GENDER DIFFERENCES IN FUNDAMENTAL MOTOR SKILLS (FMS) AMONG CHILDREN WHO ARE VISUALLY-IMPAIRED

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ABSTRACT

Fundamental motor skill (FMS) should be developed since in early stage of life of the child since it really influences their development, psychology, and social life. The aim of this preliminary study is to identify the level of FMS and to see any significant different between gender among children who are visually-impaired. Total of 30 children (15 boys; 15 girls) aged between 13-15 years old from Persatuan Orang Buta Malaysia, Wilayah Persekutuan Kuala Lumpur participated in the study. The purpose was to evaluate the ability of children who are visually-impaired to achieve the level of FMS using Bruninks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2) by Bruininks (1978). Independent t test had been used with the significant level set at 0.05. Test such as running speed agility (t= (28); p<0.001), standing broad jump (t= (28); p< 0001) and sit ups (t= (28); p<0.001) test show a significant difference between gender. Other test such as standing with preferred leg on floor (t=(28); p= 0.19), standing with preferred leg on balance beam (t(28), p=0.43), jumping in place-leg and arm on opposite side synchronized (t=(28); p=0.31), jumping up and clapping hands (t=(28); p=0.46), bouncing a ball and catching it with both hands (t=(28); p= 1.00), bouncing a ball and catching with preferred hands on (t=28); p=0.64) response speed (t=(28); p=0.35), copying a triangle with preferred hands (t=(28); p=0.54), copying a circle with preferred hands (t=(28); p=0.77), sorting shape card with preferred hands (t=(28); p=0.16) and making a dot in circle with preferred hands (t=28; p=0.54) does not show any significant different among the gender. Children who are partially blind or class B3 show lacking in motor deficit for gross and fine motor skills when performing a physical movement.

Key words: Fundamental motor skill, Bruininks Oseretsky Test of Motor Proficiency, Visual impairment, Gross motor skill, fine motor skill.

INTRODUCTION

Fundamental movement skills (FMS) is very important to individual to perform the basic movement. It is specific skill that involve our part of body such as head, trunk, leg, arm and feet. So, this will complete the movement of body. FMS can be divided into locomotor skill, balance skill and ball skill (Barnett et al., 2016). The motor skills are divided into two parts, gross motor skill and fine motor skill. Gross motor skills are skills that involve a group of large or large muscles involving many members. Fine motor skills are skills that involve a small group of muscles or are smooth and hard to see (Matheis & Estabillio, 2018). Children who have achieved FMS competence will successfully participate in sport movement activities and maintain the involvement in sport. Related to health issue, of course the achieved on FMS competence will improve the level of health related to physical fitness (Hestbaek et al., 2017). FMS among children have been shown to influence participation in physical activity with positive result of health (Jeoung, 2018). For able children, most of them can develop this quickly and there can easily to learn and perform the basic skill but when came into children with disabilities, we can see that special population has their limit on learn and develop FMS. Children with disabilities will face more challenges and obstacles as they are unlike able people who can do things (Haegele, Brian, & Goodway, 2015). So, based on basic motor skill assessment, we can identify children with problems with the development of basic motor skills need to be. However, in Malaysia, studies on basic FMS among children with disabilities are still lacking. Children who are visually impaired should focus on looking at the basic level of FMS when doing physical activity. Then, we can re-arrange and modify appropriate physical education activities and other physical activity at school or any external program that will improve their health and increase the level of FMS and overcome their shortcomings

(Burrows, Keats, & Kolen, 2014). By performing FMS assessments, it will be beneficial for teachers or other practitioners to use information for lesson planning and learning for children who are visually impaired. Based on the performance of basic motor skills in assessed children, certain skills weakness can be identified. However, studies on basic motor skills among children with disabilities need to be conducted. The results of this study will further strengthen the theory of motor learning. The findings of this study also serve as a guide for teachers and coaches in assessing motor skills movements for children who are visually impaired. Therefore, the aims of the study are to identify the level of foundamental motor skills among children who are visually-impaired.

