

Improving gross motor skill development through the Montessori method in children aged 3-5 years

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Abstract

Introduction: Montessori is a method of teaching children based on children activity. It can activate gross motor skill development in children.

Objectives: To assess the effect of the Montessori method on the gross motor skill development of children aged 3-5 years.

Method: This study used a quasi experimental research design with pre-test and post-test with control group. Purposive sampling was used. Sample size was 40 children consisting of 21 children in Nur Hidayah Early Childhood Education (ECE) Centre as intervention group and 19 children in Bina Kasih I ECE Centre as control group. Research instrument was Denver Development Screening Test (DDST) II. Statistical data analysis used was the Mann-Whitney test and the Wilcoxon test.

Results: Of the 40 children 23 (57.5%) were female, 32 (80%) were in the 49-60 month category and 25 (62.5%) were first children. In 35 (87.5%) the parental income was less than 795,000 Indonesian Rupiah. There was no difference in the development of gross motor skill development of children in control and intervention group before intervention. There was no difference of the development of the gross motor skill development in early childhood (3-5 years old) before and after intervention in control group. There was a significant difference of the gross motor skill development in early childhood (3-5 years old) before and after Montessori method in intervention group ($p=0.014$).

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Conclusions: Montessori method is effective for improving gross motor skill development in children aged 3-5 years.

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(Key words: Children 3-5 years old, gross motor skill, child development, Montessori)

Introduction

The number of 0-6 years old children globally is around 33.5 million¹. However, around 24.2 million (72.2%) children of an early age are not served by various units of early age education². The Baturaden II Health Centre in Banyumas Regency reported that the number of children aged 24-59 months was 1122³. Early stages of brain development occupy the most vital position. The development of human brain when they are children reach 80%⁴. By the time the baby is born it has reached 25% of the brain development of adults. Brain development reaches 50% at 4 years of age, 80% at 8 years of age, and the rest is processed until children are aged 18 years⁵. Early age is also called the 'golden age' because of the extraordinary development of children so that it becomes an ideal time to maximize children's development.

The development of motor skills is a very important factor for personal development as a whole. Through motor development, children can entertain themselves, obtain feelings of pleasure through motor skills, and can play or get along with their peers⁶. If a child's motor abilities are not good, it will have an impact on children's development such as social activities, concentration skills, and poor motor planning abilities⁷. Therefore, appropriate learning and stimulation are needed.

A learning method which stimulates the development of children's motor skills, whilst at the same time having fun, is the Montessori method. The basic principle of the Montessori method is activity (control), control of error (realizing its own mistakes), aesthetics (beauty), and limits (according to needs)⁸. It is a method of learning by playing⁹. The Montessori method emphasises activities by children, and the role of physical activity in absorbing the concept of learning, adaptation of the children's learning environment to the level of children's development, and practical abilities⁸. The

Montessori method uses several visual aids, including puzzles and picture cards¹⁰.

Based on a preliminary survey in Rempoah Village, Baturraden Subdistrict, Indonesia, there are three Early Childhood Education (ECE) centres, namely Nur Hidayah ECE, Bina Kasih ECE, and one ECE only established a month ago. Nur Hidayah ECE centre has a total of 45 children, has never conducted research on motor development, and has never used the Montessori method in carrying out classroom learning. Further, initial observations and interviews by the homeroom teacher and headmaster indicated that there are 2 children in Nur Hidayah ECE centre who experienced motor delays and are unable to imitate the writing of letters correctly. In addition, midwives working in the area recommend developmental screening for early childhood in ECE. This study aims to find out the effect of Montessori method on the gross motor skill development of children aged 3-5 years.

Objectives

To determine the effect of the Montessori method on the gross motor skill development of children aged 3-5 years.

Method

Study area: This research was done in two locations, namely Nur Hidayah ECE centre and Bina Kasih ECE centre in Rempoah Village, Baturraden Subdistrict, Indonesia.

Study design and sampling: This was a quasi experiment with a non-randomized design pre-test-post-test with control group. Nur Hidayah ECE centre was used as the intervention group (21 respondents) and the Bina Kasih ECE centre as the control group (19 respondents). Purposive sampling was used. Sample size was determined based on results of Denver Development Screening Test II (DDST II) with caution and delayed interpretation. DDST II has 4 categories, advanced, normal, caution, and delayed. The cases and controls were selected using simple random sampling.

Items are in sub-sample categories including race, less educated parents, and place of residence. There are 125 performance-based and parent reported items in the following four areas of functioning: fine motor-adaptive, gross motor, personal-social, and language skills. Scoring per item is rated as follows: P: pass - child successfully performs item or caregivers report that the child can do item. F: fail - child does not successfully perform the item and/or the caregiver reports that the child cannot do item.

