Physical activity is increasingly recognized as a major component contributing to the promotion of a healthy lifestyle. Evidence exists that a physically active behavior is carried over from childhood to adolescents and possibly to adulthood. Limited research about the physical activity behavior of students with visual impairment is available, but likely essential for the development of primary health-related intervention programs. The purpose of this study was to extend the previous research by examining the physical activity level as well as the duration of moderate-to-vigorous physical activity within three distinct settings of the school environment. The second purpose was to examine the level of physical activity and the duration of moderate-to-vigorous physical activity in students with visual impairment between the week and the weekend setting.

Fifteen youth between the ages of 11 to 18 with visual impairment and no additional physical disability participated in the study. Participants physical activity was assessed with the Actiwatch® for seven consecutive days. The level of physical
activity was measured as the average movement counts per assessed days. The
duration of moderate-to-vigorous physical activity was calculated based upon a
previously determined cut-point to distinguish between sedentary-to-light and
moderate-to-vigorous physical activity.

The results of the repeated measure ANOVAs indicated that there were
statistical differences within the school settings for the level of physical activity, \( F (1,13) = 29.13, p < .01 \), and for the duration of moderate-to-vigorous physical activity,
\( F (1,13) = 33.53, p < .01 \). The highest amount of physical activity was found during
physical education followed by recess and the regular classroom. This finding
supports the importance of physical education and supports the focus of possible
interventions within the school environment, which should focus on recess to increase
the voluntary engagement in moderate-to-vigorous physical activity.

The results of the 2x2 (gender X setting) repeated measure ANOVAs indicated
that there were statistical differences for both physical activity variables between the
school week and the weekend. No interactions with gender and settings were
identified. This finding suggests to focus interventions and health-promotion on the
parental environment, since the participants were less active during the weekend.

The present study contributes information about the physical activity behavior
and patterns of youth with visual impairment to the current literature. Future research
needs to take place to determine which factors are predicting variables for physical
activity in individuals with visual impairment. In addition, further research is needed
to make reliable and valid statements about physical activity in this population.
Level of Physical Activity and Duration of Moderate-to-Vigorous Physical Activity Among Youth with Visual Impairment

by

Kerstin Kindinger

A THESIS

submitted to

Oregon State University

in partial fulfillment of the requirements for the degree of

Master of Science

Presented April 25, 2005

Commencement June 2005
Master of Science thesis of Kerstin Kindinger presented on April 25, 2005.

APPROVED:

Redacted for Privacy
Major Professor, representing Movement Studies in Disability

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Chair of the Department of Exercise and Sport Science

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Dean of the Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Redacted for Privacy

Kerstin Kindinger, Author
Many people were involved in my life during the last two years as I pursued my Master of Science degree at the Oregon State University. I express my deep appreciation to all of them.

Thank you to Dr. Joonkoo Yun, my major professor and thesis advisor, for being willing to challenge, confront, and argue with me, but also for his patience, endurance, and interest in my life. To Dr. Jeffrey McCubbin, chair of the department, for accepting me into the program and leading me towards my passion of research focusing on individuals with sensory impairments. To Dr. Lauren Lieberman, Associate Professor at SUNY Brockport, for giving me in-depth insights on visual impairment as well as encouraging me throughout the thesis process. To Dr. Jessica White, my graduate representative, for her willingness to jump onto my thesis committee just a couple of days before the proposal and for her interest in this study. I deeply appreciate the financial support from the Exercise and Sport Science Department at Oregon State University.

I express my sincere appreciation to all the professors who taught me during my graduate study. A thanks goes, in particular, to Dr. Tanya Littrell, who offered me a teaching assistantship during my first year at OSU that later opened the door to a graduate teaching assistantship and through it the opportunity to finance and continue my studies. To fellow students for discussions, conversations, and work-out times to keep the balance between studying and social life.
I extend my appreciation to Dr. Friedrich Schneider, my professor in Germany, for his recognition of my potential and challenging me to apply for a Fulbright scholarship. His support continued after graduating from the University of Applied Science in Bochum, and even after my Fulbright year.

A huge thanks to my parents and siblings for their continues support. They raised me to be a person who is reaching out for goals with full commitment and who keeps looking ahead instead of back. Their phone-calls and care-packages kept me connected to my family.

Thanks to the Circle Church of Christ in Corvallis for adopting me into the church family, praying for me, and letting me feel at home. A particular thank you to Dr. Bill McCaughan for being my co-reader, but most of all for encouraging me in the whole process of writing. To the Parrish family and Frankie Marquard who supported me to stay on my path with God even when the workload of the university overwhelmed me. To my lifegroup for carrying me through, listening to my complains, and their prayers. To the University Christian Center for allowing me to be part of student-life and fun activities

Thanks to my close friends in Germany for supporting me via e-mail and phone calls, but also for showing understanding when I was too lazy to answer e-mails. Thank you for keeping in touch even with the big distance between us.

This work would not be acknowledged at all if God had not been with me at all times. Through Him I received the talents to go through the thesis process and graduate studies.
CONTRIBUTIONS OF AUTHORS

Dr. Joonkoo Yun provided guidance and consultation in the data analysis and writing of the manuscripts.
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DEDICATION

This thesis is dedicated in memory to my grandfather

Theodor Kindinger

who passed away during the process of my thesis.
LEVEL OF PHYSICAL ACTIVITY AND DURATION OF MODERATE-TO-VIGOROUS PHYSICAL ACTIVITY AMONG YOUTH WITH VISUAL IMPAIRMENT

CHAPTER 1: INTRODUCTION

BACKGROUND

Within the last decade the importance of physical activity has been recognized for its contribution to individual’s well-being. Benefits related to physical activity have been studied and become more evident in the area of health promotion (President’s Council on Physical Activity and Sports, 1996, U.S. Department of Health and Human Services, [USDHHS], 2000). Health refers to “a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity” (World Health Organization, n.d., p.1). This definition identifies three areas of physical activity benefits: physical, mental, and social well-being.

Physical activity leads to an increased physical well-being because it a) decreases the risk of obesity (Santos, Guerra, Ribeiro, Duarte, & Mota, 2003), b) decreases morbidity (Scruggs, Beveridge, & Watson, 2003), c) decreases the risk of cardiovascular heart disease (Biddle, Gorely, & Stensel, 2004), d) decreases the risk of osteoporosis (Nevill, Holder, & Stewart, 2004; Marcus, 2001), e) increases muscular strength and endurance, f) increases cardio-respiratory endurance, and g) increases flexibility (USDHHS, 2000). Mental well-being is positively affected by physical activity due to a) an increase of self-esteem, b) an increase of self-perception, c) an
increased sense of self-control, d) an increase in stress management, and e) a decrease in the risk of depression and anxiety (Crocker, Eklund, & Kowalski, 2000; Schomer & Drake, 2001). The third area, social well-being, of physical activity benefits is less researched but generally observable. Physical activity positively increases interpersonal relationships as well as the openness to interact with other people (Schomer & Drake, 2001).

Professionals have recognized links between inactivity in children and sedentary living behaviors (Blair, 1996) as well as an increase in health risks (Oja, 1997) among adults. Children and adolescents spend a major part of their daytime in schools, which are recognized as places both of education for current life situations as well as preparation for future life. Because of the potentially negative health-related outcomes of sedentary behavior, it is important to promote physical activity in all settings, including educational settings.

Within the school environment, physical education and recess are found to be critical components for engagement in moderate-to-vigorous physical activity. In the unstructured recess setting, students can voluntarily choose for themselves how they want to spend their time (Council of Physical Education for Children, [COPEC], 2001). Their level of engagement in recess-time activities already reflects the student’s attitude towards physical activity and might be carried over into unstructured after school settings. The lack of directed activity initiated by the teacher combined with the opportunity to decide for themselves which activity to engage in during recess, may influence the level of engagement in physical activity outside the school environment.
(Faison-Hodge & Porretta, 2004). In addition, several critical aspects of life, such as social interaction and voluntary engagement in physical activity, are being formulated and developed during recess.

Compared to the unstructured time of recess, physical education is a structured setting through which necessary information, knowledge, and skills regarding becoming a physically educated person are provided (COPEC, 2001). In addition, during physical education the teacher is providing instruction to the students regarding what they are supposed to do and how they should do it (COPEC, 2001). This structured time is used to introduce students to physical activity and related components, such as motor skills and fitness (National Association for Sport and Physical Education, [NASPE], 2004). The benefits of physical education encompass physical, mental, cognitive, and affective areas in an individual. The level of engagement in physical activity, however, may be effected positively or negatively by the amount of instruction provided by the teacher during structured physical education periods (Faison-Hodge & Porretta, 2004).

It is evident that individuals with visual impairment are less active than their counterparts (Kozub & Oh, 2004; Lieberman & McHugh, 2001; Longmuir & Bar-Or, 2000). Such individuals also face additional challenges to accomplish activities involved in daily living (Longmuir & Bar-Or, 2000; Seaman, 1999). Therefore, they have the same need and right to be physically active and through this to increase both their fitness and health in the same way as individuals without disabilities. Current Federal Education laws (such as IDEA), require schools to include children with
disabilities in general curriculum, including physical education. The Act specifically identifies physical education as an important component of the school-day (Council of Exceptional Children, 2004).

The role and level of physical activity in students with a visual impairment has not been well documented. The loss of sight presents barriers to engagement in physical activity, and often has a negative impact on individual's physical activity level unless these barriers are addressed and overcome (Lieberman, 2005). Several research studies make the assumption that students with a visual impairment have the potential to reach similar fitness levels as their sighted peers (Blessing, McCrimmon, Stovall, & Williford, 1993; Lieberman, 2005; Shindo, Kumagai, & Tanaka, 1987; Williams & Armstrong, 1996). The lack of research in the area of physical activity, which is a critical component to students' well-being and fitness, supports the need for further research in this field. In addition, further research will indicate preferences for primary points of intervention. The purpose of this study was to extend the previous research by examining the physical activity level as well as the duration of moderate-to-vigorous physical activity of students with visual impairments within different settings in the school environment. The second purpose was to collect information on the students' overall physical activity behavior by assessing their level of physical activity and the duration of moderate-to-vigorous physical activity during both the weekend and weekdays.
Research Questions

The following research questions were investigated in this study:

1. Did the level of physical activity and the percentage of time spent in moderate-to-vigorous physical activity differ between school settings (recess, regular class time, and physical education) in youth with visual impairment?

2. Did the level of physical activity and the percentage of time spent in moderate-to-vigorous physical activity vary as a function of gender between the weekday setting and the weekend setting in youth with visual impairment?

3. Was the degree of vision correlated with the level of physical activity and the percentage of time spent in moderate-to-vigorous physical activity?

Assumptions

For conducting the study, the following assumptions were made:

1. Participation in this study did not alter the physical activity behavior during data collection.

2. Physical activity was accurately measured by the Actiwatch®.

3. The duration of moderate-to-vigorous physical activity was accurately assessed by the previously chosen cut-point (average movement count per 30-second epoch greater than 350).
Delimitations

The following aspects delimited the study:

1. This study was delimited to students from the Oregon School for the Blind and the Washington State School for the Blind aged 11 to 18 years.

2. Participants were 16 volunteers out of 65 invited students. The participants were not randomly selected.

3. Physical activity was only measured with one method, accelerometry.

Limitations

The following limitations affected the study:

1. The weather conditions of each day may have had an affect on the level of physical activity and duration of engagement in moderate-to-vigorous physical activity, but was not controlled for in the data analysis.

2. Classification into degree of vision was determined by information provided by parents and not through classification by a professional ophthalmologist.

DEFINITIONS

Physical education: Physical education time was based on time identified for structured activities in the students' schedules. The schedules were provided by the teacher.

Recess: Recess was defined as the morning break and lunch period. Breakfast was included in the definition of recess if the participating individual had physical education prior to it.
Class Time: Class time was calculated as the time spent in classes starting with the first class and ended with the last class. However, physical education and recess were subtracted from this time period.

Week: The week setting included sleep as well as wake time and was conducted for 24 hours on each day of data collection.

Weekend: The weekend setting included sleep as well as wake time and was conducted for 24 hours on each day of data collection.

Degree of vision: B1: No light perception in either eye up to light perception, but inability to recognized the shape of a hand at any distance or in any direction.

B2: From ability to recognize the shape of a hand up to visual acuity of 20/600 and/or a visual field of less than 5 degrees in the best eye with the best practical eye correction.

B3/B4: From visual acuity above 20/600 and up to visual acuity of 20/70 and a visual field larger than 20 degrees in the best eye with the best practical eye correction.

(U.S. Association for Blind Athletes, 1998)

Physical activity: Any bodily movement produced by skeletal muscles that results in caloric expenditure (Caspersen, Powell, & Christensen, 1985).
Physical Activity Among Youth with Visual Impairment During Physical Education, Recess, and Regular Class Time

Kerstin Kindinger
ABSTRACT

Purpose: The purpose of this study was the examination of the average school physical activity level and percentage of time spent in moderate-to-vigorous physical activity for students with visual impairment.

Methods: Participants were 15 youth (10 male and 5 female) between the ages of 11 to 18 years who have a visual impairment without additional physical disability. The Actiwatch® was used to measure level of physical activity and percentage of time spend in moderate-to-vigorous physical activity.