PROBLEM STATEMENT

Visual impairment will give negative effect especially on children. We can see mostly of them are poor of motor skill development that influenced the lifestyle because limited by the physical ability. When poor of motor skill and limited movement, there will not be able doing too much activities and this will decrease the health and physical fitness. By assessing them with instruments or tools such as Bruininks-Osetersky Test of Motor Proficiency Second Edition (BOT-2), can help the researchers to know the level of motor proficiency. This will help teacher to build program of curriculum to decrease this issue among the children who are visually-impaired. Children and physical activity studies have mostly been carried out with healthy children. Limited functional abilities of children who are visually-impaired to perform daily activities and poor of level fitness decrease opportunities to learn and improve they motor skills (Rutkowska et al., 2016). What is the performance of basic movement skills among children who are visually-impaired?

Are there any significant differences in FMS among children who are visually-impaired according by gender? Therefore, the aim of the study is to identify the level of FMS among children who are visually-impaired.

METHODOLOGY

Sample and Sampling Technique

This study will employ purposive non-randomize sampling technique. A total of 30 (n=30) children who are visually-impaired participate in this study. They will be divided non-randomly and been assigned into 2 group based on the classification of gender equally 15 boys and 15 girls aged between 14-16 years old from Persatuan Orang Buta, Malaysia, Kuala Lumpur. They are being diagnosed as who are visually-impaired by an ophthalmologist. They also been granted Social Welfare Department card as a disability's identification. The subject meets the inclusion criteria such as: a) the subjects who are visually-impaired with class B3; b) they are physically in good condition; c) they fill in the consent form; d) they fill in the Physical Activity Readiness Questionaire (PAR-Q) form and injury free. Visual impairment (primary outcomes) was defined as a visual acuity worse than of 0.5 logMAR (20/60) in the better eye (Hashimi et al., 2018). But in terms of sports, The International Paralympic Committee classifies visually impaired athletes into three sport classes known as T/F11–12–13. Those with the most severe visual impairment (ie, very low visual acuity and/or no light perception) are included in sport class T/F11 (Toralba et. al., 2017). In the study, the researcher employ subject who are visually-impaired form class B3- Those with visual acuity from 20/599 through 20/200 and/or those with 5 degrees through 20 degrees in visual field (IBSA 2018).

Instrumentation

The Bruninks- Oseretsky Test of Motor Proficiency -Second Edition (BOT-2) been used to measure the motor skill proficiency and being provide to educators, clinical and researcher as valuable information to conduct and evaluating the motor skill among children who are normally and faced motor deficit. BOT-2 has been declared as a valid and reliable tool to measure motor skill performance in children since 1978. (Bruininks, 1978). BOT-2 is a valid and reliable method in both normally development and disabled children and adolescents which evaluates fundamental motor functions of children and adolescents between the ages of 4 and 21 years (Bruininks, & Bruininks, 2005). Wuang and Su (2009) did a study on intellectual disabilities children and reported excellent total score for internal consistency (Cronbach's α= 0.92). The intraclass coefficient (ICC) show subtest and composites between 0.88 to 0.98. The total score also shows excellent reliability, 0.99. This result also be supported by (Wuang, Lin, & Su, 2009). For inter -rater reliability coefficients show an excellent, 0.92. For the composite, internal consistency ranges between 0.78 to 0.97. For the purpose of this study, the test has been divided into 8 subtests; running, speed and agility, balance, bilateral coordination, strength, response speed, visual motor control and upper limb and coordination. Each subtest consists 2 tests except for running, speed and agility and response speed.

Procedures

The study been granted approval from the university's Research Ethics Committee. An approval been granted from the management of Persatuan Orang Buta Malaysia. The subjects been briefed regarding the purpose of the study, the explanation each of the tests and some demonstration. Every test will be explained with a proper demonstration using verbal hand body manipulation method to make sure all the subjects understand very precisely about it. Subjects been given the consent form and the PAR-Q form before hand, so that they can bring it and show to their parents/guardian to seek an approval by signing the forms. After the briefing, subjects need to warm up to make sure all the muscle being stretch to prevent from injury. After the warm up, the physical test will be conducted by two trials and the score each performance been recorded in the score form. All subjects have been given trial to ensure the subject knows how to execute it. An additional demonstration been given for subjects who are not be clear about the instructions. This include those subjects who cannot see very clearly, the assistance helping them

to understand better. After the test have been conducted, a cooling down session been organized so that their heart rate and blood pressure back to recovery level. All the data will be analyzed.

