minutes and the cool down is 7 minutes. Other segments were 15 minutes in duration and provide advanced and modified moves to allow differences in both intensity and ability. The exercises included in the DVD were specific for adapted populations minimizing complexity of movement, providing simple cueing and including movement repetition. Exercises were explained verbally and demonstrated visually. Contraindicated exercises such as excessive neck movements and hyperflexibility were avoided in exercise selection to minimize risk (Durst, 2009). The instructors on the DVD do not have ID. The peer models were adults with Ds or ASD. The instructors and peer models complete all exercises as the exercises were being explained but the instruction is provided by the instructors without ID only. The peer models participate in the exercise to the best of their ability. The peer models did not rehearse the exercises prior to recording to capture the naturally ability of the peer models to learn and perform the movements. Each segment also includes a modified version of the exercises from an instructor in a different colored shirt. The modified exercises were low-impact exercises with simpler range of motion. At the conclusion of each segment, the DVD screen displays the Children's OMNI scale and requests the subject to record perceived exertion in their binder.

The CD given to the control group contained the audio from the exercise DVD. Subjects in the control group received pictures of the exercises but did not receive a video

version of the exercises. There was no indication from the audio CD to suggest individuals with ID were used in the development of the CD. The instructor on the audio CD was the same instructor from the DVD who did not have ID but described each exercise and provided the same motivation as with the DVD. At the end of each segment on the CD, subjects were asked to record their perceived exertion in the subject binder.

Intervention

Intervention. Interested participants contacted the researcher. The researcher determined eligibility of the potential participant (see inclusion criteria). Eligible participants were further contacted to schedule a home visit. The home visit was conducted by the primary researcher. To minimize bias, the same primary researcher conducted all home visits.

Home visit. During the home visit, the investigator reviewed the informed consent/assent with the subject with ID and the subject's guardian. The researcher also reviewed the informed consent for the guardian or any potential others (support subjects) who planned to participate alongside the subject with ID. The binders were reviewed with the subject with ID and support subjects. The binder for the subject with ID contained 12 weeks of self-report packets. Each packet contained 7 days of self-report sheets and a pre-addressed and stamped envelope. The documents for each week were color coded to clarify separation for each packet. The investigator described how to fill out the self-report PA questionnaire. The subject completed a baseline PAQ-A while the researcher was present. The researcher measured waist circumference, hip circumference, and body weight (Appendix 7). Following the measurements, the researcher would demonstrate how to find a clear area to exercise, practice running the DVD or CD, and complete an

exercise segment with the subject with ID. Subsequently, the researcher would guide the subject through completing the self-report for the exercise segment.

DVD treatment group (experimental). The researcher asked the participant where he/she would like to exercise and ask for the DVD player he/she would like to use. The researcher evaluated the space for safety and made recommendations to create a safe exercise environment. The researcher demonstrated how to operate the DVD menu and asked the participant to model how to operate the DVD menu, focusing on increasing self-efficacy in the task. The researcher and participant watched the Introduction discussing the expectation the subject can expect from regular exercise. To further increase self-efficacy, the researcher guided the participant on how to operate the DVD and provided encouragement to participate in the DVD exercises for the Warm Up, exercise segment of subject's choice and Cool Down. To do this, the researcher participated alongside the subject.

At the end of each segment, the researcher explained the Children's OMNI scale of perceived exertion and the subject was asked to evaluate how intense the segment felt by completing the self-report PA questionnaire. To record external interactions, the subject was asked to write down who, if anyone, exercised with him/her while participating in the DVD. Similarly, the subject was asked to write down who he/she watched most of the time while participating with the DVD.

Music treatment group (control). The researcher asked the subject where he/she would like to exercise and asked for the music player he/she would like to use. The researcher evaluated the space for safety and made recommendations to create a safe exercise environment. The researcher demonstrated how to operate the CD and asked the

subject to model how to turn on the music, focusing on increasing self-efficacy in the task. The researcher discussed why exercise important using the same script from the DVD. The researcher listened to the audio with the subject and showed the subject the same exercises from the DVD. A handout with pictures of the exercises was given to the subject. The researcher participated alongside the subject while listening to the CD.

At the end of each music segment, the researcher explained the Children's OMNI scale of perceived exertion and the subject was asked to evaluate how intense the segment felt by completing the self-report PA questionnaire. To record external interactions, the participant was asked to write down who, if anyone, exercised with him/her while participating.

In using the SCT as a framework, the constructs of behavioral capabilities and emotional arousal were more similar between young adults with disabilities and prepubescent children than when compared to same aged peers. With the exception of the personal factor of observational learning and environmental factor of family support, the core determinants remained consistent between the experiment and control groups. The DVD included participants with ID and college-aged instructors without ID to observe. Observational learning can be strengthened or weakened by several factors including similarity to the model being watched or how difficult the skill is. The environmental factor varied between each participant due to location and who, if anyone, had been participating alongside the participant.

Weekly contact. The researcher emailed the participants and/or guardian weekly to (a) encourage participant to reach weekly goal and (b) reminded subject and/or

guardian to mail in weekly self-report sheets by using the pre-addressed stamped envelopes provided in the binder.

During the weekly contact at the completion of the 12th week, the researcher set up a post home visit for the end of the 13th week. The subject was also informed that he/she may keep the CD/DVD and use as often as he/she would like but the subject no longer needs to record segments or send in self-report sheets. Subjects in the control group were given a copy of the DVD at the completion of the study.

Support subjects. The support binder was explained to the support subjects along with extra copies of the informed consent in case additional supports participate with the subject with ID at any point during the 12 week intervention. The support subjects were informed to send in the weekly self-report using the self-address, stamped envelopes in the binder at the end of each week.

Post home visit. Thirteen weeks after the initial home visit, a secondary home visit was conducted. During this home visit, the researcher collected body weight, waist circumference, and hip circumference as well as guided the subject and guardian through a post PAQ-A.

Data collection. The data collected were analyzed to investigate if using an exercise DVD that includes instructors who have ID, increased adherence to PA. The data were also analyzed to find out if family support has an impact on adherence to PA. The operational definition for adherence in this study was the ability to reach the recommended number of PA minutes per week (see Table 1). Since each segment of the DVD included 15 minutes of PA, the weekly minutes were added. Weekly PA minutes totaling less than 60 minutes per week were categorized as “well below PA

recommendations.” Weekly PA minutes totaling between 61 and 120 minutes per week were categorized as “below PA recommendations.” Weekly PA minutes totaling greater than 120 minutes were categorized as “meeting PA recommendations.”

Table 1. Physical activity minute recommendation classification

	Weekly Minutes	Data Representation
Well below PA recommendations	<60	1
Below PA recommendations	60-120	2
Meeting PA recommendations	>120	3

The first independent variable was the exercise DVD and audio CD. Subjects randomized into the experimental group received an exercise DVD. Subjects in the control group received a CD with the audio only from the DVD. Both the DVD and CD contained seven exercise segments and one segment educating on the importance of exercise. The segment on both the DVD and CD included background music to exercise to as well as verbal descriptions and motivation for the exercises. The DVD, unlike the CD, included visual representation of the exercises by 5-9 individuals on each segment. All individuals on the DVD were exercising simultaneously. Five of the individuals exercising do not have an ID while the remaining individuals on the DVD have been diagnosed with either Ds or ASD. The individuals with ID on the exercise DVD complete the exercises to the best of their ability demonstrating alternate ways to complete the exercises and be physically active. There is no indication from the audio CD suggesting involvement of individuals with ID in the creation of the CD or DVD.

The second independent variable was care-giver support. This independent variable was not randomized. Families were told to help as they felt best. The research was trying to understand support as a natural phenomenon. Subjects and family members

were asked to report how support was provided. Families received two different binders. Each subject with ID received a binder to self-report (Appendix 8). Statistically, the support was categorized into three groups: no support, assisting support, and participative support. The independent support variable was determined by the percentage of segments in which the subject indicated he/she exercised by himself/herself. Support was considered as participating alongside or helping the subject complete the exercises. Subjects who completed 0-25% of the PA minutes with support were categorized as mostly independent. Subjects who completed 26-50% of PA minutes with support were categorized as somewhat dependent. Subjects who completed 51-75% of PA minutes with support were categorized as somewhat independent. Subjects who completed 76-100% of PA minutes with support were categorized as mostly dependent. Categorical representation of support is described in Table 2.

Table 2. Categorical description of support

Type of support	Percent of direct support needed of mean PA minutes	Data representation
Independent	0-25%	1
Somewhat independent	26-50%	2
Somewhat dependent on direct support	51-75%	3
Dependent on direct support	76-100%	4

There were two dependent variables that were analyzed with the two independent variables. The first dependent variables was the exercise minutes. Subjects reported the exercise segments from the CD or DVD he or she completed. The warm up segment was eight minutes and the cool down segment is seven minutes. All other segments, kickboxing, Latin dance, line dance, muscle conditioning, and yoga, were 15 minutes

each. From the self-report, exercise minutes were calculated for each week. Exercise minutes for week 1, week 6, and week 12 were analyzed with the independent variables using a MANOVA. The data were categorized as nominal data.

The second dependent variable was perceived exertion. Perceived exertion is how hard an individual feel like he/she is working. The Children's Omni scale has been demonstrated as a valid tool for measuring perceived exertion in populations with ID (Stanish & Aucoin, 2007). The OMNI scale is a 1-10 scale with "0" indicating not tired at all, "2" a little tired, "6" tired, "8" really tired, and "10" very, very tired. The OMNI children's scale was printed on each self-report document. Subjects were asked verbally on the CD and DVD after each segment to circle the corresponding number in the self-report binder for how hard he/she feel at the end of the exercise segment. The self-report indicated a rate of perceived exertion for each segment completed. The average rate of perceived exertion were calculated for each week and week 1, week 6, and week 12 were analyzed with the independent variables using a MANOVA as discrete data.

Secondary exploratory data. The primary focus of the research was to investigate the experimental treatment of the exercise DVD and natural influence of support on exercise minutes and perceived exertion. Additionally, data were collected to allow for additional exploratory analysis to better understand variables that may influence PA in the indicated population. A paired-sample t test was used to assess the data for each circumference and body weight.

Secondary descriptive statistics were used to further understand which modalities were preferred. Preference was analyzed by frequency of segments completed. Additionally, frequency of the type of support was analyzed to determine how which

family member supported most often. Frequency measures were also used to determine the most common type of support between participating alongside for all segments, participating alongside for some segments, watching, supporting verbally, helping to set up DVD/CD, or other.

The American College of Sport Medicine encourages exercise prescription to follow the subsequent principles of frequency, intensity, time, and type. To explore the principles within the intervention, descriptive statistics were used to determine the average number of days per week subjects' exercise used the CD or DVD, the average perceived exertion for each type of exercise, the average weekly duration, and the frequency for each type of mode of exercise (segments).

Overall PA outside of the CD or DVD was assessed by subject recall. The subject, with guardian help, completed the Physical Activity Questionnaire (High School) (PAQ-A). Though not validated, this assessment has previously been used to measure PA in adolescents and adults with ID, specifically cerebral palsy. This assessment has been found to have a high reliability but ultimately demonstrated a low validity when compared to accelerometers for individuals with cerebral palsy in a pilot study. (White, Volfson, Faulkner, & Arbor-Nicitopoulos, 2016) The PAQ-A asks questions regarding PA that occurred in the last seven days. The subject with guardian help completed the survey prior to intervention and at the end of week 13. A paired-sample t test was used to analyze.