Results: The results of the repeated measure ANOVAs indicated significant differences among the varying school settings. The level of physical activity and the duration of moderate-to-vigorous physical activity were significantly higher for the week setting than the weekend setting. Pearson-product correlations indicated no relationship between physical activities with gender or school placement. Significant correlation was only found between the level of physical activity in physical education and the degree of vision (r = .71, p < .05).

Conclusions: The level of physical activity and the percentage of time spent in moderate-to-vigorous physical activity by students with a visual impairment in segregated school environments differed between physical education, recess, and the general classroom setting. The participating students met the Healthy People 2010 requirement for moderate-to-vigorous physical activity engagement in physical education.
INTRODUCTION

Maintaining an appropriate physical activity level is associated with health-related benefits, especially for individuals with disabilities (U.S. Department of Health and Human Services, [USDHHS], 2000). Health-related changes through physical activity can be observed as an increase in physical well-being because it a) decreases the risk of obesity (Santos, Guerra, Ribeiro, Duarte, & Mota, 2003), b) decreases morbidity (Scruggs, Beveridge, & Watson, 2003), c) decreases the risk of cardiovascular heart disease (Biddle, Gorely, & Stensel, 2004), d) decreases the risk of osteoporosis (Nevill, Holder, & Stewart, 2004; Marcus, 2001), e) increases muscular strength and endurance, f) increases cardio-respiratory endurance, and g) increases flexibility (USDHHS, 2000). Mental well-being is positively affected by physical activity due to a) an increase of self-esteem, b) an increase of self-perception, c) an increased sense of self-control, d) an increase in stress management, and e) a decrease in the risk of depression and anxiety (Crocker, Eklund, & Kowalski, 2000; Schomer & Drake, 2001). The third area, social well-being, of physical activity benefits is less researched but generally observable. Physical activity positively increases interpersonal relationships as well as the openness to interact with other people (Schomer & Drake, 2001).

Children and adolescents in particular have become the focus of research and interventions regarding physical activity and health promotion (Fernhall & Unnithan, 2002). However, the status of physical activity for youth with visual impairment has
not been well-documented. Currently most research has focused on the level of physical fitness among individuals with visual impairment (Blessing, McCrimmon, Stovall, & Williford, 1993; Lieberman & McHugh, 2001; Shindo, Kumagai, & Tanaka, 1987; Williams & Armstrong, 1996). However, a very limited number of studies examined the level of physical activity (Kozub & Oh, 2004; Longmuir & Bar-Or, 2000). Although Kozub and Oh (2004) made a significant contribution to understand physical activity patterns of children with visual impairment, their study was restricted to the overall activity level during and after the school environment. Since youths with visual impairment spend a significant amount of time in school, it is important to evaluate the amount of physical activity during different school settings, such as physical education, recess, and classroom that might affect the level of physical activity engagement. As of now, no information on physical activity patterns among the varying school settings has been established. Studies thus far have mainly compared physical fitness levels between different school placements (Short & Winnick, 1988).

The school environment can be divided into three settings of varying physical engagement that are a) physical education, b) recess, and c) general classroom. Physical education represents a structured setting within which necessary information, knowledge, and skills about becoming a physically educated person are provided (Council of Physical Education for Children, [COPEC], 2001; Shapiro, Lieberman, & Moffett, 2003). In addition, during physical education the teacher is providing instructions on what the students are supposed to do and how to do it, and students are
being introduced to various physical activity opportunities (COPEC, 2001, National Association for Sport and Physical Education, [NASPE], 2004). Physical education has been found to be a critical component for ensuring continuous engagement in moderate-to-vigorous physical activity (Faison-Hodge & Porretta, 2004; Levin, McKenzie, Hussey, Kelder, & Lytle, 2001; McKenzie, Feldman, Woods, Romero, Dahlstrom, Stone, Strikmiller, Williston, and Harsha, 1995; USDHHS, 2000). The benefits of physical education encompass physical, mental, cognitive, and affective areas in an individual.

Another setting for engagement in physical activity is recess. In the unstructured recess setting, students can voluntarily choose for themselves how they want to spend their time (COPEC, 2001). The lack of teacher-initiation combined with the opportunity to decide for themselves which activity to engage in during recess may influence the level of engagement in physical activity outside the school environment (Faison-Hodge & Porretta, 2004). In addition, several critical aspects of life, such as social interaction and self-initiated engagement in physical activity, are being formulated and developed during recess (Horvat & Franklin, 2001).

The general classroom is the third school setting and covers all classes besides physical education and the recess setting. Within the general classroom, limited opportunities to be moderately-to-vigorously active are expected because of educational study time, which mainly takes place in a stationary, sitting position and thereby should significantly differ from the physical education setting.
The purpose of this study was the examination of the average school physical activity level and the duration of moderate-to-vigorous physical activity in youth with visual impairment. The secondary purpose was to determine if physical activity is correlated with the degree of vision.

METHODS

Participants

Participants in this study were 15 youth (10 male and 5 female) between the ages of 11 to 18 years (M = 13.93 years, SD = 2.19 years) who have a visual impairment and no additional physical disability. Participants were recruited from two schools for the blind, located in the Northwest of the United States. The parents of the participants reported the degrees of vision. One participant did not have any physical education on the schedule. Therefore the participant’s data were not included in the comparison of physical activity among the different school settings. The investigators’ Institutional Review Board approved the study. Written parental consent and participants verbal assent was obtained prior to data collection.

Instruments

The Actiwatch®-16 (Mini Mitter, 2000), an omnidirectional accelerometer, was used to measure physical activity. The Actiwatch® is a small wristwatch-like device. It can be used to objectively assess gross motor activity data over an extended
period of time in a field setting. Forces of 0.01 gravity can be sensed and recorded as epoch-by-epoch activity counts. Commonly, an epoch is characterized in seconds or minutes (Mini Mitter, 2000). Depending on the epoch set for the study, data can be stored over a specified period of time. Within the last decade, the usage of accelerometers for measuring physical activity has increased. The instrument has been recognized as reasonably accurate for measuring general locomotor tasks (Welk, 2002) as well as measuring daily physical activity (Sugimoto, Hara, Findley, & Yoncmoto, 1997) and children's free-play physical activity (Ott, Pate, Trost, Ward, & Saunders, 2000). A study by Puyau, Adolph, Vohra, Zakeri, and Butte (2004) reported on the validation of the Actiwatch® by comparing it to energy expenditure. “The [Actiwatch] prediction equation accounted for 76%- 79% of the variability in [activity energy expenditure] and [physical activity ration]” (p.1628).

Procedures

Prior to data collection, the participants in the study wore the Actiwatch® for three days on their non-dominant wrist. The non-dominant wrist was chosen as placement for the Actiwatch®-16 due to a) the original design as a wrist-worn device (Mini Mitter, 2000), b) tying the instrument most effectively to the limb, resulting in the reduction of error from external influences (Chu, Lawson, & Naughton, 2003; Nilsson, Ekelund, Yngve, & Sjöström, 2002; Welk, 2002), and c) compared with other placements no significant differences were found in previous studies (Chen, Acra, Majchrzak, Donahue, Baker, Clemens, Sun, & Buchowski, 2003; Paavonen, Fjällberg,
Steenari, & Aronen, 2002; Patterson et.al., 1993). The non-dominant hand was identified as a) the opposite hand from using a cane and/or b) the opposite hand of throwing a ball. In two cases the opposite hand from using the cane was used, even if it represented the hand used for throwing a ball. The three-day period prior to data collection allowed the participants to become comfortable and familiar with wearing something on their wrist and decreased reactivity. Data collection began after the three-day familiarization period was completed. In all cases, participants wore the Actiwatch®-16 on four consecutive days and data was obtained from Monday morning to Friday morning. The Actiwatch®-16 was worn day and night. The use of 3-4 consecutive days has been shown to be an appropriate time period for outcomes with 80% reliability if the purpose of the study is to look at the activity counts and time spent in moderate-to-vigorous activity (Matthews, Ainsworth, Thompson, & Bassett, 2002). During data collection the epoch length was set at 30-seconds, because it provides a relatively accurate measure of physical activity behaviors (Finn & Specker, 2000; Freedson & Miller, 2000; Patterson, 1993; Welk, 2002) and allows the collection of data for 5½ days without resetting the Actiwatch®-16 (Mini Mitter, 2000).

To achieve a more complete description of and orientation to the recorded movement counts, teachers were asked to complete a physical activity log each day. The “School Activity Log” (see Appendix H) was used to mark the beginning as well as ending time, the setting, and type of activity during recess, regular class time, and physical education. Parents/guardians were also asked to complete a “Parent Survey”
(see Appendix E) to provide further information about the individual’s demographic information such as age, gender, degree of vision, additional disabilities, stereotypical behavior, and school placement. The investigator was present at the school for questions on the second day of data collection. The assessed physical education sessions followed the assigned curriculum developed by the school for the current academic year and was not modified for this particular study. Participants received a talking pedometer for their participation in the study.

Variables/ Measures

Level of physical activity and percentage of time spent in moderate-to-vigorous physical activity were assessed during physical education, recess, and class time. The level of physical activity was measured as the average movement counts per 30 seconds for four consecutive days. The percentage of time spent in moderate-to-vigorous physical activity was calculated for each setting (physical education, recess, and classroom) and represented an average from four days of measurement. A frequency of greater than 350 movement counts per 30-seconds was used to determine whether a youth had participated in moderate-to-vigorous physical activity. Puyau et.al. (2004) have recommended a criterion for intensity of physical activity using the Actiwatch. They have recommended that lower than 50 movement counts per 1-minute be identified as sedentary, between 50 to 700 movement counts as light, between 700 to 2500 as moderate, and greater than 2500 as vigorous physical activity. Those cut-points were adjusted from a 1-minute epoch time to the 30-second epoch
time used in this current study. The individual’s daily means of physical activity level and duration of moderate-to-vigorous physical activity were summarized as well as averaged for each time period over four days (Monday to Thursday) and used for the final data analysis.

Data Analysis

Two separate repeated measure ANOVAs were used to examine the differences for each dependent variable: a) Total amount of physical activity, and b) duration of moderate-to-vigorous physical activity. The independent variables were the three distinct settings in the school environment that included physical education, recess, and the general classroom setting. Pearson-product correlations were performed to identify relationships between both, the amount of physical activity and the duration of moderate-to-vigorous physical activity, compared with vision, gender, stereotypical behavior, and the varying school placements. No correlations were found and therefore the data for vision and varying school placements were combined for the analyses. Data screening revealed that scores of the participants with stereotypical behavior (4x rocking, 1x hand-flapping, and 1x eye-poking) were not outliers. Data was analyzed with the SPSS 11.5 software (2002).

RESULTS

Demographic information and the results of individual’s total amount of physical activity and duration of moderate-to-vigorous physical activity for each
participant are summarized in Table 2.1. The level of physical activity for physical education ranged from 179 to 561 (M = 418, SD = 116) movement counts, for recess from 218 to 460 (M = 285, SD = 76) movement counts, and for the general classroom from 163 to 368 (M = 232, SD = 61) movement counts.

Table 2.1. Demographic Data and Participants Data for Key Variables (N = 15)

<table>
<thead>
<tr>
<th>ID</th>
<th>Vision</th>
<th>Age</th>
<th>AMC</th>
<th>%MVPA</th>
<th>Min.</th>
<th>MVPA</th>
<th>AMC</th>
<th>%MVPA</th>
<th>Min.</th>
<th>MVPA</th>
<th>AMC</th>
<th>%MVPA</th>
<th>Min.</th>
<th>MVPA</th>
<th>AMC</th>
<th>%MVPA</th>
<th>Min.</th>
<th>MVPA</th>
<th>Total School</th>
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<tbody>
<tr>
<td>1</td>
<td>B1</td>
<td>13</td>
<td>406</td>
<td>45.6</td>
<td>27</td>
<td>218</td>
<td>19.1</td>
<td>8</td>
<td>418</td>
<td>57</td>
<td>247</td>
<td>21.2</td>
<td>92</td>
<td></td>
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</tr>
<tr>
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<td>266</td>
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<td>22.2</td>
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<td>70</td>
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<td>178</td>
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<td></td>
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</tr>
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<td>15</td>
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<td>474</td>
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<td>53</td>
<td>230</td>
<td>24.6</td>
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<td>172</td>
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<td>24.1</td>
<td>112</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: AMC = Average movement count; % MVPA = Percentage of time spent in moderate-to-vigorous physical activity; min. MVPA = Amount of time (in minutes) spend in moderate-to-vigorous physical activity; # = missing data; - = no physical education; ID\(^1\) = female; ID\(^2\) = male

Table 2.2 summarizes the results of the total amount of physical activity and the percentages of time spend in moderate-to-vigorous physical activity. The 95%
confidence interval for moderate-to-vigorous physical education revealed that it is 95% certain that this interval (CI = 38.70% - 58.14%) for the percentage of time spent in moderate-to-vigorous physical activity spans the true population mean. An overlap of the 95% confidence interval for recess (CI = 24.22% to 36.70%) with the general classroom time (CI = 15.65% to 27.43%) was observed.

