

The Effect of Fundamental Motor Skills Intervention Program on Kindergarten Students

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Received March 12, 2021; Revised April 6, 2021; Accepted May 23, 2021

Cite This Paper in the following Citation Styles

(a): [1] Nuridin Widya Pranoto, Amung Ma'mun, Mulyana Mulyana, Nurlan Kusmaedi, "The Effect of Fundamental Motor Skills Intervention Program on Kindergarten Students," *International Journal of Human Movement and Sports Sciences*, Vol. 9, No. 3, pp. 583 - 589, 2021. DOI: 10.13189/saj.2021.090326.

(b): Nuridin Widya Pranoto, Amung Ma'mun, Mulyana Mulyana, Nurlan Kusmaedi (2021). *The Effect of Fundamental Motor Skills Intervention Program on Kindergarten Students*. *International Journal of Human Movement and Sports Sciences*, 9(3), 583 - 589. DOI: 10.13189/saj.2021.090326.

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Abstract Background: The ability of motor skills becomes the basis for children to master movement skills. There are still many students whose motor skills are below average. Objective: The aim is to compare the fundamental motor skills (FMS) regular program with the intervention FMS program conducted in 12 meetings within 6 weeks in schools. Methods: 80 kindergarten students were sampled and split into two equal groups where 40 students were placed in the control group to receive regular training and the rest 40 students in the intervention group. The test of gross motor development-2 (TGMD-2) was employed while measuring the motor skills through pre-test and post-test approach. Results: There was an increase in motor skills in both learning groups. After testing with the Mann-Whitney test, obtained with the mean range of 21.44 in the regular FMS program which was found lower comparing to the other one of the FMS in the intervention program of 59.56, Sig. equal to 0.000 < 0.05, meaning that this discrepancy was statistically significant at p-value = 0.05. These latter findings imply that motor skills were highly increased in the intervention group rather than in those who followed the regular FMS program. Conclusion: The FMS learning through intervention programs is better at improving students' motor skills. Schools can use FMS interventions to improve motor skills, provided that the teacher understands the implementation of the program, implements the program according to the guidelines, students follow the entire learning process.

Keywords Fundamental Motor Skills, Intervention

FMS Program, Kindergarten Students

1. Introduction

Motor skills are a combination of the basic movement patterns of two or more body segments [1], [2]. They are normally divided into 3 categories; such as (1) locomotor, namely the ability to move the body through space, (2) ball skills, broadly understood as the ability to push or manipulate objects in space, and (3) stability skills, the ability to maintain postural control [3]. Motor skills are important for children because they can improve children's physical, social, and cognitive development, as well as emotional feeling [4]. The extensive literature reveals that children with motor skills are more active and more likely to be involved in physical activity than children with low motor skills [4] [5]. Children who do not master motor skills can experience long-term difficulties in carrying out physical activities in the future [6], [5], [7]. Low motor skills in children cause the child's inability to balance/control movement skills and low self-confidence in physical activities.

The age of human development of motor skills ranges from 3 to 6 years [8], [9]. The preschool years are identified as a critical time to develop fundamental motor skills (FMS) [10], where children's movement patterns are not directed and preschoolers who lag in developing FMS are at risk of

experiencing continued delays in FMS skills until grade 1 [9]; [11], [12]. Preschool ages appear to be the basis and determinants for the development of more complex motor skills and are perhaps the most promising time in relation to prevention strategies based on improving motor skills [12], [13]. The motor development skills that develop in children between 3 and 6 years old is a basic movement pattern where the child begins to be able to carry out coordinated locomotor movements and control objects. In fact, this momentum should be harnessed by promoting motor skills learning through appropriate learning programs.

The FMS learning for kindergarten students in Indonesia is mostly done through gymnastics, traditional games, and ball games. The studies have stated that the development of children's gross motor skills is not sufficient to be adequately promoted by the well-equipped free play [14], [15]. FMS must be taught, learned, and strengthened [16]. The combination of active play and a structured training program can result in a good FMS [16]. Correctly programmed FMS interventions can improve children's motor skills [18], [19] [20]. Researchers in several countries have tried to intervene in student motor skills through intervention programs. The results of the intervention have been shown to improve motor skills [22], [22], [23].