Data Analysis

Statistical analysis for sample size. Recent systematic reviews of exercise interventions for adults with either Ds or ASD demonstrate effect sizes ranging from

small (.38) to medium (.68) post hoc using Cohen's d (Dodd & Shields, 2005; Lang et al., 2010; Li, Chen, How, & Zhang, 2013). The large majority of studies reported a medium effect size post hoc thus a medium effect size of 0.50 (Cohen's d) or 0.06 (η^2) was used for this study to determine overall effectiveness of the intervention. A medium effect size is correlated with the magnitude or impact of the treatment whereas the likelihood of an effect is determined by statistical significance. In the disability literature, effect size is considered a more powerful reflection of significance due to small numbers in most study samples and the need to determine how much of an effect the treatment or intervention had on the subject population.

A priori, the desired sample size with a statistical power of .8, commonly used in social sciences and adherence studies, using a two-way repeated measures MANOVA with two groups is 31 total subjects with 15 subjects in the control group and 16 subjects in the experimental group (see Figure 1). The groups (experimental/control groups and subject receiving family support/subjects not receiving family support) and DVD exercise program was the independent variables. Adherence (represented by ability to meet recommended PA minutes), perceived exertion, and peer model influence (see definition of terms) were the dependent variables. GPower was used to calculate desired sample size (see Table 3) (Erdfelder, Faul, & Buchner, 1996).

Table 3. Power analysis of sample

Measure	A priori
Effect Size	.06 medium
Alpha (α)	.05
Beta (β)	.20
Power (1- β)	.80
Sample size total	34
Sample size per group	17

Quantitative analysis. All data were collected on paper and inserted into an Excel spreadsheet. Formulas were added to the Excel sheet to calculate minutes per week of activity as daily activity was entered. The Excel sheet was used in scoring the PAQ-A. Quantitative analysis of the data was completed by using IBM SPSS 24 statistical software package (SPSS, ver. 24.0, Chicago, IL, USA). The statistical significant was set to an alpha level of .05.

Descriptive analysis. Descriptive statistics were calculated to describe the experimental and control groups discrete variables (types of segments) and categorical variables (weekly PA minutes, support, PAQ-A, RPE) and continuous variables (weight, waist circumference, hip circumference). Normality of data were calculated. Characteristics of distribution to include mean, standard deviation, skewness and kurtosis were calculated and analyzed.

Aim I analysis. A two-way repeated measures MANOVA was used to assess if a mean difference occurs between the two dependent variables. The independent variable

groups included the control group (music) and the experimental group (DVD) as well as level of support. Mean differences between groups with more than two dependent variables were linearly combined to produce an overall mean using regression techniques. To compare groups considering the multiple dependent variables, the omnibus F value produced in a MANOVA was comprised of a ratio of two independent variances approximations of the same population variance. If the omnibus F value is significant, this may show differences in one or more of the dependent variables when comparing the control and experimental. To determine the magnitude of the relationship between the variables, effect size was assessed.

Aim II analysis. A linear regression was used to determine the effect of support on overall PA minutes. PA minutes through the intervention were categorized into well below PA recommendations, below PA recommendation, and meeting PA recommendations. The percentage of total PA minutes needing direct caregiver support were compared with other factors (PA intervention group, gender, pre weight, and pre PA from the self-recall survey) to determine if there was a relationship and to further investigate predictor values.

Exploratory analyses. Additional analyses were conducted to further examine and explain the effects of the intervention. Independent samples t-tests were used for the difference in weight, difference in hip circumference, difference in waist circumference, and difference in PA self-recall. Frequency of mode and frequency of type of relationship to the subject were also determined. Type of support and person observed were not analyzed after data collection. Chapter IV discusses the concern with the variables not analyzed statistically.

Ethical and Safety Considerations

Since this study included two vulnerable populations, adults with cognitive impairment and children, appropriate approval was received from the Institutional Review Board prior to the study. The participant's parent(s) or guardian(s) were questioned regarding the participant's ability to provide assent/consent. The potential participant was verbally asked to agree to participate but since he/she may not be able to provide legally valid consent, a legally authorized representative was asked to give assent to the subjects' willingness to participate in the study.

The CD/DVD included a safety precautions segment which was addressed during the initial home visit with the control group. Subjects were made aware of risks and benefits of participating in the study. In case of injury or illness, the subjects were asked to notify the researcher.

The subjects' anonymity was protected through coding of data. All data remained confidential. Subjects' data and personal information was kept on a passcoded external hard drive and will be destroyed three years after the completion of the study.

Chapter 4: Results

Introduction

Between March 2016 and July 2016 a total of 35 subjects were recruited. Four subjects, two from the control and two from the experimental group, withdrew from the study between weeks 1 and 3. The reasons for withdrawing from the study include physical injury/illness, subject's preference not to continue, and withdraw without reason. Thirty-one subjects (N = 31) completed the intervention. The variables and associated statistical tests are listed in Table 4.

Table 4. Statistical analysis for each variable

Type of Variable	Type of Variable	Measure	Analysis
Independent	Support	% of PA minutes completed with direct caregiver participation 0-25% 26-50% 51-75% 76-100%	Two-way repeated measures MANOVA Multiple regression
	Intervention group	DVD (Experimental) Music (Control)	Two-way repeated MANOVA Multiple regression
Dependent	Physical activity minutes	0-60 recorded PA minutes 61-120 recorded PA minutes >120 recorded PA minutes	Two-way repeated measures MANOVA Multiple regression
	Rate of Perceive Exertion	OMNI children's scale (1-10)	Two-way repeated measures MANOVA
Exploratory dependent variables	Weight	Pre weight	Multiple regression
		Difference in pre and post (cm)	Independent samples t-test

Hip circumference	Difference in pre and post (cm)	Independent samples t-test
Waist circumference	Difference in pre and post (cm)	Independent samples t-test
7 day PA self-recall	Difference in pre and post (1-5 scale using PAQ-A)	Multiple regression
Mode	Warm up Kickboxing Latin dance Line dance Muscle conditioning Yoga Cool down	Independent samples t-test Frequencies

Sample

Descriptive statistics were calculated for the experimental and control groups and reported in Table 6. The experimental group consisted of 11 females and 5 males for a total of 16 subjects. Similarly, the control group consisted of 10 females and 5 males. The age range for the experimental group and control group were 15-32 years of age (21.4375 ± 5.6329) and 16-33 year of age (24.40 ± 5.0681), respectively. The post hoc power analysis is compared to the a priori analysis in Table 5. The demographic and descriptive statistics in the experimental and control groups were similar and can be viewed in Table 6 as well.

Table 5: Power analysis post hoc

Measure	A priori	Post hoc	
		Intervention	Support
Effect Size	.06 medium	.40 large	.15 large
Alpha (α)	.05	.004	.270
Beta (β)	.20	.099	.539
Power (1- β)	.80	.901	.461
Sample size total	34	31	31
Sample size per group	17	16 (Experimental) 15 (Control)	16 (Experimental) 15 (Control)

Descriptive statistics indicated non-normal distribution specifically of the means of week 12 minutes (2.199) and post PA (3.569) scores as slightly leptokurtick (+2). Skewness and kurtosis were considered normal for all other anthropometric and PA measures.

Table 6. Study demographics and descriptive statistics

	Total	DVD	Music
Age (years), Mean (SD)	22.87 (5.49)	21.44 (5.63)	24.40 (5.63)
Gender			
Female	21	11	10
Male	10	5	5
Ethnicity			
Caucasian	26	13	13
African American	1		1
Native American	1	1	
Hispanic or Latino	2	1	1
Asian/Pacific Islander	1	1	
Household members			
Mother only	3	2	1
Mother and father	27	13	14
Other guardian	1	1	
Siblings in home	11	5	6
Disability			
Down syndrome	20	11	9
Autism spectrum	8	3	5
Cerebral palsy	1	1	
Microcephaly	1	1	
Mild cognitive disability	1		1

Two-way repeated measures MANOVA

Specific aim I. Determine the extent to which an at-home DVD program specifically designed for adults with intellectual disability affects physical activity adherence for adults with ID.

The RM-MANOVA was used to compare adherence between the groups and support. Adherence was measured as a percent of completed PA based on PA recommendations as described in Table 1. In this study, the categorical independent factors include the intervention (DVD or CD) and amount of direct support (see Table 2). The means for the PA minutes and RPE are presented in Table 7.

Box's Test of Equality of Covariance Matrices indicated a Box's M value of 39.56, F value of 1.09, and p value of 0.35, which was interpreted as non-significant. Using Huberty and Petoskey's (2000) suggestion of $p < .005$ was used as a guideline, the covariance matrices between groups were assumed to be equal for the purposes of the MANOVA. In multivariate analysis where variables may be correlated, Box's Test for Equality of Covariance Matrices ensure no assumption has been violated suggesting the MANOVA, specifically Wilk's Lambda is a suitable analysis.

Mauchley's Test was used to assess sphericity. RPE was not significant, $W = 0.94$, $\chi^2(2) = 1.41$, $p = 0.50$, suggesting equal variances and equal covariances. PA minutes indicated high significance $W = 0.71$, $\chi^2(2) = 7.57$, $p = .02$. This indicates a need for corrected tests with the Greenhouse-Geisser corrections ($\epsilon = 0.77$).

The significance level was $p = 0.05$ for all tests. The between-subject effect was statistically significant based on the DVD and music groups for PA minutes with a large effect size, $F(1,23) = 7.12$, $p = 0.014$, $\eta^2 = 0.236$, and for RPE, $F(1,23) = 11.95$, $p = .002$, $\eta^2 = .34$. The within-subject effect was not statistically significant based on percentage of direct support for PA minutes but had a large effect size, $F(3,23) = 0.55$, $p = 0.65$, $\eta^2 = 0.07$, and for RPE, $F(3,23) = 2.61$, $p = 0.08$, $\eta^2 = 0.25$. The interaction between intervention groups and percentage of support was not significant for either RPE, $F(2,23) = 0.68$, $p = 0.52$, $\eta^2 = 0.05$, nor PA minutes, $F(3,23) = 0.10$, $p = 0.91$, $\eta^2 = 0.01$. The within-subject effects were also investigated (see Table 8). The multivariate test demonstrates significance in time and groups. The within-subject effect was statistically significant for groups, $F(2,22) = 7.32$, $p = 0.004$, $\eta^2 = 0.40$. Support, $F(6,44) = 1.32$, $p = 0.27$, $\eta^2 = 0.15$ and the group*support interaction, $F(4,44) = 0.34$, $p = 0.85$,

$\eta_p^2 = 0.03$ were not significant. Figure 2 demonstrates the mean PA minutes by groups. Figure 3 demonstrates the mean RPE by groups during weeks 1, 6, and 12. The statistical results suggest the DVD intervention was a likely reason for an increase in both the PA minutes and RPE. The effect size suggests the DVD intervention was able to increase the PA minutes and RPE greatly, resulting in most of the group adhering to the PA recommendations developed by the ACSM and AHA. Figure 4 demonstrates the mean PA minutes by both groups and percent of support received.

