2014

Effectiveness of Preschool Lessons for Active Youngsters (PLAY) curriculum on the gross motor development and physical activity level of preschool children

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EFFECTIVENESS OF PRESCHOOL LESSONS FOR ACTIVE YOUNGSTERS (PLAY) CURRICULUM ON THE GROSS MOTOR DEVELOPMENT AND PHYSICAL ACTIVITY LEVEL OF PRESCHOOL CHILDREN

An Abstract of a Thesis

Submitted

in Partial Fulfillment

of the Requirements for the Degree

Master of Arts

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August 2014

ABSTRACT

Presumably, energy balance can help to stabilize and ultimately reverse the rising rates of childhood obesity. Research findings generally point to a positive association between preschool children's motor skill competence and their level of physical activity. This study was conducted as part of Project PLAY (Preschool Lessons for Active Youngsters) to objectively evaluate Project PLAY curriculum in order to provide childcare centers with an outcome-based curriculum that can improve motor skill development and positively affect physical activity level

This study used a quasi-experimental, cross over design with pre-mid-post assessment of motor skills and physical activity. The study was conducted with 44 children age 3-5 years using a randomly assigned control group (n=23) and an intervention group (n=21). Upon completion of first 12-week intervention subjects were crossed over and a second 12-week intervention was offered to the control group. Physical activity (PA) levels were assessed using an ActiGraph 7164 accelerometer set at 15second intervals over five days during the time spent at the child care center, collecting a minimum of three days of data. The intervention consisted of 48 lessons delivered via 30 minutes lessons, 4 days per week for 12 weeks. The Test of Gross Motor Development (TGMD) version 2 (Ulrich, 2000) was used to assess six locomotor and six object control standard scores as well as determine a gross motor quotient (GMQ). After the first 12-week intervention a total of 23 children completed the PA assessment for mid-study results. After accounting for drop-outs, the results indicated a higher level of MVPA and VPA in the control group over the intervention group. However, the physical

activity program was effective in increasing VPA levels for the intervention group. This physical activity intervention was not effective in improving the gross motor skills of the treatment group over the control.

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has been approved as meeting the thesis requirement for the

Degree of Master of Arts

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DEDICATION

To my husband Kevin Finn without whose support and unwavering encouragement to keeping me on-track, this Thesis would not exist. I am grateful for his patience, in spite of the distractions along the way. We are first and foremost dedicated to our family and that is my greatest pride. To my children, Juliann, Ryan and Carmen whom I regard as my greatest treasures, may they always be curious about the world around them and never give up on their dreams.

ACKNOWLEDGEMENT

Thank you to my family, friends and supportive UNI colleagues over the years.
We have been through highs and lows, trials and tribulations, job demands, personal commitments, as well as the responsibilities of maintaining a home and raising kids.
To Bonnie Specker, Teresa Binkley & Julie Wermers, who were instrumental in starting this children's movement curriculum in the South Dakota Children's Study in 1998-99.
To Jinwook Chung, former UNI doctoral student, for her encouragement and dedication to scoring hours of gross motor skill videos for this study. Thank you to Sue Dahl and the staff at Community United Child Care for their unwavering support and participation in this study 2004-2006. Thanks also to Larry Hensley for his encouragement and belief in the value of this study. A huge Thank You goes out to my thesis committee team (Dr. Susan Roberts-Dobie, Dr. Rip Marston & Dr. Juliann Gassman) who help me finish this body of work that seemed so daunting and gave great feedback to keep me going.

This study was supported by CDC grant award H75-CCH723124-03

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CHAPTER 1

INTRODUCTION

The dramatic increase in the rate of childhood obesity among children in the United States has created unique challenges for parents, childcare providers, school health educators and health professionals. Particularly troubling is the rapid growth of obesity among preschool youth. In a summary report by Ogden, Carroll, Curtin, Lamb and Flegal (2010), data collected revealed that 21.2% of children aged 2 to 5 years are at or above the 85% in Body Mass Index (BMI) for age and height and of those children, 10.4% are at or above the 95% in BMI for age and height. Moreover, these percentages in early childhood have more than doubled since the 1970s. The obesity epidemic in children is not unique to the United States. According to the World Health Organization (2006), at least 20 million children under the age of 5 years of age are overweight across the world. These data do not indicate positive future health since a number of studies provide strong evidence showing that overweight and obesity during childhood is a predictor of adult overweight status (Goran, 2001; Guo, Wu, Chumlea, & Roche, 2002). In addition, comorbidities associated with overweight and obesity, namely elevated blood pressure, hyperlipidemia, type II diabetes and even psychological and orthopedic problems frequently appear in young children as in the adult population (Pinhas-Hamiel et al., 1996; Freedman, Dietz, Srinivasan & Berenson, 1999).

Health professionals warn that the morbidity and mortality associated with overweight and obesity among children will drive up the costs of health care and challenge the ability of the health care system to continue to provide effective services

today as well as in the future (Trasande & Elbel, 2012). While nutrition is an important component of obesity prevention and research there is widespread agreement that increasing physical activity, and thus balancing energy input and output is equally important. Presumably, energy balance can help to stabilize and ultimately reverse the rising rates of childhood obesity. In order to meet the expected energy expenditure the National Association of Sport and Physical Education (NASPE) recommended amounts of physical activity for early childhood are 60 minutes of structured physical activity and several hours of activity daily (2002). In particular, Reilly (2010) reports a consensus of evidence using various methods of recording that indicate physical activity levels in preschool age children in child care are typically very low with much less than 60 minutes of moderate to vigorous physical activity (MVPA) daily.

The basis for young children to acquire the fundamental motor skills required to participate in a wide variety of games and movement activities lies in part on being physically active. Fundamental motor skills are generally considered to be the building blocks for more complex and advanced motor skills, including specific sport skills, and may represent an important enabler for participation in many forms of physical activity (Payne & Isaacs, 2008). According to Payne and Isaacs (2008), fundamental motor skills consist of two important groups of motor skills: locomotor skills (e.g., running, jumping, skipping, etc.) and object-control skills (e.g., throwing, catching, kicking, etc.). Although there are various theories of motor development, the consensus is that acquiring competence in fundamental motor skills is an important factor to future participation in games, sports, and lifetime activities (Goodway, Robinson, & Crowe, 2010). While

somewhat equivocal, research findings generally point to a positive association between preschool children's motor skill competence and their level of physical activity, thus providing preliminary support for the notion that children with better-developed motor skills tend to be more physically active than children with less-developed motor skills (Fisher et al., 2005; Williams, Carter, Kibbe & Dennison, 2009). A study by Barnett, van Beurden, Morgan, Brooks and Beard (2009) indicated a positive relationship in adolescent physical activity level and childhood motor skill competency. It should be noted, however, that the magnitude of the relationship between fundamental motor skills and physical activity has generally been reported to be weak to moderate with motor skill competence explaining between 3% to 25% of the variance in physical activity (Cliff, Oakley, Smith, & McKeen, 2009). Moreover, recent findings provide evidence indicating the relationship between fundamental motor skills and physical activity may vary according to the gender of the child, with a stronger relationship existing in boys (Barnett, Ridgers & Salmon, 2014). Based on the findings in adolescents, competency in motor skill in early childhood should also have a positive effect on physical activity level.

The preschool-age (2-5 years) in children is a critical period in the development of childhood obesity (Dietz, 1997). In addition, this is the period when children are developing motor skills and coordination via motor programming in the brain (Galluhue & Osmun, 1998). Promoting physical activity at this age may play a major role in the prevention of childhood obesity and providing strong motor skills with body control to ensure successful, safe physical activity. Although young children are inherently active

and are considerably more active than adults, acquiring the motor skills needed to persist in a physically active lifestyle is a product of the interaction of both nature and nurture.

While nature refers to one's heredity, nurture consists of several environmental aspects. For instance, the environments where the child was raised, parenting, early schooling, the home, eating habits, interactions with people, and many other similar attributes impact a child's development. Some would argue that beyond the early physical growth, the predominant influence on a child's development and subsequent behavior is due to the environment (nurture; Collins, Maccoby, Steinberg, Hetherington & Bornstein, 2000). Historically, Newell (1984, 1986) supports this premise when he suggests that motor skill competency does not naturally "emerge" during early childhood; rather, motor skill competency results from many factors influencing the child's motor skill development. Results from Graham, Holt-Hale, and Parker (2001) continue to support the same premise, in order for children to learn and acquire competence in fundamental motor skills, quality interventions and effective instructional programs must be provided regularly. Therefore, physical and motor skill developments in early childhood are milestones in which noted delays can indicate adverse environmental stressors or other physical development concerns (Allen & Marotz, 1989).

According to the U. S. Department of Education (2013), the percentage of 3 to 5 year old children enrolled in full time educational centers has risen dramatically, from 39% in 1990 to 60% in 2012. This increased use of preschool education centers provides early childhood specialists with an opportunity to influence the development and behavior patterns of young children. Neither federal nor state regulations mandate

specific curricula in childcare centers, thus the programs and curricula can vary tremendously based on each center's philosophy, policies, practices, and available resources. There is a growing demand to include physical activity programs as part of the daily routine in preschool centers. For example, guidelines published by NASPE, designed to promote physical activity for children birth to five years state "all children birth to age five should engage in daily physical activity that promotes health-related fitness and movement skills" (2002, p. 2). These guidelines emphasize the importance of planned movement experiences designed to promote the development of fundamental motor skills for young children. Furthermore, the National Association for the Education of Young Children (NAEYC) standards include a recommendation for preschool children to have varied opportunities to engage in large motor experiences (2005). Additional support for the importance of increased physical activity in early childhood has increased at the national level with the launch of the *Let's Move Childcare* initiative in 2011.

Despite the calls for including opportunities for active play and motor skill development in childcare centers, local policies, resources, and capabilities of staff dictate the curricula and the extent to which movement activities are included in the program. Complicating this predicament is the fact that there are only a few comprehensive preschool-specific physical activity programs available for adoption. The existing programs vary in cost, support, equipment needs, criteria to meet physical activity recommendations and progressive child development needs. The development of Project PLAY addresses the need for an age appropriate physical activity program, easily

integrated into existing early childhood curricula, utilizing existing equipment to enhance child development and to meet physical activity recommendations.

