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Stimulating fundamental movement skills through field games: An experimental study on elementary school students

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ABSTRACT

Basic movement skills are the skills needed to explore the body's ability to move as a result of learning to respond to stimuli. However, the learning process is still focused on mastering the skills but does not include the cognitive abilities. The research aims to measure the success of implementing field games in stimulating elementary school students' fundamental movement skills. The experiment adopted the one-group pretest and posttest designs. It was conducted in three consecutive stages: pretest, treatment, and posttest. The study involved a sample of 126 students who were randomly taken from elementary schools in Pontianak. The data on fundamental movement skills were collected through the Test of Gross Motor Development-2 (TGMD-2) instrument, which was analyzed descriptively. The results of the study showed that there had been an increase in the average TGMD-2 score of students on the posttest when compared to the pretest. The t-test between pre- and post-test showed that the scores were significantly different, as suggested by the calculated t-value having a greater value than the t-table. This result indicates that the implementation of field games can stimulate fundamental movement skills. It is concluded that applying field games can improve students' fundamental movement skills and can be used as an alternative for teachers in carrying out motion learning at school.

Keywords: Fundamental motor skill; field games; elementary school student

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INTRODUCTION

One component of physical development in students is fundamental motor skills (FMS). Fundamental Motor Skills is a stage of motor development indicated by active students exploring their body movement abilities as a result of learning how to respond to a stimulus in the form of motion control and movement skills (Goodway et al., 2019). The importance of fundamental motor skills as a substantial basis for the formation of sport-specific skills in general can be implemented (Kokstejn & Musalek, 2019), as can

11 the basic building blocks of the more advanced and complex movements needed to participate in physical activity (Behan et al., 2019). Fundamental movement skills enable students to apply basic motor skills to participate in sports and games requiring more advanced movement throughout school and life (Ma et al., 2021). Fundamental movements and skills are observable basic movements of behaviour patterns and observable basic movements that have existed since childhood (Goodway et al., 2019). Moreover, fundamental movement skills are a phase of movement formation that is learned from previous movement phases such as reflexive and rudimentary movements and prepares for the acquisition of more advanced skills in a specific sports stage (O'Brien et al., 2016). Basic movement skills require the activation of large muscle groups and are classified as object control skills, which involve the transmission, capture, or emission of objects, and locomotive skills (movement moves the body from one location to another) (Han et al., 2018).

Fundamental movement skills are movement skills learned by exploring and providing opportunities for students to be involved in an appropriate environment with space, equipment, and positive reinforcement that allows children to practise and learn (Nesbitt & Bullard, 2021). In addition, FMS mostly appeared around the age of 6 years and in students aged 11 years (Shams et al., 2021), and fundamental movement skills in early childhood support lifelong health (Branje et al., 2022). This makes FMS interventions necessary to start during the preschool and early school years with a focus on motion learning for students (Barnett et al., 2016; Goodway et al., 2019; Hardy et al., 2012; Xin et al., 2020). Fundamental movement can be taught and practised in the form of playing a game, either structured or unstructured. This approach needs to be integrated into the curriculum or practise environment (Estevan & Barnett, 2018), and must be carried out directly, take place in a social context, and be embedded in the context of the teacher's own school (Dyson et al., 2016).

The problem associated with achieving fundamental movement skills is that not all students have access to conditions that will promote fundamental movement learning at an appropriate level or have the capacity to learn independently (Kim & Lee, 2016). In addition, students' fundamental movement skills are still low due to the low understanding of parents regarding the importance of motion stimulation in students (Mahmud, 2019). The duration of time provided by the school for students to carry out physical activities is relatively short so it results in less good students' physical abilities (Kremer et al., 2012). In addition, many teachers fail to provide students with adequate motor skills development (Dyson et al., 2016). Students who spend more time doing movement activities are considered wasted. After all, they result in students failing at school because of reduced academic time. So, opportunities for practice, instruction and learning modeling are important for the development of fundamental movements (Ma et al., 2021).

Research that has been carried out around the topic of stimulating fundamental movement skills includes Using a traditional game approach which significantly influences the development of the fundamental movement of elementary school students (Supriadi, 2019), Invasion games and netting games influence students' fundamental movement skills (Burstiando & Nurkholis, 2017), and the Active 1+ Fun program is effective in improving students' fundamental movement skills (Ha et al., 2021). The results of the three studies show that fundamental movement skills can be stimulated in many ways and approaches. However, this research still focuses on studying how the fundamental movement skills are affected by the common field games, yet to be integrated into a form of play that can encourage students to build their understanding.