Figure 2. Means of PA minutes during weeks 1, 6, and 12 with standard error bars

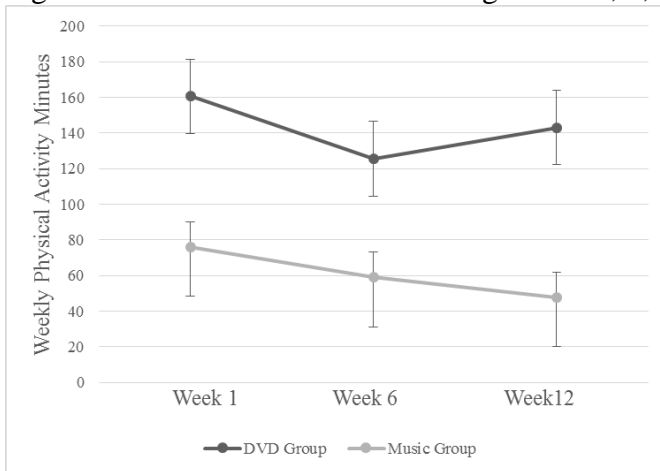


Figure 3. Means of RPE during weeks 1, 6, and 12 with standard error bars

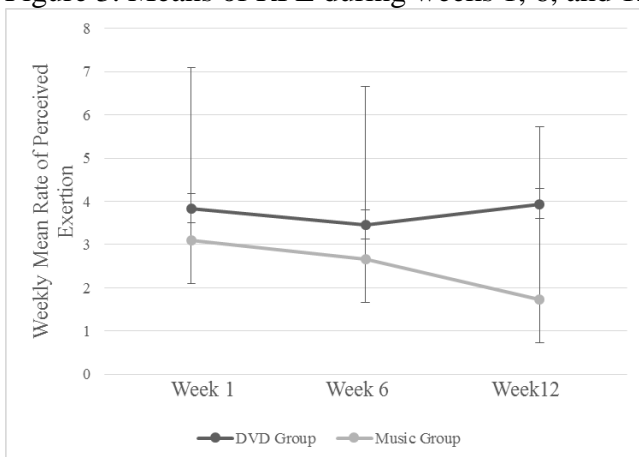


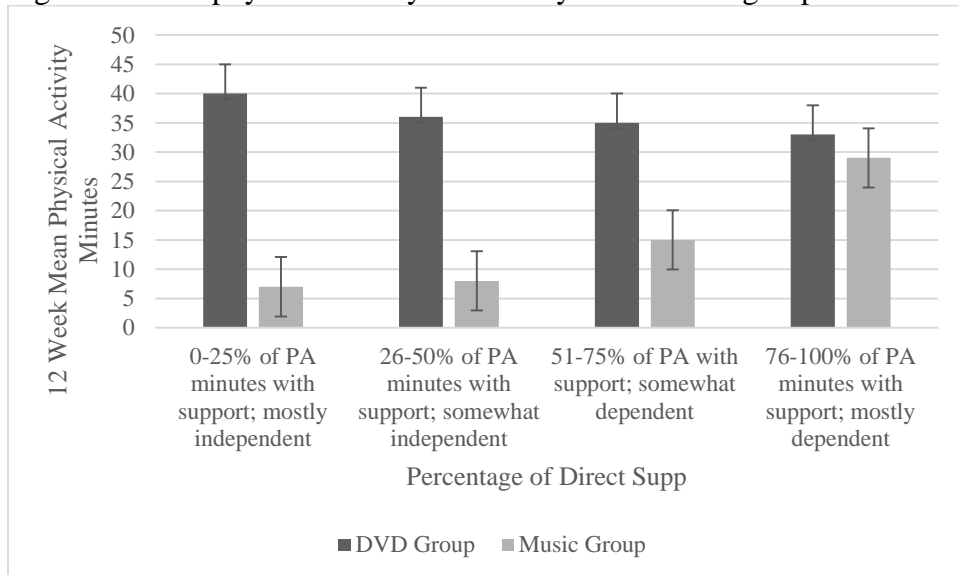
Table 7. Means of PA minutes and RPE for intervention groups

PA minutes	Week 1	Week 6	Week 12
DVD	160.63 (83.70)	125.63 (75.07)	143.12 (85.18)
Music	75.93 (54.77)	55.71 (80.55)	43.92 (109.99)
Total	119.64 (82.18)	93.00 (84.16)	96.83 (108.21)
RPE			
DVD	3.83 (1.44)	3.45 (1.31)	3.94 (1.64)
Music	3.10 (1.49)	2.66 (.86)	1.73 (1.61)
Total	3.49 (1.48)	3.08 (1.17)	2.91 (1.95)

Table 8. MANOVA analysis for direct support percentage and intervention group on PA minutes

	Λ	F	P	η_p^2	Power
Between Subjects					
Group	.601	7.316	.004	.399	.901
Support	.719	1.318	.270	.152	.461
Group*Support	.941	.341	.849	.030	.120
Within Subjects					
Time (Weeks 1, 6, 12)	.793	2.763	.032	.109	.739
Time*Group	.815	2.416	.054	.097	.673
Time*Support	.882	.485	.918	.061	.257
Time*Group*Support	.919	.487	.863	.041	.214

Figure 4. Mean physical activity minutes by intervention group and amount of support.



Multiple Linear Regression

Specific aim II. Examine the extent to which care-giver support influences physical activity adherence for adults with intellectual disability.

Because aim II is investigating the overall influence of support, a multiple linear regression is used to determine overall influence on PA. While intervention type is included in the analysis, the multiple regression determined adherence of intervention and support separately to appropriately investigate aim II. The multiple linear regression analysis was run to determine the extent to which variables predicted PA minutes. Categorical data was used to PA adherence. The categories are identified in Table 9. The variables included intervention group, gender, support, pre weight, and pre PA from the self-recall survey. These variables statistically significantly predicted PA adherence, $F(5, 24) = 5.328$, $p = .002$, $R^2 = .526$. Three of the five variables added statistically significantly to the predication including intervention group ($b = 0.348$, $t(25) = -2.32$, $p = .029$), support ($b = 0.416$, $t(25) = -2.88$, $p = .008$), and pre PA survey ($b = 0.36$, $t(25) = 2.39$, $p = .025$). The analysis suggest an increase in support has a null relationship to PA minutes. Two variables did not add statistically to the predication, pre intervention weight ($p = .597$), and gender ($p = .148$).

Table 9. Frequencies of adherence by categorical representation

	Week 1	Week 6	Week 12
Subjects whose PA minutes were well below recommendations (0-60)			
DVD	2	1	2
Music	11	14	14
Subjects whose PA minutes were below recommendations (61-120)			
DVD	2	6	2
Music	2	1	0
Subjects whose PA minutes met recommendations (>121)			
DVD	9	6	11
Music	2	0	1

Exploratory Statistics

To further understand the influence of the at-home DVD intervention and influence of the type and amount of support, additional analysis and descriptive statistics were conducted. The primary analysis does not address variables that may help to explain why there were differences in the control and experimental group. Furthermore, the exploratory analyses describe the anthropometric outcomes and choices of subjects, specifically, the type of PA as this was not controlled. Descriptive statistics of the anthropometrics and PAQ-A results may be seen in Table 10.

Table 10. Descriptive statistics of exploratory measures

	Total	DVD	Music
Anthropometrics			
Pre weight (kg)	73.0 (13.95)	76.82 (15.55)	68.92 (11.11)
Post weight (kg)	72.46 (12.99)	74.96 (14.46)	69.80 (11.07)
Pre hip circumference (cm)	111.54 (15.98)	113.13 (13.3)	109.84 (18.73)
Post hip circumference (cm)	109.63 (15.91)	108.41 (12.25)	110.93 (19.45)
Pre waist circumference (cm)	99.68 (15.14)	97.00 (13.90)	102.53 (16.35)
Post waist circumference (cm)	97.86 (15.69)	91.49 (12.86)	104.34 (16.23)
Physical Activity			
Pre PA score	1.94 (.50)	1.97 (0.47)	1.91 (0.55)
Post PA score	1.08 (.64)	1.21 (0.70)	0.95 (0.55)
Adherence	1.90 (.98)	2.63 (0.72)	1.13 (.52)

Weight. An independent samples t-test indicated that those who participated in the DVD intervention had statistically significantly greater weight loss (-2.49 ± 2.8 kg) one week after completion of the intervention compared to those who participated in the music intervention ($.8730 \pm 1.07$ kg), $t(19.312) = -4.357$, $p = 0.000$.

Waist and hip circumference. An independent samples t-test indicated that those who participated in the DVD intervention had statistically significantly greater loss of hip circumference (-5.81 ± 4.64 cm) one week after completion of the intervention compared to those who participated in the music intervention (1.08 ± 2.66 cm), $t(24.18) = -5.117$, $p = 0.000$. Similarly, there was a statistically significant change in waist circumference in DVD group (-5.74 ± 5.31 cm) and the music group (1.08 ± 2.68 cm), $t(22.505) = -5.045$, $p = 0.000$.

Physical activity recall. An independent samples t-test demonstrated the difference in overall PA activity recorded through the self-recall survey conducted at week 13 did not change significantly between the DVD group and the music group ($p = .491$).

Frequency of mode. Subjects would independently choose which PA sessions to complete. Warm up and cool down were consistent during weeks 1, 6, and 12. Figures 3, 4, and 5 present the frequencies of the selected mode. The preferred mode of PA was not significant to PA minutes during week 1 ($p = .538$), week 6 ($p = .635$), and week 12 ($p = .672$). The frequencies of mode are displayed in Figures 5, 6, and 7 for weeks 1, 6, and 12, respectively.

Type of support. The relationship to the participant was noted when support was received. Of the 54 different individuals who provided support, 50% were noted as the mother of the subject, 28% were noted as the father of the subject, 13% were siblings of the subject, 5% were friends of the subject, 2% were an aunt/uncle, 2% were therapists. There was no significant difference PA minutes depending on the type of support using a one-way ANOVA, $p = .766$, $p = .618$, $p = .811$, for weeks 1, 6, and 12, respectively.

Unused data. Upon collection of the data, subjects were asked to record who they watched during exercise. Only one subject routinely noted who he/she observed during exercise, thus this information was not analyzed.