Statement of the Problem

There was lack of outcome based motor skill development programs available to child care providers therefore, the this study was conducted to evaluate the impact of the Project PLAY (Preschool Lessons for Active Youngsters) curriculum on the gross motor development of preschool children.

In addition there was also lack of comprehensive outcome based physical activity programs for child care providers therefore, this study evaluated changes in activity level of preschool children enrolled in a preschool utilizing the Project PLAY curriculum.

Hypothesis

The hypothesis was that children who participate in the PLAY curriculum will have a greater change in gross motor skill development when compared to children with no structured program.

The secondary hypothesis was that children who participated in the PLAY curriculum would have an increased level in physical activity when compared to children without a structured physical activity program.

Significance of the Study

The purpose of the study was to objectively evaluate Project PLAY curriculum in order to provide childcare centers with an outcome-based curriculum that can improve motor skill development and positively affect physical activity level. Providing an

outcome-based program integrated with current preschool philosophy would give young children an optimal foundation for continued physical activity. Theoretically, regular physical activity can then influence the future risks of being overweight and obese as well as the additional health conditions commonly associated with being overweight.

Delimitations

The study delimited to:

1. Preschool children 3-5 years of age in full time childcare at Valley Park – Community United Childcare Center (VP-CUCCC) in Cedar Falls, IA.
2. Trained research staff administered a pre-test, and post-test assessment using the Test of Gross Motor Skills – 2 (TGMD-2).
3. Accelerometer data collection of each participant during attendance time at the child care center.
4. Trained physical activity specialist delivered the 12-week intervention four days a week.
5. Each session of 30 minutes in length included a warm-up, movement stations and closing.
6. Activity stations used specific age-appropriate equipment as indicated in TGMD-2.
7. Activity sessions took place in an empty classroom at VP-CUCCC.

Limitations

Limitations of the study include:

1. Participation of only one childcare center.
2. Demographically homogenous participant pool may hinder generalizability.
3. Variation of teacher styles and use of equipment during implementation may limit repeatability.
4. There may be researcher bias due to researcher involvement in design and implementation of research project.
5. Limited data for final analysis due to inherent challenges in childcare: child not wanting to leave friends to participate, inconsistent attendance at the center, transfer out of childcare center, insufficient assessment data.
6. Motivation and participation level may vary among participants.

Assumptions

Assumptions made for this study were:

1. Consistent implementation of the intervention with positive motivation in all sessions each week.
2. All children participate equally throughout the intervention.
3. The TGMD-2 administered in standard format providing validity and reliability of the measuring instrument.
4. Accelerometer data collection was reliable and consistent.
5. Integrity of completed compliance forms by instructor.

Definition of Terms:

BMI – Body mass index is a calculation of height in meters squared divided by mass in kilograms.

Childhood overweight – Overweight for children and adolescents is defined as BMI at or above the sex-and age-specific 95th percentile BMI cut points from the 2000 CDC Growth Charts.

Developmentally appropriate – refers to the suitability of the activity, equipment, or instruction for the present performance or ability level of the child.

Full-time childcare – attendance of equal to or greater than 6 hours daily at the childcare center or preschool center.

Fundamental Motor Skills - foundational skills that provide the building blocks for specific movements such as those found in sport, games, and dance. Examples of FMS are running, galloping, hopping, leaping, sliding, and horizontal jumping.

Locomotor skills - moving from place to place independently using FMS.

MTI ActGraph – is a single axial accelerometer device that is commonly used to measure physical activity. It utilizes a cantilevered beam sensor. Previously known as CSA accelerometer.

Obese - BMI greater than or equal to sex- and age-specific 95^{th} percentile on the 2000 CDC Growth Charts.

Object control skills – FMS that involve an object such as a ball or bean bag such as striking a stationary ball, stationary dribble, kicking, catching, overhand throwing, underhand rolling.

Overweight - BMI greater than or equal to the 85^{th} on the CDC Growth Charts.

Physical activity behavior – behavior indicators are frequency, duration and type.

Physical Activity Level (PAL) – expression of a person's daily physical activity as a number, and is used to estimate a person's total energy expenditure with the level of physical activity categorized as low, moderate or vigorous activity.

TGMD-2 - a major revision of the Test of Gross Motor Development, a norm-referenced measure used in assessment of common gross motor skills in youth.

CHAPTER 2

LITERATURE REVIEW

Prevalence of Obesity in Preschool Age Children

The U.S. Department of Health and Human Services in *Healthy People 2010* and 2020 reports (2000, 2010) have identified obesity as a top national priority. The prevalence of childhood obesity in the United States has tripled in the 20 years prior to 2002 from 5% to 15% (Hedley et al., 2004). Leading Health Indicator Updates from *Healthy People 2020* reveal that one in six children are obese accounting for 16.9% of the American child population. This trend, although slowing, continues to be a priority for the overall health of our children. This issue is so important to our nation that on February 9, 2010, President Obama signed a memorandum to form the first ever Task Force on Childhood Obesity. The goal as stated by President Obama, is "…to solve the problem of childhood obesity within a generation so that children born today will reach adulthood at a healthy weight."(White House press office, 2010)This Task Force began with the *Let's Move* campaign for schools and added the 2011 *Let's Move Child Care* Initiative, which supports a multifaceted approach to solving early childhood obesity, including improved nutrition, physical activity, infant breastfeeding, and reduced screen time.

Overweight children are much more likely to incur additional risk factors that may reduce their life expectancy. Risk factors include but are not limited to chronic diseases such as cardiovascular disease and diabetes, certain types of cancers as well as the associated complications that often accompany these diseases and a higher mortality

rate. According to the U.S. Surgeon General 2010 Report on Overweight and Obesity, type -2 diabetes, considered previously as an adult disease, has increased dramatically in children and adolescents. Moreover, an estimated 61% of overweight young people have at least one additional risk factor for heart disease, such as high cholesterol or high blood pressure (Freedman et al., 1999). The World Health Organization (2003) fact sheet has acknowledged there is a great cost of obesity to the health care systems in developed countries where it is as high as 7% of total health costs. The true costs, although predictably higher, are unknown as not all obesity-related conditions are included. The extra burden is putting stress on an already struggling healthcare system compounding the beneficial effect that prevention of obesity would have on the health of the growing global population.

Finding the period of growth that might be the earliest predictor of obesity may assist in promoting intervention programs that would work toward a decrease in the prevalence of adult obesity and a decrease in the accompanying chronic diseases. According to the World Health Organization (2006), at least 20 million children under the age of 5 years are overweight globally in 2005. The increased weight trend in early childhood provides even more impetus to find solutions as the childhood obesity problem becomes a global epidemic. In addition, overweight children have a greater risk of becoming an obese adult. For the young child aged 6-10 years, a body mass index (BMI) for age at or above the 85^{th} and 95^{th} percentiles are likely to become an obese adult at age 25 years, 55% and 69% of the time respectively.

While, children aged 3-6 years, the risk is at 36% and 52% for a body mass index (BMI) for age at or above the 85th and 95th percentiles respectively (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997).

Some researchers looking at growth and development surmise that an early onset of obesity may predict adolescent obesity trends (Lumeng, Gannon, Appugliese, Cabral & Zuckerman, 2005). Increased prevalence of overweight begins as early as 4 years old, this maybe the optimal age group to focus effective intervention (Ogden et al., 1997). However, preschool age children pose a challenge to researchers, as there is no system wide routine surveillance available. Since preschool children are not required to attend school, they are not consistently available to gather data regarding growth patterns. There is also the difficulty of a universal form of measure to determine level of overweight or obesity in this young age population. The International Obesity Task Force suggests using the standard of Body Mass Index (BMI) by means of height and weight, classified by age as the recommended universal measurement for children, (Cole, Bellizzi, Flegal & Dietz, 2000) but many studies use a range of BMI over 85th percentile and 95th percentile for overweight and obese children respectively. These parameters coincide closely with the Center for Disease Control and Prevention (2013) ranges for adults being overweight at >25 BMI and obese at > 30 BMI.

National Physical Activity Policy and Recommendations for Early Care Settings

Published evaluations of policies and practices in child care centers support the importance a providing a more active environment to increase the amount of daily MVPA (Dowda, Pate, Trost, Almeida & Sirard, 2004). According to National Center on Child Care Quality Improvement and National Association for Regulatory Administration report (2013), childcare centers vary dramatically in regulations from state to state but they are reflecting a trend to include positive indicators that permit regular outdoor physical activity and specified duration of daily physical activity. Establishing healthy habits of regular physical activity would help in obesity prevention and encourage healthy weight in children.

The National Association for Sport and Physical Education position statement regarding children birth to five years states that, “all children… should engage in daily physical activity that promotes health-related fitness and movement skills” (NASPE, 2002, p 2). The recommendations provide guidelines to assist childcare providers, parents and teachers in the enhancement and development of young children. Guidelines cover such areas as adult-child interactions that promote development of movement skills, recommended duration and frequency of structured and unstructured physical activity, development of competence in fundamental motor skills as well as indoor and outdoor areas that are safe for physical activity.

NASPE 2002 Physical Activity Guidelines for Preschoolers:

Guideline 1. Preschoolers should accumulate at least 60 minutes of structured physical activity each day.

Guideline 2. Preschoolers should engage in at least 60 minutes and up to several hours of unstructured physical activity each day, and should not be sedentary for more than 60 minutes at a time, except when sleeping.

Guideline 3. Preschoolers should be encouraged to develop competence in fundamental motor skills that will serve as the building blocks for future motor skillfulness and physical activity.

Guideline 4. Preschoolers should have access to indoor and outdoor areas that meet or exceed recommended safety standards for performing large-muscle activities.

Guideline 5. Caregivers and parents in charge of preschoolers' health and well-being are responsible for understanding the importance of physical activity and for promoting movement skills by providing opportunities for structured and unstructured physical activity.

While there is abundance of age appropriate material and information available promoting the benefits of regular physical activity, national statistics reflect little change in our young children's BMI. These statistics hold true even in rural communities where public programs must address varying demographic and economic conditions. For instance, according to the U.S. Department of Education (2010), South Carolina, Tennessee and Iowa ranked in the top fifteen in percent of rural students. While states like Illinois, New York and California rank in the lowest percent of rural students. Therefore, physical activity and childhood obesity interventions need to reflect the specific needs of not only urban settings but rural settings as well.