Data Analysis

The data has been computed into the Statistical Package for the Social Science (SPSS) version 24 with significant level has been set at 0.05. Descriptive statistical is used to determine the mean and the standard deviation of the subjects. The Independent T-Test has been applied for both the subjects and the independent variable (gender) and dependent variable (FMS).

RESULTS

Table 1 below revealed the descriptive data on gross motor skills performance on BOT-2 among the subjects. Running, Speed and Agility shows the mean ± SD for boys (2.53±0.64) and girls (1.33±0.73). The boys show better performance (better upper and lower body strength) than the girls. In balance subtest shows the mean ± SD for the boys standing on preferred leg on floor (3.87±0.35) and the girls (3.47±52). Mean ± SD for standing on preferred leg on balance beam for the boys (5.07±0.80) and girls (4.53±0.64) shows that the boys are better than the girls on performing running speed and agility because of their physical body and appearance. The boys performing a good balancing between two tests compare to the girls. Lower body strength also required on balancing on balance beam. Bilateral Coordination shows the mean ± SD for jumping in place-leg and arm on opposite side synchronized show the boys recorded (0.93±0.26) and the girls recorded (0.60±0.51). Mean ± SD for the boys in jumping up and clapping hands is (4.73±0.45), and for the girls is (4.60 ±0.51). Jumping in place-leg and arm synchronized opposite side show lower mean than jumping up and clapping hands. This because jumping up and clapping hands is easier to perform than jumping in place-leg and arm synchronised opposite side. Strength subtest shows the mean ± SD for the boys in standing broad jump recorded (6.67±1.54) and the girls recorded (4.60±1.18). Mean ± SD for the boys in jumping up and clapping hands is (3.07±0.70), and for the girls are (1.20±1.15). Generally, the boys having better on strength and body mass.

Table 1: Gross Motor Skills Development on BOT-2 among the Subjects

	Male		Female	
	M	SD	M	SD
Running speed and agility	2.53	0.64	1.33	0.73
Standing on preferred leg on floor	3.87	0.35	3.47	0.52
Standing on preferred leg on balance beam	5.07	0.80	4.53	0.64
Jumping in a place-leg and arm synchronized opposite side	0.93	0.26	0.60	0.51
Jumping up and clapping hands	4.73	0.46	4.60	0.51
Standing broad jump	6.67	1.54	4.60	1.18
Sit up	3.07	0.70	1.20	1.15