Figure 5. Frequencies of mode of physical activity during week 1

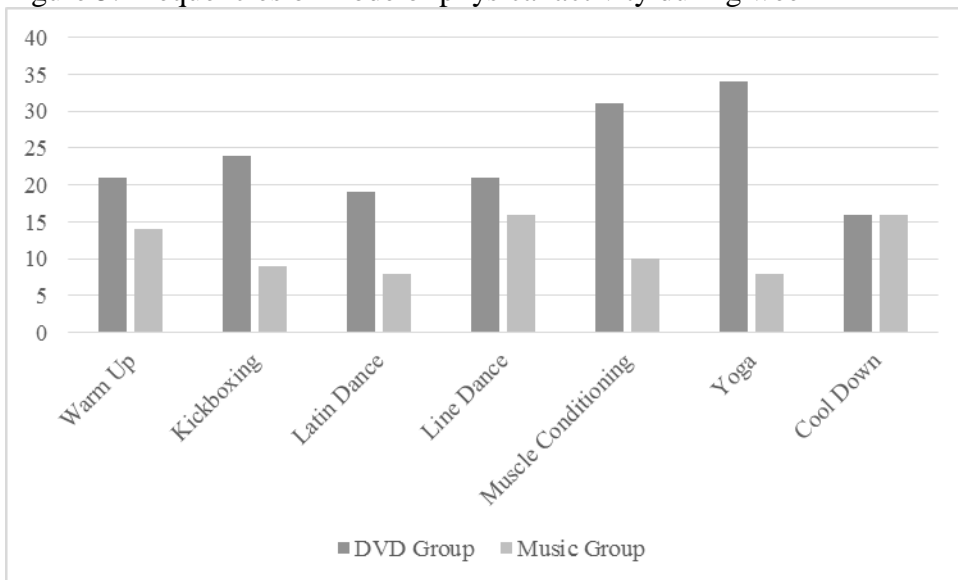


Figure 6. Frequencies of mode of physical activity during week 6

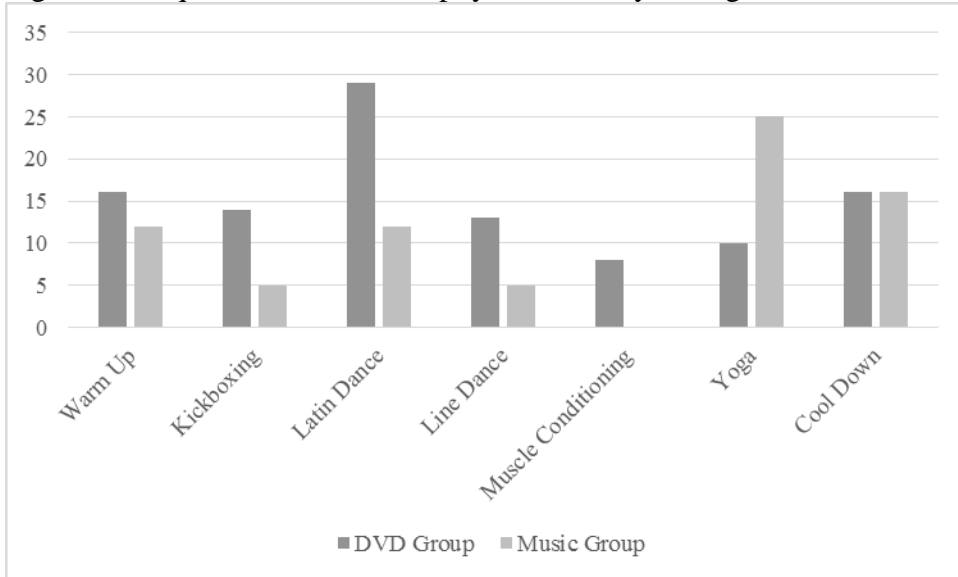
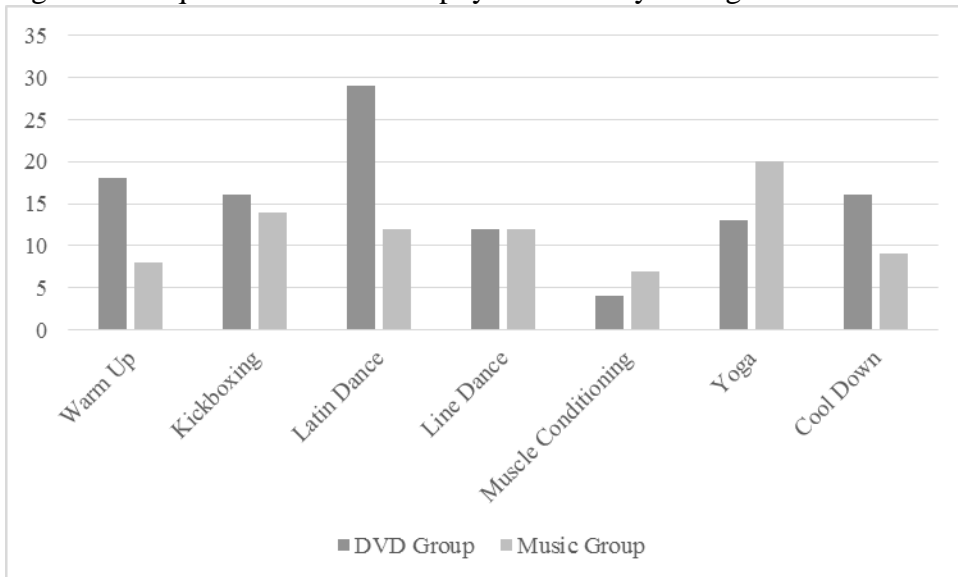


Figure 7. Frequencies of mode of physical activity during week 12



Summary of Findings

Table 11 provides a description of the research hypothesis and outcome of results. The analysis indicated significant findings between intervention group and PA minutes and RPE with a large effect size. Support between the groups on PA minutes was not

significant but did have a large effect size. RPE was not significant against the variable of support through the two-way repeated measures MANOVA.

The findings for influence of support using the multiple regression suggested support had a null effect on PA minutes when analyzing the group as a whole and not separating data by experimental and control groups.

In reviewing the results specific to aim I and aim II, the subjects in the DVD intervention group were able to adhere to the recommended amount of PA minutes needed to promote overall health. The multiple regression suggests the individuals in the DVD group received various amounts of family/caregiver support to obtain the PA minutes. The CD control group did not adhere to the recommended amount of PA minutes needed to promote health. Support to not appear to have an effect of the number PA minutes within this group.

Exploratory data suggested the intervention provided a significant loss in weight, waist circumference, and hip circumference for the DVD (experimental) group compared to the music (control group). PA recall pre and post intervention was not significant between groups. The mode of PA performed through the intervention was not significant to the number of PA minutes completed. The family role of the person providing the support was also not significant to the adherence of PA minutes.

Table 11. Summary of aims, hypothesis, and findings

Aim	Null Hypothesis	Fail to reject	Reject	Findings
I	The DVD group will not have an increase in PA minutes compared to the audio only control group.		x	The DVD intervention group had significantly more PA minutes than the music intervention group.
I	Perceived exertion from PA not be different between individuals with intellectual disability randomized to the DVD group compared to an audio only control group.		x	There was a significant difference and large effect size on RPE between the DVD and music group. The DVD group reported a higher, more intense, RPE during PA.
II	Care-giver support will not have an impact on PA adherence for adults with intellectual disability	x		Without the influence of the intervention, support had a null effect on PA minutes. The role of the person in the family or care-giver position did not influence PA minutes.

Chapter 5: Discussion

Introduction

The main objective of the study was to determine the effects of an at-home exercise program using a DVD on RPE and adherence measured through PA minutes. Secondary, the objective was to investigate the influence of support on PA minutes. Additionally, perceived exertion, weight, circumferences, mode of exercise, and overall PA during the intervention were explored. As a result of conducting the study, the investigator added to the body of knowledge in adherence and opened possibilities for future research to help improve health for individuals with ID.

Summary of Subjects

The groups were similar in gender, diversity of ethnicity, household members, PA self-recall, and disability diagnosis. The subject groups varied slightly in mean age. Fifty-four different family members participated as support for the subjects with ID. The pretest weight was higher for the DVD group (77.5 ± 14.4 kg) compared to the music group (68.9 ± 11.1 kg). This may be significant as pretest weight was demonstrated to be an influence in PA minutes at week 12. Additionally waist circumference and hip circumference were slightly different in the pretest measures.

Aim I

To measure physical exertion and PA adherence, RPE and PA minutes completed through the intervention were recorded and analyzed through a two-way repeated measures MANOVA. There was not a significant difference in RPE by intervention groups though a large effect size was observed. This suggests subjects receiving the DVD recorded a higher RPE than the subjects who participated with the music which may have

indicated a more vigorous engagement in the PA. The average RPE for the DVD group during weeks one, six, and 12 was 3.74 while the average RPE for the music group during weeks one, six, and 12 was 2.49. A “3” or “4” on the OMNI scale is classified as moderate intensity while a “2” on the scale is classified as low intensity suggesting the DVD group was able to maintain a moderate level of intensity while exercising alongside the DVD. The results suggested subjects who participated with the music intervention obtained a low intensity of exercise. It is important to note that this difference may also be attributed to poor conceptual understanding of effort.

The current recommendation for exercise is moderate activity as there are greater health benefits at the moderate level than with low intensity exercise. The difference may be due to observing individuals on the DVD. The exercisers on the DVD were performing moderate levels of exercise. By observing their exertion (ie, watching them sweat, breathing harder, etc), subjects may be able to replicate the high level movements to obtain this exertion. The DVD exercisers visibly provided motivation by smiling and demonstrating positive body language acting as a type of encouragement. On the contrary the music group did not receive such visual encouragement. Additionally, there were exercisers on the DVD with DS and ASD who were performing the exercises to the best of their abilities. This association could have provided encouragement to the subjects and movements of individuals who look and move like them.

The between-subject effect on PA minutes by groups was also statistically significant with a large effect size. Subjects receiving the DVD intervention completed an average of 161 ± 84 , 126 ± 7 , and 143 ± 85 minutes for weeks one, six, and 12

respectively. Subjects receiving the music intervention completed an average of 76 ± 55 , 56 ± 81 , and 44 ± 110 minutes during weeks one, six, and 12, respectively.

The DVD group maintained recommended levels of PA minutes throughout the intervention while the music group PA minutes decreased with each week. The maintenance of PA minutes through the duration of the intervention may be because the subjects found the exercise easier. The mean RPE was 3.49, 3.08, 2.91 for weeks one, six, and 12, respectively, for the total subject pool. An RPE of 3 suggests the intensity of exercise border-lined low to moderate intensity. The exercisers on the DVD demonstrated low to moderate activity thus the DVD group were able to observe the desired level of intensity. Additionally, the DVD intervention provided options for duration of activity, type of activity, and frequency to allow the subject to select the most appropriate and enjoyable activity based on subjects' preferences. Subjects may find watching individuals with DS or ASD easier to replicate movements compared to the music intervention who did not have an individual to observe. The exercisers in the DVD who had DS or ASD performed low intensity movements. Subjects in the music group who had more direct support may have had individuals to observe who may have demonstrated a higher level of exertion making the PA too high of an exertion to adhere. This may be an alternative explanation for the lack of statistical significance while maintaining the large effect size for RPE. Additionally, an intervention such as this fits the criteria for a technique known as peer video modeling.

The SCT construct of observation is the core foundation for peer video modeling and may be a rationale for the significance indicated in the results. Video modeling began in the 1990's as a teaching methodology but has been utilized in research more recently

(Branham, Collins, Schuster, & Kleinert, 1999; Cuvo & Klatt, 1992). In studies comparing video modeling versus static pictures, video modeling and static pictures combined with live instruction were similar in effectiveness at teaching skills related to a specific task (Alberto, Cihak, & Gama, 2005). Specific to exercise, Stanish (2001) used a video modeling protocol to compare an intervention using video-only and leader (in vivo)-video support. Seventeen adults with ID were included in an alternating treatment design in which the adults exercised in a group at their local workplace with a video specifically designed for the adults including use of participants' names. The author found that although leader support video had higher engagement the video-only group still adhered to exercise.

This study included audio (music group) and audiovisual motivators similar to Owlia et al., (1995) who found these were relevant to increasing duration of exercise minutes on ergometers. While statistical information was not provided in the study, graphical evidence and author discussions support greater time-on-task ability in both audio and audiovisual reinforcement compared to no reinforcement. There did not appear to be a difference between audio and audiovisual reinforcement, unlike the findings of the current study. Lynnes, Nichols, and Temple investigated peer video modeling for Special Olympic athletes (2009). This study provided insight into adherence in an at-home DVD exercise program and demonstrated an increase in exercise frequency by three-fold (Lynnes, Nichols, & Temple, 2009). The authors used a combination of at-home exercise with face-to-face exercise sessions to create an effective mode for increasing exercise adherence. To date, there has not been a study investigating at-home audio compared to audiovisual influence with peer modeling on PA adhere for individuals with ID with the

exception of the present study. While this study did use peer video modeling, the study design did not allow for specific analysis in this regard. Based on the results, however, peer would be a possible rationale for the differences observed. Specifically, more research should be conducted to further understand if including individuals with ID in peer video modeling may help to increase exercise adherence.

In investigating support through a repeated measure two-way MANOVA, there was not a significant difference in either RPE or PA minutes. Aim II provides a clearer view of how support impacted the adherence.

Aim II

The support variable was measured as a proportion of direct PA support received by a parent, caregiver, family member, or friend received compared to total number of PA minutes for weeks one, six, and 12. Six subjects received direct support for 0-25% of the PA minutes, four subjects received support for 26-50% of PA minutes, eight subjects received support for 51-75% of PA minutes, and 10 subjects received support 76-100% of PA minutes. A multiple linear regression was used to investigate how support influences adherence. Of the five variables were included in the regression three of the five were significant. Regression analysis indicated that the variables were moderate in its relationship to PA adherence. The beta value indicated support had greater influence than intervention group and pre intervention PA level, respectively.

