



The effect of gender and level of vision on the physical activity level of children and adolescents with visual impairment

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ABSTRACT

This study was planned in order to determine physical activity levels of visually impaired children and adolescents and to investigate the effect of gender and level of vision on physical activity level in visually impaired children and adolescents. A total of 30 visually impaired children and adolescents (16 low vision and 14 blind) aged between 8 and 16 years participated in the study. The physical activity level of cases was evaluated with a physical activity diary (PAD) and one-mile run/walk test (OMR–WT). No difference was found between the PAD and the OMR–WT results of low vision and blind children and adolescents. The visually impaired children and adolescents were detected not to participate in vigorous physical activity. A difference was found in favor of low vision boys in terms of mild, moderate activities and OMR–WT durations. However, no difference was found between physical activity levels of blind girls and boys. The results of our study suggested that the physical activity level of visually impaired children and adolescents was low, and gender affected physical activity in low vision children and adolescents.

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1. Introduction

Physical activity is important for general health, physical fitness and quality of life (Cartmel & Banister, 1969). Physical activity is important not only for all sighted children and young adults but also for visually impaired individuals. A visually impaired student has the same needs for activities like team play, competition and cooperation with all normal students. Participation in physical activity helps personality development, confidence and independence and is of vital importance for all environmental development of visually impaired children (Blessing, McCrimmon, Stovall, & Williford, 1993). In many studies in literature, blind children and adolescents have been reported to adopt a more sedentary life style and to have lower physical fitness compared to sighted counterparts (Houwen, Hartman, & Visscher, 2009; Kozub & Oh, 2004; Lieberman & McHugh, 2001; Lieberman, Stuart, Hand, & Robinson, 2006; Longmuir & Bar-Or, 1994, 2000). The low physical fitness level and impaired motor skills of visually impaired children are suggested to arise from limited participation in physical activities (Chen & Lin, 2011; Ponchillia, Strause, & Ponchilli, 2002; Ponchillia, Armbruster, & Wiebold, 2005). Additionally, it has been emphasized that blind children had less chance to take part in physical activities and their participation in after-school sports activities is insufficient (Craig & Armstrong, 1996).

Different methods are used to evaluate physical activity or energy consumption. Some of these methods are physiological measurements such as an activity diary, physical activity record, questionnaires, electronic or mechanical follow up

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(calorimeter, accelerometer, pedometer), and determination of cardiorespiratory fitness (Montoye, 2000; Lamonte & Ainsworth, 2001). An activity diary is an assessment method including records of daily activities with their types and durations at certain intervals (Lamonte & Ainsworth, 2001). Cardiovascular fitness is frequently the most important component of health related physical fitness. This main factor may be improved by developing aerobic fitness through increased physical activity (Lyudmilova & Dimitrova, 2010).

In descriptive epidemiological studies, the activity level of boys was found to be superior when the physical activity levels of boys and girls were compared (Dencker & Andersen, 2008; Eiberg et al., 2005; Riddoch et al., 2004; Sallis, Prochaska, & Taylor, 2000; Sallis, 1993; Trost & Pate, 1999). While the motor performances of boys and girls show moderate differentiation after school age, this difference gradually increases after puberty due to outward oriented activities of boys (Thomas & French, 1985).

Although there are many studies in literature evaluating changes in physical activity at different stages of life including childhood, adolescence, adulthood and old age, there are few studies investigating the physical activity levels of disabled individuals, especially disabled children and adolescents (Blessing et al., 1993; Houwen et al., 2009; Kozub & Oh, 2004; Lieberman & McHugh, 2001; Lieberman et al., 2006). To the best of our knowledge there are no studies comparing physical activity levels of visually impaired children and adolescents and partially blind and blind children or investigating the effect of gender on physical activity in visually impaired children and adolescents using a physical activity diary. This study was planned in order to determine the physical activity level of visually impaired children and adolescents and the effects of gender and level of vision on physical activity in visually impaired children and adolescents. The hypotheses of this study were:

- (1) the level of participation in physical activity and the cardio-respiratory endurance capacity of children and adolescents with low vision are higher than those of blind children and adolescents.
- (2) the level of participation in physical activity and the cardio-respiratory endurance capacity of boys with visual impairment are higher than those of girls with visual impairment.

2. Methods

2.1. Study group

The study comprised a total of 30 visually impaired children and adolescents (11 female and 19 male) aged between 8 and 16 years. All the children and adolescents were attending a special primary/secondary school for the blind. All the participants were examined by an ophthalmologist. After examination, the visually impaired children and adolescents were divided into two groups. Sixteen children and adolescents with low vision were in Group I and 14 blind children and adolescents were in Group II. All parents gave informed consent for this study.