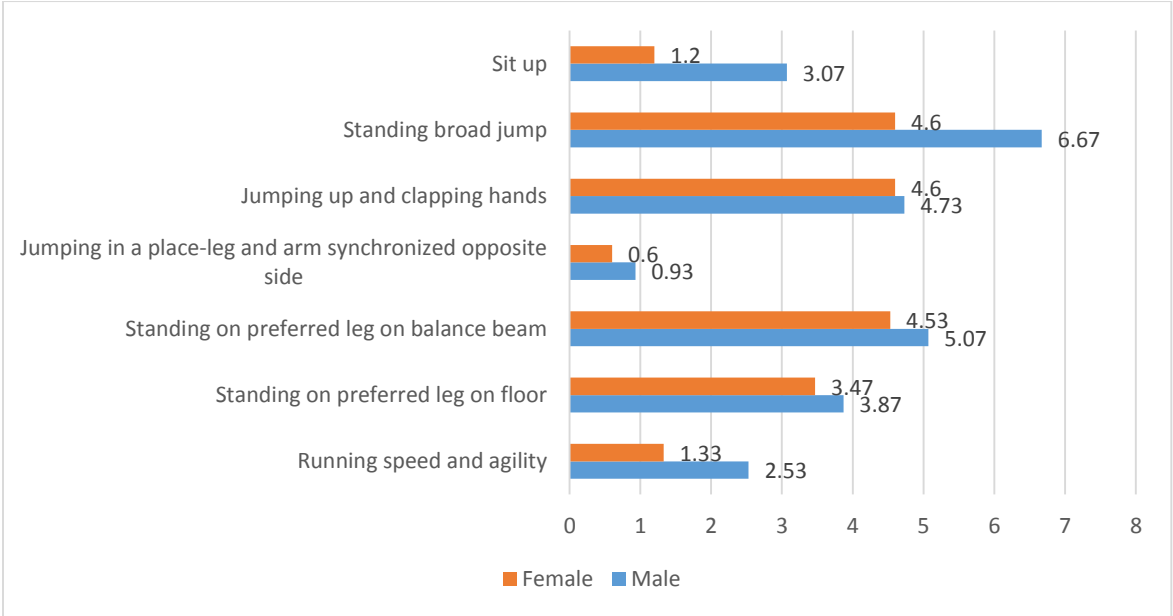

Figure 1: Descriptive data on gross motor skill among the subjects

Table 2 below revealed the descriptive data for fine motor skills performance on BOT-2 among the subjects. Upper limb coordination subtest shows the mean ± SD on bouncing a ball and catching it with both hands test is (0.93±0.26) for both subjects. Mean ± SD among the boys in bouncing a ball and catching it with preferred hand test are (4.73 ±0.46), and for

the girls are (4.60±0.51). Response speed test subtest show the mean ± SD for the boy's response speed is (4.53±0.64) and for the girls (4.27±0.88). Bouncing a ball and catching it both hands show same result for both subjects because of they have the similar ability and can recognise objects.

Visual motor control subtest shows the mean ± SD for the boys in copying a circle with preferred hand where the score is (1.40±0.50) and for the girls the mean score is (1.40±0.51). The mean score for the boys in copying a triangle with preferred hand are (1.33±0.46) and for the girls are (1.33±0.68). The boys perform better visual motor control than the girls but it does not show too much different between them for both test because both also having visual problem during executing the test.

Upper limb speed and dexterity subtest show the mean ± SD for the boys in sorting shape cards with preferred hand where the mean score are (4.67±1.05) and for the girls the mean score are (4.40±1.30). The mean ± SD for the boys in making dots in circle with preferred hand shows (5.47±1.06) and for the girls shows (4.93±0.96). Sorting shape card with preferred hands revealed that the girls perform better than the boys because they are better in recognizing separate cards with different shape. For making dots in circle with preferred hands shows that both subjects do not show much different even though the boys are better.

Table 2: Fine Motor Skills Development on BOT-2 among the Subjects

	Male		Female	
	M	SD	M	SD
Bouncing a ball and catching it with both hands	0.93	0.26	0.60	0.51
Bouncing a ball and catching it with preferred hands	4.73	0.46	4.60	0.51
Response speed	4.53	0.64	4.27	0.88
Copying a circle with preferred hand	1.40	0.51	1.20	0.72
Copying a triangle with preferred hands	1.33	0.46	1.33	0.68
Sorting shape card with preferred hands	4.67	1.05	4.40	1.30
Making dots in circle with preferred hands	5.47	1.06	4.93	0.96