The FMS intervention is a solution to improving students' motor skills. Intervention through the development of basic movement skills has the potential to reverse motor skills decline in children [24], [25]. In this study, researchers tried to provide an FMS program intervention. The intervention program is based on a theoretical literature review of several previous studies that have successfully implemented intervention programs. So far we acknowledged 12 basic movement skills learning materials that consisting of 6 locomotor materials and 6 control object materials which are carried out all 6 weeks with sessions of 2 times per week.

This present study aims to determine the effect of the FMS intervention program on students' motor skills and to compare the increase in motor skills of students who carry out regular FMS programs with intervention FMS programs. The hypothesis in this study is that there is a significant increment in motor skills in students who take learning programs using the FMS intervention program. The second hypothesis was formulated that the intervention FMS learning program can improve motor skills better than regular FMS learning.

2. Materials and Methods

2.1. Participants

The sampling technique used in this study is purposive sampling. Ideally, the purposive sampling technique allows

researchers to determine samples based on certain criteria so that they can get a representative sample. A total of 80 kindergarten students with an age range of 4-6 years were sampled. The selected kindergarten schools are schools that implement FMS learning consistently, seen from the physical motoric learning implementation plan program that teaches FMS material in schools. School consistency in implementing FMS learning will help the process of comparing learning outcomes between regular FMS and intervention FMS.

The sample was divided into two groups, namely the control group who received regular FMS learning and the treatment group who received intervention FMS learning. The control group, consisting of 40 students, 23 of whom were male students and 17 female students, who carried out regular FMS learning. The treatment group, consisting of 40 students, 22 of whom were male students and 18 female students, who carried out intervention FMS learning.

2.2. Method

The study in hands is a quantitative study with the nature of quantitative data collected henceforth need to be analyzed based on the emphasis of theory testing. The research design was in the form of an experiment where the researcher looked at the results of the pre-test and post-test in the two research groups and analyzed the mean difference of the groups. The first step of the researchers was to test motor skills using the TGMD-2 instrument in both groups. There are 12 items assessed movement skills which are divided into 2 categories such as locomotor motion and control objects. The former one, which falls into the locomotor motion category. The test items are running, gallop, jumping, leap, horizontal jumping, sliding. However, in the category of control object motion, the test items are in the form of hitting the ball, dribbling, catching, kicking, throwing up, and rolling the ball.

The procedure is carried out in the implementation of the TGMD-2 test. The tester fills in the form data. The tester provides a demonstration of the motion for each test item implementation. The student does two trials on the movement skill item and is assessed by the testing according to the criteria on the assessment sheet. To this end, if the students' motion criteria correctly are given point 1, and in contrast, wrong motion criteria are awarded 0 points. The maximum score on the locomotor test is 48 points, while the maximum score on the control object is 48 points. The scores obtained by students showed the performance of students' motor skills.

The assessment on the TGMD-2 test was carried out by one researcher. This type of assessment of locomotor movement skills is employed to determine the raw score for locomotor motion as well as the assessment of control objects. Overall, data of standardized score, the percentiles of locomotor motion, and data from control objects were yielded from converting the score from table subtest raw to

standard score and percentile. On the other hand, the age equivalent for participants results from converting subtest raw score to age equivalent. However, by converting sums of subtest standard scores to percentiles and quotients, the gross motor quotient was then obtained. The description of the level of student motor skills is seen through the gross motor quotient points in the TGMD-2 Descriptive rating table.