Table 2.2  Means, Standard Deviation, and 95% CI for key variables (N = 14)

<table>
<thead>
<tr>
<th></th>
<th>AMC Mean</th>
<th>SD</th>
<th>% MVPA Mean</th>
<th>SD</th>
<th>min. MVPA Mean</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Education</td>
<td>418</td>
<td>116.45</td>
<td>48.4%</td>
<td>16.8%</td>
<td>33.26</td>
<td>38.70% - 58.14%</td>
</tr>
<tr>
<td>Recess</td>
<td>285</td>
<td>76.01</td>
<td>30.5%</td>
<td>10.8%</td>
<td>19.14</td>
<td>24.33% - 36.70%</td>
</tr>
<tr>
<td>Classes</td>
<td>232</td>
<td>60.58</td>
<td>21.5%</td>
<td>10.2%</td>
<td>72.06</td>
<td>15.65% - 27.43%</td>
</tr>
</tbody>
</table>

Notes: AMC = Average Movement Count; SD = Standard Deviation; % MVPA Mean = Percentage of time spent in moderate-to-vigorous physical activity; min. MVPA Mean = Amount of time (in minutes) spent in moderate-to-vigorous physical activity; 95% CI = 95% Confidence Interval.

The results of the repeated measure ANOVAs indicated that there were statistically significant differences among the settings for the level of physical activity, F (1,13) = 29.13, p < .01, and for the duration of moderate-to-vigorous physical activity, F (1,13) = 33.53, p < .01. The average movement counts for physical education were, with 418 movement counts, higher than for recess and for the general classroom setting. The participating youth spent an average of 48.42% (SD = 16.83%) of their physical education time in moderate-to-vigorous physical activity. In comparison, only an average of 30.46% (SD = 10.81%) of the break time and an average of 21.54% (SD = 10.19%) of the class time were spent in moderate-to-vigorous physical activity. The average length of physical education on each day of
the week ranged from 55 minutes to 105 minutes (M = 70.6 minutes, SD = 17.7 minutes).

The follow up analyses of pair comparisons with the Bonferroni-Test indicated that there were significant differences between physical education and recess (Mean difference = 133.01, p < .05). Significant differences were also found between physical education and the general classroom (Mean difference = 186.31, p < .05) and finally between recess and class (Mean difference = 53.23, p < .05).

Table 2.3  Correlation Matrix (N = 15)

<table>
<thead>
<tr>
<th></th>
<th>PE - ACM</th>
<th>PE - MVPA</th>
<th>Recess - ACM</th>
<th>Recess - MVPA</th>
<th>Class - ACM</th>
<th>Class - MVPA</th>
<th>School - ACM</th>
<th>School - MVPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE - ACM</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE - MVPA</td>
<td>0.97* (N=14)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recess - ACM</td>
<td>-0.23 (N=14)</td>
<td>-0.19 (N=14)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recess - MVPA</td>
<td>-0.22 (N=14)</td>
<td>-0.19 (N=14)</td>
<td>0.98* (N=15)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class - ACM</td>
<td>0.04 (N=14)</td>
<td>0.05 (N=14)</td>
<td>0.62* (N=15)</td>
<td>0.49 (N=15)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class - MVPA</td>
<td>0.23 (N=14)</td>
<td>0.25 (N=14)</td>
<td>0.54* (N=15)</td>
<td>0.44 (N=15)</td>
<td>0.96* (N=15)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School - ACM</td>
<td>0.41 (N=14)</td>
<td>0.4 (N=14)</td>
<td>0.42 (N=15)</td>
<td>0.30 (N=15)</td>
<td>0.90* (N=15)</td>
<td>0.92* (N=15)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>School - MVPA</td>
<td>0.44 (N=14)</td>
<td>0.45 (N=14)</td>
<td>0.48 (N=15)</td>
<td>0.38 (N=15)</td>
<td>0.88* (N=15)</td>
<td>0.95* (N=15)</td>
<td>0.97* (N=15)</td>
<td>1</td>
</tr>
<tr>
<td>Vision</td>
<td>0.71* (N=12)</td>
<td>0.58 (N=12)</td>
<td>0.00 (N=13)</td>
<td>-0.00 (N=13)</td>
<td>0.29 (N=13)</td>
<td>0.36 (N=13)</td>
<td>0.56* (N=13)</td>
<td>0.53 (N=13)</td>
</tr>
</tbody>
</table>

Notes: PE ACM = Level of physical activity during physical education; PE MVPA = Duration of moderate-to-vigorous physical activity during physical education; Recess ACM = Level of physical activity during recess; Recess MVPA = Duration of moderate-to-vigorous physical activity during recess; Class ACM = Level of physical activity during general classroom time; Class MVPA = Duration of moderate-to-vigorous physical activity during general classroom time; School ACM = Level of physical activity during school hours; School MVPA = Duration of moderate-to-vigorous physical activity during school hours; * = statistical significance
Pearson-product correlation revealed that the total amount of physical activity during school hours was significantly correlated with vision ($r = .56, p < .05$); whereas school hours were not significantly correlated with the amount of time spent in moderate-to-vigorous physical activity ($r = .53, p > .05$). The level of physical activity was not correlated with the degree of vision except for physical education ($r = .71, p < .05$). Correlation results can be found in Table 2.3.

DISCUSSION

This study has revealed a clear difference in the level of physical activity and duration of moderate-to-vigorous physical activity within the varying school settings for youth with visual impairment. The highest level of physical activity engagement was found to be during physical education, followed by recess, and with the smallest physical activity engagement occurring during the general classroom period. This outcome is contradicting with studies involving children without disabilities (McKenzie, 1995; McKenzie, Sallis, Elder, Berry, Hoy, Nader et.al., 1997), children with mental retardation (Faison-Hodger & Porretta, 2004), and children with autism (Sandt & Frey, 2005), where recess was spent in more moderate-to-vigorous physical activity than physical education. Nevertheless, this current study demonstrates the importance of physical education. Based on this study, structured physical education is important in the school environment because participating students engaged in significantly more physical activity during that time. Physical education is teaching
youth to stay active and to acquire a healthy-lifestyle (Pangrazi, 2003). During physical education children and adolescents learn new skills, which is less likely to happen as an adult. Having the knowledge of a variety of skills increases the competence to engage in activities as adult using the previously obtained skills (Pangrazi, 2003). If opportunities to engage in physical activity within the school environment are limited, youth seem not to be able to compensate the missed physical activity time within the after school time (Dale, Corbin, & Dale, 2000). Physical education is therefore very important with respect to meeting public health requirements for physical activity engagement and it needs to be part of the educational environment.

Based on the investigation results, youth with visual impairment at a segregated school environment received an adequate amount of physical education. In addition, the Healthy People 2010 standard indicating that 40% of physical education should be spent in moderate-to-vigorous physical activity was met. At both schools for the blind, the participants received some type of physical education on every day of data collection. Physical education included activities such as stationary bike, treadmill, walking on a wired track, goalball, and swimming. Such positive results might be due to the segregated school environment and a physical education curriculum specifically designed for individuals with visual impairment. Short and Winnick (1988) in their study compared the physical fitness level of students with visual impairment in different educational settings. Their study outcome favored youth in the segregated school environment. However, caution needs to be exercised in the
interpretation of the indicated high engagement in moderate-to-vigorous physical activity, due to the fact that the cut-point used was originally set for youth without disabilities. It is recommended that a future study be completed looking at Actiwatch® placement differences as well as testing the cut-point for moderate-to-vigorous physical activity for this specific population.

The length of physical education classes in the current study is twice as long as physical education classes in the regular school environments assessed by McKenzie et.al. (1995) and Levin et.al. (2001). An increase in the length of physical education classes for students with visual impairment seems to provide increased activity participation time and allow more time for continuous engagement in physical activity. Based on the data, longer physical education sessions are recommended to meet the required physical activity standards as well as promoting physical activity engagement and thereby supporting the notion of a healthy-lifestyle. This information about the affect of the length of physical education classes positively supports the relatively high amount of moderate-to-vigorous physical activity results of in this present study.

The provision of daily physical education and a variety of physical education activities reflect that the participants were exposed to physical activities developed to respond to the needs of students with visual impairment. Exposure to physical activity as well as disability related sports and the experiences gained through participation are important components of such a program. Those components increase the potential for the individual continuing with sports and overcoming barriers related to engagement
in physical activities outside the school environment. It also enhances the potential for the individual’s pursuing a healthy-lifestyle throughout life (Lieberman, 2005, Shapiro, Lieberman, & Moffett, 2003).

As shown in the correlation matrix (Table 2.3), no relationship between the physical education and the recess as well as the general classroom setting was found. This outcome identifies unique characteristics of the physical education setting, which are the introduction to various physical activity opportunities (COPEC, 2001; National Association of Sport and Physical Education, [NASPE], 2004), education through movement (Pangrazi, 2003), and the continuous engagement in moderate-to-vigorous physical activity (Faison-Hodge & Porretta, 2004; Levin et.al., 2001; McKenzie et.al., 1995; USDHHS, 2000). Physical education compared to the recess setting is also a structured setting for the engagement in physical activity (COPEC, 2001).

It is of interest that the level of physical activity for the recess and the general classroom setting were correlated, but the follow-up analyses of pair comparison revealed significant differences. Classroom activities ranged from Math, Language, Biology, and Living Skills as well as Orientation and Mobility, which represent a variety of stationary desk-activities and activities of daily living. Living skills as well as Orientation and Mobility include more physical activity than desk-activities and therefore increase overall physical activity of the general classroom so that a correlation to recess may occur. In addition, the daily living activities included similar activities as during recess such as walking or interacting with peers. Nevertheless, it needs to be pointed out that the correlation between physical activity level with recess
and the general classroom setting is a moderate correlation. The percentage of shared factors is 38%, which is relatively small. No correlation was found between the two variables for the duration of moderate-to-vigorous physical activity. Therefore, the results of the follow-up analyses of pair comparison that indicated statistical differences are not as contradicting. Recess and the general classroom setting are two physical activity-differentiating components. Participants were more physically active during recess compared to the classroom. However, compared to previous results (Faison-Hodge & Porretta, 2004; McKenzie et al., 1997; Sandt & Frey, 2005) where the percentage of time spent in moderate-to-vigorous physical activity was beyond 40%, recess in this current study was primarily spent in sedentary behavior by the participating youth.

Although it is logical to believe there are significant relationships between vision and amount of physical activity, the results have indicated that there is not a relationship between vision and level of physical activity or the duration of moderate-to-vigorous physical activity (Table 2.3). Previous studies that examined levels of physical activity for individuals with visual impairment found similar results. For example Kozub and Oh (2004) investigated physical activity patterns of children and adolescents with visual impairment in a segregated school environment as well as in an after school environment. They did not find significant correlation between physical activity and gender or degree of vision. Kobberling, Jankowski, and Léger (1991) in their study about the relationship between habitual physical activity and aerobic capacity in blind, partially-sighted, and sighted adolescents came to the same
conclusion that visual acuity was not related to aerobic capacity nor to the duration of their weekly exercise periods. Only one study researched found a significant correlation between the degree of vision and physical activity (Hopkins, 1987). In the area of physical fitness several studies found significant differences between individuals with visual impairment and their sighted peers (Kobberling et.al., 1991; Kozub & Oh, 2004; Lieberman & McHugh, 2001; Seelye, 1983). Some study data reflected differences between degree of vision and physical fitness (Lieberman & McHugh, 2001; Seelye, 1983), but no statistically significant effect was mentioned. This inconsistency in correlation between vision, physical activity, and physical fitness suggests the need for further research with increased control for the degree of vision. Knowing if physical activity and vision are correlated could influence the use of intervention as well as curricular specificities related to certain degrees of vision.

The current study found one exception to the just mentioned outcome. The degree of vision was positively related to the physical activity level in physical education (r = .71, p < .05). Participants categorized as B1 were less active during physical education than participants with B3. This result may lead to the conclusion that the effects of visual acuity differences are observable in a structured setting. If this is the case, the physical education curriculum would need to be adjusted for the varying degrees of vision to accommodate and challenge the student to the best extent possible. But before such a conclusion can be made further research needs to take place that compares structured physical activity with unstructured physical activity
and controls for the degree of vision provided by a trained professional rather than the parents.

The conclusion that gender did not correlate with the level and duration of physical activity contradicts with research involving children without a disability. Several research studies (Ernst & Pangrazi, 1999; Marshall, Biddle, Sallis, McKenzie, & Conway, 2002; Mota, Santos, Guerra, Ribeiro, & Duarte, 2002; O'Connor, Buel, Steinbeck, Davis, Wishart, Gaskin, & Baur, 2003) involving children who do not have a disability found gender differences related to physical activity. Such contradictions between results might be due to the loss of vision and/or the small sample size. However, further research needs to take place with a larger sample size to determine whether gender is or is not a predicting variable for physical activity.

