



## Fine and Gross Motor Skill Proficiency Differences of Children Aged 8-9 Years based on Gender

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### Abstract

The aim of this study was to investigate the differences of proficiency in fine motor skills and gross motor skills based on gender. 147 children at the elementary school level were divided into two groups according to their gender. 78 Boys (aged  $8.5 \pm 0.4$ ) and 69 girls (aged  $8.3 \pm 0.3$ ) have participated in this study. The instrument used in this research was the Movement Assessment Battery for Children—second edition (MABC-2). The statistical test used a non-parametric Mann-Whitney U test, while r coefficient was used to interpret the effect size. The result of the study showed that the manual agility of boys was better than girls. However, the difference was not significant and the effect size was small ( $p > .05$ ,  $r = .004$ ). The result also showed that the catching and throwing skills of boys were better. The difference was not significant and the effect size was small ( $p > .05$ ,  $r = .023$ ). Meanwhile, the balance of the boys was better than the girls with a significant difference and medium effect size ( $p < .05$ ,  $r = .055$ ). In general, the result of the study shows that boys are better than girls in fine and gross motor skills proficiency.

## INTRODUCTION

The increase of sedentary behavior is a current global problem, although it is commonly known that active lifestyle gives various positive impacts. The lack of physical activity in the children will create a wide chance of obesity (Kumar & Kelly, 2017). The important factor deciding children participation in physical activity is motor skill proficiency. The motor skill proficiency has a vital role on the involvement in physical activity (Stodden et al., 2008). long-term studies show that the higher the children proficiency in mastering motor skills, the higher the possibility of the children to move actively and is physically fitter in their adolescent and adulthood periods (Stodden et al., 2008; Barnett et al., 2009). Besides holding an important role in physical activity involvement, motor skill also has an important role in academic achievement success (Haapala, 2013). Another study shows that motor skill correlates with the physical activity level and physical fitness related to health (Cohen et al., 2014; Okely, et al. 2004). Motor skill has a positive relationship with physical fitness related to health, such as muscle strength and endurance, and a negative relationship with the adolescent body fat (Stodden et al. 2009).

Motor skill is also needed to participate in sports, games, and a long-life physical activity (Logan, et al. 2012). Calley (2010) reports that a person will be easier to involve in various physical activities if they have understood the basic movement level. According to the fact, motor skill becomes an interesting topic for the researcher to develop the motor skill. Developing motor skill and mastering gross motor skill are crucial for lower level elementary school students (Hardy et al., 2010). The skill is the infrastructure for them to learn sports, games, and complex physical activity skills in the future (Branta, 1984). Motor skill is divided into gross motor skill and fine motor skill. Gross motor skills require coordination of arms, legs, and other major parts of body to carry out acts, such as running, jumping, and throwing (Haibach-Beach, Reid, & Collier, 2011). Meanwhile, fine motor skills need a smaller movement coordination between fingers, hands, and feet to act, such as lifting and pressing a small object (Piek, Dawson, Smith, & Gasson, 2008). The gross and fine motor skills are parts of growth and development since childhood which gradually get better by the age and movement experience based on their physical activities. Gross motor skill is the movement involving

major muscle groups as the basic (Magil, 1990). Meanwhile, fine motor skill is the skill requiring controls from small body muscles to achieve the goal of the skill (Magil, 1990).

In previous research, the motor skill proficiency is affected by gender. Robinson (2011) reports that boys have better locomotor skills and object controls than girls. The research also found that boys performance was better due to their higher and regular involvement in sport activities. However, results of researches related motor skills are different. The result of a study showed that the motor skill of boys and girls is not different (Van Waelveld et al., 2008; Hardy et al., 2010). The object control skill tends to be similar according to gender (Pope, 2011; LeGear et al., 2012). However, another research states that boys are better in object control skills (Foulkes et al., 2015; Spessato et al., 2013). Differences also happen in locomotor skill, a research shows that the locomotor skill is similar (Foulkes et al., 2015; Spessato et al., 2013), a research shows that female children are better (Barnett et al., 2008; van Beurden et al., 2002), while another research shows that boys are better (Robinson, 2010). Another motor skill research shows that the boys and girls balance motor skill results are similar (Singh et al., 2015; Shala, 2009), while another research states that girls are better (Venetsanou & Kambas, 2011; Livesey, 2007).

According to the distribution of the result of the study, the results were not consistent, although some of the researches have a similar result pattern. To answer the aforementioned issues, this research was aimed at comparing motor skill proficiency of boys and girls aged 8-9 years. Meanwhile, the test instrument used was MABC-2. This test is one of valid and reliable test instruments to measure fine and gross motor skills (Whyatt & Craig, 2012; Liu & Breslin, 2013). The strength of MABC-2 is that it could measure the fine and gross motor skill of 3-16-year age range (Brown & Lalor, 2009). The MABC-2 instrument covers manual dexterity, catching and aiming, and balance skills.