Interestingly, regression indicated caregiver support had a relationship to PA adherence whereas the two-way repeated measures MANOVA, which included the independent variable of the intervention, did not indicate support had a strong influence on PA minutes. The juxtaposition of these two analyses suggest there is a need for further

research to understand the differences. One theory may be subjects in the music group typically required support to complete. When the variable of intervention groups are removed, the support may play a greater role in reporting adherence. The DVD intervention group demonstrated an increase in independent sessions from 19% during week one to 37% of sessions completed independently during week 12. The number of sessions needing direct support decreased between week one and week 12 from 44% to 31%, respectively. The music intervention group showed a consistent percent of subjects completing the sessions independently (7%) during weeks one, six, and 12. The percent of sessions completed needing direct support also decreased in the music group from 73% to 40% but the number of subjects who completed no sessions increased between week one and week 12 from 13% to 46%, respectively, suggesting those who may have required full direct support stopped exercising during the intervention.

This study only measured support through direct support of another individual such as the parent or guardian. The DVD itself may have been a form of support not initially considered. Because the DVD intervention included individuals to observe on the television, this may have provided the support needed, thus the DVD may not have needed as much direct support. The SCT suggests observational learning is more impactful if the person being observed is in an authoritative position. Because the subjects were watching the DVD on the television or computer, the exercise leaders from the DVD may have been perceived as an authoritative figure because they were on the screen. Bodde & Seo (2009) identified social support and instrumental support may be used as facilitators to encourage PA. The DVD may have been an instrumental support in this study. Further research may investigate the difference between direct social support

from family members or caregivers and the DVD as an instrumental support to better understand specifically how each form of support influences adherence.

There is not enough research to definitely identify the need for support but most research indicates a positive association between support and PA for individuals with ID. This study measured support as an individual exercising next to and providing verbal feedback or encourage to the subject. This research contradicts the need for direct support in PA in previous studies such as Stanton (1995). A possible explanation may be the type of support. The DVD group may have perceived DVD as a form of visual and auditory support thus did not need direct support from a caregiver. There is very limited research investigating the need for support in PA though research in other adaptive behaviors maintains evidence for a need for more support such as Mansell (2002). Mansell demonstrated individuals who receive more specific support such as step-by-step verbal cues had greater engagement in adaptive behaviors. Investigating the influence of different types of support such as visual, auditory, or hands-on may be instrumental in understanding what type of support creates the greatest adherence in PA or other adaptive behaviors. SCT's construct of observation may be a possible explanation. Because subjects in the DVD intervention were provided with a viewable example of how to complete the exercises thus the need for outside support is diminished. Additionally, the average age of the subjects in the DVD intervention group was 21.44 years. For individuals with ID, the transition to adulthood begins earlier than their non-disabled peers. Individuals with ID with Indiana special services programming begin transition planning to adulthood at age 14 through the educational system. When intentionally starting this process earlier, individuals are closer to more independent activities by the

time they reach legal adulthood. Thus during this time, the subjects are beginning to start more independent activities. Parents, guardians, or caregivers may be more apt to allow the individual to attempt activities or encourage independence within activities.

Individuals with ID may also be more open to trying different activities independently during this age. Individuals with ID may remain in the educational system until 22 (Title 551, 1995). A transition plan for individuals with ID may begin planning at age 14 and continue in implementation until age 22 (Cimera, Burgess, & Wiley, 2013). These individuals may be more susceptible to independent activities because many are actively engaged in programs through their educational systems to encourage independent activities of daily living. Conversely, individuals in the music intervention group were slightly older, 24.4 years of age. Individuals may be out of the educational system and be routine in the activities of daily living. Providing a new intervention may be difficult for this group without direct support. The FSF supports this rationale. During different family life cycles, or developmental stages, the family functions, or outputs, may change. If an individual is working on independent activities through the education system or vocational training typically occurring between ages 14 and 22, the family may unintentionally take a less active role in the intervention as the family members are encouraging independence (Davies & Beamish, 2009).

The implications of these findings suggest there may be modes of interventions that require less direct support. Less support and providing the individual opportunities to improve health independently may increase the likelihood and frequency of PA since it minimizes the reliance on an outside party in order for the PA to be completed. The observational construct of the SCT supports Aim I. The individuals in the DVD group

completed greater amounts of PA with a maintained RPE when a video representation of the exercises were present. The individuals may have viewed the exercisers from the DVD as authoritative figures. Bandura's SCT demonstrates individuals will be more influenced through observational learning if the individual being viewed has a place of authority. Simply by being on the television screen, the subjects may have assumed the exercisers as an authoritative figure (Hayden, 2009). The construct of self-efficacy may have influenced adherence as well. Self-efficacy was not assessed but individuals who had prior experience in the exercises through other program or physical education classes may have a higher confidence in their ability to complete the exercises from the DVD. The need for the second theoretical foundation is demonstrated through the varied support provided in completion of PA minutes. The FSF suggests different family characteristics and life cycles may influence the outputs. The output of support provided varied across PA minutes completed. The DVD group was fairly equally distributed between mostly independent, somewhat independent, somewhat dependent, and mostly dependent with similar amounts of PA minutes completed. This suggests the families provided support based on the characteristics and lifecycle of the individual. The music group required a greater amount of support while completing fewer PA minutes. While observational learning may be a critical aspect of PA adherence, direct support may be varied depending on the individual. Additionally, the implications for this research indicate support may be a complex variable needing further investigation particularly in using the FSF as a framework to understand how support and family changes interact with each other. It would be advantageous to investigate the influence of age on support, particularly looking at children before the transition period, and older adults beyond the

transition years. Additionally, support was a non-controlled element of this study. An element that would provide a more clear understanding of the influence of support would be to control specific modes of support including verbal support, peer participation support, and caregiver participation support.

Exploratory Analysis

Weight and circumferences. An independent samples t-test demonstrated significant change in weight in the DVD group compared to the music group. The subjects who participated in the DVD intervention lost an average of 2.5 ± 2.8 kg compared to the music group who gained slightly. Similarly, there were hip and waist circumferences statistically significant differences in the DVD group while there were slight increases in the music group. Reasoning for weight and circumference loss may be due to an increase in the number of minutes of PA or may be due to an increase in intensity of PA. Alternative considerations may include changes in diet unrelated to the intervention. The data suggests the DVD may be an option as a weight loss program for the studied population. As noted in chapter II, individuals with ID struggle with weight. Obesity increases the risk of co-morbidities. Thus a program that may successfully aid in weight loss in a healthy manner may be useful in further preventing chronic diseases and co-morbidities. The original aim of the study was not weight loss; therefore, there is a need for further studies to be conducted specifically investigating weight loss through additional clinical measures such as body fat analysis.

PA recall. The PAQ-A completed at the beginning of the intervention and at the conclusion of week 13 did not demonstrate a significant difference between the groups. Possibilities for the results may be that many subjects who were still in the school system

returned to school during week 13 which may have influenced the PAQ-A. Additionally, while the PAQ-A has been used as a PA recall, it is not designed nor validated for individuals with ID. Another possibility may be a stopping of the DVD and music intervention after the recording of the PA sessions subsided at the conclusion of week 12. Future research may include measuring PA recall for PA completed outside of the intervention more regularly and to determine a validated measure for PA recall for individuals with ID.

Mode. There was not a significant difference in which mode increases PA adherence. The aggregate data does not fully explain the individual data. The weekly frequencies suggest a fairly consistent choice of mode. When looking at each individual subject's data, most subjects tried all modes during week 1. By week 6 each subject had one or two preferred sessions and did not vary. The subjects would do more of his or her preferred mode. While each mode stayed fairly consistent in frequency for the subject pool overall, the subjects participated more in each of his/her preferred mode during weeks six and 12. This may be a reason for the increase in PA minutes in the DVD group. Most interventions require the subjects to follow a specific regimen for exercise. This intervention allowed the subject to choose which he/she enjoyed the most suggesting subject preference may play a role in PA adherence. Another possible explanation for an increase in frequency for specific modes may be due to transfer of learning leading to increases in self-efficacy. If the subject has learned movements similar to the movements incorporated within the DVD prior to the research study, there may be a transfer of skill. Individuals tend to feel greater self-efficacy in skills if able to transfer components of a previously learned skill to the new skill (Magill & Anderson, 2007). Greater self-efficacy

may have played a role in the choice of mode. Further research may investigate the rationale for the selection of each mode of exercise. Additionally, further research may investigate different modes of exercise such as high intensity training, circuits, Pilates, Zumba®, or other common modes to determine if there is a difference compared to the modes in this study. Additionally, weekly means of PA minutes were investigated as means. To better understand the interaction between mode and PA minutes, researchers may investigate how many segments were completed in a single exercise session as well as the average number of days of exercise each week. There may be an influence from the mode of exercise to the number of segments completed per week.

Unusable data. Subjects were asked to record who they watch most during the activity. This information was poorly recorded by all and unable to be analyzed. This particular component of the study would have helped to understand if the subjects were watching the exercisers with ID in the DVD and its influence on adherence. Eye movement monitoring may be needed to fully understand who the subjects are watching while exercising along with the DVD.

Support type was recorded but appeared to be an all-or-nothing response. Either support was not provided or the subject needed help in all aspects (verbal support, participating alongside, setting up the DVD, and helping with recording PA). This study encouraged subjects and families to support in whichever way felt natural for the family, thus support was not controlled. Further studies may choose to control the support for more consistent findings or may choose to survey to determine the family's position in the life cycle according to the FSF. Additionally, the DVD intervention may need to be

viewed as a form of support in future studies investigating the difference between in-person support and digital/video support.

Limitations

The data may not tell a complete story. Seven parents provided spontaneous, unsolicited feedback on their child's adherence. Each noted recording was difficult for their child. Their child would complete the exercise regularly and independently but did not remember to record after completion of the exercise segment. Future research may include use of an accelerometer to more accurately record intensity and activity completed.

A limitation to weight loss and PA self-recall may be due to the particular time of the intervention. The intervention began during the end of the academic school year and was completed during the summer into the beginning of the next school year. The PA self-recall increased for both groups possibly because of an increase in PA with summer activities such as swimming and bike riding. A similar study comparing the results during different seasons may provide different results. In a systematic analysis of seasonal PA changes, PA decreases during wet and cold seasons suggesting more in-door activities should be included during winter or poor weather months (Tucker and Gilliland, 2007). Assuming a similar phenomenon is true for individuals with ID, the use of the intervention during different seasons or over a year-long period may provide varying results particularly since the intervention is likely to be completed in-doors.

Future Implications

The study demonstrated a DVD intervention promoted PA, an increase in RPE, weight loss, and circumference loss for individuals with ID. Many studies have been

conducted to further understand how to increase PA for individuals with ID. As noted in Chapter II, individuals with ID must overcome many barriers to maintain PA such as “weather”, “others stop me”, “no one to participate with”, and “my health stops me” (Temple, 2007). Additionally, cost and transportation were identified as further barriers (Bodde & Seo, 2009). This intervention is unique by addressing many of the barriers. Because the DVD may be used at-home, poor weather and transportation are removed as barriers. The DVD provides a view of others, both with and without ID, to exercise along with. Because the DVD provides low and moderate intensity levels of exercise along with the short duration of each segment, even individuals with health complications may be able to safely participate in PA. By providing an at-home option, the cost of a gym membership or personal trainer is diminished. Individuals may be able to complete the PA on his/her own or may choose to use support based on the life cycle of the family.