Inclusion criteria for this study were:

1. ages between 8 and 16 years,
2. having no additional neurological, rheumatological or orthopedic disease or problem,
3. children and adolescents with visual impairment (low vision or blindness),
4. having no communication problem.

2.2. Outcome measures

2.2.1. Physical activity diary

The physical activities of visually impaired children and adolescents were evaluated with a 24-h activity diary (Bouchard et al., 1983) for two week days and one day at the weekend within the same week. Activities done at 15 min intervals were recorded in the diary by the observer during the day. The observers comprised a teacher and intern physiotherapists, who were informed about the method of diary keeping. The list classifying the activities according to severity was given to the observers and they were instructed how to use the list. Activities were classified in nine different categories according to their severity. The mildest activity was sleeping and the most severe activities were sports activities causing sweating such as running and football. The name of the activity, the severity of the activity determined by the activity list and the duration of performance were recorded in the diary by the observers. In order to estimate physical activity through the diaries, the activities in the list were categorized as sleep, light activities (listening to a lesson, studying, listening to music, playing chess etc.), moderate activities (walking, recreational activities played in the playground etc.) and vigorous activities (running, football etc.) and the durations of activities were totalled for each category.

The activities on the physical activity list, the durations of the same activities specified on three distinct days were totalled as hours (durations totalled as minutes were converted to hours). Then the total values of all activity durations in the categories according to activity severity and the total weekly durations of the activities on the physical activity list were estimated by totalling the values of light, moderate and vigorous activities and sleep categories.

2.2.2. One-mile run/walk test

The participants' cardiorespiratory capacity was assessed by the one-mile walk/run test (Winnick & Short, 1999). The one-mile walk/run test is a recommended test for visually impaired children and adolescents and this test is an item of The Brockport Physical Fitness Test which is a health-related, criterion-referenced test of fitness. The test was performed on the outdoor track of the school. Following 5 min warm-up (lower extremity stretching and military stepping), each participant was instructed to run or walk one-mile at the fastest pace possible. The blind participants were assisted by a sighted partner and ran/walked together. Verbal encouragement was given to all participants. At the end of the test participants walked slowly for 5 min for cool-down. In this test, the participants run or walk one mile (1609 m) in the shortest time possible.

2.3. Statistical analysis

Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS version 16.0) (SPSS Inc., Chicago, IL, USA) in Windows 2007. Descriptive statistics were given as mean (*M*), and standard deviation (*SD*). The comparison of groups was calculated with the Mann–Whitney *U* test (Kruskal, 1957). A level of $p < 0.05$ was used to denote statistical significance.

3. Results

3.1. The basic information of the students tested

The physical characteristics of the students including age, body weight, height, and body mass index (BMI), are shown in Table 1.

3.2. Physical activity diary (hours/week)

When the total durations (hours/week) of sleep (32.15 ± 0.56 for low vision, 32.11 ± 3.77 for blind), light (27.81 ± 0.31 for low vision, 28.27 ± 2.57 for blind), moderate (10.55 ± 3.06 for low vision, 10.36 ± 2.32 for blind) and vigorous activities (0.03 ± 0.12 for low vision, 0.00 ± 0.00 for blind) determined through the physical activity diary of partially blind and blind children and adolescents were compared, no statistically significant difference was found between sleep, light, moderate and vigorous activities ($p > 0.05$) (Table 2).

When the physical activity diaries were compared in terms of gender, there was a significant difference in favor of boys between low vision boys and girls in terms of light (25.87 ± 2.82 for boys, 30.30 ± 1.96 for girls) and moderate activities (12.16 ± 2.56 for boys, 8.48 ± 2.41 for girls) ($p < 0.05$) (Table 3), but no statistically significant difference was found between physical activity parameters (light activities; 27.78 ± 2.58 for boys, 29.50 ± 2.43 for girls and moderate activities; 10.70 ± 2.43 for boys, 9.52 ± 2.07 for girls) according to the gender of blind children and adolescents ($p > 0.05$) (Table 4).

3.3. One mile-run/walk test (minute)

When the durations of completing the one mile run/walk test of low vision (12.28 ± 2.17 min) and blind (13.95 ± 2.75 min) children and adolescents were compared, no statistically significant difference was found between the two groups ($p > 0.05$).