2.3. Procedure Program of Intervention

The FMS interventions are designed to help children systematically learn basic movement skills. The FMS intervention consisted of 12 motion learning materials, 6 locomotor materials, and 6 control object materials. As the main activities in such physical learning program, the locomotor motion material consists of running, gallop, jumping, leap, horizontal jumping, sliding, and control object material consists of hitting the ball, dribbling, catching, kicking, throwing up motion, and rolling the ball. The intervention of the FMS program was carried out in 12 meetings with learning carried out 2 times in one week with a duration of 60 minutes where 10 first minutes were dedicated for warming-up and 40 minutes for lecturing (learning with 3-4 times of repetition), explanation and asking questions and the last 10 minutes of cooling and evaluation.

Before implementing the FMS intervention program, the teaching staff/teachers are first given training, with the aim that teachers understand the concept of implementing FMS intervention learning. After the teacher training sessions, a test was administered to determine the level of understanding of the FMS intervention material. Teachers who obtained high test scores proceed to the FMS intervention program; however, teachers who got low scores to carry out regular learning as is usually taught in schools. Each teacher's meeting taught one motion learning material in the intervention group. Learning movement skills on each item of motion is carried out step by step, starting from the position of the start of the motion, the execution of the motion, the ending of the motion, a complete series of motion and ending with a game that uses the movements that students have just learned.

3. Results

Motor skills of kindergarten students were measuring using the TGMD-2 test. To find out the difference in effect, first, the TGMD-2 pre-test results were displayed in the regular FMS learning group and the intervention FMS.

Table 1. Pre-test data from regular and intervention FMS programs

Category	N	Minimum	Maximum	Mean	Std. Deviation
FMS Reguler	40	67	88	75,05	6,941098
FMS Intervensi	40	67	88	77,05	6,17252

From the table above, descriptive statistics is obtained from the pre-test data of each learning program. It is known that the mean (\bar{X}) for the motor skills of the regular FMS program is 75.05, with a standard deviation (S) of 6.94. Meanwhile, the mean (\bar{X}) for the motor skills of the intervention FMS program was 77.05, with a standard deviation (S) of 6.17. From this data, it is known that there are similarities in the level of motor skills in the control class and the intervention class at the beginning of the lesson. The similarity in the level of motor skills explains that the two groups come from the same cluster. In the posttest, it is known that students in the intervention group obtained significantly higher mean points than students in the control group. The following table shows the post-test:

Table 2. Post-test data from regular and intervention FMS programs

Category	N	Minimum	Maximum	Mean	Std. Deviation
FMS Reguler	40	79.00	109.00	91.3000	6.88812
FMS Intervensi	40	97.00	127.00	111.75000	6.55113

From the table above, descriptive statistics are obtained from the data of each learning program. It is known that the mean (\bar{X}) for the motor skills of the regular FMS program is 91.30, with a standard deviation (S) of 6.88. Meanwhile, the mean (\bar{X}) for the motoric skills of the intervention FMS program was 111.75, with a standard deviation (S) of 6.55. From the data above, it can be seen that the average results of the motor skills of students who do the regular FMS program learning are smaller than the average results of the motor skills of students who do learning with the intervention FMS. Therefore, based on the average value above, it can be concluded that there are differences in the results of students' motor skills between the regular FMS program and the intervention FMS. Also, because the average score of motoric skills for intervention FMS is greater than the average value of motoric skills for regular FMS, it can be concluded that the intervention FMS program is better than the regular FMS program. The following is a bar chart of the regular FMS motor score and the intervention FMS.