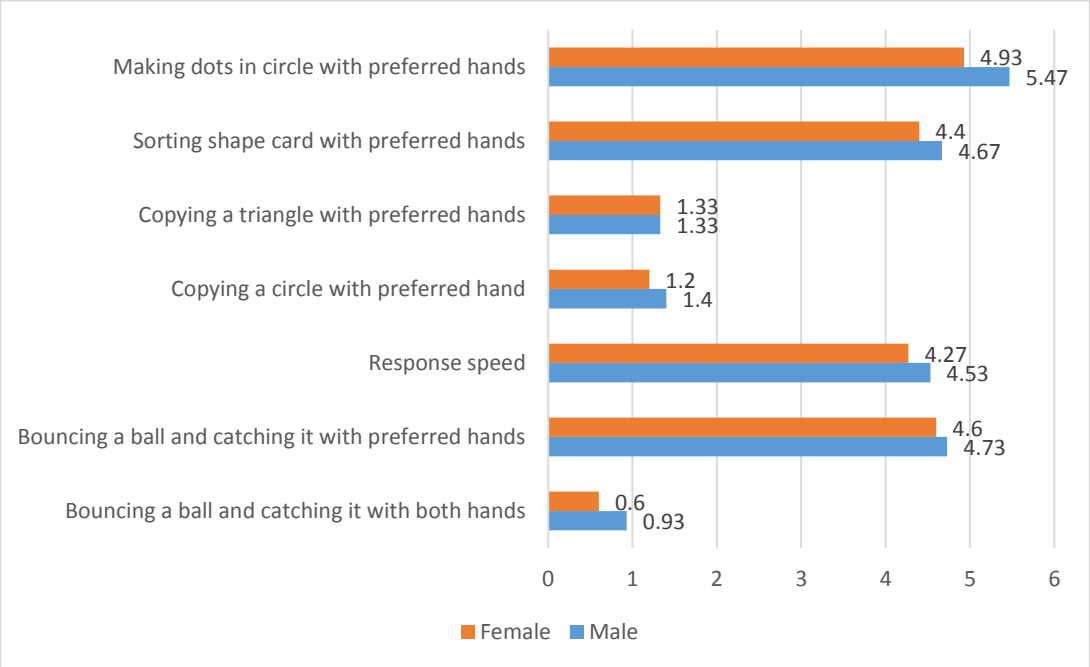

Figure 2: Descriptive data for fine motor skill among the subjects

Table 3 below show the independent t-test for gross motor skill among the subjects. The Independent T-Test for running speed and agility (t=4.81; p=0.79) shows there is a significant difference between the both subjects because of the boys have better physical strength. Standing with preferred leg on floor test (t=2.48; p= 0.200) and standing with preferred leg on balance beam (t=2.12; p=0.430) shows that there is no significant difference between the both subjects for balance subtest, standing with preferred leg on floor and balance beam. The boys perform better on the upper and lower body balancing. Jumping in place and arm on opposite side synchronized (t=2.27; p= 0.310) and jumping up and clapping hand (t=0.76; p= 0.460) shows that there is no significant difference between both subjects for jumping in place and arm on opposite side

synchronized test. This test shows that both genders have difficulties to perform on jumping in place-leg and arm synchronized opposite side because it needs to performance more than one movement on same times. Standing broad jump (t=0.27; p< 0.001) and sit ups (t=5.37; p<0.001) shows that there is a significant difference between both subjects for strength subtest, standing broad jump and sit ups. The boys have good strength for upper and lower body and this can be an advantage during performing gross motor skill movements.

Table 3: Independent samples T-Test on Gross Motor Skills among the Subjects

Test	t	df	p.value
Running speed and agility	4.81	28	<0.001*
Standing on preferred leg on floor	2.48	28	0.200
Standing on preferred leg on balance beam	2.12	28	0.430
Jumping in place-leg and arm synchronized opposite side	2.27	28	0.310
Jumping up and clapping hands			
Standing broad jump	0.76	28	0.460
Sit ups	4.12	28	<0.001*
	5.37	28	<0.001*

**P value<0.05 (2 tailed)*

Table 4 below revealed the independent t-test for fine motor skills among the subjects. Bouncing a ball and catching it with both hands test (t=0.00; p=1.00) and bouncing a ball and catching it with preferred hands (t=0.47; p= 0.64) shows that there is no significant difference between the both subjects for both upper limb coordination, bouncing a ball and catching it with both hands and preferred hands. This test needs a good visual and good coordination but they it difficult for them because of the visual problem. Response speed test (t=0.95; p=0.35) shows that there is no significant difference between both subjects. Copying a circle with preferred hand test (t=0.30; p=0.72) and copying triangle with preferred hands (t=0.62; p=0.54) shows that there is no significant difference between both subjects for visual motor control, copying circle and triangle with preferred hand. This subtest also shows that both genders share the same problem where visual is being the main problem went try to copy the shape. Sorting shape cards with preferred hands (t=1.44; p=0.16) and making dots in circle with preferred hand (t-0.62; p=0.54) shows that there is no significant difference between both subjects for both upper limb speed and dexterity subtest, sorting shape cards and making dots in circle with preferred hand. This test also needs a better visual and speed to perform the task. It shows a little difficult to recognize the shape and colour and to aiming on circle when doing a dot.