New assessment tools like Nutrition and Physical Activity – Self Assessment in Child Care (NAP-SACC) have become available in recent years that help provide a systematic guideline for the child care setting to promote daily MVPA. Some of the items in the NAP-SACC assessment include items like adequate space for activity, itemization

of portable equipment, specific physical activity policies and continuing education in physical activity programming.

According to the 2002 U.S. Department of Education statistics, the percentage of 3 -to 4 -year olds enrolled in childcare centers increased from 15% in the 1970's to 56% in 2001. Therefore, a majority of young children are influenced by childcare center's curricula. Curriculum in childcare centers can vary tremendously based on each center's policies and practices regarding active play. Some variations in practice of considerable note are space available for active play, the type and amount of play equipment available, policies on outdoor or indoor gym-time, appropriate physical activity curriculum, as well as staff participation and education level.

Preschool policies can dictate how often children can go outside and under what conditions such as temperature and weather indications. Availability of space and types of equipment can influence the quantity and nature of activity to which children are exposed. In addition, frequency and duration of time spent in active play are determined independently of each center. Policies for including developmental large motor curriculum into the current program also vary from center to center, governed only by suggested national and state guidelines.

For instance, in Iowa, the Iowa Department of Health Services (2005), through voluntary license, regulates the policy regarding space, equipment and activity curriculum. The policy manual specifically addresses adequate indoor and outdoor space, balance of active and quiet activities, indoor and outdoor activities and staff-initiated and child-initiated activities as well as activities, which promote both gross and fine motor

development (IDHS, 2005). Furthermore, NAEYC released recommended standards, effective September 2006. Section 2.C.04 specifically addresses the need for preschool children to have varied opportunities and to provide equipment to engage in large motor experiences. The new standards promote strategies for large motor experiences that stimulate a variety of skills, enhance sensory-motor integration, develop controlled movement, enable children with varying abilities to have similar experiences, include a range of activities from familiar to new and challenging as well as help learn physical games with rules and structure (NAEYC, 2005). Thus, defining developmental physical activity curricula is important to meet these needs and needs further research.

Physical Activity in Preschool Children

Widespread agreement in several professional fields, such as nutritionists, health professionals, medical professionals and physical education support the importance of regular physical activity to influence the risks of being overweight. Furthermore, physical activity is a factor that would reduce the many health risks commonly associated with obesity, including but not limited to cardiac health, diabetes, stroke, physical disability.

As stated earlier, there is a significant rise of preschool age children in child care settings from 15% in the 1970's to 53% in 2008 (U.S. Department of Education Statistics, 2002, 2010). This provides early childhood specialists with an opportunity to have significant influence on the behavior patterns of young children. There is a growing demand to include physical activity programs as part of the daily routine for children as evidenced by the recommendations made in *Healthy People 2010* report. Preschool-aged (3-5 years old) children are included in these recommendations since this is a critical

period in the prevention of childhood obesity (Dietz, 1997). There are currently few preschool specific physical activity programs available. Furthermore, established outcome-based curriculum is in its infancy.

Measuring Physical Activity in Early Childhood

Early studies in determining physical activity level in preschool age children relied on various direct observation instruments. Direct observation, regardless of instrument, is time and staff intensive but with the advent of technology, accelerometer use has become more widespread. A study by Noland, Danner, McFadden, DeWalt and Kotchen (1990) found a positive correlation between direct observation and the sensitivity of Caltrac accelerometer in determining physical activity with preschool age children. Noland et al. (1990) utilized a minute-to-minute correlation between direct observation and accelerometer data in a controlled setting for one-hour duration. Noland et al. (1990) also found that using accelerometers helped quantify movement in children that wiggled in their chairs or moved from one activity to another. Researchers found a strong correlation when using direct observation to validate accelerometers (Finn & Specker, 2000) thus, making a strong case for utilization in preschool age children. Further studies support the use of accelerometers as a viable means of determining physical activity level but failed to achieve consensus on cut off points for intensity. In 2003, Reilly et al. surmised that cut off points are unknown in this young age group and a potential exists to record inactivity such as when young children are being carried. Although, Reilly et al. (2003) still encouraged the use of accelerometers for measurement in early childhood, determining consistent cut off points would allow more reliable

comparisons in similar research. Research validation studies by Sirard, Trost, Dowda and Pate (2001) suggested common cut off times for ActiGraph as 400 counts per 15 seconds for MVPA and 700 counts per 15 seconds for VPA. This is further supported by Pate, Pfeiffer, Trost, Ziegler and Dowda (2004) utilizing 15 second counts correlated to Vo_2 in preschool children with ActiGraph correlated 420 counts per 15 second for MVPA and 842 counts per 15second for VPA. In another validation and calibration study of ActiGraph, correlation of MVPA and VPA was determined at 329 counts per 15 second and 726 counts per 15 second respectively (Pate, Almeida, McIver, Pfeiffer & Dowda, 2006). Placement of the accelerometer in each of these studies was on the waist of the child utilizing a pouch for the accelerometer attached to a belt.

Further studies support the use of accelerometers with similar cut points and intervals to measure the levels of physical activity in preschool age children. In a study Shen et al. (2010) used these measures to determine that a sample of Midwest preschool children spend a great amount of time in sedentary activities in the school setting. The children were not meeting the national guidelines (NASPE, 2002) suggesting that the school setting influenced activity level. Emerging research considers the age specific cut points to differentiate intensity level of physical activity by age based on earlier research by Sirard, Trost, Pfieffer, Dowda, and Pate (2005) to better capture the changes in activity level based on maturation. However, Reilly (2010) reported consistent low levels of PA and high sedentary behaviors in preschool children in child care in literature review of accelerometer, direct observation, pedometers, & heart rate monitors in 96 centers with > 1900 children. Pate, O'Neill and Mitchell (2010) also reviewed various

measures of physical activity used reporting the advantages and disadvantages of each method. Consistent reporting measures play a role in comparing research data. In reviewing 29 studies using accelerometers with preschoolers, Bornstein, Beets, Byun and McIver (2011) reported data in percent of time over total minutes of MVPA versus minutes. Bornstein et al. (2011) who suggested that care should be taken in comparison reviews since cut off points have not been standardized and varied between studies. Determining correlation of PA data using various methods, environmental factors and intervention opportunities has proven to be a challenge to researchers for this age group.

Motor Skill Development in Early Childhood

Considering that fundamental motor skill development, which occurs early in life, is a key underlying component to an active lifestyle, it seems likely that improving gross motor development could influence physical activity level, thus promoting a healthy active lifestyle in early childhood. Gross motor development is not a new topic; in fact, there are several tools available to teachers and motor development specialists to evaluate children. TGMD-2, Peabody Developmental Motor Scales, and Bruininks-Oseretsky Test of Motor Proficiency are just a few of the more common assessment tools readily available. The means of assessing children has an established standard but the way that the children are exposed to developmental physical learning is the concern in this study.

A great deal of focus in the preschool curriculum is on school readiness, especially in the areas of literacy (NAEYC, 1995). There is a progressive nature to the various areas of early childhood development with the exception of motor skill

development. For instance, teaching the alphabet before sounds or reading are examples of a typical progressive format. Finding a way to integrate the progressive philosophy of early childhood curriculum with age appropriate gross motor development proves to be a challenge for the field.

The NASPE guidelines (2002) for Active Start promote a physical activity experience that can enhance the overall physical, mental and social development of children. Among the five guidelines of Active Start for preschoolers is the recommendation that "preschoolers should develop competence in movement skills that are building blocks for more complex movement tasks" (p. 9). Developing a program that integrates the discipline areas of Physical Education and Early Childhood Education, and thus creates a common ground is the basis for the development of the *PLAY* curriculum.

Motor Skill and Physical Activity Relationship

Goodway and Branta (2003) used a quasi-experimental design for motor skill intervention that showed improvement with the intervention. Increased differences in results may be due to baseline children who showed developmental delays as compared to their same age peers. In addition, data analysis utilized raw scores and percentiles for reporting which does not take into consideration typical age development as it does when using standard score tables. The 2003 study by Woodard and King also suggests that gross motor skill performance improves when engaged in a developmental program in early childhood. Wall, Rudisill, Parish and Goodway (2004) found that a mastery climate had significant influence on improved motor skill in children who had developmental delays.

Fisher et al., (2005) in one of the more comprehensive large sample studies in the field observed a weak but positive correlation of PA with fundamental motor skill mastery. The study involved 5-6 year old children utilizing accelerometer & movement assessment battery. Accelerometers were set for 1 min epoch reported for cut points. Results of the study showed significant but weak relationship and largely with MVPA. In another study, Williams et al., (2008) examined the relationship of MS performance and PA in a large sample of preschool children found that children with higher motor development spent more time in MVPA and VPA. In addition, the changes noted were greater in 4-year old children versus 3-year old children; this suggests that gross motor development is still emerging at this early age. A smaller study of comparative value also considered the relationships between motor skill development and PA preschool children, 3-5 year olds using TGMD-2 and ActiGraph (Cliff et al., 2009). This particular study found that the relationship of MS and PA is stronger in boys than in girls of the same age. Actigraph cut points used age differentiation (Sirard et al., 2005) to determine MVPA and VPA. Results of studies are conflicting with weak to strong correlations. Furthermore, the studies utilize various tools for skill assessment and cut points in PA making comparisons across results difficult.

Early Childhood Care: Current Programs Available

There is an abundance of information promoting physical activity for young children on the internet, but there is no widely accepted research based program. The programs that are available vary greatly from printed material that is self-taught to full equipment purchase along with trainers that come to do site training. For instance,

outcome based *Active Start: Physical Activity for Children Birth to Five* (Wall et al., 2004) is the precursor to *I Am Moving, I Am Learning* program that is widely utilized in Head Start programs. Active Start encourages small bouts of activity incorporated throughout the day. The results from the intervention showed positive changes in motor skill development but was not assessed for physical activity changes. The program relies on materials easily accessible in a child care setting like scarves, make-it-your-self targets and upcycling everyday household items. The sixteen-hour training includes hands on opportunity to develop activities to use in the classroom. The training however, is not held regularly to accommodate the turnover needs of childcare.