Future studies should involve greater sample size, the after school environment, and be extended to the inclusive class setting. Since structured physical education and activities are already provided for students with visual impairment in a segregated school setting the focus of possible future interventions should be on physical activity during recess time with the goal of increasing voluntary, self-initiated engagement in moderate-to-vigorous physical activity. Intervening at this level may enhance the level of physical activity involvement outside of the school environment for students now and as they mature into adulthood. In addition, it might also positively impact the physical, mental, and social well-being of individuals in this population and support the development of a healthy-lifestyle.
The results of this investigation can be summarized as follows: The level and percentage of time spent in moderate-to-vigorous physical activity among students with visual impairment at the schools for the blind varies between physical education, recess, and general classroom. The Healthy People 2010 requirement that 40% of structured physical education time should be spent in moderate-to-vigorous physical activity was met.
REFERENCES


CHAPTER 3

Physical Activity Among Youth with Visual Impairment

A Comparison of Weekend Versus Weekdays

Kerstin Kindinger
Purpose: The purpose of the study was the examination of the average physical activity level and percentage of time spent in moderate-to-vigorous physical activity among students with visual impairment between the weekend and the weekday setting.

Methods: Participants in this study were 13 youth (8 male and 5 female) with visual impairment between the ages of 12 to 18 years. Physical activity was measured with the Actiwatch®.

Results: The results of the 2x2 (gender X setting) repeated measure ANOVAs indicated that there were statistically significant differences between the settings. The level of physical activity for the week was with an average of 186 movement counts significantly higher than for the weekend (M = 129). A statistical significant main effect, $F(1,11) = 19.20$, $p < .01$, was found for the duration of moderate-to-vigorous physical activity between the week and the weekend setting.

Conclusions: Based on this study it can be concluded that all participants met the 60-minute standards on all days of data collection when outcome is viewed from an accumulated perspective. In addition, the week and weekend physical activity are two independent variables and it cannot be generalized from week setting to the weekend setting.
INTRODUCTION

Physical activity is increasingly recognized as a major component contributing to the promotion of a healthy lifestyle. Over the last two decades the health benefits of physical activity have been studied and have shown evidence that physical activity reduces the risk of cardiovascular heart disease (Biddle, Gorely, & Stensel, 2004), of obesity (Santos, Guerra, Ribeiro, Duarte, & Mota, 2003), and increases muscular strength as well as cardiorespiratory endurance (U.S. Department of Health and Human Services, [USDHHS], 2000). Besides physical benefits, physical activity positively affects the mental (Crocker, Eklund, & Kowalski, 2000) and also the social (Schomer & Drake, 2001) well-being.

The Surgeon General’s Report on physical activity and health (USDHHS, 1996) and the Healthy People 2010 study (USDHHS, 2000) reported an unsatisfactory physical activity behavior for all age groups in the U.S. Research results provide evidence that a physically active behavior is carried over from childhood to adolescence and probably to adulthood (Blair, 1996; Oja, 1997; Telema & Yang, 1997). Such information characterizes the importance of health promotion during childhood and adolescence. Therefore it is important to emphasize physical activity throughout childhood and adolescence. Knowledge of skills necessary for joyful and competent engagement in physical activity is important to start at a young age, because it will allow participation in a wide range of sports and activities (Garcia, Garcia, Floyd, & Lawson, 2002; Pangrazi, 2003). Further knowledge of physically
active behaviors provides opportunities for primary interventions. For young individuals with disability physical activity promotion is of even greater importance. They are facing additional barriers towards physical activity engagement (Lieberman, 2005; Longmuir & Bar-Or, 2000) and have often a lower self-determination to initiate physical activity involvement (Robinson & Lieberman, 2004).

Youth with visual impairment, in particular, may need to be targeted as they are less physically fit (Blessing, McCrimmon, Stovall, & Williford, 1993; Lieberman & McHugh, 2001; Shindo, Kumagai, & Tanaka, 1987; Williams & Armstrong, 1996), have a lower level of self-determination (Robinson & Lieberman, 2004), and need to overcome various barriers when wanting to engage in physical activity (Lieberman, 2005; Lieberman, Houston-Wilson, & Kozub, 2002) compared to their sighted peers. They are at risk for remaining inactive as adults, when engagement in physical activity and/or sports requires a greater degree of initiative. However, the status of physical activity in individuals with visual impairment has not been well documented. A limited number of studies examined the level of physical activity. Kozub and Oh (2004) examined the physical activity level using accelerometry throughout the wake-time on two weekdays and two days of the weekend. Their intention was to determine if specific factors such as residential status, gender, vision level, and body composition predict physical activity. Another purpose was to explore the incidence of moderate-to-vigorous physical activity “to determine when children with visual impairment are most active” (p.2). They made an excellent contribution to the knowledge of research and provided the first information on the physical activity level in youth with visual
impairment. Their study found that youth with visual impairment were less active than youth without disabilities. Approximately 72% of the total moderate-to-vigorous physical activity bouts took place during the week, whereas only 28% occurred on the weekend.

The current study extended the previous research by increasing the number of days for data collection as well as assessment during all 24 hours of the day. The study by Kozub and Oh (2004) was limited to the wake-time (9a.m. to 9p.m.). Their data is susceptible to variation because the younger participants may have been asleep at 7p.m., whereas older participants may have gone to bed after 9p.m., especially on the weekend. To increase the validity the collection of data for over 24 hours was chosen. Besides focusing on the percentage of time spent in moderate-to-vigorous physical activity, this current study also focused on the average movement counts during the week as well as the weekend. Measuring the percentage of time spent in moderate-to-vigorous physical activity allowed the comparison with public health recommendation for physical activity engagement. No study focusing on individuals with visual impairment compared the physical activity engagement with the current recommendations. The assessment of the average movement counts, in addition, provided information about the intensity and frequency of physical activity throughout the days of measurement. By conducting information on the percentage of time spent in moderate-to-vigorous physical activity and the average movement count, three defining characteristics of physical activity were considered: a) intensity, b) frequency, and c) duration. Therefore, the purpose of the study was the examination of
the physical activity level and the percentage of time spent in moderate-to-vigorous physical activity in youth with visual impairment during both the weekday and the weekend settings.

METHODS

Participants

Participants in this study were 13 youth (8 male and 5 female) between the ages of 12 to 18 years (M = 14.38 years, SD = 1.98 years) with visual impairment. None of the participants had an additional physical disability that would have affected physical activity. Participants were recruited from two schools for the blind, located in the Northwest of the United States. The parents reported the degrees of vision. The study was approved by the investigator’s Institutional Review Board. Written parental consent and participants’ verbal consent were obtained prior to data collection.

Instruments

For the assessment of physical activity level and duration of moderate-to-vigorous physical activity the Actiwatch®-16, accelerometers (Mini Mitter, 2000), were used. The Actiwatch®-16 is a small wristwatch like activity monitoring device that can be used to objectively assess gross motor activity data over a longer period of time in a field setting. Forces of 0.01 gravity can be sensed, recorded, and stored in the Actiwatch® as epoch-by-epoch activity counts. An epoch is characterized in seconds or minutes (Mini Mitter, 2000). Over the last decade the usage of activity monitoring
devices, specifically accelerometers, for measuring physical activity has increased. It has been recognized as reasonably accurate for measuring general locomotor tasks (Welk, 2002) as well as measuring daily physical activity (Sugimoto, Hara, Findley, & Yonemoto, 1997) and children's free-play physical activity (Ott, Pate, Trost, Ward, & Saunders, 2000). A study by Puyau, Adolph, Vohra, Zakeri, and Butte (2004) reported on the validation of the Actiwatch® by comparing it to energy expenditure. It also supports the usage of accelerometers to distinguish between sedentary, light, moderate, and vigorous physical activity.

Procedures

The participants in the study wore the Actiwatch®-16 for three days on their non-dominant wrist before any data was recorded. The non-dominant wrist was chosen as placement for the Actiwatch®-16 due to a) the original production as a wrist-worn device (Mini Mitter, 2000), b) tying the instrument most effectively to the limb, resulting in the reduction of errors introduced by external influences (Chu, Lawson, & Naughton, 2003; Nilsson, Ekelund, Yngve, & Sjöström, 2002; Welk, 2002), and c) compared with other placements no significant differences were found in previous studies (Chen, Acra, Majchrzak, Donahue, Baker, Clemens, Sun, & Buchowski, 2003; Paavonen, Fjällberg, Steenari, & Aronen, 2002; Patterson, Krantz, Montgomery, Deuster, Hedges, & Nebel, 1993). The non-dominant hand was identified as a) the opposite hand from using a cane and/or b) the opposite hand of throwing a ball. In two cases the opposite hand from using a cane was used, even if it
was the hand used for throwing a ball. The three-day period prior to data collection allowed the participants to become familiar with the activity monitoring device and to decrease reactivity to the instrument. Data collection began after this familiarization period was over. All participants wore the Actiwatch®-16 for eight consecutive days and data was therefore obtained from Monday to Monday. The epoch length was set to 30-seconds during data collection. This provides a relatively accurate measure of physical activity behaviors (Finn & Specker, 2000; Freedson & Miller, 2000; Patterson et al., 1993; Welk, 2002) as well as the collection of data for 5½ days without replacement of the Actiwatch®-16 (Mini Mitter, 2000). By doing this interruptions of the daily routine were reduced. After five days of data collection the Actiwatch®-16 was replaced with a new Actiwatch®-16.

Parents/guardians were also asked to complete a “Parent Survey” (see Appendix E) to collect further information about the degree of vision, after school residency, siblings, stereotypical behaviors, and additional disabilities.

Variables/ Measures

The following variables were collected in order to assess the physical activity pattern during the week as well as the weekend in youth with visual impairment: a) level of physical activity and b) time spend in moderate-to-vigorous physical activity. The level of physical activity was measured as the average movement counts per weekdays and the average movement counts per weekend days. The percentage of time spent in moderate-to-vigorous physical activity was calculated based upon a
previously developed criterion value (Puyau et al., 2004). Puyau et al. recommended that lower than 700 movement counts per 1-minute count as sedentary-to-light physical activity; whereas greater than 700 movement counts reflects moderate-to-vigorous physical activity. The cut-point was adjusted for 30-second epochs, where greater than 350 movement counts per 30-seconds represented the criterion to distinguish between moderate-to-vigorous physical activity. The combination of level and duration of physical activity provides more information on the participants’ physical activity behavior than the assessment of only one variable. The individual’s daily level and duration of physical activity means were summarized and averaged for four consecutive weekdays (Monday to Thursday) and two consecutive weekend days (Saturday and Sunday) and used for the final data analysis.

Data Analysis

Two separate 2x2 (gender X setting) repeated measure ANOVAs were used to examine the differences for the two dependent variables: a) total amount of physical activity and b) duration of moderate-to-vigorous physical activity. The independent variables besides gender were the week setting as well as the weekend setting. Pearson-product correlations between the two dependent variables and vision as well as stereotypical behavior were obtained to determine if vision needed to be considered for data analysis. No correlation was found and therefore the data was combined. The scores of the participants with stereotypical behavior (3x rocking and 1x eye-poking) were not outliers. Data was analyzed with the SPSS 11.5 software (2002).
RESULTS

The participants' characteristics and their individual results are provided in Table 3.1. The results show that the mean of individual's movement counts for the week ranged from 137 to 264 (M = 186, SD = 33.32) movement counts, whereas the range for the weekend was with 83 to 233 (M = 129, SD = 42.47) movement counts lower. Less than an average of 20% of a day during the week (M = 19.07%, SD = 4.86%) was spent in moderate-to-vigorous physical activity. The percentage was with a mean of 12.62% (SD = 4.86%) even lower for the weekend.