Table 1
Comparison of the physical characteristics of the participants.

Physical properties	Low vision (<i>n</i> = 16)		Blind (<i>n</i> = 14)		<i>p</i> *
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Age (yr)	10.81	1.79	11.0	3.06	.90
Weight (kg)	36.93	9.11	37.35	12.46	.95
Height (cm)	139.93	13.82	142.92	19.93	.81
BMI (kg/cm ²)	18.63	2.19	17.73	1.95	.25

* Two independent samples tests.

Table 2
Comparison of the physical activity diary and one-mile run walk test results of the participants.

PAD (hours/week)	Low vision (<i>n</i> = 16)		Blind (<i>n</i> = 14)		<i>p</i> *
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Sleep	32.15	0.56	32.11	3.77	.83
Light	27.81	0.31	28.27	2.57	.80
Moderate	10.55	3.06	10.36	2.32	.73
Vigorous	0.03	0.12	0.00	0.00	.35
One mile-run/walk test (minute)	12.28	2.17	13.95	2.75	.06

* Mann–Whitney *U* test.

Table 3

Comparison of the physical activity diary and one-mile run walk test results of children with low vision.

PAD (hours/week)	Girl (n = 7)		Boy (n = 9)		<i>p</i> [*]
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Sleep	32.22	0.55	32.10	0.59	.52
Light	30.30	1.96	25.87	2.82	.00**
Moderate	8.48	2.41	12.16	2.56	.01**
Vigorous	0.00	0.00	0.05	0.16	.37
One mile-run/walk test (minute)	13.55	2.59	11.29	1.13	.04**

* Mann–Whitney *U* test.** *p* < 0.05.**Table 4**

Comparison of the physical activity diary and one-mile run walk test results of the blind children.

PAD (hours/week)	Girl (n = 4)		Boy (n = 10)		<i>p</i> [*]
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Sleep	32.18	0.37	32.09	0.39	.71
Light	29.50	2.43	27.78	2.58	.15
Moderate	9.52	2.07	10.70	2.43	.32
Vigorous	0.00	0.00	0.00	0.00	1.00
One mile-run/walk test (minute)	15.19	2.31	13.46	2.86	.32

* Mann–Whitney *U* test.

(Table 2). The time taken to complete the test was found to be shorter for low vision boys than girls ($p < 0.05$) (Table 3). However, no statistically significant difference was found between the test times of blind girls and boys ($p > 0.05$) (Table 4).

4. Discussion

In this study, the physical activity levels of visually impaired children and adolescents were evaluated with an activity diary and one-mile run/walk test and the effects of level of vision and gender on physical activity was investigated. To the best of our knowledge, there are no studies in literature determining physical activity level using a physical activity diary in visually impaired children and adolescents and physical activity studies have mostly been carried out with healthy children and adolescents (Gavarry, Giacomoni, Bernard, Seymant, & Falgairette, 2003; Sleap & Warburton, 1996; Trost, Pate, Freedson, Sallis, & Taylor, 2000). However in a previous study, the physical activity levels of 49 visually impaired children on weekdays and at the weekend were compared using a physical activity diary and it was reported that light activities were usually done on weekdays, taking part in moderate activities was at the weekend and vigorous activities were never done (Aslan, Kitis, Aslan, & Çalik, 2004). In the current study, low vision and blind children and adolescents were found to participate in light and moderate activities and there was little or no participation in vigorous activities. When Houwen et al. (2009) compared participation in moderate and vigorous physical activities between healthy and visually impaired elementary school children and adolescents, they found the activity level of visually impaired children and adolescents to be lower than that of healthy counterparts. In some other studies, physical activity levels of visually impaired children and adolescents were found to be lower than those of healthy children and adolescents and in addition, they were reported not to take part in vigorous activities in physical activity lessons (Houwen et al., 2009; Lieberman & McHugh, 2001; Longmuir & Bar-Or, 2000; Longmuir, 1998; Sit, Linder, & Sherril, 2002).

A decrease in participation in physical activity leads to impairment in the physical fitness level of visually impaired children and adolescents and insufficiency in motor skills development (Ponchillia et al., 2002, 2005). In previous studies, motor skills, physical abilities and physical fitness levels of children and adolescents with visual impairment were shown to be lower than those of healthy counterparts (Brambling, 2001; Gronmo & Augestad, 2000). In a previous study, it was reported that physical fitness levels and physical fitness subparameters, such as flexibility, cardiorespiratory endurance and muscular endurance, muscle strength and velocity of visually impaired individuals were low (Skaggs & Hopper, 1996). Similar data were obtained in the current study and it was determined that cardiorespiratory endurance levels of visually impaired children and adolescents were low. When the times of completing the one-mile run/walk test in a study conducted on healthy children and adolescents aged between 8 and 16 years (Castro-Pinero et al., 2009), were compared with the completion times of the one-mile run/walk test in the current study, it was seen that the duration was longer for visually impaired children and adolescents.