As described earlier, the problems currently faced are related to students' fundamental movement skills, focusing not only on ways to stimulate but also on how the movement skills are able to stimulate students' cognitive abilities. This is in line with the principle of current learning of motion skills, which must be carried out by providing continuous transforming experiences to confront further experience (Quennerstedt, 2019). In addition, the essential points that need to be considered when teaching fundamental movement skills are the skill-based learning approach and the games. This approach aims to promote mastery of skill development in a non-competitive and non-threatening learning environment (Estevan & Barnett, 2018). ¹

Based on the description of the problem, an effort is needed to find learning activities that can stimulate fundamental movement skills through a game approach. The games used must be able to stimulate understanding so that students' fundamental movement skills can be well formed. For this reason, choosing a form of field games as a learning medium to stimulate students' fundamental movement skills seems adequate. The urgency of using field games is because they have a major contribution to making students aware of the role of tactics in achieving success in real-life situations. In addition, Field Games is able to develop students' abilities to have technical knowledge and tactics simultaneously (Mitchell et al., 2020). The research was carried out by encouraging students to carry out pre-designed game activities, and when playing games, students were given tasks to complete. It is intended that students can carry out movement activities to improve playing performance and encourage student involvement in learning. The research aims to measure the success of implementing field games as a learning activity to improve the fundamental movement skills of elementary school students.

METHOD

Type of Research

The research aims to measure the success of using the field game approach to encourage the improvement of elementary school students' fundamental movement skills. The study adopted pre-experimental research with one-group pretest-posttest designs. The research was conducted in three simultaneous stages, namely the pretest, treatment, and posttest. The treatment phase was carried out by implementing the prepared learning with a game approach. The differences in fundamental movement skill ability before and after treatment were monitored in the pretest and posttest phases.

Participant

The research participants were fourth graders (years 9–10) from two elementary schools in Pontianak. Samples were taken using an intact group (classroom) approach. Two out of four fourth-grade classes from each school were randomly chosen. In total, 126 students participated in the study.

Procedure

The research is conducted in several stages. The initial phase is intended to provide explanations regarding the purpose of the study to the involved participants and teachers whilst the researcher prepared all required equipment for the field games. At the session of the initial phase, the researcher introduced the games and the rules for playing the games to the students. This becomes the important point of the experimental study because at this stage students are encouraged to understand the concept of the game and master the involved skills, i.e., decision-making, skill execution, and game performance.

The second stage is the pretest, the before-treatment data collection using the instrument. The third stage of the study is the intervention implementation (treatment), which consists of asking students to play the prepared games. The final stage is the posttest, the after-treatment data collection. In total, the research was carried out in fourteen meetings with a duration of 100 minutes for each meeting (look at Table 1).

Materials and Apparatus

The students' fundamental movement skills were measured using the Test of Gross Motor Development-2 (TGMD-2). The aspects measured in the TGMD-2 instrument emphasise the qualitative aspects of movement and the way students carry out movements. Aspects measured in TGMD-2 include locomotor movement skills and object control, which include twelve components of fundamental movement skills including movements such as running, galloping, prancing, jumping, sliding, hitting the ball, dribbling the ball, catching the ball, kicking the ball, throwing the ball, and rolling the ball.

Table 1. Course Schedule

Phase	Session	Material Focus	Stages
Introduction to Game Forms	1	Introduction and explanation of learning objectives	Introduction to the Game Forms
	5	Game Introduction	Introduction to the Game Forms
Pretest	3	Games Play	Games Skill
Intervention	4	Games Play	Understanding Game Concepts
	5	Games Play	Understanding Game Concepts
	6	Games Play	Decision Making
	7	Games Play	Decision Making
	8	Games Play	Skills Execution
	9	Games Play	Skills Execution
	10	Games Play	Skills Execution
	11	Games Play	Skills Execution
	12	Games Play	Games Performance
	13	Games Play	Games Performance
Post Test	14	Games Play	Games Skill

Data Analysis

Data analysis was performed with both descriptive and inferential statistics. At first, using TGMD-2 instrument sheet, scoring was calculated for each activity carried out by students. All activity scores were then summed up and converted to a standard score using a quotient table. The conversion results will then be matched with the descriptive rating table. The significant differences between pre-test and post-test were measured using the t-test.

RESULTS AND DISCUSSION

Table 1 shows the pre-test results for students. It revealed that students' fundamental movement skills are predominantly in the average category (71 out of 126, or 56.35%), followed by 53 students (42.06%) who are in the below-average category. Only two students (1.59%) are at the above-average level. These results indicated that most of the students have low fundamental movement skills.