Future Directions

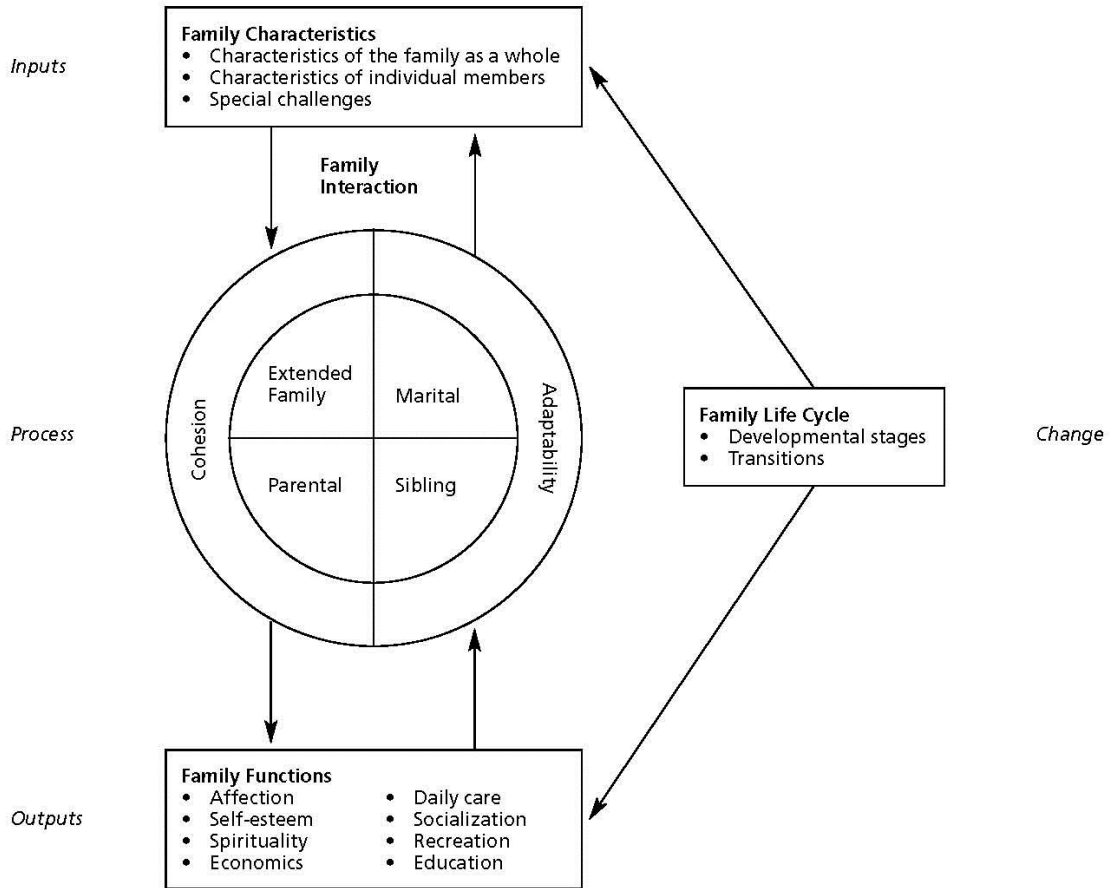
There are future studies that may be conducted to further understand adherence to PA as well as the effects of an at-home DVD program. Adherence has been an area of limited research for the general population with even fewer studies being conducted for individuals with ID. Short and long term adherence studies may help to shed more light on the topic. Dishman’s theory of adherence should continue to be used as a theoretical foundation with aims to understand how intention and motivation impacts adherence for individuals with ID. This study used a self-report measuring tool for adherence. Currently there are no validated tools for measuring short or long term adherence to PA recommendations. A base tool to understand adherence may encourage further studies in adherence research.

The use of a DVD may open several research options for this population. It would be beneficial to understand if peer modeling played a role in adherence. As noted in the limitations, use of an accelerometer would provide a clearer picture of PA levels. Heart rate during participation in the DVD PA may also be of interest for health practitioners. Additional studies may investigate the physical effects of the DVD program such as hemodynamic measures, resting values, muscular strength, muscular endurance, cardiovascular endurance, and flexibility. Psychological and behavioral effects may also be of interest such as depression, ability to focus, attitude, and memory. Type of disability, gender, age, IQ level, and participation with peers with ID may be modifiable variables to gain a clearer picture of PA through the use of DVD programs.

Pragmatically, this program provides an alternative for health care providers to encourage PA and educate on the importance of PA for individuals with ID. Families may also desire a modified exercise program for their family members with ID as provided in the intervention. This study provides a foundation for future research or application using peer-video modeling or DVD implementation in the field of health, specifically PA.

Appendices

Appendix 1: Family systems framework



Family systems framework. (From Turnbull, A.P., Summers, J.A., & Brotherson, M.J. [1984]. *Working with families with disabled members: A family systems approach* [p. 60]. Lawrence: University of Kansas, Kansas Affiliated Facility; adapted by permission.) (Wehmeyer, 2017)

Appendix 2: Recruitment flyer

At-Home Physical Activity Program for Adults with Intellectual Disability



The Study Individuals who have Down syndrome, moderate to severe Autism Spectrum disorder, or other intellectual disability may benefit from participating in an at-home workout program

Free Workout Program at Home From the privacy of your home, learn basics of staying fit through kickboxing, low impact aerobics, weight lifting, dancing, and yoga. Participants will be asked to exercise approximately 150 minutes a week.

To sign up, please contact:

Kyra Noerr
knoerr@franklincollege.edu
317-738-8112

At the completion of the study, all participants will receive an adapted exercise DVD specific to individuals with intellectual disabilities.

Note: If you participate in the study, a study number will be assigned. Your privacy will be protected.

Investigators:

Kyra Noerr, MS
IU School of Health and Rehabilitation Sciences
1481 W. 10th Street, 11H
Indianapolis, Indiana 46202

Rachel Swinford, PhD
IU School of Health and Rehabilitation Sciences
1481 W. 10th Street, 11H
Indianapolis, Indiana 46202

Appendix 3: Recruitment email

1212010195 Recruitment Email Dated 12-28-12

Hi,

You or your child has been identified as a possible participant in an at-home 12-week exercise program for adults with Down syndrome or Autism Spectrum Disorders. The exercise program is for a study that is being conducted by Kyra Noerr, doctoral student in the School of Health and Rehabilitation Sciences at IUPUI. The purpose of the study is to investigate the potential benefits of at-home workout videos designed for individuals with intellectual disability.

The 12-week exercise program will include:

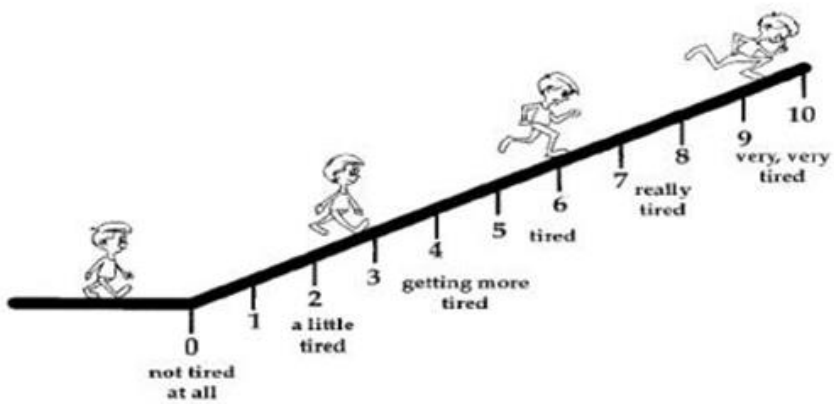
- ❖ Exercise DVD or Music CD designed for individuals with intellectual disability
- ❖ A binder to record exercise

For more information or to participate in this research, please contact Kyra Noerr at klkline@iupui.edu or call 317-738-xxxx.

Thank you,

Kyra Noerr, MS, RCEP
Doctoral candidate, IUPUI School of Health and Rehabilitation Sciences

Appendix 4: Children's OMNI rate of perceived exertion scale



Appendix 5: Physical activity questionnaire-adolescents

Physical Activity Questionnaire (High School)

Name: _____ Age: _____
 Sex: M _____ F _____ Grade: _____
 Teacher: _____

We are trying to find out about your level of physical activity from *the last 7 days* (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember:

3. There are no right and wrong answers — this is not a test.
4. Please answer all the questions as honestly and accurately as you can — this is very important.

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Mark only one circle per row.)

	No	1-2	3-4	5-6	7 times or more
Skipping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rowing/canoeing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-line skating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tag	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Walking for exercise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bicycling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jogging or running	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aerobics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Swimming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Baseball, softball	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Football	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Badminton	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Skateboarding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soccer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Street hockey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Volleyball	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Floor hockey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Basketball	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ice skating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cross-country skiing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ice hockey/ringette	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (Check one only.)

- I don't do PE
- Hardly ever
- Sometimes
- Quite often
- Always

3. In the last 7 days, what did you normally do *at lunch* (besides eating lunch)? (Check one only.)

- Sat down (talking, reading, doing schoolwork).....
- Stood around or walked around
- Ran or played a little bit
- Ran around and played quite a bit
- Ran and played hard most of the time

4. In the last 7 days, on how many days *right after school*, did you do sports, dance, or play games in which you were very active? (Check one only.)

- None
- 1 time last week
- 2 or 3 times last week
- 4 times last week
- 5 times last week

5. In the last 7 days, on how many *evenings* did you do sports, dance, or play games in which you were very active? (Check one only.)

- None
- 1 time last week
- 2 or 3 times last week
- 4 or 5 last week
- 6 or 7 times last week

6. *On the last weekend*, how many times did you do sports, dance, or play games in which you were very active? (Check one only.)

- None
- 1 time
- 2 — 3 times
- 4 — 5 times
- 6 or more times

7. Which *one* of the following describes you best for the last 7 days? Read *all five* statements before deciding on the *one* answer that describes you.

- F. All or most of my free time was spent doing things that involve little physical effort
- G. I sometimes (1 — 2 times last week) did physical things in my free time (e.g. played sports, went running, swimming, bike riding, did aerobics)
- H. I often (3 — 4 times last week) did physical things in my free time
- I. I quite often (5 — 6 times last week) did physical things in my free time
- J. I very often (7 or more times last week) did physical things in my free time

8. Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very often
Monday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tuesday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wednesday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thursday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Friday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Saturday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sunday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Were you sick last week, or did anything prevent you from doing your normal physical activities? (Check one.)

- Yes
- No

If Yes, what prevented you? _____

Reference:

The Physical Activity Questionnaire for Older Children (PAQ-C) and Adolescents (PAQ-A)

Kowalski, K., Crocker, P., & Donen, R. The Physical Activity Questionnaire for Older Children (PAQ-C) and Adolescents (PAQ-A) Manual. College of Kinesiology, University of Saskatchewan.

Kent C. Kowalski, Ph.D.
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University of Saskatchewan

Peter R. E. Crocker, Ph.D.
School of Human Kinetics
University of British Columbia

Rachel M. Donen, Bsc. Honours
College of Kinesiology
University of Saskatchewan

Appendix 6: Support binder

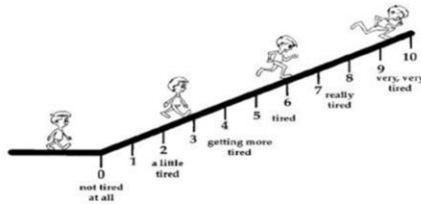


Sunday

Today's date is: _____

What is your relationship with the participant?

- Friend Fitness instructor Mom Dad
 Brother Sister Helper Other: _____



Warm Up

How many times did I do the **Warm Up workout** today?

0 1 2 3 4 5

How tired was I after the **Warm Up workout** today?