Schneck (2005), stated that visual perception is required in order to carry out school, occupational, entertainment and social activities in daily life. In a study of children with different levels of vision, it was stated that the motor skills of children with low vision were higher than those of the blind (Atasavun & Düger, 2011). As it was thought that the level of visual perception can influence participation in physical activity, the first hypothesis of the current study was defined as “the level

of participation in physical activity and the cardio-respiratory endurance capacity of children and adolescents with low vision are higher than those of children and adolescents with visual impairment". However, the results of this study did not support the hypothesis. When physical activity participation of low vision and blind children and adolescents in this study was compared, no statistically significant difference was determined between the groups. However, according to the mean values, it was observed that blind children and adolescents did light activities for longer periods and moderate activities for shorter periods compared to low vision children and adolescents. In addition, no difference was found when one-mile run/walk test durations of low vision and blind children were compared. The main factor causing no difference is thought to arise from the lower participation of children and adolescents in our sample in physical activity compared to healthy children and adolescents as stated in literature and that they live in the same environment. These children and adolescents are at boarding school and times of sleeping, walking, lesson, eating, play etc. are specified. When the physical activity diaries were analyzed, this situation was seen to be reflected in the diary. Their doing similar physical activities influenced the one-mile run/walk test results and led to there being no difference between the partially blind and blind children and adolescents. Lieberman, Byrne, Mattern, Watt, & Vivó (2010) evaluated cardiorespiratory fitness of low vision and blind children and adolescents with the one-way run/walk test and did not find any difference between the groups and found cardiorespiratory fitness of all the participants to be low. This result conforms with the results obtained from the current study.

That gender affects participation in physical activity in healthy children and adolescents has been determined in many studies and in these studies boys have been found to be more active physically compared to girls (Nielsen, Pfister, & Andersen, 2011; Purslow, Hill, Saxton, Corder, & Wardle, 2008; Trost et al., 2002). When one-mile run/walk test durations were compared in 68 healthy and active children and adolescents aged between 8 and 17 years, girls were reported to complete the test in a longer time and there was a statistically significant difference between girls and boys (Castro-Pinero et al., 2009). The second hypothesis of the current study was that "the level of participation in physical activity and the cardio-respiratory endurance capacity of boys are higher than those of girls".

In the current study, consistent with literature, it was determined that gender affected physical activity in low vision children and adolescents and participation in moderate activity and the one-mile run/walk test durations demonstrated a difference in favor of boys. However, gender was not determined to have an effect on physical activity in blind children and adolescents. This result showed that the presence of visual perception caused a difference between boys and girls similar to that of healthy children and adolescents. Visual perception in low vision children and adolescents increased participation in physical activity and revealed the effect of gender. However, there is very little information on how gender influences physical activity among healthy children and adolescents (Nielsen et al., 2011). The absence of visual perception in blind children and adolescents decreased the chance of participation in physical activity in their daily lives and caused both genders to do similar physical activities. In the current study, one of the possible reasons for gender not having any impact on physical activity among blind children and adolescents, was thought to be that they do not have visual perception. There is a need for further studies analyzing the effect of gender on physical activity and cardio-respiratory endurance among children and adolescents with different levels of visual perception.

The current study has some limitations, such as the use of self-reported data for physical activity, the absence of more direct measures of energy expenditure to differentiate participation in physical activity, and the small number of visually impaired children and adolescents. Also, the study sample live in a boarding school, which could affect the participants' life style.

The results of this study show that low vision and blind children and adolescents studying at a boarding school had similar physical activity participation and did not take part in vigorous activities. The cardiorespiratory fitness of low vision and blind children and adolescents was found to be similar and lower compared to that of healthy counterparts. Gender was determined to lead to an advantage in favor of boys with low vision both in participation in physical activity and cardiorespiratory fitness. In the light of these results, future research could further investigate the effect of gender and level of vision on physical activity and levels of physical fitness of children with visual impairment. Also, greater participation in physical activity of children and adolescents with visual impairments should be encouraged and developed.

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