Table 3.1. Participants Demographic Data and Data for Key Variables (N = 13)

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Vision</th>
<th>Age</th>
<th>AMC</th>
<th>% MVPA</th>
<th>min. MVPA</th>
<th></th>
<th>Gender</th>
<th>Vision</th>
<th>Age</th>
<th>AMC</th>
<th>% MVPA</th>
<th>min. MVPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>1</td>
<td>13</td>
<td>91</td>
<td>5.8%</td>
<td>83.2</td>
<td>1</td>
<td>Male</td>
<td>15</td>
<td>14</td>
<td>148</td>
<td>18.3%</td>
<td>263.5</td>
</tr>
<tr>
<td>2</td>
<td>Male</td>
<td>1</td>
<td>12</td>
<td>148</td>
<td>18.3%</td>
<td>263.5</td>
<td>1</td>
<td>Female</td>
<td>1</td>
<td>12</td>
<td>148</td>
<td>18.3%</td>
<td>263.5</td>
</tr>
<tr>
<td>3</td>
<td>Male</td>
<td>1</td>
<td>12</td>
<td>152</td>
<td>14.9%</td>
<td>214.0</td>
<td>1</td>
<td>Female</td>
<td>1</td>
<td>18</td>
<td>109</td>
<td>10.9%</td>
<td>157.2</td>
</tr>
<tr>
<td>4</td>
<td>Female</td>
<td>1</td>
<td>18</td>
<td>109</td>
<td>10.9%</td>
<td>157.2</td>
<td>1</td>
<td>Male</td>
<td>1</td>
<td>15</td>
<td>167</td>
<td>17.2%</td>
<td>247.5</td>
</tr>
<tr>
<td>5</td>
<td>Male</td>
<td>1</td>
<td>15</td>
<td>167</td>
<td>17.2%</td>
<td>247.5</td>
<td>1</td>
<td>Female</td>
<td>1</td>
<td>12</td>
<td>83</td>
<td>6.3%</td>
<td>90.3</td>
</tr>
<tr>
<td>6</td>
<td>Female</td>
<td>#</td>
<td>12</td>
<td>83</td>
<td>6.3%</td>
<td>90.3</td>
<td>1</td>
<td>Male</td>
<td>1</td>
<td>16</td>
<td>103</td>
<td>11.2%</td>
<td>161.0</td>
</tr>
<tr>
<td>7</td>
<td>Female</td>
<td>3</td>
<td>16</td>
<td>103</td>
<td>11.2%</td>
<td>161.0</td>
<td>2</td>
<td>Male</td>
<td>1</td>
<td>17</td>
<td>127</td>
<td>10.2%</td>
<td>146.3</td>
</tr>
<tr>
<td>8</td>
<td>Female</td>
<td>#</td>
<td>14</td>
<td>86</td>
<td>7.4%</td>
<td>106.7</td>
<td>2</td>
<td>Male</td>
<td>2</td>
<td>15</td>
<td>163</td>
<td>17.3%</td>
<td>249.3</td>
</tr>
<tr>
<td>9</td>
<td>Male</td>
<td>1</td>
<td>17</td>
<td>127</td>
<td>10.2%</td>
<td>146.3</td>
<td>2</td>
<td>Male</td>
<td>3</td>
<td>15</td>
<td>163</td>
<td>17.3%</td>
<td>249.3</td>
</tr>
<tr>
<td>10</td>
<td>Male</td>
<td>3</td>
<td>14</td>
<td>233</td>
<td>25.2%</td>
<td>363.0</td>
<td>2</td>
<td>Male</td>
<td>3</td>
<td>16</td>
<td>102</td>
<td>8.3%</td>
<td>118.8</td>
</tr>
<tr>
<td>11</td>
<td>Male</td>
<td>3</td>
<td>16</td>
<td>102</td>
<td>8.3%</td>
<td>118.8</td>
<td>2</td>
<td>Male</td>
<td>3</td>
<td>13</td>
<td>119</td>
<td>11.2%</td>
<td>160.8</td>
</tr>
</tbody>
</table>

Notes: AMC = Average movement count for the week or weekend; % MVPA = Percentage of time spent in moderate-to-vigorous physical activity; min. MVPA = Amount of time (in minutes) spent in moderate-to-vigorous physical activity; # = missing data
Table 3.2 summarizes the mean values for each setting as well as for male and female participants separately. The results of the 2x2 repeated measure ANOVAs revealed significant main effects within the settings, $F (1, 11) = 24.03$, $p < .01$, for level of physical activity. Also, the time spent in moderate-to-vigorous physical activity was significant different between the settings, $F (1,11) = 19.20$, $p < .01$. However, the results indicated no significant interaction with gender and setting. Although, surprisingly, there were no significant main effects on gender.

Table 3.2 Summary of mean values (N = 13)

<table>
<thead>
<tr>
<th></th>
<th>AMC Mean</th>
<th>Stand. Dev.</th>
<th>% MVPA Mean</th>
<th>Stand. Dev.</th>
<th>min. MVPA Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>129</td>
<td>42.47</td>
<td>12.6%</td>
<td>5.7%</td>
<td>181.7</td>
</tr>
<tr>
<td>Female</td>
<td>151</td>
<td>39.96</td>
<td>15.3%</td>
<td>5.5%</td>
<td>220.4</td>
</tr>
<tr>
<td></td>
<td>94</td>
<td>11.08</td>
<td>8.3%</td>
<td>2.6%</td>
<td>119.7</td>
</tr>
<tr>
<td>Week</td>
<td>186</td>
<td>33.32</td>
<td>19.1%</td>
<td>4.9%</td>
<td>274.6</td>
</tr>
<tr>
<td>Male</td>
<td>187</td>
<td>24.71</td>
<td>18.9%</td>
<td>2.5%</td>
<td>272.8</td>
</tr>
<tr>
<td>Female</td>
<td>183</td>
<td>47.44</td>
<td>19.3%</td>
<td>7.8%</td>
<td>277.4</td>
</tr>
<tr>
<td></td>
<td>(N = 8)</td>
<td>(N = 5)</td>
<td>(N = 8)</td>
<td>(N = 5)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: AMC = Average Movement Count; % MVPA Mean = Percentage of time spent in moderate-to-vigorous physical activity; min. MVPA Mean = Amount of time (in minutes) spent in moderate-to-vigorous physical activity.
DISCUSSION

The main finding of this study was that youth with visual impairment at the segregated school environment were significantly more active during the weekdays than the weekend. Their level of physical activity and percentage of time spent in moderate-to-vigorous physical activity was the highest during the week. This information is similar to the outcome of the study obtained by Kozub and Oh (2004), where 72% of the overall moderate-to-vigorous physical activity bouts occurred during two weekdays (48% of the total physical activity occurred within the school environment and 24% of the total physical activity occurred within the after school environment). The percentage of moderate-to-vigorous physical activity bouts during the weekend was, with 28%, lower than during the week. A limited number of studies examined and compared the physical activity level of the week with the physical activity level of the weekend. A study by Trost, Pate, Freedson, Sallis, and Taylor (2000) using accelerometers revealed that adolescent youth without a disability had a statistical significant lower amount of physical activity on the weekend. This is congruent with the results found in this study. Differences between the week and weekend suggest the consideration of new interventions. Besides having the focus of interventions in the educational setting, it is of importance to extend interventions and health-promotion to the parental setting. The results of varying amounts of physical activity during the week and weekend reflect the importance of including weekdays as well as the weekend in the assessment of physical activity. More information could be gathered, which could be useful for the explanation of physical activity patterns.
Statistical differences between weekdays and the weekend, where youth were less physically active during the weekend provides evidence that the weekend was spent in more sedentary activities when compared to weekdays. This may be due to multiple factors. During data collection on the four consecutive weekdays the majority of participants took part in daily physical education. In addition, all participants were enrolled at a school for the blind in the Northwest of the United States. The segregated school environment does not only provide physical education based on a specified curriculum, it also offers opportunities to interact with other peers who have a visual impairment as well. These are all factors that need to be considered for the weekday setting.

The residential status did not correlate with either the weekday setting or the weekend setting. All participants in the study spent the weekend at home and were therefore spread all over the Northwest area of the United States. The weekend surrounding may be another factor to take into consideration. The home residency over the weekend may be less modified and accommodating than the segregated school setting, with limited exposure to various activities, and less familiar. A smaller exposure to physical activity may be due to anxiety or parental overprotection (Lieberman et.al., 2002). Further research needs to be obtained focusing on parental physical activity behavior as well as types of physical activity performed during the weekend. It could provide important information for better understanding of physical activity characteristics and thereby increase the opportunity for more effective and specified interventions.
Another finding of the current study was that males seemed to be more active during the weekend than girls, but no statistical main effect on gender was found with the 2x2 repeated measure ANOVAs. These results are similar to the findings of Kozub and Oh (2004), but are contradicting with the literature focusing on children and adolescents without disabilities (Ernst & Pangrazi, 1999; Marshall, Biddle, Sallis, McKenzie, & Conway, 2002; Pate, Trost, Dowda, Ott, Ward, Saunders, & Felton, 1999; Sääkslahti, Numminen, Niinikoski, Rask-Nissilä, Viilari, Tuominen, & Välimäki, 1999) where statistically significant gender differences were identified. In those previous studies the male participants engaged in more physical activity than the female participants. The information provided by the current study needs to be treated with caution. Such contradictions between the results might be due to the loss of vision and/or the small sample size. In addition, eta square revealed that 29% of the total variation was due to the factor gender. This percentage is relatively high, especially with respect to the sample size. Therefore, further research is suggested to determine if gender affects physical activity level and the percentage of time spent in moderate-to-vigorous physical activity level.

This study also assessed and calculated the average percentage of time spent in moderate-to-vigorous physical activity for the weekdays and the days of the weekend. The outcomes were compared to the physical activity recommendations developed for children and adolescents by the American Cancer Society [ACS] (Byers, Nestle, McTiernan et.al., 2002) and the U.S. Department of Agriculture (U.S. Department of Agriculture, [USDA], 2000). The ACS recommended at least 60 minutes of moderate-
to-vigorous physical activity on at least five days of the week, whereas the USDA recommended 60 minutes of moderate-to-vigorous physical activity on most to all days. All 13 participants in this study met the requirements during the weekdays as well as during the weekend. Their daily moderate-to-vigorous physical activity during the week ranged from 164 minutes to 459 minutes and from 83 minutes to 363 minutes on the weekend. This result provides evidence that the participating youth were all very active and adequately meeting the public health standards for daily moderate-to-vigorous physical activity. Although all the participants seem to meet the public health standards the issue arises as to how these standards for moderate-to-vigorous physical activity engagement should be interpreted. The outcome is contradictory with statistics from the Healthy People 2010 study, where a high percentage of inactivity was identified for all age groups with in the United States (USDHHS, 2000).

Sleap and Tolfrey (2000) identify three interpretational issues. Interpretations of recommendations are “depending upon the criterion selected to distinguish activity from inactivity” (p.595). In the current study a cut-point was set based on a study using the same instrument, but placement and population varied. This may be viewed as a limitation of this study, but a previous study by Chen and colleagues (2003) has shown that the hip placement of an activity monitor underestimated lower-intensity physical activity whereas the wrist placement caused an underestimation of higher-intensity activities. The wrist placement accurately estimated energy expenditure to 86%.
This issue of placement leads to the second aspect that interpretation is “depending on the method [used for] physical activity assessment” (Sleap & Tolfrey, 2000, p.595). The Actiwatch®16- used in this current study provides information about average movement counts related to a certain epoch time and needs to be further tested for reliability and validity with respect to the available physical activity recommendations.

Thirdly, interpretation is “depending on whether assessment of physical activity is based on intermittent, accumulated physical activity, or sustained periods of physical activity” (Sleap & Tolfrey, 2000, p.595). The information provided in the current study allows only the interpretation for accumulated physical activity. If the guidelines of NASPE for children (National Association for Sport and Physical Education, 2004) are taken into consideration, several bouts of 15 minutes or more of moderate-to-vigorous physical activity are recommended for each day. Further and more in-depth research in the area of physical activity is needed to make a reliable and valid statement about physical activity in youth with visual impairment. Public health recommendations should be more specifically defined to make justifiable as well as reliable comparisons.

Based on this study it can be concluded that all participants met the 60-minute standards on all days of data collection when outcome is viewed from an accumulated perspective. In addition, the week and weekend physical activity are two independent variables and it cannot be generalized from week setting to the weekend setting.
REFERENCES


CHAPTER 4: SUMMARY

The following summary will discuss each research question presented in the introduction, and will provide suggested future research directions.

RESEARCH CONCLUSION

1.) Did the level of physical activity and the percentage of time spend in moderate-to-vigorous physical activity differ between school settings (recess, regular class time, and physical education) in youth with visual impairment?

The results show that the level of physical activity, $F(1,12) = 29.13$, $p < .01$, and duration of moderate-to-vigorous physical activity, $F(1,13) = 33.53$, $p < .01$, differ significantly within the school components. No significant effects were found between gender and school settings. More research with a larger sample size is needed to determine if gender has an effect on the variety of school settings. The results reflect that the participating students were most physically active in the structured physical education setting.

2.) Did the level of physical activity and the percentage of time spent in moderate-to-vigorous physical activity vary as a function of gender between the weekday and the weekend setting in youth with visual impairment?

The results show that the level of physical activity, $F(1, 11) = 24.03$, $p < .01$, and percentage of time spent in moderate-to-vigorous physical activity, $F(1,11) =$
19.20, p < .01, differed significantly between a week and a weekend setting. However, no interaction effect with gender was found. The results provide evidence that weekends were spent more in more sedentary activities than weekdays. In addition, the results show the importance of extending interventions and health-promotion to the parental setting.

3.) Was the degree of vision correlated with the level of physical activity and the percentage of time spent in moderate-to-vigorous physical activity?

Although it is logical to believe there are significant relationships between vision and amount of physical activity, the results have indicated that there is not a relationship between vision and level of physical activity or the duration of moderate-to-vigorous physical activity. Pearson-product correlation revealed a significant correlation only between the degree of vision and the level of physical activity during physical education (r = .71, p < .05). But no correlation was found for the level of physical activity and duration of moderate-to-vigorous physical activity between the chosen settings and vision. The inconsistency in correlation between vision and physical activity in this study as well as other studies focusing on physical fitness among youth with visual impairment suggests the need for further research with increased control for the degree of vision. Knowing if physical activity and vision are correlated could influence the use of intervention as well as curricular specificities related to certain degrees of vision.
FUTURE RESEARCH DIRECTIONS

Based on the results of this study and the small amount of research obtained in the area, several suggestions for future research investigations are made.

The first suggestion for future research is to conduct a study, using a larger sample size as well as including youth from an inclusive school environment. This would allow generalizing and extending of the data to the general population. In addition, the classification into degree of vision should be determined by an ophthalmologist to better control for this variable as well as increasing the validity of conclusions. Knowing if physical activity and vision are correlated could influence the use of interventions as well as curricular specificities related to certain degrees of vision.