Researchers Trost, Fees and Dzewaltowski (2008) studied an 8-week *Move and Learn* program focused on increasing PA throughout the preschool curriculum included activities in math, science, language arts and nutrition education. Findings suggest that integrating physical activity into existing curriculum is a feasible and promising strategy. Although increase of physical activity occurred in the test subjects, motor skill development was not assessed as an outcome.

Another program, *Hip Hop Jr*., is geared toward urban minority preschool programs. *Hip Hop Jr*. includes a 14-week dietary and physical activity program aimed at decreasing BMI and increasing PA. The program also addresses family education on diet and activity. Two-year follow-up results showed decreases in BMI (Fitzgibbon, Stolley, Schiffer, VanHorn & KauferChristoffel, 2005). Although results for BMI were positive, there were no measures of PA or motor skill development as part of the study. It is difficult to determine whether changes in behavior and/or diet account for BMI decrease.

In addition, the program showed no significant effect between groups of physical activity and sedentary behavior at follow-up.

Sports, Play and Active Recreation for Kids - Early Childhood (*SPARK-EC*) is an offshoot of the *SPARK* for school age children. *SPARK EC* was pilot tested in 100 Memphis, Tennessee Title 1 Early Childhood Classrooms in 1997 to 2000 and by New York City Head Start Centers in 2006 to 2007. The program is a research based physical education curriculum with many positive results relating to increased physical activity (Levin & Martin, 2002). SPARK-EC relies heavily on equipment purchases and 12-hours of on-site training. The cost of $4700 for the equipment and training can be prohibitive to most child care centers and home child care providers.

Animal Trackers is another physical activity program that is geared toward increasing physical activity in the preschool setting. The program showed promise by increasing the number of minutes of daily physical activity. Activities are encouraged in ten-minute sessions throughout the day at the child care center (Williams et al., 2009). While number of minutes of physical activity increased, there were no assessments of gross motor development or evaluation of physical activity intensity.

Project PLAY development

According to the proposal for the Centers for Disease Control and Prevention 2003 funded project, Rural Iowa Preschool Movement Startup Program (RIPMSP) included curriculum development of Project PLAY, training of child care teachers, evaluation of the *PLAY* curriculum and dissemination of the information. The first two criteria occurred during 2003 through 2005. This study 2005 through 2006 was the next

step in developing an outcome based comprehensive physical activity program for child care. Physical activity in early childhood could help lower the prevalence of childhood and adolescent overweight and obesity. Increasing time outdoors or in a gym has shown to increase overall physical activity in preschoolers (Dowda et al., 2004). Utilizing an effective and easy to use developmentally appropriate physical activity program is of particular concern for RIPMSP. Unfortunately, there currently is not a widely accepted research-based physical activity curricula available for the preschool age population. It is the aim of RIPMSP to assess childcare center needs, gather data on current preschooler activity patterns including demographics and evaluate a current curriculum for efficacy with the final goal of training and disseminating results.

The Project PLAY activity curriculum grew from a similarly designed weight bearing activity program to evaluate bone growth with calcium supplementation. The intervention was developed to determine the effects of weight bearing activity on bone development and physical activity behavior in young children. Years of experience of the researcher in leading activity programs for young children provided the foundation to design an age appropriate physically active program that included predominately weight-bearing activities. The results of the South Dakota Children's Health Study 2003 found a positive effect in bone development with the physical activity program compared to the control group (Specker & Binkley, 2003). In addition, children receiving the calcium supplement with the gross motor activity had a significant bone growth change over the placebo group with gross motor activity. Furthermore, the effects of bone growth lasted one-year post intervention with the physical activity groups as reported by Binkley and

Specker (2004). Continuing on the theory that a systematic program of physical activity can effect positive health change, the evaluation of this program may also influence motor skill development. The development of Project PLAY activity curriculum by this researcher is an effort to further fine tune an outcome based early childhood activity program. The PLAY curriculum is based on a constructivist philosophy of teacher guided but child driven exploration and discovery. Curriculum activities are semi-structured, non-competitive–success oriented, weight bearing, physically active that focuses on creative movement activities while potentially enhancing gross motor skills.

Existing preschool physical activity programs do not provide an outcome based curriculum that meets the needs of both preschool children and the teacher's early childhood philosophy of exploration. Evaluating the *Preschool Lessons for Active Youngsters* (*PLAY*) curriculum may provide childcare centers and preschool teachers with an outcome-based curriculum, thereby promoting early childhood physical activity.

CHAPTER 3

METHODS

This study was conducted as part of Project PLAY (Preschool Lessons for Active Youngsters), a sponsored program of University of Northern Iowa - Youth Fitness & Obesity Institute, to provide research and service opportunities in support of efforts to improve the health of youth in Iowa. Four area child care centers in Northeast Iowa were identified as possible study sites as they each met the minimum criteria for number of potential research participants (≥60). Following consultation with the administrator of each facility, a single childcare center was selected due to access of an indoor play area and equipment that supported the curriculum. A letter of cooperation to participate in the study was acquired from the administration of Community United Child Care (CUCC, see Appendix A.1). The CUCC had a previous relationship with University of Northern Iowa research and student teacher placement. The center served approximately 100 children ages three to five years of age. CUCC also had an open classroom available and equipment to support the activities during the treatment times. Requirements established for the protection of human subjects by the Institutional Review Board at the University of Northern Iowa were satisfied prior to recruitment of research participants (see Appendix A.2).

Participants

Eligibility of participants included preschool children 3-5 years of age and required at least 3 days of full time (≥ 6 hours) attendance at the childcare center. A letter of invitation was sent to all parents of children 3-5 years old at the selected childcare

center (see Appendix A.3). The researcher or a study representative was present at the child care center with a poster near the classroom hallway during dismissal time between 3-5 pm several days during the three weeks of recruiting to answer questions and facilitate recruitment of research participants (see Appendix A.4). Informed consent and enrollment forms were acquired from parents or guardians of the children (see Appendix A.5 & 6). Forty-four participants were recruited from the 78 eligible children enrolled at the selected child care center (56% recruitment rate). Of the 44 children enrolled there were 24 females and 20 males. Verbal assent was obtained from each child by asking the child if she or he would like to participate in a "gym-time class". Children responded in a positive manner by nodding their head or saying "yes" indicating their assent to the investigator. Teachers in the four classrooms affected at the child care center were also informed and agreed to support the study. The classroom teachers witnessed the child's assent. Enrollment from the four classrooms was not equal (15, 14, 9, 6). The four and five year olds were evenly dispersed between the two rooms with high recruitment and the three year olds were in the two lower recruitment rooms. The participant distribution by age range included: seven 5-year-olds, twenty 4-year-olds and seventeen 3-year-olds (N=44). Children were randomly assigned to a 12 week physical activity program (n=21) conducted four days per week by a master teacher in three morning classes with no more than eight students per class. The control group (n=23) during this time, participated in regular classroom activities.

Study Design

This study used a quasi-experimental, cross over with pre-mid-post intervention design using a control group and an intervention group. Upon completion of first 12 week intervention subjects were crossed over and a second 12-week intervention occurred. The intervention consisted of 48 lessons delivered via 30 minutes lessons, 4 days per week for 12 weeks. Enrolled participants were randomly assigned to a treatment group (n=21) or control group (n=23). Children in the treatment group participated at designated times in the intervention (*PLAY*) program. A master instructor delivered "planned-play" experiences in an environment (open space and equipment) conducive to active play. Children in the control group participated in the traditional program of free play during the same time, according to childcare center schedule. Study personnel performed assessments prior to the implementation of the intervention, at the end of the first twelve-weeks of intervention and upon completion of the second intervention. Evaluation of compliance with the intervention used direct observation of teaching content and participant attendance forms.

Physical Activity Assessment.

Physical activity (PA) levels were assessed using an accelerometer over five days during the time spent at the child care center, collecting a minimum of three days of data. Accelerometers have become a valid means of assessing physical activity levels in young children with the adaptation of utilizing 15-second epoch to accommodate children's short bursts of energy (Pate et al., 2006; Sirard et al., 2005). Assessments were

conducted pre-intervention, mid-point (end of first twelve-week session) and post intervention (end of second twelve-week session). The study used an Actigraph 7164 (MTI Health Services, Fort Walton Beach, Florida) accelerometer, a single axial device that samples movement at 30 Hz from 0.5 to 1.5 G-forces. This small (2" x 1.5" x 0.6") monitor was placed in a pouch with a clip attached to a child-sized belt worn on the waist with the monitor positioned at the curve of the back. This placement was used to prevent interference by the child thus providing consistency in acquiring data. Collection of accelerometer data occurred over five days, during the time that the child was at the child-care center. Accelerometer data was acquired prior to starting the intervention and repeated after each 12-week session. Each classroom teacher involved was familiarized with the protocol placement of the belts. The classroom teachers were instrumental in placement of the belt upon the child's arrival at school as well as removal at dismissal. Post-assessment of PA followed the same protocol within one week after the intervention program was completed.

Accelerometers are programmed to record movement into 15-second intervals to determine amount of time involved in MVPA using predetermined fixed cut-off points. Three days of activity counts for the subject file were used for the child to be included in the analysis. The total time engaged in MVPA and VPA was found using 400 and 700 counts for every 15-second interval as the criterion cut-off score as suggested by Sirard et al. (2005). Fifteen-second intervals were totaled covering the hours of 8am-5pm and divided by four to calculate total minutes of MVPA and VPA by day. To be included in

the study, minimum amount of wear time per day was six hours. Participant with less than 6 hours per day for a minimum of 3 days were removed from the study data.

Motor Skill Assessment.