Table 4: Independent samples T-Test on Fine Motor Skills among the Subjects

Test	t	df	p.value
Bouncing a ball and catching with preferred hands	0.00	28	1.000
Bouncing a ball and catching with both hands	0.47	28	0.640
Response speed	0.95	28	0.350
Copying a circle with preferred hands	0.30	28	0.770
Copying a triangle with preferred hands	0.62	28	0.540
Sorting shape cards with preferred hands	1.44	28	0.160
Making a dot in circle with preferred hands	0.62	28	0.540

**P value<0.05 (2 tailed)*

DISCUSSION

Test such as running speed agility, standing broad jump) and sit ups show a significant difference between both subjects. Other test such as standing with preferred leg on floor standing with preferred leg on balance beam, jumping in place-leg and arm on opposite side synchronized, jumping up and clapping hands, bouncing a ball and catching it with both hands , bouncing a ball and catching with preferred hands and response speed, copying a triangle with preferred hands , copying a circle with preferred hands, sorting shape card with preferred hands and making a dot in circle with preferred hands does not show any significant different between the boys and the girls.

Previous study shows that different in gender was not significant effect on the score points and item of BOT-2 (Rutkowska et al., 2016). In the present study, a trial was conducted to determine whether there is a sex effect on bilateral coordination or not. There is not supported evidence about the relationship between sex and motor performance of children who are visually-impaired (Matheis & Estabillo, 2018). There is no significant effect on balance subtest score between gender. The result depended on the degree of vision loss and age of the subjects (Rutkowska et al., 2016). Some researchers point out that the girls do better than the boys in activities that require balance. Age and gender are not necessarily the determining factors for balance skills between boys and girls (Malina & Bouchard, 1992).

Most of this subtest did not show a big different of mean point score between both subjects but the boys tend to perform better than the girls for all the tests except for jumping in place- opposite sides synchronized test where the boys and the girls perform similar ability. During in school age, motor performance between the boys and the girls only show a moderate different rather after puberty which increase slowly where the different can be seen (Aslan, Calik & Kitis, 2012).

Diff erences in motor performance between the boys and the girls is low to moderate during childhood, but slowly changes after puberty, where the boys more perform than the girls in physical activity (Rutkowska et al. 2016). This is because factor of growth and maturation of physical body, and movement experience may influence the individual motor development and its show differences between them. There is, however, controversy in the literature on the matter of gender differences related to agility as well, because some researchers did find some differences (Malina & Bouchard, 1992). The boys and the girls are having similar performance on running speed and agility test when age up to 7 years old but after 8 to 12 age years old, the boys improve their performance significantly than the girls.

The present study shows jumping in place- opposite sides synchronized test show the low mean from all the test. This is due to the point score also low between 0 to 1. The result also shows most of children score 0 point because the difficulty of perform the test. This also supported by (Rutkowska et al., 2016), where the most difficult test for all subjects who are visually impaired was the jumping in place opposite sides synchronized. Most of them cannot perform it properly because the movement using the arms and legs was difficult to do. Possible of low mean value because of high percentage of point score is 3 to 0. That may be issue of this task to provide valid information for children in assessing their motor performance (Venetsanou et al., 2009). So, the instrument being adjusted with additional test that may be led to validity of the test assessment for children. The higher mean that being score by children who are visually-impaired (B3) is standing broad jump where the boys and the girls shows a minimum and maximum score that is from 4.60 to 6.67. This because the point score for is higher than another test.

Gender differences in muscle strength discovered in 12 years old children where the boys performed better than the girls. Pennington (2019) supports this finding by pointing out that gender differences about strength can be better in the upper limb's coordination and core, where boys showed significantly greater strength than girls did in physical activities. Strength, agility and balance are important components in the development of children's motor skill performance and are regarded as effective movements if they can be mastered by children in physical activity. Muscle strength is a major component of physical fitness and increases slowly from the early childhood to adolescence. Inger, Fredriksen, Fosdahl and Vøllestad (2008) found that there are no gender differences in the strength of 7 to 12 years old children.

When it comes to strength, the present study revealed that the boys performed statistically significantly better than the girls in sit ups test. However, Prista (1998) mentioned, these findings are contradictory where it was reported that the girls did better than the boys in sit-ups test. The boys show a slow progression of motor development on drawing skill than the girls. The development of visual motor coordination and perception has been shown to be affected particularly in boys unmatured development. Circles got more accurate and human figure drawings showing the maturation of visual motor control. Results confirmed that using simple classification of developmental stages of human figure drawing is a good reflection of developing visual motor coordination and perception (Geldof et al., 2011).