Contradictions between the results of the current study and previous studies involving children with and without visual impairment on gender differences require to be addressed in future research. It is of interest to determine whether gender is or is not a predicting variable for physical activity in youth with visual impairment.

It would be beneficial to collect data for the school environment as well as the environment outside of school in 30 to 60 minute intervals. This would allow for detailed information on the physical activity engagement behavior and the times of the day and week, when youth with visual impairment are most active. Beyond that further research needs to be obtained focusing on parental physical behavior as well as types of physical activity performed during the weekend. It could provide important
information for better understanding of physical activity characteristics and thereby increase the opportunity for more effective and specified interventions.

Since the placement of activity monitors seems to be an issue in research, it would be helpful to include a second activity-monitoring device on the hip. This would provide the opportunity to receive more accurate data. Limb as well as upper body movement would be considered.

With respect to interpretational issues related to public health recommendations, it would be beneficial if multiple assessment instruments were used, sample size increased, and recommendations interpreted in two ways: a) as accumulated physical activity and b) as sustained periods of physical activity.

The physical activity level and the percentage of time spent in moderate-to-vigorous physical activity in youth with visual impairment still remains relatively unclear and leaves several questions. Further research is needed in the area of physical activity assessment. The suggested recommendations for future studies could provide insight into physical activity patterns. In addition, it could aid professionals and other significant people working with individuals with visual impairment to have information for developing curricula and health-based interventions. Through this the likelihood of a lifelong healthy-lifestyle in individuals with visual impairment could be increased.


Office of Special Education and Rehabilitative Services (OSE/RS), 34 CFR 300 (2002).


Welk, G.J. (2002a). Introduction to physical activity research. In G.J. Welk (Ed.), *Physical activity assessments for health-related research*. Champaign, IL: Human Kinetics


APPENDICES
Within the last decade the importance of physical activity and its contribution to quality of life has been recognized. The amounts of published professional research, evidence in public media, and number of intervention programs have increased (President’s Council on Physical Activity and Sports, 1996, U.S. Department of Health and Human Services, 2000). A general goal of professionals in the area of physical activity could be summarized as follows: Every human being should have the opportunity to access and be involved in movement, physical activity and sport (Doll-Tepper, 1996).

Physical Activity – General Information

Physical activity is commonly defined as “any bodily movement produced by skeletal muscles that results in caloric expenditure” (Casperson, Powell, & Christensen, 1985). Since “bodily movement” is influenced by several factors, the understanding of physical activity variability is a specific topic of interest. The wide variety of physical activity factors has been examined in current and previous literature (Katzmarzyk, Malina, Song, & Bouchard, 1998; Oja, 1997; Reid, 2000; Santos, Guerra, Ribeiro, Duarte, & Mota, 2003; Welk, 2002a). Factors like type, intensity, frequency, and duration of physical activity are defining characteristics. Besides these quantitatively measurable characteristics the following dichotomous characteristics are extending the variety of physical activity factors: Occupational
versus leisure physical activity; continuous versus intermittent physical activity; weight bearing versus non-weight bearing physical activity; individuals with disability versus individuals without disability (Welk, 2002a). There are other areas in the list of factors that exemplify physical activity that could also be expanded upon. Awareness of the differences in definition is required to avoid using the words physical exercise and/or physical fitness interchangeably with the word physical activity. Both words are incorporated in the definition of physical activity, but do not reflect the multiplicity of physical activities that encompasses “any bodily movement” (Casperson, Powell, & Christensen, 1985) as well as the improvement of health (Schomer & Drake, 2001). Physical exercise is known as “physical activity that is planned, structured, repetitive, and results in (an) increase or maintenance of one or more facets of physical fitness” (Welk, 2002a, p.4), whereas physical fitness is well-known as “a set of outcomes or traits that relate to the ability to perform physical activity” (Welk, 2002a, p.4). The multiple components and usages of physical activity produce limitations to research, especially to the comparison of research study results, where research specific physical activity components and measures are used.

Method of Measuring Physical Activity – Actiwatch®

One common way to objectively assess physical activity in a field setting is the use of an activity-monitoring device including the usage of an activity log. The Actiwatch® is a small, lightweight, omnidirectional, wrist-watch like activity-monitoring device developed by Mini Mitter (2000) to measure dynamic, gross-motor
movement. Forces of 0.01 gravity can be sensed, recorded, and stored in the Actiwatch® as epoch-by-epoch activity counts. An epoch is characterized in seconds or minutes (Mini Mitter, 2000). Depending on the epoch set for the study, data can be stored over a certain period of time.

Over the last decade the usage of activity monitoring devices, specifically accelerometers, for measuring physical activity has increased. It has been recognized as reasonably accurate for measuring general locomotor tasks (Welk, 2002b) as well as measuring daily physical activity (Sugimoto, Hara, Findley, & Yoncmoto, 1997) and children’s free play physical activity (Ott, Pate, Trost, Ward, & Sanders, 2000). A study by Puyau, Adolph, Vohra, Zakeri, and Butte (2004) has been reported on the validation of Actiwatch® and Actical® by comparing it to energy expenditure. They concluded that both accelerometers “provide a valid measure of children’s (activity energy expenditure) and (physical activity ratio) and can be used to discriminate sedentary, light, moderate, and vigorous levels of physical activity” (p.1631).

As just mentioned, the Actiwatch® has been found to be an appropriate method for measuring physical activity. However, its usage can be and has been questioned on a) the possibility of error during the conversion from amount of movement counts to energy expenditure, b) the influence of external factors, as i.e. external vibration, on the movement count, c) the placement of the device at different body parts, and d) the variation of movement counts related to certain activities (Chu, Lawson, & Naughton, 2003; Nilsson, Ekelund, Yngve, & Sjöström, 2002; Ott et al., 2000; Puyau et al., 2004; Welk, 2002b, Westerterp, 1999). Besides the mentioned
issues, the Actiwatch® has benefits that support its value in the research of physical activity. Benefits include: a) the reduction of subjectivity and thereby the increase of objectivity within physical activity research, b) the opportunity to use it in lab as well as field setting with fairly valid results, c) the tracking and recording of information over several days using a particular epoch setting for recording, d) the provision for receiving information on frequency, intensity, duration, and energy expenditure of physical activity, and e) the small disruption of wearing the device, which is similar to wearing a watch and/or a belt (Finn & Specker, 2000; Freedson & Miller, 2000; Ott et.al., 2000; Puyau et al., 2004; Telford, Salmon, Jolley, & Crawford, 2004; Welk, 2002b).

Benefits of Physical Activity

Benefits related to physical activity have been studied over the last decade and have become more evident in health promotion. Health defined as “a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity” (World Health Organisation, n.d., p.1), reflects the three key areas of physical activity benefits.

Physical activity leads to an increased physical well-being because it a) decreases the risk of obesity (Santos et al., 2003), b) decreases morbidity (Scruggs, Beveridge, & Watson, 2003), c) decreases the risk of cardiovascular heart disease (Biddle, Gorely, & Stensel, 2004), d) decreases the risk of osteoporosis (Nevill, Holder, & Stewart, 2004; Marcus, 2001), e) increases muscular strength and
endurance, f) increases cardio-respiratory endurance, and g) increases flexibility (U.S. Department of Health and Human Services, 2000). Mental well-being is positively affected by physical activity due to a) an increase of self-esteem, b) an increase of self-perception, c) an increased sense of self-control, d) an increase in stress management, and e) a decrease in the risk of depression and anxiety (Crocker, Eklund, & Kowalski, 2000; Schomer & Drake, 2001). The third area, social well-being, of physical activity benefits is less researched but generally observable. Physical activity increases interpersonal relationships as well as the openness to interact with other people (Schomer & Drake, 2001). Based on the positive influence of physical activity on the physical, mental, and social well-being it can be concluded that physical activity increases the understanding of health as proposed by the World Health Organisation and thereby is associated with an increase in the quality of life.

Physical Activity

The Surgeon General’s Report on Physical Activity and Health (U.S. Department of Health and Human Services, 1996) and the Healthy People 2010 Study (U.S. Department of Health and Human Services, 2000) reported an unsatisfactory physical activity behavior for all age groups in the U.S. In the year 2001, only 32% of those age 18 years and older were involved in physical activity on a regular basis. The percentage was even lower for students in grades nine through twelve with 26% of that group involved in moderate physical activity. 65% of ninth to twelfth graders were involved in vigorous physical activity. That is a greater percentage than for
individuals aged 18 years and over. However, this percentage still does not meet the objective set by Healthy People 2010 (U.S. Department of Health and Human Services, 2000). Results for people with a disability were only available for the age group 18 years and older. These results indicated that people with a disability were less active. 65% of the adult population with disability engaged in no leisure-time physical activity, whereas less than 25% of the adult population without disability did not engage in leisure-time physical activity (U.S. Department of Health and Human Services, 2000). This might be due to the fact that less modified opportunities are available for individuals with disability. Results for physical activity level for K through eighth grade were not even mentioned for those without a disability. Gaining more data about certain populations with a disability will provide information necessary for interventions and the impact of the disability as well as health conditions in general.

Previous research studies have been focusing on the physical activity level of children during the school day, physical education, recess, after school and for attaining an overall physical activity level (Faison-Hodge, & Porretta, 2004; Jarrett, 2002; Keating, Kulinna, & Silverman, 1999; McKenzie, Feldman, Woods, Romero, Dahlstrom, Stone, Strikmiller, Williston, & Harsha, 1995; Pellegrini & Bjorklund, 1997; Scruggs et.al., 2003). More research in this area is needed since professionals are recognizing links between inactivity in children and sedentary living behaviors (Blair, 1996) and an increase in health risks (Oja, 1997) among adults. Pate, Trost, Dowda, Ott, Ward, Saunders, and Felton’s (1997) longitudinal study about the
tracking of physical activity from elementary to middle school came to the conclusion that fifth graders usually remain at risk of low physical activity two years after they had been categorized as being at risk for low physical exercise levels. The study included a higher tracking level of male student physical activity behaviors. For the analysis of 30-minute blocks of vigorous as well as moderate-to-vigorous physical activity, sedentary behaviors, and energy expenditures, the Previous-Day-Physical-Activity-Recall was used. The results also reflected a greater activity level in male students than female students, which provides an explanation for a lower energy expenditure rate by female students observed in this study.

Another significant study completed by Sääkslahti, Numminen, Niinikoski, Rask-Nissilä, Viikari, Tuominen, and Välimäki (1999) in a Scandinavian country obtained a noteworthy correlation between low engagement in physical activity and low fundamental motor-skills as well as a higher risk of cardiovascular heart disease (CHD) in children three to four years of age. Sääkslahti et al. results show no gender differences in motor-performance, but do show differences in the type and intensity of physical activities. Boys have a higher level of play activities, whereas girls are more active if their play is unattended. Similar tendencies towards significant gender differences regarding the type, duration, and intensity of physical activity have also been found in a variety of research studies (Ernst & Pangrazi, 1999; Marshall, Biddle, Sallis, McKenzie, & Conway, 2002; Mota, Santos, Guerra, Ribeiro, & Duarte, 2002; O’Connor, Buel, Steinbeck, Davis, Wishart, Gaskin, & Baur, 2003). Santos et.al. (2003) in addition found a significant age difference in activity levels for female
students aged 11 to 13 years compared to their female peers aged 8 to 10 years and 14 to 16 years.

Age as well as gender influenced aspects of vigorous physical activity in first through twelfth graders observed by Sallis, Taylor, Dowda, Freedson, and Pate (2002). In their study of the comparison of daily physical activity level in children aged 8 to 15 years with a focus on Body Mass Index (BMI), Mota et al. (2002) found significant differences between non-obese and obese girls as well. Non-obese girls were more active and engaged in a greater amount of moderate-to-vigorous physical activity per day, whereas the obese girls in the study did not reach the desired objective of one hour moderate-to-vigorous physical activity per day. This outcome was gender specific and was not found in male students in this study.

Previous research findings make it obvious that it is important to prevent a decline in the state of children’s current as well as future health, which includes the physical, mental, and social well-being. Children are still emotionally and physically developing. Prevention can be accomplished through the promotion of living a healthy as well as a physically active lifestyle.

Physical Activity – School Day

With respect to a decrease in physical activity behaviors and thereby an increase of health-risks throughout all age-groups, the U.S. Department of Health and Human Services (2000) has started a program to improve health, fitness, and quality of life through daily physical fitness. In addition, the implementation of health-related
education in the general curriculum of American schools has been recommended due to the fact that children spend a relative high percentage of their time at school. Schools are recognized as having a great educational influence on students' current and future lifestyles and their capacity to manage life-situations.

Within the school environment physical education and recess are found to be critical times for increased engagement in physical activity. "Physical education provides a sequential instructional program" (COPEC, 2001, p.2) that introduces students to physical activity and related components such as motor skills, physical competence, and fitness. Benefits of physical education encompass the physical, mental, cognitive, and affective areas of an individual. "Recess is unstructured playtime" (COPEC, 2001, p.1) and should be seen as an important educational component within the general curriculum, since it is a place where students can make choices and voluntarily engage in physical activity. Such a setting provides each individual with opportunities for physical, emotional, and social development. The general class time as a third major school component is characterized with limited opportunities to be active.