The Test of Gross Motor Development (TGMD) version 2 (Ulrich, 2000) was used to assess six locomotor and six object control standard scores as well as determine a gross motor quotient (GMQ). Locomotor, object control, standard scores, and gross motor quotient (GMQ) were determined pre- and post-intervention in all subjects The TGMD-2 assesses the process of motor skill performance rather than the outcome or product of the performance, has been widely used for assessing fundamental motor skill development in youth children, and has acceptable reliability and validity (Ulrich, 2000). The resultant measures were used to calculate standard scores for locomotor and object control subscales as well as determine a gross motor quotient (GMQ). The locomotor skills consisted of running, skipping, hopping, leaping, galloping, horizontal jumping and sliding. The object control skills consisted of striking, dribbling, catching, kicking, overhead throw and underhand roll.

The investigator, with the help of research assistants, administered the testing using a rotation of two to three children performing the skills in two trials while the session was videotaped for subsequent scoring. These tests were conducted in a separate area of the child development center with only the study participant (and possibly the test administrator) pictured in the camera lens. Only study investigators to score the tests viewed the recordings. The skills were scored using the performance criteria and raw scores recorded on the standard scoring sheet for two trials. One researcher trained in

these movements performed all of the scoring at the end of the study. Standard scores were determined using age at the time of testing and sum of the six raw scores. The GMQ was calculated using the sum of standard scores and an assigned value that is provided in the test manual. The researcher conducted all pre- and post- tests in the same room for child familiarity and continuity. Protocol established in the TGMD-2 manual was followed to increase repeatability.

Each of the 12 skills (6 Locomotor and 6 Object control) was scored using the performance criteria described in the test manual (Ulrich, 2000). For example, if a child demonstrated the specified performance criteria for the skill, a "1" was recorded for that trial. Additionally, if the performance criteria were not present, a "0" was recorded. A single research assistant trained in evaluating these movement skills performed all of the scoring at the conclusion of the study. Skill raw scores were tabulated with a possible range of 0-48 in each subset of Locomotor and Object Control. Raw scores were then calculated on the scoring sheet for each of the two trials. Standard scores were calculated for locomotor and object control skills in accordance with TGMD-2 test procedures using age at the time of testing and sum of the six raw scores. The GMQ was calculated using the sum of standard scores and an assigned value that is provided in the test manual (Ulrich, 2000).

Data Analysis

Data were entered into an Excel spreadsheet and imported into SPSS-Version 11 software. Descriptive statistics were calculated for each of the dependent variables. The statistical tests were selected to answer the following study questions:

- Are there group differences in physical activity at baseline?
- Does the treatment result in greater physical activity levels after intervention?
- Does the treatment group have accelerated changes in gross motor development?
- Is there a correlation between physical activity level and gross motor development?

To test group differences at baseline an Analysis of Variance (ANOVA) was used on all children with initial PA assessment scores. The effect of treatment on PA levels was tested using an ANOVA with repeated measures on children with initial and mid-study scores of MVPA and VPA. To test the effect of treatment on gross motor development, an ANOVA with repeated measures was used on children with initial and mid-study scores of GMQ, standard object control, and locomotor scores. Non-significant interactions are tested for simple effects. Paired t-test was used to determine differences within groups and independent t-tests used between groups. Pearson-product correlations were calculated to ascertain the relationship between the physical activity measures and the fundamental motor skills. Statistical significance was set at $p<.05$.

CHAPTER 4

RESULTS

While 44 children consented to participate, 34 children actually completed baseline assessments and were eligible to continue. Of the 34 children with baseline, 23 completed mid-study data collection. The ten lost between consent and baseline were due to three children refused to wear the motion sensor, five children transferred to another center, and two had malfunction of the motion sensor. Of the nine lost between baseline and mid-study one refused final assessments, two transferred to another center, and two were absent the week of final assessments, four children had poor compliance (<75% attendance) in activity program and one accelerometer malfunctioned. Therefore, 23 children completed both pre- and mid-study PA testing with sufficient data to be included in the analyses. Motor skill assessments were complete for 32 children at baseline and mid-study. Additional analysis for post study, second 12-week session, was not completed due to significant loss of comparison subjects prior to final assessments (7 treatment, 5 control).

Physical Activity

Baseline results of randomized subjects showed no significant differences between treatment and control groups in levels of MVPA p=0.16 and VPA p=0.37 (see Table 1). In the intervention group (n=12), mean (SD) MVPA increased 51.7 (23.7) to 59.8 (18.2) minutes while the control (n=11) decreased 75.1 (20.9) to 62.7 (21.3) minutes, however neither change was significant (see Table 2). Mean (SD) VPA increased significantly for the intervention group 23.7 (12.1) to 29.9 (12.4) minutes. (see

Table 3) The control group decreased VPA from 35.5 (10.0) to 29.7 (12.1) minutes, however the results of paired t-test were non-significant. As to be expected there was a significant interaction for minutes of MVPA [F= 5.424 (1, 21), p=0.03] and VPA [F= 6.372 (1, 21), p=0.02] between tests and groups (Table 2). Of note, the significance between groups was found in mid-study results but not at baseline. Group difference found in recalculation of MVP, but not in baseline as the more active children in the intervention group dropped out and more sedentary dropped out of control group.

Table 1

Baseline Physical Activity

	Group	*N*	Mean	Standard Deviation	p-Value
MVPA (min) Baseline	Intervention	18	55.3	22.4	0.16
	Control	16	66.9	25.0	
VPA (min) Baseline	Intervention	18	27.7	11.6	0.37
	Control	16	31.1	13.3	

Note. Group differences were non-significant. Results based on one day of accelerometer data collection.

Table 2

Descriptive Statistics MVPA

	Group	N	Mean	Standard Deviation	p-Value
MVPA (min) Pre-Study	Intervention	11	51..7	23.7	0.02
	Control	12	75.1*	20.9	
MVPA (min) Mid-Study (1^{st} 12weeks)	Intervention	11	59.8	18.2	0.73
	Control	12	62.7	21.3	

Note. Mean MVPA does not match Baseline because mean is calculated only on participants with follow-up data.

Table 3

Descriptive Statistics VPA

	Group	N	Mean	Standard Deviation	p-Value
VPA (min) Pre-Study	Intervention	11	23.7	12.1	0.018
	Control	12	35.5**	10.0	
VPA (min) Mid-Study (1^{st} 12weeks)	Intervention	11	29.9*	12.4	0.97 (0.047*)
	Control	12	29.7	12.1	

Note. *Within treatment groupsignifican difference pre-mid study. **Group difference

Motor Skill

Thirty two children (15 intervention and 17 control) completed the pre- and mid-study-motor skill assessments. There was no significant interaction between group and test in any of the gross motor standard scores. Table 4 illustrates the Standard Locomotor Scores, non-significant simple main effect between groups (p=0.17). In addition, there were no effect of time on this variable (p=0.20). Table 5 illustrates the Standard Object Control scores, there were no significance between groups (p=0.14) or time (p=0.17). No significant main effect of group (p = 0.10) or test (p=0.70) was evident on Gross Motor Quotient. (see Table 6). There was a trend (p=0.08) for increasing gross motor quotients for both groups over the 12 week period. Indicating that with this group there was little effect than would otherwise occur in normal maturation.

Table 4

TGMD-2 Locomotor Standard Scores

	Group	N	Mean	Standard Deviation	p-Value
Locomotor Standard 1 Pre-study	Intervention	15	6.07	2.22	-
	Control	17	7.06	1.60	
	Combined	32	6.59	1.95	0.17
Locomotor Standard 2 Mid-study (1st 12weeks)	Intervention	15	6.53	3.02	-
	Control	12	7.65	2.60	
	Combined	32	7.13	2.81	0.20

Table 5

TGMD-2 Object Control Standard Scores

	Group	N	Mean	Standard Deviation	p-Value
Object Control Standard 1 Pre-study	Intervention	15	6.4	2.23	-
	Control	16	7.13	1.78	
	Combined	32	6.77	2.02	0.14
Object Control Standard 2 Mid-study (1st 12weeks)	Intervention	15	6.87	2.20	-
	Control	16	7.94	2.11	
	Combined	32	7.42	2.19	0.17

Table 6

TGMD-2 Gross Motor Quotient

	Group	N	Mean	Standard Deviation	p-Value
GMQ Pre-study	Intervention	15	77.40	11.67	-
	Control	16	82.75	7.78	
	Combined	31	80.16	10.06	0.10
GMQ Mid-Study (1st 12weeks)	Intervention	15	80.20	13.97	-
	Control	16	87.06	11.42	
	Combined	31	83.74	12.98	0.08

CHAPTER 5

DISCUSSION

Physical Educators have long supported the value of physical activity and motor skill development in childhood but most of the programs available have targeted school age children. In fact, the *Let's Move* 2010 campaign began with school age children. In the past, programs for preschool children were primarily social gatherings for free-play during the day and not readily accessible to an increasing population of working mothers. Only in more recent years has there been increased awareness and national emphasis put on early childhood physical activity in the child care setting with the *Let's Move Child Care* initiative (2011). This may largely be due to the fact that the percentage of 3-5 year olds in preprimary care has risen from 32% in 1980 to 59% in 2011 (U.S. Department of Education, 2013) creating a growing need for child care programs. Compounding the matter is the rise in early childhood overweight from 5.7% in 1994 to 13.9% in 2004 (Ogden, Carroll, Kit & Flegal, 2014; Ogden et al., 1997). It has become evident that over the past 20 years more children are in child care do not get the physical activity level recommended by NAPSE (Reilly, 2010). Therefore, early childhood education should embrace physical activity and motor development in a manner that is consistent with national guidelines.

Limitations

One of the crucial challenges when studying children in child care is variance of attendance. Children do not arrive at consistent times daily nor do they depart at consistent times. This results in some children missing the treatment due to late arrivals,

not having enough accelerometer data or not being available for assessments. In addition, young children can be non-compliant in participating in the intervention or assessments. These variables can confound results with loss of subjects during the study period. In addition to those challenges while CUCC was a convenient site at which to collect data it's established relationship with the research team further complicated the data collection. In this particular study, several CUCC teachers were trained in the spring of 2004 to deliver the Project PLAY curriculum. Previously trained teachers leading daily activities from the PLAY curriculum in a gym setting for children for both the treatment and control groups may have may have confounded the results, as control children may have had more exposure to structured activities promoting motor skill development and increasing physical activity than children in a setting without trained teachers.