NO: No opportunity - the child has not had the opportunity to perform the task due to restrictions, R: Refusal - the child refuses to attempt and the parent cannot report.

These items are scored to a normative age line with notation to caution, advanced and delayed items. These lines represent the normative data and the percentile ranks. Percentile ranks include: 25th, 50th, 75th, and 90th. Ages should be adjusted for prematurity as needed. Some items for the youngest ages do not have percentile ranks. Items involve 90% performance rate for inclusion in the screen. The number of scores a child received below the normal expected range classifies the child as within advanced, normal, caution, or delayed. Scores are recorded per item through direct observation of the child and in some cases what the parent reports. The test is interpreted to place the child into two categories: normal or suspect. If the child is suspect it is recommended that rescreening occur in 1-2 weeks. One of the new editions to the DDST-II was the addition of a behavioral scale. The DDST-II also increased language items by 86%, included two articulation items, a new category of item interpretation to ID milder delays, and new training material.

Data Collection: The data were collected through questionnaire and observation which was done on respondents 3-5 years old. The implementation of Montessori was done in 20 minutes for 2 weeks. The instrument used in Montessori method such as puzzle, pictures cards, and DDST II forms. Kinds of games which done including puzzle 123, puzzle ABC, puzzle red yellow green lights, geometry cards and imitate walking animal cards. The games stimulated gross motor combining *engklek* method. *Engklek* is a traditional game of jumping on a flat plane drawn on the ground by drawing squares, then jumping with one foot from one box to the next. The scoring of this game done if the respondent could pass the end of game.

Data analysis: Data was analysed using computer program. Univariate data was cited to present variables of each variable and respondent characteristic through presentation table. Bivariate data analysed to know the effect of free variable with bond variable using *Wilcoxon Signed Ranks Test* and *Mann-Whitney*.

Results

The total number of respondents in this study was 40 children, 21 children in the intervention group in Nur Hidayah ECE centre and 19 children in the control group in Bina Kasih ECE centre. The respondents' characteristics are shown in Table 1.

Table 1: Respondents' characteristics in Nur Hidayah ECE and Bina Kasih ECE centres (n=40)

Respondents' characteristics	Control group Number (%)	Intervention group Number (%)
<i>Gender</i>		
Male	07 (17.5)	10 (25.0)
Female	12 (30.0)	11 (27.5)
<i>Age (months)</i>		
36-48	06 (15.0)	02 (05.0)
49-60	13 (32.5)	19 (47.5)
<i>Child's position in family</i>		
First child	12 (30.0)	13 (32.5)
Second, third child etc.	05 (13.5)	02 (05.0)
Youngest child	02 (05.0)	06 (15.0)
<i>Parents' income (IDR)</i>		
<795.000	18 (45.9)	17 (42.5)
≥795.000	01 (02.5)	04 (10.0)

IDR: Indonesian Rupiah

Of the 40 children 23 (57.5%) were female, 32 (80%) were in the 49-60 month category and 25 (62.5%) were the first child. In 35 (87.5%) the parental income was less than 795,000 IDR.

Table 2 shows the difference in gross motor development of children between control group and intervention group before intervention.

Table 2: Differences in gross motor development of children between control group and intervention group before intervention (n=40) based on DDST II interpretation

Gross motor development	Control group Pre (%)	Intervention group Pre (%)	α	p value
Delayed	- (-)	- (-)	0.05	0.052
Caution	14 (73.7)	9 (42.9)		
Normal	05 (26.3)	12 (57.1)		
Advanced	- (-)	- (-)		
Total	19 (100)	21 (100)		

Analysis result from the Mann Whitney statistical test at the same time before intervention obtained p-value of 0.052 with $\alpha=0.05$, so there was no difference in the development of gross motor development of children in control and intervention group before intervention. In other words, both control and intervention group had almost the same

gross motor development of children before being treated.

Table 3 shows the difference of children's gross motor development before and after conventional method intervention in control group.

Table 3: Differences of children's gross motor development before and after conventional method intervention in control group based on DDST II interpretation

Gross motor development	Control group		α	p value
	Pre (%)	Post (%)		
Delayed	- (-)	- (-)	0.05	0.083
Caution	14 (73.7)	12 (63.2)		
Normal	05 (26.3)	06 (31.6)		
Advanced	- (-)	01 (05.2)		
Total	19 (100)	21 (100)		

The analysis result using Wilcoxon with level of confidence 95% ($\alpha = 0.05$) was gained p-value score which was 0.083 so that $p\text{-value} > \alpha$ ($0.083 > 0.05$), so there was no difference of the development of the gross motoric in early childhood (3-5 years old) before and after intervention in control group.