Physical Education

During physical education children engage in moderate-to-vigorous physical activity. In the McKenzie et.al. (1995) study, for example, students engaged an average of 36.2% of the lesson in moderate-to-vigorous physical activity, whereas third graders from the other study participated even less. However, the percentage of participation in moderate-to-vigorous physical activity increased with grades up to an
average maximum of 42.4% for fifth graders (Levin, McKenzie, Hussey, Kelder, & Lytle, 2001). This increase might be due to a more active physical education curriculum for the different age groups. A decrease of physical activity, starting with sixth grade, might occur due to the fact that the percentage of schools that require physical education for these grades fall below 40% and decrease even further with the upper grades (Burgeson, Wechsler, Brener, Young, & Spain, 2001). Based on these studies physical education programs as now practices, which are viewed as an important component of physical activity and health promotion, did not meet the requirement that 40% of the physical education time should be spent in moderate-to-vigorous physical activity (U.S. Department of Health and Human Services, 2000).

The length of physical education is another important indicator for increased engagement in physical activity. McKenzie et.al. (1995) as well as Levin et.al. (2001) came to congruent results regarding the length of physical education lessons. The McKenzie et al. study acquired data from third graders who received an average physical education lesson length of 29.5 minutes. This outcome is similar to the measured duration of 33 minutes for children participating in the study by Lenin et al. (2001). In addition, they found that the duration of the physical education lesson does not vary significantly for grades 3 through 5.

Recess

Most articles regarding recess focus on social behaviors instead of physical activity (Anderson-Butcher et.al., 2003; Pellegrini & Bjorklund, 1997; Pellegrini, Huberty, & Jones, 1995). A study in 1997 focusing on the physical activity patterns of
children during recess over a period of 2 years, concluded that boys are more active during recess than girls (McKenzie, Sallis, Elder, Berry, Hoy, Nader et al., 1997). This result is congruent with the research on the general physical activity level. Scruggs et.al. (2003) also investigated gender differences for the moderate-to-vigorous physical activity engagement during recess in their study. During a regular lunch break female students engaged 41.9% in moderate-to-vigorous physical activity, whereas the male students engaged 14% more than the females in moderate-to-vigorous physical activity. Besides this gender difference, the duration of recess decreased with an increase in grade levels (McKenzie et al., 1997). Knowing that mandatory physical education decreases with grade level it is alarming to discover that the second component for physical activity during school time, which is recess, also decreases as grade levels increase and is not even present for middle and high school students.

An interesting outcome, that would need some further observation and analysis including the physical activity level during general classes, is the high amount of physical activity during the first three minutes of recess. After three minutes the engagement in moderate-to-vigorous physical activity decreases with the time spent in recess. Nevertheless, an average participation of 43.3% of the recess time by preschoolers was spent in moderate-to-vigorous physical activity. This engagement increased over the years to 49.1% when the children were in elementary school (McKenzie et al., 1997)

Recess interventions to promote physical activity (Scruggs et al., 2003) and social skills (Anderson-Butcher et.al., 2003) have shown beneficial outcomes,
especially an increase of the school-time physical activity level. However, researchers should keep in mind when developing intervention programs that the purpose of recess is unstructured playtime. In a study about the effect of recess on children’s behavior during recess compared to their behavior within the classroom, the researchers observed a lower attention span in the classroom setting before recess than after recess (Butcher, 1999).

Physical Activity – Students with Disability

Students who are living with a disability have just as great a need and right to be physically active and increase their fitness level as those without disabilities. Disabled People International defines “disability as the outcome of the interaction between a person with an impairment and the environmental and attitudinal barriers he/she may face” (Mulcahy, n.d., p.1). Whereas impairment is defined by United Nations Enable as “any loss or abnormality of psychological, physiological, or anatomical structure or function” (United Nations Enable, n.d., p.1). Physical activity is especially important for students with disabilities due to the fact that physical activity is associated with positive health-related benefits, i.e. an increased ability to complete daily physical activities, a decrease in secondary disabilities, and thereby an overall increase in the quality of life.

Recognizing physical activity as an important component of quality of life is already a big step towards an active lifestyle. Nevertheless, people with disability are facing several challenges on different levels that do vary from individual to individual
as well as from disability to disability (Longmuir & Bar-Or, 2000; Seaman, 1999). In addition, a majority of people with disabilities are less active or not physically active at all. This might be due to limited participation opportunities in comparison to children without a disability. The current federal education law (such as IDEA), requires schools to include children with disability into general education and specifically identifies physical education as an important component within the school-day (Council of Exceptional Children, n.d.).

For children with a mental retardation, recess is a setting where they show a higher level of physical activity than during the general classroom setting (Horvat & Franklin, 2001). This outcome is consistent for an inclusive as well as a non-inclusive recess setting. When compared with a group of non-disabled children that have been categorized as low cardio-respiratory fitness, children with mild mental retardation showed similar engagement in moderate-to-vigorous physical activity during recess and physical education (Faison-Hodge & Porretta, 2004). This outcome provides information about activity engagement for people with mental retardation that is comparable to children without a disability, who are less fit and active. So far, most research studies in this area have been conducted with a focus on mental retardation and physical disabilities. These research studies reflect the importance of focusing on and determining the physical activity level of students with a disability throughout the school day. In addition, children with a disability have been identified as future research priorities (Cooper, Quatrano, Axelson, Harlan, Stineman, Franklin et.al., 1999). So far less research has been done to explore the physical activity level of
children with disability (Fernhall & Unnithan, 2002). However, this research is important because physical activity has an important role in the improvement of health as well as the prevention of diseases.

Students with Visual Impairment

*General Information*

Visual impairment is defined by the Office of Special Education and Rehabilitation Services (2002) as “impairment in vision that, even when corrected, adversely affects a child’s educational performance. The term includes both partial sight and blindness.” If loss of sight occurs before or at birth it is usually a congenital vision loss, whereas the loss of sight during childhood or later is described as adventitious vision loss (Lieberman, 2005). Multiple classifications of visual impairments are currently available and related to particular topics of interest. Within the exercise and sport science research domain the visual acuity categorization into B1, B2, B3 and B4 by the United States Association for Blind Athletes (1998) is used. The incidence rate of visual impairment for children under the age of 18 years results in 12.2 per 1,000 with the occurrence of severe visual impairment in 0.6 per 1,000 (National Dissemination Center for Children with Disabilities, 2004).

*Common Barriers*

Due to their loss of sight, students with visual impairment are facing several challenges and barriers throughout the day. There are barriers and challenges a student with a visual impairment faces regarding introduction to and engagement in physical
activity. The child or adolescent does not have the opportunity to observe others participating in physical activity. If they are partially sighted, some observation may occur but with limitations. In addition, a level of anxiety takes place if an activity is new and/or includes a high amount of physical movement and space for the activity. This anxiety often originates with overprotection by parents, dependence on others and a lower exposure to physical activity opportunities (Lieberman, 2005; Lieberman, Houston-Wilson, & Kozub, 2002; Longmuir, 1998). Other barriers for children and youth with a visual impairment also arise as a result of deficits in the educational environment, insufficient preparation of the professionals working with them (Suvak, 2004), and lack of adequate equipment and programming (Lieberman, Houston-Wilson, & Kozub, 2002).

Longmuir (1998) as well as Lieberman (2005) mention several aspects that positively effect the participation of visually impaired students in physical activity and thereby reduce barriers. Verbal communication is a very important factor, but often underestimated by physical education teachers. Appropriate physical assistance from the instructor, if needed, provides an opportunity for the student with impairment to understand and implement the correct body-movement of a motor-exercise. Lieberman (2005) identifies the most significant challenge for students with a visual impairment as follows: “(T)he missing component in the development of normal patterns of movement and fitness among students with visual impairments is experience, not ability (p.210).”
Physical Activity and Fitness

Most research studies in the field of visual impairment focus on physical fitness (Kobberling, Jankowski, & Léger, 1991; Lieberman & McHugh, 2001; Meek & Maguire, 1996; Seelye, 1983; Short & Winnick, 1988). A few studies focused on individuals with a visual impairment only in addition to examining physical fitness (Jankowski & Evans, 1981; Marley & Beverly-Mullins, 1997; Shindo et al., 1987; Short & Winnick, 1988). Marley and Beverly-Mullins (1997) as well as Shindo et al. (1987) focused on intervention studies. Their intervention programs revealed that students with a visual impairment increased their fitness level significantly. Those results reflect that physical fitness can be positively influenced through a precise intervention focus over several weeks.

Short and Winnick (1988), in comparison, took the differences between educational settings into consideration when assessing the physical fitness level. The result of the Short and Winnick study identified the educational setting as a significant factor for 4 out of 6 fitness test items favoring the segregated group over the included group. Such a result points out that a segregated education setting for visually impaired students seems to be more appropriate. This might be due to the better preparation of educators, their broader knowledge regarding the special disability, and the availability of an increased amount of special equipment.

Short and Winnick (1988) developed the Project UNIQUE Physical Fitness Test to determine body composition, muscular hand strength, power strength, low back-hamstring flexibility, power-speed, and cardiorespiratory endurance, which when
combined, reflect physical fitness. Their test presents several aspects that are relevant for health-related physical fitness.

Significant differences have been found in physical fitness related to the degree of vision in children and adolescents with visual impairment. They generally have a lower physical fitness level than their sighted peers (Lieberman & McHugh, 2001; Meek & Maguire, 1996; Seelye, 1983). Only the research study from Williams and Armstrong (1996) came to a different conclusion. In their study, visually impaired girls showed a higher VO₂ uptake and a lower average maximum heart rate than sighted girls. Both researchers explain this finding that the visually impaired girls' physical education program consisted mainly of cardiovascular endurance.

A few studies examined whether individuals with visual impairment have a sufficient physical fitness level for performing their daily life activities. Meek and Maguire (1996) as well as Seelye (1983) for example used the Kraus-Weber Minimum Physical Fitness Test as a more functional and real life oriented test to determine the physical fitness level. The results of these studies were disappointing and indicated limited physical fitness for individuals with visual impairment.

In 2001, Lieberman and McHugh (2001) used the Fitnessgram to determine health-related physical fitness for individuals with a visual impairment. The Fitnessgram is often used in schools and therefore may suggest the focus on fitness in some current physical education settings. Passing rates for children with visual impairment were 4 out of 5 test items with less than 20%, which is very low compared to sighted children, who passed at least 4 out of 5 items with 48% to 70%. This result
indicates that individuals with a visual impairment perform at lower physical fitness levels than their sighted peers. Lieberman and McHugh (2001) also observed better passing rates for children with low vision compared to children, who were blind. However, the variations in passing rates were not significantly different.

The literature review revealed a deficit of research and information about the physical activity behavior and pattern of individuals with visual impairment. So far only Kozub and Oh (2004) performed an exploratory study of physical activity patterns during the day with this particular population. Low levels of moderate-to-vigorous physical activity bouts were identified. No relationships of physical activity compared to the degree of vision, residency, nor gender were revealed. Further research in this field is needed and may be of great importance for disease prevention as well as health improvement.

Based on the review of these studies it can be summarized that individuals with a visual impairment seem to have a lower physical fitness level than their sighted peers, yet there are many good examples of people with visual impairment who have high levels of aerobic fitness and/or are highly skilled athletes (i.e.: Harry Cordella, Jim Mastro, and Jennifer Butcher).
TO: Joonkoo Yun,  
Exercise and Sports Science

RE: Physical Activity Level Throughout the School Day of Students with Visual Impairment  
(Student Researcher: Kerstin Kindinger)

IRB Application No. 2768

The referenced project was reviewed under the guidelines of Oregon State University's Institutional Review Board (IRB). The IRB has approved the application. This approval will expire on 1/3/2006. This new request was reviewed at the Expedited level. A copy of this information will be provided to the full IRB committee.

Enclosed with this letter please find the approved informed consent documents for this project, which have received the IRB stamp. This information has been stamped to ensure that only current, approved informed consent forms are used to enroll participants in this study. All participants must receive the appropriate IRB-stamped informed consent document.

- Any proposed change to the approved protocol, informed consent form(s), or testing instrument(s) must be submitted using the MODIFICATION REQUEST FORM. Allow sufficient time for review and approval by the committee before any changes are implemented. Immediate action may be taken where necessary to eliminate apparent hazards to subjects, but this modification to the approved project must be reported immediately to the IRB.
- In the event that a human participant in this study experiences an outcome that is not expected and routine and that results in bodily injury and/or psychological, emotional, or physical harm or stress, it must be reported to the IRB Human Protections Administrator within three days of the occurrence using the ADVERSE EVENT FORM.
- If a complaint from a participant is received, you will be contacted for further information.
- Please go to the IRB web site at: http://oregonstate.edu/research/RegulatoryCompliance/HumanSubjects.html to access the MODIFICATION REQUEST FORM and the ADVERSE EVENT FORM as needed.

Before the expiration date noted above, a Status Report will be sent to either close or renew this project. It is imperative that the Status Report is completed and submitted by the due date indicated or the project must be suspended to be compliant with federal policies.