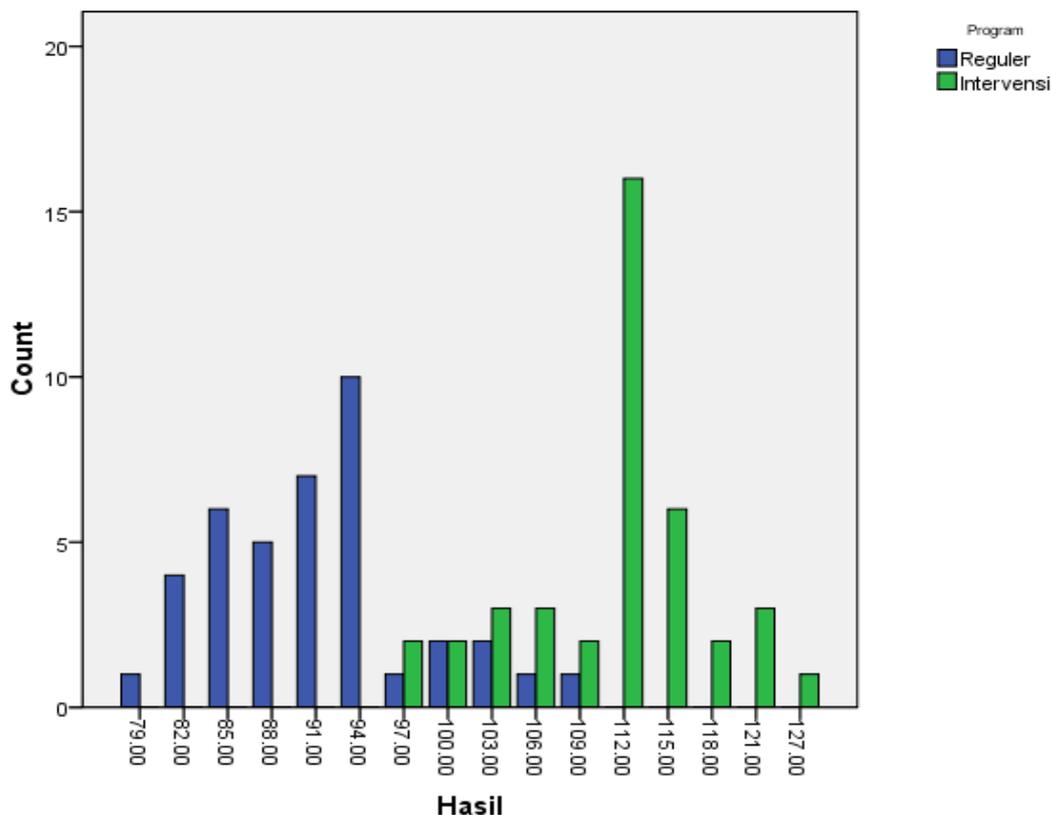


Diagram Score Motor Skills of Regular FMS Learning and Intervention FMS

From the bar chart above, the difference can be seen in the results of motor skills between regular FMS and intervention FMS. The lowest score for regular FMS was 79 and the highest score was 109. The score for intervention FMS was 97 and the highest score was 127. From the visual bar chart, it can be viewed also that the motoric skill score of the intervention FMS group was higher than the regular FMS. To see the difference in the mean rankings of the two groups, a statistical test was carried out using the Mann-Whitney test. The results of data analysis using the Mann-Whitney test are depicted in the following table.

Table 3. Mean Rank Uji Mann Whitney

	Program	N	Mean Rank	Sum of Ranks
Result	Regular	40	21.44	857.50
	Intervention	40	59.56	2382.50
	Total	80		

The table above shows the mean rank or average ranking of each group. In the regular FMS learning group, the mean rating is 21.44, lower than the mean FMS intervention value of 59.56. This means that the use of the Intervention FMS program is better at improving motor skills than the regular FMS program. To determine the difference in the mean statistically between the two groups, the Mann-Whitney test was performed.

Table 4. Results of the Mann-Whitney Test for Kindergarten Students' Motor Skills

Regular FMS and Intervention FMS	
	Result
Mann-Whitney U	37.500
Wilcoxon W	857.500
Z	-7.383
Asymp. Sig. (2-tailed)	0.000
	Total

Based on the output "test statistics" in the Mann-Whitney test, it is known that the Asymp. Sig. (2-tailed) of 0.000 < 0.05. It is known that there is a significant difference in the results of motor skills of kindergarten students between those who carry out regular FMS program learning and intervention FMS.

The next step to see the level of effectiveness of learning between students who carry out the regular FMS program and the intervention FMS is to do the N-gain test. The N-gain test calculates the difference between the pretest and posttest scores.