Table 4 shows the difference of gross motor development in early childhood (3-5 years old) before and after Montessori method in intervention group.

Table 4: Differences of gross motor development in early childhood (3-5 years old) before and after Montessori method, in intervention group (n=21)

Gross motor development	Intervention group		α	p value
	Pre (%)	Post (%)		
Delayed	- (-)	- (-)	0.05	0.014
Caution	09 (42.9)	04 (19.0)		
Normal	12 (57.1)	13 (61.9)		
Advanced	- (-)	04 (19.0)		
Total	19 (100)	21 (100)		

The analysis result using Wilcoxon statistical test with the level of confidence 95% ($\alpha = 0.05$). Based on this test result, it was gained score p-value which was 0.014 so that $p\text{ value} < \alpha (0,014 < 0,05)$, therefore there was the difference of the development of gross

motoric in early childhood (3-5 years old) before and after intervention in intervention group.

Table 5 shows the development of children’s gross motor development between control group and intervention group (after intervention)

Table 5: The children’s gross motor development between control group and intervention group (after intervention) (n=21)

Gross motor development	Group		α	p value
	Control	Intervention		
	Post (%)	Post (%)		
Delayed	- (-)	- (-)	0.05	0.005
Caution	12 (73.7)	04 (19.0)		
Normal	06 (26.3)	13 (61.9)		
Advanced	01 (-)	04 (19.0)		
Total	19 (100)	21 (100)		

The analysis result from Mann Whitney statistical test at the time after intervention obtained p-value score in amount of 0.005 dengan $\alpha=0.05$ so there was the difference of the development of children’s gross motoric in control group and intervention group after being treated.

Discussion

Of the children aged 3-5 years in Nur Hidayah and Bina Kasih ECE centres, 23 (57.5%) respondents were female and 17 (42.5%) were male. The gross motor development of males was more than in females¹¹. The research respondents were in the age range of 36-60 months. Most (80%) were in the age range of 49-60 months. Older children will have more experience so that they will think more maturely and logically^{12,13}.

The position of children in the family was dominated by the first child. Twenty five (62.5%) children, comprising 12 in control group, and 13 in intervention group, were first children. In general, intellectual abilities are more rapidly developed in the first or single child, because they often interact with adults^{14,15}. However, motor development was sometimes late, because of the absence of stimulation by his/her siblings.

The parents’ income was <795.000 IDR, the regional minimum wage, in 87.5% respondents and above it in 12.5%. In previous research, too, the

family’s income was under the regional minimum wage in 80.5%^{13,16}. Good income of family will support the growth of children because parents can provide all the children’s needs, both primary (food, cloth, health) and secondary (education, course, recreation)¹⁵. With good parental education, it will be easier to receive information from outside, especially related to good ways to nurture children and maintain healthy. Generally, children who come from upper middle class families receive more guidance and good guidance from their parents¹⁷.

The results of the research of increasing gross motor development of children after receiving the Montessori method were strengthened by the Montessori statement¹⁸. Sensory teaching aids allow children to receive knowledge of the physical world and make decisions about various qualities. Sensory refinement was the ultimate goal, when children touch, see, feel, listen and taste, will create a category in the brain for each new sensory input¹⁹. The Montessori method prioritizes motor skills in children so that children can understand the principles or skills that are designed according to their abilities, which are not burdensome so that the preschooler will always be enthusiastic and happy²⁰. The results of the research of increasing gross motor development of children after receiving the Montessori method were strengthened by the Montessori statement that the Montessori method was for preschoolers²¹. Montessori method provides

effective learning methods for preschoolers, providing stimuli for children's motor skills, sharpening their intellectual and control abilities and preparing children to enter more complex exercises²². Montessori method emphasizes the importance of motor, sensory and language education for pre-school children. Motor education directs children's movements into more meaningful movements that will make children more calm, happy, and satisfied²³.

Research showed that the therapeutic values contained in traditional kris games include the values of early detection, good physical development, good mental health, problem solving, and social value²⁴. The value of physical development was good for exercise, increasing coordination and balance of the body, and developing skills in the growth of children²⁵. In problem solving, children learned to solve problems so that these abilities could be transferred in real life²⁶. Social values, namely children learning social skills that would be useful for provision in real life²⁷.

Conclusions

Montessori method is effective for improving gross motor skill development in early childhood (3-5 years old).

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