If you have any questions, please contact the IRB Human Protections Administrator at IRB@oregonstate.edu or by phone at (541) 737-3437.

Date: 1/4/05
APPENDIX C – INVITATIONAL LETTER
Date:

Dear Parent/Guardian,

My name is Kerstin Kindinger, and I am currently enrolled in the Master of Science program in Movement Studies in Disability at Oregon State University. I would like to invite your child to participate in my Masters Thesis project.

Maintaining an appropriate physical activity level is associated with health-related benefits and well-being, especially for individuals with disabilities. Children who are physically active usually carry over an active and healthy lifestyle into adulthood. However, research has identified disparities in physical activity participation between children with and without disabilities. Although children with disabilities have the same need and right to be physically active, it is widely believed that children with a disability are less active than their counterparts. Furthermore, there is a lack of knowledge on physical activity pattern of children with visual impairment. The purpose of this study is the examination of the average school day physical activity level of students with a visual impairment. This project will provide valuable information on a better understanding of children’s physical activity behavior and school curriculum adjustments to increase in the level of physical activity.

Participation in this study is voluntary. If your child has been diagnosed with a visual impairment and is capable of walking, then you and your child may be able to participate in this study. During the study your child’s general physical activity behavior will be monitored for a period of 10 days. Your child’s participation will involve wearing a watch-like monitoring device for 10 full days and nights. If you would be interested in having your child participate in this study, please read and return the completed informed consent form to the research investigator in the envelope provided.

You, as parent/guardian, will be asked to support the study through completing a demographic survey as well as recording your child's after school activities. The completion of the survey should take approximately 10 minutes and the recording of the after school activity may be as much as 5 minutes per day.

Choosing to participate or not in the study will not affect the student or parent relationship with the school or teachers.

If you have any questions or concerns do not hesitate to contact me. (Kerstin Kindinger, by e-mail at kindinger@onid.orst.edu or by phone at (541) 737-5927.)

Thank you for your time, effort, and participation in this study. It is greatly appreciated!

Sincerely,

Kerstin Kindinger

Joonkoo Yun, Ph.D.
Assistant Professor
Project Title: Physical Activity Level throughout the school day of students with visual impairment

Investigators: Kerstin Kindinger and Joonkoo Yun, Department of Exercise and Sport Science

PURPOSE

You and your child are invited to participate in a research study carried out in the Movement Studies in Disability program at Oregon State University. According to the Surgeon General physical activity is essential for the health and well being of all individuals. However, research has identified disparities in physical activity participation between children with and without disabilities. Furthermore, very limited information is available regarding physical activity pattern of children with visual impairment. Therefore, the purpose of this study is the examination of the average school day physical activity pattern of students with a visual impairment.

The following sections summarize what you and your child will be asked to do; the potential risks and benefits of this study; and your child's and your rights as a volunteer so that you can both make a decision as to whether you both will participate in this study. The intended uses of the project are to complete partial requirements for a Master of Science degree and to publish the results in a journal.

PROCEDURE

If you both agree to take part in this study, your child will be asked to wear a small watch-like activity-monitoring device, that records body movement, on his/her non-dominant wrist for 10 consecutive days. This device is called Actiwatch®. Since wearing the Actiwatch® is similar to wearing a regular wrist-watch and it should not be of any discomfort to your child. Your child is asked to wear the Actiwatch® continuously throughout the study, both day and night. The Actiwatch® is waterproof and can therefore be worn while bathing, washing, etc.

If your child lives with you during school weeks you will be asked to complete a daily activity log on 5 of those 10 days. The completion of the activity log will take approximately 5 minutes each day. You will also be asked to fill out a survey to provide the researcher with demographic information. Kerstin Kindinger will be present at the school for questions and comments on every other day in the mornings before classes start.

If your child stays in school dormitory, the residence hall staff will be asked a daily activity log, but you will be asked to complete demographic information.

RISKS

There are no foreseeable risks for the participants in this study.

BENEFITS

After data collection and analysis are performed you will receive a copy of your child's physical activity pattern evaluation that has been recorded during the study. The participation in this study provides useful information about the possible need of physical activity modification. Also, your school officials
will receive a copy of students’ physical activity pattern evaluation in summarized form. This evaluation will provide valuable information to make curriculum adjustment if there is needed.

**COSTS AND COMPENSATION**

There will not be any costs for you or your child’s participation in this study. Neither you nor your child will be compensated for participating in this research study. Your child will be eligible to receive a talking pedometer if he/she participates fully in the study.

**CONFIDENTIALITY**

Records of participation in this study will be kept confidential to the extent permitted by law. In case of any report (i.e.: to the principal of the school your child is attending) and publication including data from this study, your child’s identity will not be released. Results will be reported in a summarized manner, so that your child cannot be identified.

**VOLUNTARY PARTICIPATION**

Participation in the study is voluntary and there are no penalties for choosing not to participate or for withdrawing from the study early. If you or your child chooses to withdraw from the study before it has been completed, data that is collected from the participant prior to withdrawal will not be included in the study results.

**QUESTIONS**

Questions are encouraged. If you have any questions about this research project, please contact: Kerstin Kindinger at (541) 737-5927, email: kindingk@onid.orst.edu or Joonkoo Yun at (541) 737-8584, email: jk.yun@oregonstate.edu. If you have questions about your child’s rights as a participant, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator, at (541) 737-3437 or by e-mail at IRB@oregonstate.edu.

You indicate your voluntary agreement to your child’s participation in this research project by completing and returning this form to the research investigator in the envelope provided. Your signature also indicated that this research study has been explained to you and that your questions have been answered. You will receive a copy of this form.

**Student Name (printed):**

**Name of Parent/Guardian (printed) (Date)**

**Signature of Parent/Guardian (Date)**

**OSU IRB Approval Date:** 01-04-05

**Approval Expiration Date:** 01-03-06
SURVEY OF STUDENT'S DEMOGRAPHIC INFORMATION

The information of this survey is of importance for performing a detailed and valuable analysis of the physical activity behavior in students with visual impairment. Gender, age, degree of vision, setting, and siblings are influencing factors of physical activity. Therefore, your support and cooperation through filling out this survey to the best of your knowledge is highly appreciated.
(This survey should be completed by parent/guardian of the participating student!)

Student's Name: ____________________________

Date of Birth (mm/yy): ____/____  Gender:  ____ male  ____ female

Please, describe the vision of your child:

1.)  ____ Check here, if your child does not have any light perception in either eye OR if your child has light perception but is unable to recognize the shape of a hand at any distance/ in any direction.

2.)  ____ Check here, if your child can recognize the shape of a hand up to visual acuity of 20/600 (i.e.: Your child can see a line of text that is 20 feet away with the same readability that a person with "normal" vision would see that line of text from 600 feet away.) AND/OR has a visual field of less than 5 degree (that is the area of space visibility to an eye in a given position of gaze) in the best eye with the best practical eye correction.

3.)  ____ Check here, if your child has a visual acuity between 20/600 to 20/200 (i.e.: Your child can see a line of text that is 20 feet away with the same readability that a person with "normal" vision would see that line of text from 600 to 200 feet away.) AND/OR has a visual field of less than 20 degrees but more than 5 degrees (that is the area of space visibility to an eye in a given position of gaze) in the best eye with the best practical eye correction.

If you know the cause of your child's visual impairment and the acuity of your child's vision, indicate it here:

________________________________________________________________________
________________________________________________________________________

Please, indicate if your child has any stereotypical behaviors:

1.)  ____ Rocking

2.)  ____ Hand flapping

3.)  ____ Other: ______________________

Please, indicate if your child has an additional disability:

1.)  ____ Autism

2.)  ____ Mental Retardation

3.)  ____ Other: ______________________
Please, indicate the school your child is currently attending:

________________________________________________________________________

Please, indicate, where your child is living during school weeks:

1.) ___ On campus
2.) ___ At home
3.) ___ Other:__________________________

Please, mention if your child, when at home is living with siblings:

1.) ___ Age ___ male ___ female Normal vision: ___ yes ___ no
2.) ___ Age ___ male ___ female Normal vision: ___ yes ___ no
3.) ___ Age ___ male ___ female Normal vision: ___ yes ___ no

Mailing Address:
(Information of your address is not required but helpful for sending individual results of the analysis.)

Street: ________________________________

City: __________________________ State: _______ ZIP: ________________

By providing either phone number or e-mail address you indicate the way you would like to be reminded for the recording of your child's after school activities:
(This information is not needed when your child is living on campus during school weeks.)

Phone: (______) _______ - _______

E-mail: ______________________________________

Date: ___/___/____

Thank you for taking the time to fill out this survey!
Outline of the verbal assent conversation with the students

Investigator: Hello everybody! How are you doing?
(Time to respond!)

Investigator: My name is Kerstin Kindinger and I am a student at Oregon State University. Do you have an idea why I am here?
(Time to respond!)

Investigator: I want to find out what kind of physical activities you are doing at school and at home. Because physical activity is important for everyone.

Investigator: It is important to stay healthy and to enjoy life. To find out how often and how much you are moving around during the school day, I am using a special instrument. It is similar to a watch that you can wear on your hand. This instrument is called Actiwatch®.
(Distribution of the Actiwatch® so that the participant can feel them and get a better understanding what I am talking about.)

This instrument recognizes and counts all your movements. For this study you would wear it for 10 days, day and night. You do not have to take it off at any time, because the Actiwatch® is waterproof. You can wear it while you shower, wash your hands, and even when you swim. Your parents and teachers will write down on a piece of paper what activities you are doing. For example, you have a physical education class, then your teacher would write down the time when you started, the time you finished the class.

Investigator: When you wear the watch you can do all things you are usually doing. And the watch should not bother you at all. In 10 days, I will come again and ask you to give me the Actiwatch® back so that I can look at the information on a computer. Later I want to send the results to your parents, your teachers, and I may write an article, so that other children can also benefit.

Everybody of you who decides to wear the Actiwatch® for the 10 days without taking it off will get talking pedometer.
Do you have any questions?
(Time to respond!)

Investigator: If you like to participate in the study, I would like you to wear the Actiwatch® for 10 days without taking it off. However, if you want to take the watch off because you do not like to wear it or you do not want to be in the study, you need to let me know. It is okay if you want to do that and no one will be angry about it. It is your decision.

If you do not want to participate in the study, then place the Actiwatch® in front of you.

Have a great weekend! I see you all in 10 days!
APPENDIX G – TEACHER INFORMATION LETTER
Date: __________________________

Dear __________________________,

My name is Kerstin Kindinger, and I am currently enrolled in the Master of Science program in Movement Studies in Disability at Oregon State University. You are being contacted, because one of your students has agreed to be part of my Masters Thesis project that is being supported by your school. I would like to invite you to voluntarily support the data collection process of my research.

Maintaining an appropriate physical activity level is associated with health-related benefits and well-being, especially for individuals with disabilities. Children who are physically active usually carry over an active and healthy lifestyle into adulthood. However, research has identified disparities in physical activity participation between children with and without disabilities. Although children with disabilities have the same need and right to be physically active, it is widely believed that children with a disability are less active than their counterparts. Furthermore, there is a lack of knowledge on physical activity pattern of children with visual impairment. The purpose of this study is the examination of the average school day physical activity level of students with a visual impairment. This project will provide valuable information on a better understanding of children’s physical activity behavior and school curriculum adjustments to increase in the level of physical activity.

Your involvement in this study is voluntary and if you choose to participate or not in the study it will not affect your relationship to the students, parents, and/or school. Records of participation in this research project will be kept confidential to the extent permitted by law. If you choose to support the data collection you are asked to complete a school activity log on every school day for one week starting Monday /_____/2005 for the students that agreed to participate in the study and are part of your class. Participating students are going to wear a wrist-watch like device on their wrist, which will make it easy for you to recognize participating students from your class. The estimated time commitment for recording school activities of one student may be as much as 5 minutes per day. If more than one student of your class section agreed to participate in the study you may note all their first and last names on the school activity log at once. You can find 5 sheets of the school activity log attached to this letter. Please return the completed school activity logs into an envelope posted at the reception at the end of each day.

If you have any questions or concerns about this study, please do not hesitate to contact Kerstin Kindinger by e-mail at kindinskc@onid.orst.edu or by phone at (541) 737-5927 or Dr. Joonkoo Yun by e-mail at JK.Yun@oregonstate.edu or (541) 737-8584. If you have questions about your rights as a participant, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator by e-mail at IRB@oregonstate.edu or (541) 737-3437.

Thank you for your time, effort, and participation in this study. It is greatly appreciated!

Sincerely,

Kerstin Kindinger

Joonkoo Yun, Ph.D.
Assistant Professor

OSU IRB Approval Date: 01-04-05
Approval Expiration Date: 01-03-06
SCHOOL ACTIVITY LOG

Participant(s) Name(s):

Date: [MM/DD/YYYY]

<table>
<thead>
<tr>
<th>Approx. Beginning Time</th>
<th>Duration (in min.)</th>
<th>Setting (Indoor/Outdoor)</th>
<th>Activity</th>
<th>Initial from teacher</th>
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<tbody>
<tr>
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Beginning of 1st lesson: ____________________ End of last lesson: _______________

Comments:

_____________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________