## METHOD

### Participant

Participants of the study were 147 elementary school children aged 8-9 years in Bandung City, Indonesia. The samples were chosen according to the class (*quota sample*) as the part of the population. The samples consisted of 78 boys (aged 8.5±0.4) and 69 girls (aged 8.3±0.3). Before the data

collection process, the researcher has conducted a coordination with Physical Education teachers to get consent forms from the parents.

### Measurement

To measure the gross and fine motor skills, the instrument used was MABC-2 (Movement Assessment Battery for Children-2) (Henderson et al., 2007). The age group used was band 2 for age 7-10 years. The test consisted of 8 movement tasks divided into three components, including the manual dexterity (the fine motor skill), catching and aiming, and balance (gross motor skill). The first motor skill was the manual dexterity consisting of placing pegs, threading lace, and drawing trail age. The second stage was aiming and catching consisting of catching with two hands and throwing beanbag onto mat. The third skill test was the balance test consisting of one-board balance, walking heel to toe forwards, and hopping on mats. The test was administered by five persons and two Physical Education, Sport, and Health teachers. Before administering the test, the researcher had given an explanation and training directly to the assessing team and a prior test trial. The test was conducted in the school field with floor as the base. The test was conducted one by one by the assessing team. Data were taken during the Physical Education instruction, thus the participants had been ready with their sport attires and shoes. Before conducting the test, the participants received an explanation and direct demonstration of each motor test movement by the assessing team. The team assured that every participant understood each demonstrated movement.

### Data Analysis

After gaining raw scores from the measurement, the scores were then derived into the standard score and percentile. The percentile scores were then used to compare the motor skill proficiency of male and female children. Before conducting the parametric test, the normality test and homogeneity test were conducted by using one-sample kolmogorov-smirnov test for normality test and levene's test for testing the homogeneity. According to the normality test, the data were not normally distributed  $<.05$ . Therefore, a non-parametric Mann-Whitney U test ( $p < .05$ ) was used to find out the result differences of motor skill proficiency of male and female children. To examine the significance statistically, the  $r$  coefficient was used to interpret the effect size. The effect is small if  $r < 0.3$ , the effect is moderate if  $r$  is in the range 0.3–

0.5, and the effect is high if  $r > 0.5$  (Fritz et al., 2012). The statistical analysis used IBM SPSS Statistic version 22 software.

### RESULT

Table 1 shows the characteristic description of manual dexterity, catching and aiming, balance, and the total score. In the manual dexterity, boys were better than girls, but the difference was not significant and had a small effect size ( $p > .05$ ,  $r = .004$ ). Similar with manual dexterity, boys were better in catching and aiming, but the difference was not significant and had a small effect size ( $p > .05$ ,  $r = .023$ ). Meanwhile, in balance proficiency, boys were better than girls. The difference was statistically significant and had a medium effect size ( $p < .05$ ,  $r = .055$ ). In general, from three skill tests, statistical data show that boys outperformed girls significantly with a medium effect size ( $p > .05$ ,  $r = .033$ ).

**Table 1.** Description of Motor Skill Characteristics based on Gender

	n	M	SD	Med.	<i>p</i>	<i>r</i>
Manual Dexterity						
Boys	78	5.38	5.05	5	.438	.004 <sup>+</sup>
Girls	69	6.2	4.7	5		
Catching and Aiming						
Boys	78	48.4	30.2	50	.069	.023 <sup>+</sup>
Girls	69	39.2	20.2	50		
Balance						
Boys	78	36	8.52	37	.005*	.055 <sup>++</sup>
Girls	69	31.5	8.6	37		
Total						
Boys	78	65.3	7.46	65.5	.031*	.033 <sup>++</sup>
Girls	69	62.5	7.05	62		

#### Note:

n =total sample; M =mean; SD =standard deviation; *p* =value Mann-Whitney U test; *r* =effect size; \*=significance ( $p < 0.05$ ); <sup>+</sup> = small effect size; <sup>++</sup> = moderate effect size