Implications for Early Child Care Settings

Loss of subjects from the treatment group (7 children) and control group (8 children) in the PA comparison analyses might have confounded the results. For instance at baseline PA differences between groups was non-significant, after accounting for drop out the baseline MVPA at mid-study was significantly higher in the control group over the treatment group. This change would indicate that the subjects lost were active children. The trend to increase the gross motor quotient over time (combining the groups) may also suggest that this particular style of intervention, if duration increased, may have some effect on the development of gross motor skills over natural development or the reactive effects of testing.

Additionally, the first 12 week program was conducted during the late fall and early winter months (October – December 2005-06) in East Central Iowa. The change to winter weather limited free play time outdoors during the mid-study testing period and may have influenced the PA levels of the control group even with access to a gym. Child behavior outside has been established as a positive factor in physical activity in the child care setting (Finn, Johannsen & Specker, 2002; Gunter, Rice, Ward & Trost, 2012). Although the physical activity intervention was not effective in improving the gross motor skills of the treatment group over the control this may be indicative of working with a pre-exposed subject pool. However, the physical activity program was effective in increasing VPA levels when not in the activity program. This may suggest that structured teaching of active games encourages the children to be more active in unstructured play with their peers.

While many child care centers are regulated and often hire academically prepared staff, home child care providers outnumber centers but without the same regulation. As reported by Child Care Aware of America (2013), 44% of home child care providers have a high school education or less. This leaves many children without properly prepared providers to support physical and educational standards. Access to additional education is needed in early childhood physical activity possibly provided though outreach, online or in-person training. Providing aid in professional development supported by technical assistance from trained physical and/or health educators would provide a framework to sustainable changes. Without a widely accepted evidence based physical activity program, child care providers are left to piece together activities without

knowledgeable support. Child Care Aware of America (2013) encourages regulatory changes in all states to increase quality child care specifically in the health training category. Possible options for wide acceptance would be stronger partnerships with the American Academy of Pediatrics, state legislative changes that would provide incentives for training in obesity prevention, and compliance using current quality rating childcare systems. Child Care Aware of America is the leading organization that advocates for use of state level Quality Rating Systems, education of parents and providers and encourages continued government funding for Child Development Block Grants. Any legislative changes would also need to include oversight changes for Department of Health and Human Services that locally oversees registered and licensed childcare providers. In addition, funding resources may be needed for technical assistance from health or physical activity specialists. Another option for local control would be to associate the Child Development Block Grants or improved child care assistance reimbursements specifically to quality training in physical activity and obesity prevention. Cost and access are significant issues in the field of child care due to the low wages and long hours that providers experience.

Opportunities for Further Development

Future studies in measuring outcomes in physical activity level and motor skill development should follow consistent measures and sound methodology for study comparisons. In reviewing similar studies for comparison, it was found that consistency

in accelerometer cut off points should be established for comparisons studies especially in the preschool age population. Technological advances support the use and efficiency of accelerometer use for large group assessment where direct observation would be cumbersome and costly due to necessary personnel time. Variances in accelerometer results make comparisons difficult across studies. The results of this study are encouraging enough to replicate the study with a true control group, whose children and teachers have not been exposed to a specific activity curriculum. Under those circumstances, there may be a more significant change in motor skill development and physical activity.

A multi-layered approach is needed to change culture that involves collaborative programs promoted by physical education professionals and early childhood professionals, environment of care policy changes to support healthy behaviors, and legislative funding changes tied to improving quality child care with physical activity training and healthy practices. An emerging area of research with a growing body of evidence considers how the factors of policy and practice impact adoption of regular physical activity programming in child care settings. Combining policy with cost effective easy to integrate physical activity curriculum may assist in wide adoption of successful programs. Estimations are that as many as 250,000 premature deaths per year attribute to lack of regular physical activity (McGinnis & Foege, 1993). Combating childhood overweight with physical activity programs in child care settings that meet national standards may help in reducing the long term effects of health care costs related to overweight and obesity.

Because of the continued work on Project PLAY, several online learning modules were developed in 2013-2014 that include topics like the importance of child care providers in obesity prevention, managing active children in the classroom, self-assessment supports for teachers, outdoor/indoor activities, cost effective and durable equipment and developing sound policies and practices. One of the most unique components of the Project PLAY online is that it is aligned with the Iowa Early Learning Standards. This is the only preschool program to date that has been cross-walked to the academic school readiness standards using physical activity.

Conclusion

The increase in VPA in the intervention group is suggestive of possible influence on the physical activity behavior during free play. Physical Educators typically work with school age children and not the developmental needs of preschool age children. In contrast, early childhood educators primarily focus on academic preparation, literacy, social development, expression and free play. Only in recent years have these two disciplines come together to also promote physical activity and development in early childhood. Collaboration between disciplines and professional organization should help support evidence based programs for child care settings. Staniford's (1982) statement, "Play is not only a source of physical activity for the child, but an essential means of learning" (p.14), supports working across the disciplines of Physical Education and Early Childhood Education.

REFERENCES

Allen, K., & Marotz, L. R. (1989). *Developmental profiles: Birth to six.* Albany, NY: Delmar.

Barnett, L. M., Ridgers, N. D. & Salmon, J. (2014). Associations between young children's perceived and actual ball skill competence and physical activity. *Journal of Science and Medicine in Sport,* Retrieved from doi.org/10.1016/j.jsams.2014.03.001

Barnett, L. M., van Beurden, E., Morgan, P., Brooks, L. & Beard, J. (2009) Childhood motor skill proficiency as a predictor of adolescent physical activity. *Journal of Adolescent Health*, *44*(3), 252-259.

Binkley, T. & Specker, B. (2004). Increased periosteal circumference remains present 12 months after an exercise intervention in preschool children. *Bone, 35*, 1383-1388. doi: 10.1016/j.bone.2004.08.012

Bornstein, D. B., Beets, M. W., Byun, W. & McIver, K. (2011). Accelerometer-derived physical activity levels of preschoolers: A meta-analysis. *Journal of Science Medicine and Sport, 14*(6), 504-11. doi: 10.1016/j.jsams.2011.05.007

Center for Disease Control and Prevention. (2003). Youth Fitness and Obesity Institute CDC grant award H75-CCH723124-03

Center for Disease Control and Prevention. (2013). *Assessing adult BMI*. Retrieved from http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html

Child Care Aware of America. (2013). *Rankings of state child care center regulations and oversight*: *We can do better update*. Retrieved from http://www.naccrra.org/sites/default/files/default_site_pages/2013/wcdb_2013_final_april_11_0.pdf

Cliff, D. P., Oakley, A. D., Smith, L. M. & McKeen, K. (2009). Relationships between fundamental motor skill and objectively measured physical activity in preschool age children. *Pediatric Exercise Science, 21*, 436-449.

Cole, T. J., Bellizzi, M. C., Flegal, K. M., Dietz, W. H. (2000). Establishing a standard definition for child overweight and obesity worldwide: International survey. *British Medical Journal, 320*, 1240–1243.

Collins, W., Maccoby, E., Steinberg, L., Hetherington, E. & Bornstein, M. (2000). Contemporary research on parenting: The case for nature and nurture. *American Psychologist, 55*(2), 218-232.

Dietz, W. H. (1997). Periods of risk in childhood for the development of adult obesity– What do we need to learn? *Journal of Nutrition, 127*, 1884S-1886S.

Dowda, M., Pate, R. R., Trost, S. G., Almeida, M. J. & Sirad, J. R., (2004). Influences of preschool policies and practices on children's physical activity. *Journal of Community Health, 2*9(3), 183-196.

Finn, K. J., Johannsen, N. & Specker, B. (2002). Factors associated with physical activity in preschool children. *Journal of Pediatrics, 140*(1), 81-85.

Finn, K. J. & Specker B. (2000). Comparison of Actiwatch activity monitor and Children's Activity Rating Scale in children. *Medicine & Science in Sports & Exercise, 32*, 1794-1797.

Fisher, A., Reilly J. J., Kelly, L. A., Montgomery, C., Williamson, A., Paton, J. Y. & Grant, S. (2005). Fundamental movement skills and habitual physical activity in children. *Medicine & Science in Sports & Exercise, 37*(4), 684-688.

Fitzgibbon, M. L., Stolley, M. R., Schiffer, L., VanHorn, L. & KauferChristoffel., K. (2005). Two-year follow-up results for Hip Hop to Health Jr.: A randomized controlled trial for overweight prevention. *Journal of Pediatrics, 146,* 618-625.

Freedman, D. S., Dietz, W. H., Srinivasan, S. R. & Berenson, G. S. (1999). The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa Heart Study. *Journal of Pediatrics, 103*(6),1175-1182.

Galluhue, D. L., & Osmun, J. C. (1998). *Understanding motor development – infants, children, adolescents, adults*. Boston, MA: McGraw-Hill.

Goodway, J. D. & Branta, C. F. (2003). Influence of a motor skill intervention on fundamental motor skill development of disadvantaged preschool children. *Research Quarterly for Exercise and Sport, 74*(1), 36-47.

Goodway, J. D., Robinson, L. E., & Crowe, H. (2010). Gender differences in fundamental motor skill development in disadvantaged preschoolers from two geographical regions. *Research Quarterly for Exercise and Sport, 81*, 17-24.

Goran, M. I. (2001). Metabolic precursors and effects of obesity in children: A decade of progress, 1990-1999. *American Journal of Clinical Nutrition, 73,* 158-171.

Graham, G., Holt-Hale, S. A., & Parker, M. (2001). *Children moving: A reflective approach in teaching physical education* (5th ed.). Mountain View, CA: Mayfield.

Gunter, K. B., Rice, K. R., Ward, D. S. & Trost, S. (2012). Factors associated with physical activity in children attending family child care homes. *Preventive Medicine, 54*(2), 131-133.

Guo, S. S., Wu, W., Chumlea, W. C., & Roche, A. F. (2002). Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *American Journal of Clinical Nutrition, 76,* 653-658.

Hedley, A. A., Ogden, C. L., Johnson, C. L., Carroll, M. D., Curtin, L. R. & Flegal, K. M. (2004). Prevalence of overweight and obesity among U.S. children, adolescents, and adults, 1999-2002. *Journal of the American Medical Association, 291*(23), 2847-2850.