0 1 2 3 4 5 6 7 8 9 10

Kickboxing

How many times did I do the **Kickboxing workout** today?

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Sunday

How did you support?

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 Supported verbally Helped set up DVD Other: _____

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How many times did I do the **Cool Down workout** today

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How tired was I after the **Cool Down workout** today?

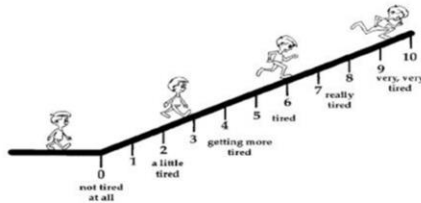
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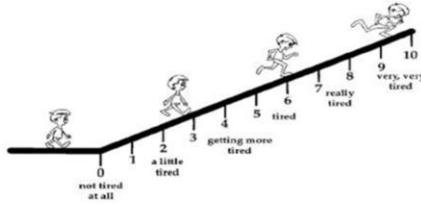
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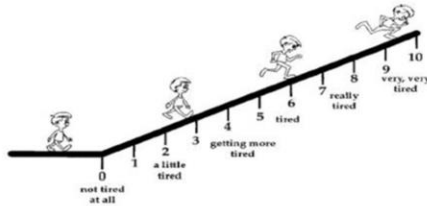
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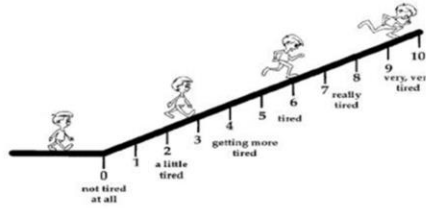
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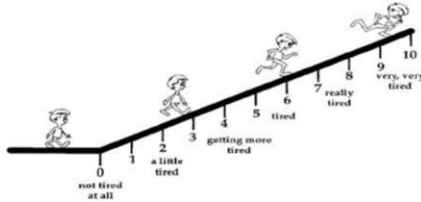
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Friday

How did you support?

- Participated along side for all segments
- Participated alongside for some segment
- Watched
- Supported verbally
- Helped set up DVD
- Other: _____

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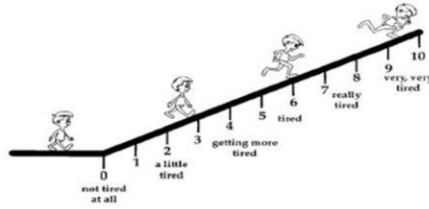
0 1 2 3 4 5 6 7 8 9 10

Saturday

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Cool Down

How many times did I do the **Cool Down workout** today

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How tired was I after the **Cool Down workout** today?

0 1 2 3 4 5 6 7 8 9 10

You are finished with this week!

Please mail this week's recording sheets using the pre-stamped envelopes provided in your binder.

If you have questions, please email Kyra Noerr.

klkline@iupui.edu.

Appendix 7: Demographic questionnaire

Subject's name:	
Subject's gender:	
Parent/Guardian's name:	
Subject's date of birth:	
Email:	
Best phone contact:	
Address:	
Start Day:	
What is the subject's ethnicity?	<input type="checkbox"/> White <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Black or African American <input type="checkbox"/> Native American or American Indian <input type="checkbox"/> Asian / Pacific Islander <input type="checkbox"/> Other: _____

<p>What is the subject's household composition? <i>Please select all.</i></p>	<input type="checkbox"/> Mother <input type="checkbox"/> Father <input type="checkbox"/> Non-married significant other <input type="checkbox"/> Siblings (How many _____) <input type="checkbox"/> Grandmother <input type="checkbox"/> Grandfather <input type="checkbox"/> Other: _____
<p>What is the subject's employment status? <i>Please select all.</i></p>	<input type="checkbox"/> Employed for wages <input type="checkbox"/> Self-employed <input type="checkbox"/> Not currently looking for work <input type="checkbox"/> Currently looking for work <input type="checkbox"/> A homemaker <input type="checkbox"/> A student <input type="checkbox"/> Military <input type="checkbox"/> Retired <input type="checkbox"/> Unable to work
<p>Please select all that apply to the subject?</p>	<input type="checkbox"/> Down syndrome <input type="checkbox"/> Autism spectrum disorder <input type="checkbox"/> Other: _____
<p>Weight: <i>Researcher will measure.</i></p>	
<p>Hip circumference: <i>Researcher will measure.</i></p>	
<p>Waist circumference: <i>Researcher will measure.</i></p>	

Questions for subject:

Do you like to exercise?	
What is your favorite type of exercise?	

Appendix 8: Subject binder

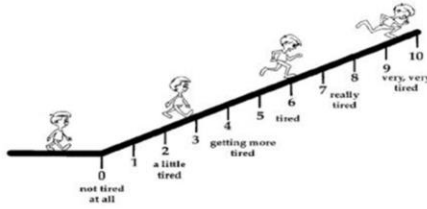


Sunday

Today's date is: _____

I am exercising:

- By myself With a fitness instructor With my mom With my dad
 With my brother With my sister With a helper With a friend



Warm Up

How many times did I do the **Warm Up workout** today

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Sunday

Who did you watch most during your exercise session?

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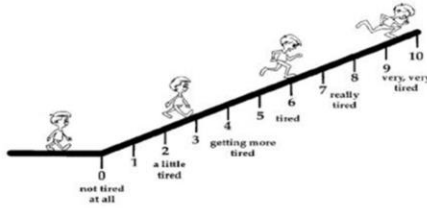
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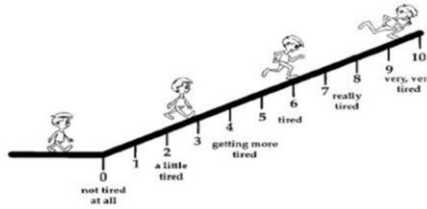
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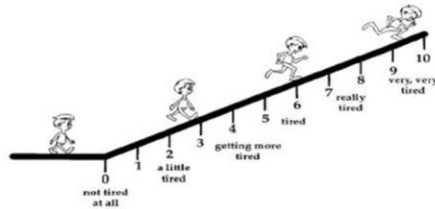
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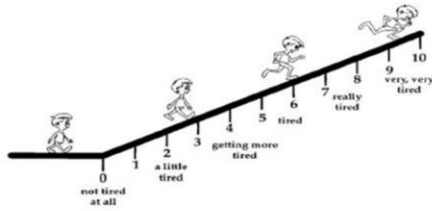
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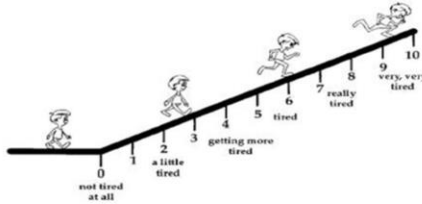
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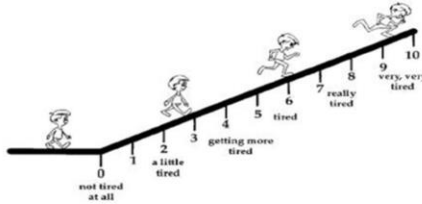
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How many times did I do the **Warm Up workout** today

0 1 2 3 4 5

How tired was I after the **Warm Up workout** today?

0 1 2 3 4 5 6 7 8 9 10

Kickboxing

How many times did I do the **Kickboxing workout** today

0 1 2 3 4 5

How tired was I after the **Kickboxing workout** today?

0 1 2 3 4 5 6 7 8 9 10

Latin Dance

How many times did I do the **Latin Dance workout** today

0 1 2 3 4 5

How tired was I after the **Latin Dance workout** today?

0 1 2 3 4 5 6 7 8 9 10

Saturday

Who did you watch most during your exercise session?

Line Dance

How many times did I do the **Line Dance workout** today

0 1 2 3 4 5

How tired was I after the **Line Dance workout** today?

0 1 2 3 4 5 6 7 8 9 10

Muscle Conditioning

How many times did I do the **Muscle Conditioning workout** today

0 1 2 3 4 5

How tired was I after the **Muscle Conditioning workout** today?

0 1 2 3 4 5 6 7 8 9 10

Yoga

How many times did I do the **Yoga workout** today

0 1 2 3 4 5

How tired was I after the **Yoga workout** today?

0 1 2 3 4 5 6 7 8 9 10

Cool Down

How many times did I do the **Cool Down workout** today

0 1 2 3 4 5

How tired was I after the **Cool Down workout** today?

0 1 2 3 4 5 6 7 8 9 10

You are finished with this week!

Please mail this week's recording sheets using the pre-stamped envelopes provided in your binder.

If you have questions, please email Kyra Noerr.

klkliner@iupui.edu

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- Wojnar, D. M., & Swanson, K. M. (2007). Phenomenology an exploration. *Journal of holistic nursing, 25*(3), 172-180.

Curriculum Vita
Kyra L. Noerr

Education

- 2012-2017 Doctor of Philosophy in Health and Rehabilitation
Science
Concentration: Functional Participation
Minor: Cardiovascular Science
Indiana University-Purdue University Indianapolis
Indianapolis, Indiana
- 2010-2012 Master of Science in Kinesiology
Clinical Exercise Science Track
Indiana University-Purdue University Indianapolis
Indianapolis, Indiana.
- 2006-2010 Bachelor of Science *with distinction* in
Physical Education with an
emphasis in Exercise Science
Indiana University-Purdue University Indianapolis
Indianapolis, Indiana.

Academic Appointments

- 2013-Present Program Director, Instructor of Exercise Science
Department of Kinesiology
Division of Health Sciences
Franklin College
Franklin, Indiana
- 2008-2013 Adjunct Faculty
Department of Kinesiology
School of Physical Education and Tourism Management
Indiana University-Purdue University Indianapolis
Indianapolis, Indiana
- 2010-2012 Graduate Assistant
Department of Kinesiology
School of Physical Education and Tourism
Management
Indiana University Purdue University Indianapolis
Indianapolis, Indiana

Certifications

2015-Present	KAATSU level 1 specialist
2013-Present	American College of Sports Medicine- Registered Clinical Exercise Physiologist®
2013-Present	American College of Sports Medicine and National Center of Health, Physical Activity and Disability- Certified Inclusive Fitness Trainer
2012-Present	American College of Sports Medicine- Clinical Exercise Physiologist
2011-2015	Zumba® Fitness Basic 1
2009-Present	American Heart Association- Healthcare Provider Certification in CPR and AED

Honors, Awards and Scholarships

Distinguished Service Award, Indiana Center for Exceptional Children, 2015.

STAR Advocate Award, Down Syndrome Indiana, 2013.

Favorite Professor IUPUI, nominated by student athletes, 2011.

William M. Plater Civic Engagement Medallion, presented to graduates who have excelled in establishing a commitment to the community through service learning, volunteerism, and community/social issue advocacy, 2010.

Outstanding Female Student Leader Award, presented to two undergraduate females who excel academically, have established strong personal skills and leadership capability, and committed to service of others, 2010.

Service Learning Assistant Scholar, 2007-2009.

Community Service Leader Scholarship, ServiceCorp Mentor, 2009.

Dr. Carl B. Sputh Scholarship, 2008.

Grants and Fellowships

2015 Technology grant at Franklin College (\$3,414) for smart classroom in Athletic Training and Exercise Science Lab (Department of Kinesiology).

2013 Technology grant at Franklin College (\$2,216) for a smart classroom in Annex lab (Department of Kinesiology).

2012-2013 National Science Foundation GK-12 Fellowship (\$41,000)
Resident Scientist for local middle school students to enhance understanding of scientific concepts by bringing research and experience into the classroom.