Al-Thumali (2016) reported that it is a reality that the boys do better in physical activities that require speed and strength test while the girls do better in activities that require balance and fine motor skills. Boys scores better on upper limb coordination and the girls better on response speed. The boys found more likely to involved in activities than use gross motor skill while the girls perform better in flexibility and motor coordination. There is no difference between them when performing upper limb speed and dexterity activity such as sorting cards.

Size and strength are important in motor skill performance. So, the boys may have an advantage than the girls due to their larger and more muscular physiques different. During infancy, the gender differences in motor skills not so obvious. However, by the time their being grows as a preschool, the boys begin to up the level than the girls in gross motor skills, and their become excellence by the time they reach preschool and adolescent. A review show that the boys perform than the girls at all ages across a range of motor tasks and that for tasks because they have advantages such as sit-ups, long jump, and shuttle run. It started increases from elementary school (Pennington, 2019). The boy's skills improve continuously between 7 and 17 years, but the girls show a slow progress where only can be seen after 12 years of age.

Biological and environmental factors that contribute to such differences between the boys and the girls. With more evaluations in test findings and differences observed, it is concluded that the boys tend to more high performance in gross motor skill while the girls have higher performance in fine motor skills and the result is significant different (Barnett et al., 2010). The results showed that the boys had significantly better gross movements, and in contrast the girls had significantly better fine movements. The performance level on gross and fine motor skills depends on the level of daily muscle recruitment, and early education can improve the motor skills and the level of learning among these children. According to previous studies (Geldof et al., 2011; Geldof et al., 2011; Pennington, 2019), therefore the study results revealed that further investigation needs to be conducted in the area of fundamental motor skills as below:

1. Small number of sample sizes might influence the outcome of the study. More large samples are needed that can exhibit the differences between the gender.

2. The boys and the girls who are visually impaired have a very poor when performing a task that involve their visual acuity. They need to be involved in fundamental motor skill since their preschool days. A positive result may be seen such as

improvement on gross and fine motor skill. They can learn and practice it repeatly during thier sporting activity. It also builds the confident and positive vibe on developing good output on motor skill task.

3. Authority need to carefully identify the lack of motor skill among the boys and the girls who are visually impaired. Failure on screening their fundamental motor skill will see there is no improvement on the level of motor skill among them.

4. The boys and the girls who are visually impaired need to be encouraged to do physical activity to make sure they are adapting and experiencing the motor skill movement. It may be helpful for them to perform better on test because initial exposure on the development of fundamental motor skill.

5. The girls tend to have a low performance than the boys on gross motor skill. Due to that problem, their need attention to improve their strength to the next level. An effective training will increase their strength and can overcome their motor deficit on gross motor skill.

6. Even though the present study shows that the attention is necessary to monitor their level of development on fundamental motor skills, but the information gathered from the study can provide a valuable information on gender differences that can help parents and guardians to identify the motor deficit that need improvement and attention.

CONCLUSION

The boys and the girls who are visually impaired who are doing physical activity show better improvement on fundamental motor skill and their level of fitness also increase at least near to the level of sighted children. They need to be encouraged them to join any physical activity program that will improve their motor skill performance for the sake for their benefit. We need to help them to acquire certain level of fundamental motor skills so that it would be sufficient for them to participate in various physical activities. Even though the present study shows that the attention is necessary to monitor their level of development on fundamental motor skills, but the information gathered from the study can provide a valuable information on gender differences that can help parents and guardians to identify the motor deficit that need improvement and attention. That way, the boys and the girls who are visually impaired could practice and learn the basics of skills. Future studies are needed to address limitations of the study.

PRACTICAL IMPLICATIONS

This information is useful for any coaches who deals with athletes who are visually impaired. The boys and the girls who are visually impaired can also improve their fundamental motor skill as well as their sighted peers. Due to the difficulty on performing the motor skill movement, the training program and physical fitness need to be adjusted appropriatly with focusing on the problem of motor skill deficit that need to be improve in sports. When they involved in physical activity, their can adapt progressively and learn how to do the correct fundamental motor skill movement. Many of them became an athlete and also have the potential to become an athlete in the future. This study can be the assistance for coaches to improve their athletes' level of fitness and modify the training program. Their training program can be including of certain test that may challenge the motor skill performance.

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