Iowa Department of Health Services (IDHS). (2005) *Child Care Centers Policy Manual* (p. 1-24). Retrieved December 15, 2005, from http://www.dhs.state.ia.us/policyanalysis/PolicyManualPages/Manual_Documents/Rules/441-109.pdf

Levin, S. & Martin, M. (2002). Catch the Catawba SPARK: Physical activity for Head Start youths. *Journal of Physical Education Recreation and Dance, 73*(3), 39-42.

Lumeng, J. C., Gannon, K., Appugliese, D., Cabral, H. J. & Zuckerman, B. (2005). Preschool child care and risk of overweight in 6- to 12-year-old children. *International Journal of Obesity, 29,* 60-66.

McGinnis, J. M. & Foege, W. H. (1993). Actual causes of death in the United States. *Journal of the American Medical Association, 270*(18), 2207-12.

National Association for the Education of Young Children (NAEYC). (1995). *School Readiness: A position statement of the NAEYC.* Washington, DC. Retrieved from http://www.naeyc.org/files/naeyc/file/policy/state/PSready98.pdf

National Association for the Education of Young Children (NAEYC). (2005). *Accreditation performance criteria: Universal and preschool strands*. Retrieved October 2010 from http://www.naeyc.org/accreditation/pdf/AssessmentCriteria.pdf

National Association for Sport and Physical Education (NASPE). (2002). *Active Start: A statement of physical activity guidelines for children birth to five years*. American Alliance for Health, Physical Education, Recreation and Dance. Reston, VA.

National Center on Child Care Quality Improvement & National Association for Regulatory Administration. (2013). *Trends in child care center licensing regulations and policies for 2011*. (Research Brief No. 1). Fairfax, VA: National Center on Child Care Quality Improvement. Retrieved August 22, 2013, from http://childcare.gov/sites/default/files/065_1304_center_licensing_trends_brief_final.pdf

Newell, K. (1984). Physical constrains to development of motor skills. In J. Thomas (Ed.), *Motor development during preschool and elementary years.* p. 105-120. Minneaoplis, MN: Burgess.

Newell, K. (1986). Constraints on the development of coordination. In M. C. Wade & H. T. Whiting (Eds.), *Motor development in children: Aspects of coordination and control*. p. 341-360. Dordrecht, The Netherlands: Nijhoff.

Noland, M., Danner, F., McFadden, M., DeWalt, K. & Kotchen, J. M. (1990). The measurement of physical activity in young children. *Research Quarterly for Exercise Science and Sport, 61*(2), 146-153.

Office of the Surgeon General (US). (2010) *The Surgeon General's vision for a healthy and fit nation.* Rockville (MD). Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK44660/

Ogden, C. L., Carroll, M. D., Curtin, L., Lamb, M., & Flegal, K. M. (2010). Prevalence of high body mass index in US children and adolescents, 2007-2008. *Journal of the American Medical Association, 303*(3), 242-249. doi:10.1001/jama.2009.2012

Ogden, C. L., Carroll, M. D., Kit, B. K. & Flegal, K .M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *Journal of the American Medical Association, 311*(8), 806-814. doi: 10.1001/jama.2014.732

Ogden, C. L., Troiano, R. P., Briefel, R. R., Kuczmarski, R. J., Flegal, K. M. & Johnson, C. L. (1997). Prevalence of overweight among preschool children in the United States, 1971 through 1994. *Pediatrics, 99*(4), 1-7.

Pate, R. R., Almedia, M. J., McIver, K. L., Pfeiffer, K. A. & Dowda, M. (2006). Validation and calibration of an accelerometer in preschool children. *Obesity, 14*(11), 2000 –2006.

Pate, R. R., O'Neill, J. R. & Mitchell, J. (2010). Measurement of physical activity in preschool children. *Medicine & Science in Sports & Exercise.* doi: 10.1249/MSS.0b013e3181cea116

Pate, R. R., Pfeiffer, K. A., Trost, S. G., Ziegler, P., & Dowda, M. (2004). Physical activity among children attending preschools. *Pediatrics, 114*(5), 1258-1263.

Payne, V. G. & Isaacs, L. D. (2008). *Human motor development: A lifespan approach*. (7th ed.). Boston, MA: McGraw-Hill.

Pinhas-Hamiel, O., Dolan, L. M., Daniels, S. R., Standiford, D., Khoury, P. R., & Zeitler, P. (1996). Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. *Journal of Pediatrics, 128,* 608-615.

Reilly, J. J. (2010). Low levels of objectively measured physical activity in preschoolers in childcare. *Medicine & Science in Sports & Exercise, 42,* 502-507.

Reilly J .J., Coyle, J., Kelly, L., Burke, G., Grant, S. & Paton, J. Y. (2003). An objective method for measurement of sedentary behavior in 3-to 4-year olds. *Obesity Research, 11,* 1155-1158.

Shen, B., Rinehart-Lee, T., Alexander, G., Milberger, S., Groesbeck, M. & Jen, K-L. (2010). *Medicine & Science in Sports & Exercise, 42*(5), 352-353. doi: 10.1249/01.MSS.0000386673.67126.c0

Sirard, J. R., Trost, S. G., Dowda, M. & Pate, R. R. (2001). Calibration of the Computer Science and Applications, Inc., physical activity monitor in preschool children. *Medicine & Science in Sports & Exercise, 5*(suppl), S144.

Sirard, J. R., Trost, S. G., Pfeiffer, K. A., Dowda, M. & Pate, R. R. (2005). Calibration and evaluation of an objective measure of physical activity in preschool children. *Journal of Physical Activity and Health, 2*(3), 345-57.

Specker, B. & Binkley, T. (2003). Randomized trial of physical activity and calcium supplementation on bone mineral content in 3- to 5-year-old children. *Journal of Bone and Mineral Research, 18,* 885–892.

Staniford, D. J. (1982). *Natural movement for children : Guidelines for parents and teachers on play and physical activity*. Dubuque, IA: Kendall/Hunt Publishing Company.

Trasande, L. & Elbel, B. (2012). The economic burden placed on healthcare systems by childhood obesity**.** *Expert Review Pharmacoeconomic Outcomes & Research, 12*(1), 39-45.

Trost, S., Fees, B. & Dzewaltowski, D. (2008). Feasibility and efficacy of a "Move and Learn" physical activity curriculum in preschool children. *Journal of Physical Activity and Health, 5,* 88–103.

Ulrich, D. A. (2000). *Test of gross motor development* (2nd ed.). Austin, TX: Pro-Ed, Inc.

U.S. Department of Education. (2002). National Center for Education Statistics, *The Condition of Education 2002*, NCES 2002-025, Washington, DC: U.S. Government Printing Office.

U.S. Department of Education. (2010). National Center for Education Statistics, Common Core of Data, *Public Elementary/Secondary School Universe Survey, 2010-11* (version 2a). Retrieved from http://nces.ed.gov/surveys/ruraled/tables_archive.asp

U.S. Department of Education. (2013). National Center for Education Statistics. *The Condition of Education* (NCES 2013-037), Retrieved from http://nces.ed.gov/programs/coe/indicator_cfa.asp

U.S. Department of Health and Human Services. (2000). *Healthy People 2010: Objectives for improving health*. (2nd ed.). Washington, DC: U.S. Government Printing Office. Accessed November 2005

U.S. Department of Health and Human Services. (2010). *Healthy People 2020: Improving the health of all Americans*. Washington, DC. Retrieved from http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=10

Wall, S. J., Rudisill, M. E., Parish, L. E., & Goodway, J. D. (2004). Effectiveness of early motor skill interventions: Implementing active start. (Abstract). *Research Quarterly For Exercise & Sport*, *75*(1 Suppl), A-53.

Whitaker R., Wright, J., Pepe, M., Seidel, K. & Dietz, W. (1997). Predicting obesity in young adulthood from childhood and parental obesity. *New England Journal of Medicine, 37*(13), 869-873.

White House press office. (2010). Presidential Memorandum Februrary 9th 2010. *Taskforce on Childhood Obesity*
Retrieved from http://www.whitehouse.gov/the-press-office/presidential-memorandum-establishing-a-task-force-childhood-obesity

Williams, C. L., Carter, B. J., Kibbe, D. L. & Dennison, D. (2009). Increasing physical activity in preschool: A pilot study to evaluate Animal Trackers. *Journal of Nutrition Education and Behavior, 41*, 47-52.

Williams, H. G., Pfeiffer, K. A., O'Neill, J. R., Dowda, M., McIver, K. L., Brown, W. H. & Pate, R. R. (2008). Motor skill performance and physical activity in preschool children. *Obesity, 16*(6), 1421-1426.

Woodard, R. J. & King, R. V. (2003, Summer). Influence of a gross motor skill curriculum on children enrolled in Head Start. *Journal of International Council of Health, Physical Education Recreation-Sport and Dance*, 15-18.

World Health Organization. (2003). *Global Health Strategy on diet, physical activity and health* pg2. Retrieved from http://www.who.int/dietphysicalactivity/publications/facts/obesity/en/

World Health Organization. (2006, September). *Fact sheet, N 311*. Retrieved from http://www.who.int/mediacentre/factsheets/fs311/en/index.html

APPENDIX A

RECRUITMENT MATERIAL

A.1 Intent to Participate – Child Care Center

A.2 Human Subject Review approval

A.3 Recruiting Letter

A.4 Recruiting Poster

A.5 Consent to Participate (Parent)

A.6 Enrollment Form

A.1 Intent to Participate – Child Care Center

Karyn Finn, Project PLAY Coordinator

School of HPELS

University of Northern Iowa

Cedar Falls, IA 50614-0241

Dear Ms. Finn,

I, **(print name)** _____, as the **(print title)** _____ of the **(print center or school)** _____ in the city (town) of _____ approve of recruiting and assessing preschool-aged children in our facility for your upcoming research study titled "**The evaluation of PLAY (preschool lessons for active youngsters) curriculum on motor skill development and physical activity behavior in preschool children**". I understand that the center will be providing you an area to assess motor skills and that children enrolled in the study will be wearing activity monitors during the time at our center (school). We also understand that we will be providing a suitable activity space within our center to deliver the PLAY curriculum at a 1:8 ratio for 3 year olds or 1:10 ratio for 4-5 year olds. You have my permission to allow research personnel identified by you to administer the PLAY curriculum at our center (school). with the intent to place activity monitors on participating child, directly observe them while in an active play setting, and communicate to parents and teachers information pertaining to the study.