Table 5. Data Mean N-Gain Score Regular Program of FMS and FMS Intervention

Category	N	Minimum	Maximum	Mean	Std. Deviation
FMS Regular	40	30	175	68.84	29.72
FMS Intervensi	40	85.71	275	157.18	42.68

Based on the results of the N-gain score test, it is known that in the regular FMS learning group the N-gain score is at least 30 and a maximum of 175. The average N-gain score for the regular FMS program group is 0.68 which is included in the medium category or based on the interpretation of the effectiveness of the N-gain of 68.84, which is categorized as quite effective. In the FMS intervention learning group, it is known that the N-gain score is at least 85.71 and a maximum of 275. The average N-gain score for the FMS intervention program group of students was 1.57 which was included in the high category or based on the interpretation of the effectiveness of the N-gain of 157.18 which was included in the effective category. It is more effective to improve the motor skills of kindergarten students than regular FMS learning programs.

4. Discussion

To understand the context in this study, several points need to be discussed. The success of the FMS program intervention is influenced by the ability of teachers to implement program content according to the guidelines. Program implementation can run well if there is the readiness of the teaching staff, the readiness of teaching materials, control in learning [24]. Providing coaching for the implementation of intervention programs at the beginning for teachers is the key so that teachers are believed to implement intervention programs for students. It is assumed that the fundamental motor skills shortly known as (FMS) interventions could significantly be improved in children with and without delay when only delivered by an expert in such field [26]. Students' participation is the second key in providing intervention. Participation has many benefits for the development of student learning outcomes [27]. Students as objects of recipients of the intervention have unique characters. Differences in ability and level of motivation to learn for each student affect learning outcomes. Student activeness is needed to succeed in the FMS program intervention. Students are required to follow the entire program content so that the intervention results are successful. It takes the teacher's ability to manipulate students so that students are motivated and active in the implementation of learning. Manipulation can be done by interacting by involving students in the learning process, using fun learning methods, interesting learning tools, giving attention when learning to all students.

This study was carried out for the purpose of determining the effect of the fundamental motor skills intervention program on students' motor skills. From the TGMD-2 pre-test data, it is known that students in the intervention group obtained a mean value of motor skills in locomotor motion and the control object was 77.05, which is in the poor category. After obtaining the FMS learning intervention 12 times within 6 weeks on the TGMD-2

post-test, it is known that the mean value of motor skills in locomotor motion and control objects is 111.75 in the category above average. The increase that occurred in the intervention class students proved that there was an influence of the FMS intervention program on students' motor skills. The increase in motor skills in students of the intervention group shows that learning FMS which is designed in a structured way by selecting learning material for movement skills, paying attention to learning stages, preparing teacher competencies, designing learning implementation, providing an appropriate dose of learning time can improve student motor skills. A supportive FMS program can enhance the development of an FMS [28].

Another objective of this study was to compare the regular FMS program provided by schools with the intervention FMS program. From the pre-test and post-test data of the regular learning group, it is known that the mean increase in motor skills is 16.25, while in the intervention group the mean increase in motor skills is 34.7 points. The two learning groups adrift the difference in the score of an increase of 18.45 points with the intervention learning group outperforming the regular learning group. These findings prove that programmed FMS intervention learning has a greater effect on improving motor skills than regular learning. The ability of the FMS intervention program to improve motor skills is the basis for recommendations for using a structured FMS program in learning motor skills in schools.

5. Conclusions

Mastery of motor skills is important for children because it becomes the basis for carrying out movement skills and the basis for future movement development. In some kindergarten education institutions, it is known that there are still students who have motor skills below average. One of the obstacles to improving motor skills is the less programmable learning program. The FMS learning, which is carried out by some kindergarten institutions, is considered not optimal. The results prove that the provision of the FMS intervention program can improve motorbike skills above average. After addressing all data, findings showed that the FMS program intervention can be used as a learning program to improve students' motor skills.

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