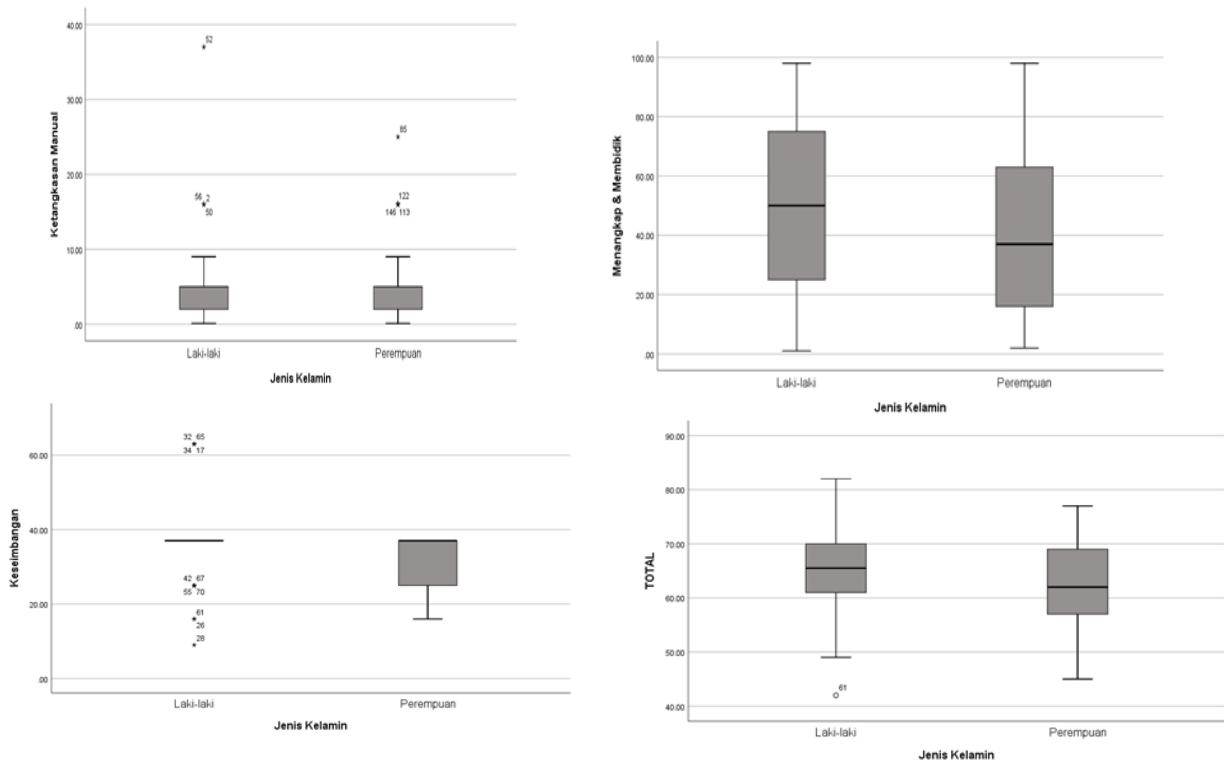
Figure 1 shows the characteristics and distribution of manual dexterity, catching and aiming, balance, and the total score data. In the manual dexterity data, boys and girls had distribution range data and outlier data that were almost similar which mean that the data of manual dexterity had a high range. Meanwhile, in catching and aiming, the variance of the data was fairly high with higher median and maximum scores of male children. The balance skill data showed that the variance and median of both groups were almost the same. Although the girls had higher minimum scores than boys, some boys had higher maximum scores than the girls. In general, it

shows that boys group outperformed girls group (Van Waelveld et al.,2008).

**DISCUSSION**

The aim of the research was to find out the motor skill differences between boys group and girls group aged 8-9 years by using MABC-2 test. The research showed that the boys group was superior from girls group. From eight test items divided into three test categories, including manual dexterity, catching and aiming, and balance skills, boys statistically significantly outperformed girls with a moderate effect size. The significant difference was found

than the girls, but the difference was not significant (Van Waelveld et al.,2008). Meanwhile, in catching and aiming, the male children group outperformed with an insignificant difference. It might be because male children tend to enjoy ball games (Badrić, et al. 2015), thus their experiences in the games affected their catching and aiming performances. This result is relevant to the previous research of (Kokštejn et al., 2017; Spessato et al., 2013). The significant difference was found in balance. Boys group showed a significant difference compared to the girls group. Boys spend their time in various sport games, such as ball games and activities involving major mus



**Figure 1.** Characteristics and Distribution of MABC-2 Motor Skill Test Data

in the balance test, while the manual dexterity and catching and aiming of male children were higher with insignificant differences and small effect sizes.

Although boys and girls groups were different in the manual dexterity performance, the result was not significant. It shows that the fine motor skill of both groups was not significantly different with a small effect size. It might be caused by the fine motor skill activities experienced by the children before. The fine motor skill, such as drawing, writing, coloring, sewing, folding, and other activities, are attained in the preschool level until elementary school level. This result supports the previous research that the manual dexterity of boys was better

cles, namely playing ball that would affect the balance skill difference. Meanwhile, most of female girls like art activities, language learning, and various fine motor skills (Pate, et al., 2004).

**CONCLUSION**

This research shows that boys had better fine and gross motor skills than the girls aged 8-9 years. The significant effect and moderate effect size were found on the balance component. Meanwhile, in the manual dexterity, catching, and aiming components, the effect sizes were small.

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