Sincerely,

_____ (Signature Center Director)

_____ (Signature Center Administrator)

A.2 Human Subject Review approval

Office of Sponsored Programs

University of Northern Iowa

Human Participants Review Committee
213 East Bartlett
University of Northern Iowa
Cedar Falls, IA 50614-0394
319.273.6148

Date: October 5, 2005

To: Karyn Finn
HPELS, 0241
UNI

From: Dr. Mary E. Losch, Chair
UNI Human Participants Review Committee (IRB)

Title: The Effectiveness of the PLAY Curriculum on Gross Motor Development and Physical Activity Level in Preschool Children

Re: ID# 05-0013

At the full IRB meeting on September 8, 2005, your protocol received unanimous approval. If you alter your project in any way that increases the physical, emotional, social, or legal risk to the participants or you change the targeted participants, you should notify the Human Participants Review Committee in the Office of Sponsored Programs before continuing with the research. Additionally, your project must be reviewed annually. You will receive a notification and continuing review form approximately 10 months from now asking for an update on your project.

If you have any further questions about the Human Participants Review policies or procedures, please contact me at mary.losch@uni.edu or David Walker, the Human Participants Committee Administrator, at 319.273.6148 or email david.walker@uni.edu. Best wishes for your project success.

cc: Institutional Review Board
Kevin Finn, advisor

A.3 Recruiting Letter

Project PLAY Phase II: Evaluation

Preschool Lessons for Active Youngsters

The School of Health, Physical Education and Leisure Services at the University of Northern Iowa would like to invite you and your preschool-aged son or daughter to participate in a research study.

Current research promotes the introduction of a physical activity program in early childhood in order to promote physical activity and to offset the increasing prevalence of childhood obesity. However, little data have been collected which test the effectiveness of these movement programs. As a result, a graduate student, Karyn Finn, is involved in a study sponsored by the Center for Disease Control to "T he effectiveness of the PLAY curriculum on the gross motor skill development and physical activity level in preschool children". A physical activity specialist teaches the 30-minute physical activity intervention on four mornings per week for twelve weeks starting in September 2005.

Community United Childcare Center – Valley Park has agreed to participate in the intervention study. In order to study the effectiveness of this program it is necessary to gather information on as many preschool children as possible. The goal is to have at least 60 children enrolled in Project PLAY by September 30, 2005. Parents **must** enroll their child in Project PLAY in order to participate. This is a free activity program in addition to the other services offered at Valley Park.

The purpose of this study is to examine the relationship between motor skills and physical activity. The evaluation of the study consists of three 30-minute assessments at the childcare center. The assessment will consist of collecting data on developing motor skills at three points in time (fall, winter & spring). The child will also need to wear a motion sensor periodically during the activity sessions to collect data on their activity level.

At the end of the study period, reports providing information pertaining to your child's individual gross motor skill development and physical activity level are available.

I look forward to your participation in this project.
Sincerely,

Karyn Finn

----------cut here----------

For more information, please fill out this portion and return to the Project PLAY display table at Valley Park. A UNI researcher will contact you to answer any questions you may have and mail out the enrollment form for your child.

Parent's Name _____ Classroom _____

Child's name _____ Birth date _____

Home number _____ Work number _____

Best time to call_____

A.4 Recruiting Poster

Project PLAY

Preschool Lessons for Active Youngsters

Phase II : Evaluation

What: Preschool Lessons for Active Youngsters – a 12-week Physical Activity program delivered at the childcare center.

Who: Children 3-5 years old at Community United Child Care Center (must be attend center at least 4 days/week)

Why: To evaluate the effectiveness of the PLAY curriculum on Gross Motor Skill Development and Physical Activity Levels in Preschool Children.

When: *12 week activity program taught 4 days/week for 30 minutes in the Fall and again in the Spring.
*Three assessments (Fall, Winter & Spring) scheduled for 30 minutes at CUCCC – Valley Park

How: Enrolled children will be randomly assigned to a Fall or a Spring session. *Starting Fall 2005*

NOTE: Your child must be enrolled in PLAY, with parental consent, in order to participate. Children not enrolled will participate in regular childcare center activities.

For further information contact Karyn Finn at 273-3066 or email Karyn.finn@uni.edu

Youth Fitness & Obesity Institute
University of Northern Iowa

A.5 Consent to Participate (Parent)

UNIVERSITY OF NORTHERN IOWA
INFORMED CONSENT

Project Title: Understanding Physical Activity Behavior in Preschool Children and Its Association with Body Composition.

Project Director(s): Dr. Kevin J. Finn, and Dr. Jennifer Waldron
School of Health, Physical Education, and Leisure Services

Invitation to Participate: The School of Health, Physical Education, and Leisure Services at the University of Northern Iowa would like to invite you and your preschool-aged son or daughter to participate in a research study. The University requires that you give your signed agreement to allow you and your child to participate in this project. The following information is provided to help you make an informed decision whether or not to participate.

Nature and Purpose: The number of preschool-aged children who are "overweight" has significantly increased in the last few years. Experts feel that physical inactivity could be related to this change and have suggested promoting physical activity in young children. To promote this behavior, we must know more about what contributes to this behavior. Physical activity behavior experts have suggested that multiple factors contribute to an active behavior yet these factors have not been tested in preschool-aged children. In addition, little information is available to suggest children with high levels of physical activity are less "overweight" or have higher levels of muscle and/or bone. Relationships between body composition and physical activity need to be established for this population. Therefore the purpose of this project is to begin to understand physical activity behavior in preschool-aged children and determine if an association is present with body composition.

Explanation of Procedures: If you consent to participate, you and your preschool-aged child will be involved in a number of activities that will be conducted during a two week period in the winter of 2004-05. The activities include:

1. Completing an enrollment form that ask you to list your child's name, permanent residence, birth date, gender, weeks of the pregnancy (gestation) for this child, ages and genders of siblings, name of preschool, and a brief description of the physical activity behavior of your preschool-aged child. This information is needed to provide us demographic and environmental information.
2. Assessing the physical activity behavior of your child. Your child will be asked to wear a small (2" x 1.5") device on his/her waistband for four days (4 weekdays) during a week period. The device (activity monitor) detects movement and stores it. We will be able to detect how much time your child spends in light,

moderate, and vigorous (hard) physical activity each day. In addition, you will be asked to report how much time the child has spent outdoors, in organized play (sport or dance), and sitting quietly either watching TV, playing videogames, or working on the computer. Finally during one day at the preschool (child-care center), a research person will watch your child for 30 minutes in an active play setting and record the types of physical activity.

3. Coming to the UNI campus (on a scheduled Saturday) to assess motor skills, weight, height, body fatness, and to complete surveys (both child and parent) evaluating attitudes related to physical activity. The total session will last approximately 60 minutes with a variety of tasks for your child. The child's tasks include:
    a. Assessment of motor skills to include running, galloping, hopping, sliding, jumping, leaping, throwing, catching, kicking, hitting a stationary ball, rolling a ball.
    b. Completing a survey conducted by a researcher to determine your child's answer to the question "Am I able to be physically active?"
    c. Determining body mass using a digital floor scale, standing height using a wall mounted tape measure, waist circumference using a cloth tape measure, and skinfold thickness at six commonly used sites taken by a technician pinching the skin and measuring width with an instrument.

    In addition, you (as a parent or guardian) will fill out a survey that asks you to report on your level of physical activity, perceptions of your child's physical competence, perceived value of physical activity, reasons for physical activity participation, and perceptions of success for your child in terms of physical skills and activity. This information (and data collected from your child) will be used to test relationships between physical activity and body composition, motor skills, your child's perception of competence, and your own physical activity and beliefs concerning physical activity.

Discomfort and Risks: Pinching the skin to take skinfold thickness may cause mild pain however care will be taken to minimize it by slowly pulling the skin. All motor skills are activities expected in an active play situation.

Benefits: There are no direct benefits from participating in this study however information pertaining to your child's individual physical activity will be shared with you at the end of the study period in a report. You will be compensated $100 in the form of a check from the university for you and your child's efforts when all assessments are complete.

Confidentiality: Information obtained during this study which could identify your child will be kept strictly confidential. Information collected from you or your child during this project may be used in future studies. However, if there are any future projects that

include additional time or effort on your part, we will re-contact you at that time to ask if you are interested in further participation.

Right to Refuse or Withdraw: Your child's participation is completely voluntary. He or she is free to withdraw from participation at any time or to choose not to participate at all without any loss of benefits or information. Not participating in this study will not affect your child's treatment at the preschool or child-care facility.

Questions: If you have questions about the study you may contact or desire information in the future regarding your child's participation or the study generally, you can contact Dr. Kevin J. Finn at 319-273-5921 at the School of HPELS, University of Northern Iowa 319-273-2141. You can also contact the office of the Human Participants Coordinator, University of Northern Iowa, at 319-273-2748, for answers to questions about rights of research participants and the participant review process.

Agreement for participation of your child:

I am fully aware of the nature and extent of my child's participation in this project as stated above and the possible risks arising from it. I hereby agree to allow my son/daughter to participate in this project.

_____ _____

(Signature of parent/legal guardian) (Date)

_____

(Printed name of parent/legal guardian)

_____

(Printed name of child participant)

Agreement for your participation:

I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I acknowledge that I have received a copy of this consent statement. I am 18 years of age or older.

_____ _____

(Signature of participant) (Date)

_____

(Printed name of participant)

_____ _____

(Signature of investigator) (Date)

A.6 Enrollment Form

Project PLAY Preschool Lessons for Active Youngsters Phase II : Evaluation

Enrollment Form

Name of Child: _____ Age: _____ Sex: ____

Birthday: ____/____/_____

Parent's Name: _____

Home Phone: _____

Address:_____

City: _____

Zip:_____

Is there anything special that we should know about your child?

None ___ Premature Birth ___ Mental Disability ___ Physical Disability ____
Other___

Data entered by: _____ Date _____ ID assigned _____