2012-2013 IAHPERD Advocacy Grant (\$525) Funds for development of health program titled: Everyone Exercising Everywhere: Home exercise videos targeted towards individuals with intellectual disabilities. Collaborative project with Dr. Rachel Swinford (School of Physical Education).

2012-2013 IAHPERD Advocacy Grant (\$750) Funds for continuation of health camp titled: Live Laugh Dance: A dance camp for young individuals with Down syndrome. Collaborative project with Dr. Rachel Swinford and Allison Plopper (School of Physical Education).

2012 Educational Enhancement Grant, Graduate Student Government (\$500).

2012 Pets in the Classroom (\$150) Funds obtain were used to incorporate geckos into a middle school classroom to further investigate genetics of reptiles. Collaborative project with Decatur Middle School.

Teaching Assignments

Franklin College

BIO 120, Anatomy and Physiology II (co-taught)

EXE 119, Concepts of Wellness

EXE 221, Contemporary Issues of Health

EXE 234, Introduction to Exercise Science

EXE/HSE/PED 341, Organization and Administration of Health Programs

Service learning course: Franklin College Wellness Program

EXE 375, Exercise Testing and Prescription

Service learning course: Partnering with HTS Therapy and Compass Park

Masonic Home Wellness Center

EXE 382, Motor Learning

EXE 385, Sport and Exercise Psychology

EXE 401, Research Methods in Exercise Science I

EXE 402, Research Methods in Exercise Science II

EXE 425, Exercise Prescription for Special Populations

Service learning course: Partnering with INSPIRE Franklin College

EXE 480, Fitness Internship

EXE 483, Fitness Practicum

EXE 489, Professional Development Experience

EXE 498, Professional Development Portfolio

EXE 499, Senior Competency Practicum

LA 100, New Student Leadership

PED 004, Zumba

PED 325, Introduction to Adapted Physical Education

Independent studies:

EXE 490: Arousal, Anxiety, and Stress in Athletes during Performance

EXE 470: Physical Activity for Adapted Populations

Indiana University-Purdue University Indianapolis

HPER E100, Zumba

HPER E102, Group Exercise

HPER E121, Conditioning and Weight Training

HPER P244, Performance and Teaching of Cardiovascular Fitness

HPER P246, Performance and Teaching of Cardiovascular and Resistance Training

HPER P403, Theory and Practice of Cardiovascular Exercise

HPER P410, Exercise Prescription and Programming for Individuals with Disabilities (Service Learning Co-Director)

HPER P419, Fitness Testing and Interpretation (Assistant)

Supervision

Undergraduate Research

2014-2015

Effects of foam rolling on lower body power

Effects of music on RPE and mile time

Effects of object-assisted and human-assisted PNF stretching

2015-2016

The effects of foam rolling on perceived muscle soreness

The effects of resistance training on short-term working memory

The effects of gender on hamstring flexibility in college athletes

The effects of dumbbell and kettlebell training on 1RM in high school students

Flexibility in baseball and softball college athletes after a yoga intervention

Differences in handgrip between softball, tennis, and pole fitness athletes

The effects of music on heart rate and perceived exertion (*Presented at Indiana Physiological Society state conference*)

The effects of KAATSU training on muscle size and strength

Internship Supervision

2014-2015

Fall: 1

Winter term: 8

Spring: 2

Summer: 2

2015-2016

Fall term: 3

Winter term: 15

Spring: 15

Summer: 9

2016-2017

Fall: 6

Winter 21

Spring: 12

Presentations

Ladyman, M., et al. Does a dance and activity-based intervention for the Down syndrome population affect the physical limitations associated with employment? Accepted for presentation at American Occupational Therapy Association Annual Meeting, Philadelphia, PA, March 30-April 2, 2017.

Horsley, M., **Noerr, K.**, Webb, A. A transition program at Franklin College. Indiana Center for Exceptional Children State Conference, February 23, 2015.

Swinford, R. and **Noerr, K.** Kick-off Party. Presented at National Down Syndrome Congress Convention, July 11, 2014.

Noerr, K., Sanders, G., McCullough, T., Kerr, M., Swinford, R. Mixer Mash with the Dance Council. Presented at Indiana Association for Health, Physical Education, Recreation and Dance at State Conference, Indianapolis, Indiana, October 31-November 1, 2013.

Swinford, R., **Noerr, K.**, Kerr, M. Adapted Dance: Creative Movement for All. Presented at Indiana Association for Health, Physical Education, Recreation and Dance at State Conference, Indianapolis, Indiana, October 31-November 1, 2013.

Noerr, K. Brain, Body and Biomechanics: Use Technology in PE to Teach Science. Presented at Indiana Association for Health, Physical Education, Recreation and Dance at State Conference, Indianapolis, Indiana, October 31-November 1, 2013.

Richards, K., Plopper, A., Bower, G., **Noerr, K.** Finding Money to Supplement Your Advocacy Project: Case Studies of Successful Advocacy Grantees. Presented at

Indiana Association for Health, Physical Education, Recreation and Dance at State Conference, Indianapolis, Indiana, October 31-November 1, 2013.

Swinford, R., Kerr, M., **Noerr, K.** Rhythm Activities for Teachers: Grades K-12. Presented at Indiana Association for Health, Physical Education, Recreation and Dance at State Conference, Indianapolis, Indiana, October 31-November 1, 2013.

Noerr, K., Johann, N. Lifelong Fitness: Fitness Class Design and Activities for the Geriatric Population. Presented at Indiana Association for Health, Physical Education, Recreation and Dance at State Conference, Indianapolis, Indiana, October 31-November 1, 2013.

Kerr, M., Swinford, R., **Noerr, K.** A Cross-curricular Approach to Zumba in the Classroom. Presented at Indiana Association for Health, Physical Education, Recreation and Dance at State Conference, Indianapolis, Indiana, October 31-November 1, 2013.

Swinford, R., Kerr, M., **Noerr, K.** Adapted Dance-Creative Movement for All. Presented at American Alliance of Health, Physical Education, Recreation and Dance Association and National Dance Association National Conference, Charlotte, North Carolina, April 23-27, 2013.

Swinford, R. **Kline (Noerr), K.**, Kerr, M. Rhythm Activities for Teachers-Grades K through 12. Presented at Indiana Association for Health, Physical Education, Recreation and Dance (IAHPERD) Regional Workshop, Marion, Indiana, October 19, 2012.

Kline (Noerr), K., Kerr, M. Rhythm Activities for Teachers-Grades K through 12. Presented at Indiana Association for Health, Physical Education, Recreation and Dance (IAHPERD) at Regional Workshop, Indianapolis, Indiana, October 13, 2012.

Swinford, R. **Kline (Noerr), K.**, Stanton-Nichols, K., Plopper, Allison. Adapted Dance: Findings from a Dance Program for Individuals with Down Syndrome. Presented at North American Federation of Adapted Physical Activity Conference, Birmingham, Alabama, October 11-13, 2012.

Swinford, R., **Kline (Noerr), K.** (2012) Dance Class for the 4p Children. Invited by Wolf-Hirschhorn and 4p Relation Conditions National Conference, Indianapolis, Indiana, July 21, 2012.

Kline (Noerr), K., Kerr, M. (2012) Experiential Learning: Self-efficacy of Students-Instructors in an Adapted Dance Program. Presentation accepted for American Alliance for Health, Physical Education, Recreation and Dance Association and National Dance (AAHPERD) National Conference, Boston, Massachusetts, March 13-17, 2012.

Sweeting, T., Fede, M., Langstaff, A., Swinford, R., Kerr, M., & **Kline (Noerr), K.** (2012). Dance: Composition and Choreography. Presented at American Alliance for

Health, Physical Education, Recreation and Dance Association and National Dance Association National Conference, Boston, Massachusetts, March 13-17, 2012.

Kline (Noerr), K., Swinford, R., & Kerr, M. (2011). Fitness Line Dancing. Presented at Indiana Association for Health, Physical Education, Recreation and Dance (IAHPERD) State Conference, Indianapolis, Indiana, November 11, 2011.

Kerr, M., **Kline (Noerr), K.**, & Walsh, C. (2011). Zumba Basics. Presented at Indiana Association for Health, Physical Education, Recreation and Dance (IAHPERD) State Conference, Indianapolis, Indiana, November 11, 2011.

Swinford, R., **Kline (Noerr), K.**, Kerr, M., Plopper, A., Velotta, J., Gutierrez, A. (2011). Adapted Dance: Creative Movement for All! Presented at Indiana Association for Health, Physical Education, Recreation and Dance (IAHPERD) State Conference, Indianapolis, Indiana, November 11, 2011.

Swinford, R., **Kline (Noerr), K.**, Kerr, M., Walsh, C., McCullough, T., Sanders, G. (2011). The Dance Council Presents Line Dances & Dance Mixers. Presented at Indiana Association for Health, Physical Education, Recreation and Dance (IAHPERD) State Conference, Indianapolis, Indiana, November 11, 2011.

On-Campus Presentations

Gash, J., Barton, A., Smith, R. **Noerr, K.** Engaged Learning. Parent Day Council. Franklin, IN, September 24, 2016.

Ables, C., Jimerson, J., **Noerr, K.** Teaching Diversity in the Classroom. Faculty Development Session, Franklin, IN, April 15, 2016.

Gaven, S. **Noerr, K.** Digital Fitness. Campus Wellness Presentation, Franklin, IN, April 27, 2016.

Publications

Noerr, K., Swinford, R. (2013), Cross-Curricular Education: Combining a Cultural Story and Creative Movement into Physical Education. Indiana Association of Health, Physical Education, Recreation and Dance Journal, May 2013.

Professional Organizations

American College of Sports Medicine

Clinical Exercise Physiology Association

Indiana Association of Health Physical Education, Recreation and Dance
VP Dance Council 2012-2013

North American Federation of Adapted Physical Activity

Society for Health and Physical Activity

Service to Institution

Franklin College

Selection committee for master's of athletic training students, 2015-present
Selection committee for bachelors of exercise science students, 2014-present
Academic Advising committee, 2016-2017.

IRB committee, 2014-2016.

Academic Champion, INSPIRE program, 2014-present.

Search committee for Director of Athletic Training Master's Program, 2013-2014.

Search committee for tenure-track assistant professor of exercise science, 2015-2016.

Indiana University-Purdue University Indianapolis

Search committee for Sam H. Jones scholarships, 2009-2012

Screen and Selection committee for William Plater Civic Engagement Medallion, 2011.

Service to Community

Work team for Student/University Involvement, Top 10 Coalition, 2013-present.

Live Laugh Dance Co-director for dance camp and research for persons with Down syndrome, Indianapolis, Indiana, 2011-present.

Fitness instructor, The Gathering Place, 2012-2016.

Physical activity leader, Johnson County Camp Can Do for individuals with Autism Spectrum Disorder, 2014-2015.

Line Dance and Zumba Volunteer Instructor, Indianapolis, Indiana, 2009-present.

IPS Arsenal Tech High School Strength and Conditioning Intern, Indianapolis, Indiana, 2010-2010.

JAG Program-IUPUI Service Learning Volunteer, Office of Community Service, Indiana University Purdue University, Indianapolis, Indiana, 2009-2009.

Fit for Life-IUPUI PETM and IPS Service Learning Assistant, Office of Community Service, Indiana University Purdue University Indianapolis, Indiana, 2006-2009.

Motor Activity Clinic Service Learning Volunteer, Office of Community Service, Indiana University Purdue University, Indianapolis, Indiana, 2009.

Varsity/JV/JH Cheer Coach George Washington Community School Indianapolis, Indiana, 2007-2008.

Global Youth Service Day Coordinator, Office of Community Service, Indiana University Purdue University, Indianapolis, Indiana, 2006-2007, 2008-2009.