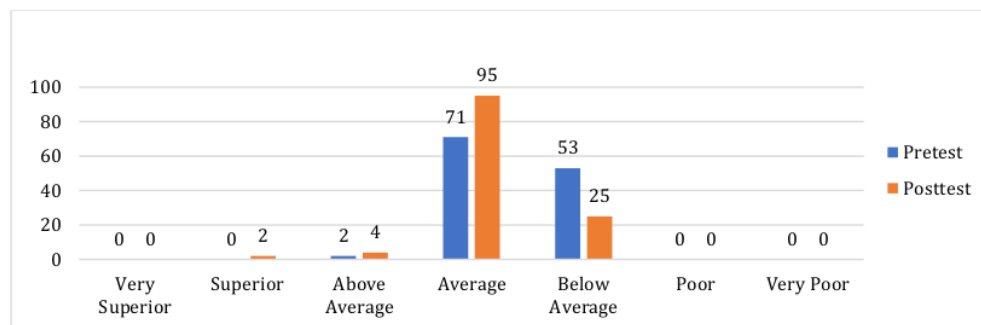
Table 1. Pretest Analysis Results Using TGMD 2

No.	Gross Motor Qoutient	Absolute (f)	Percentage (%)	Descriptive Ratings
1	> 130	0	0%	Very Superior
2	121-130	0	0%	Superior
3	111-120	2	1.59%	Above Average
4	90-110	71	56.35%	Average
5	80-89	53	42.06%	Below Average
6	79-79	0	0%	Poor
7	<70	0	0%	Very Poor

Table 2 showed the post-test results, which exhibit the increase in students' fundamental movement skills after the treatment phase. At the after-treatment stage, students were predominantly in the average category (95 out of 126, or 75.4%). Only 25 students (19.84%) were below the average level. Interestingly, 4 students (3.17%) were now in the above average category, and even the other 2 students (1.59%) were in the superior category. These results indicated that there was an increase in students' fundamental movement skills following the Field Games intervention given in this study (as depicted in Graph 1). In more detail, the success of the intervention could be evidenced by the increase of 24 students at the average level and the decrease of almost half of a number of students (19.84%) at the below average level. Moreover, the after-treatment also showed an additional number of students at the above-average level and students who achieved superior motor skills (1.59%) who were not seen in the pre-test.

Table 2 Posttest Analysis Results Using TGMD 2

No.	Gross Motor Qoutient	Absolute (f)	Percentage (%)	Descriptive Ratings
1	> 130	0	0%	Very Superior
2	121-130	2	1.59%	Superior
3	111-120	4	3.17%	Above Average
4	90-110	95	75.40%	Average
5	80-89	25	19.84%	Below Average
6	79-79	0	0.00%	Poor
7	<70	0	0.00%	Very Poor



Graph 1. A comparison of the number of student-participants based on the TGMD-2 Descriptive Ratings level

The success of the intervention was also indicated by the increase in the mean values of the posttest compared to the pretest (Table 3). The mean increased by 4.5 points. An increase showed that the students' fundamental movement abilities had improved after being treated. The significance of the treatment was investigated by looking at the value difference between the pre- and post-tests using the t-test analysis. The result showed

that the t-value was 18.29, which was greater than the t-table (1.66). Since the t-value (18.29) was greater than the t-table (1.66), or else the p-value was 0.000.005, therefore H_0 was accepted. Thus, there is a significant difference between the pretest and posttest TGMD-2 scores. The results prove that learning activities using the field game approach can improve elementary school students' fundamental movement skills.

Table 3. Descriptive Statistics of Fundamental Movement Skills Measurement

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post-Test	96.33	126	8.05	.72
	Pre-Test	90.83	126	5.40	.48

Table 2. The paired t-Test Result of Fundamental Movement Skills Measurement

Paired Samples Test									
Paired Differences									
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pre-test - Post-test	5.5	3.38	.31	4.90	6.09	18.28	125	.000

he results showed that implementing field games in elementary school students' learning can stimulate fundamental movement skills. This is shown by the increased score of TGMD-2 in the posttest. In addition, the intervention resulted in supporting students in achieving the Above Average and Superior motor ability categories. The significant difference between posttest and pretest scores through a t-test shows that learning activities using the field game approach can improve the fundamental movement skills of elementary school students. This result indicated that students' fundamental motor skills can be improved through the implementation of field games. It is in line with Strotmeyer et al. (2021) statement that the intervention of movement skill abilities can be done through games.

Using field games as a learning approach to stimulate students' fundamental movement skills is the right thing. Field games provide opportunities for students to combine or repeat movements and take risks, support physical, cognitive, and socio-emotional (holistic) development, and increase awareness of students' physical development (Branje et al., 2022; Rinaldo et al., 2021). In addition, games-based learning provides opportunities for students to develop tactical aspects, decision making, technical skills or levels of physical activity (Barba-Martín et al., 2020; Burton et al., 2021), and able to increase enjoyment so as to be able to motivate students in learning student movement skills (Gómez-Urquiza et al., 2019; Harvey et al., 2020; Jia, 2021; Ab-Rahman et al., 2020; Vasileva-Stojanovska et al., 2015). Learning through field games certain components of children's development of understanding motion (Mandigo et al., 2019).

The increase in students' fundamental movement skills stimulated by the application of field games occurs because students are allowed to make specific movements to achieve fundamental movement skills. When playing games, students are faced with conditions to analyze situations and are required to make decisions related to technical and physical activities that must be carried out immediately. Apart from that, students carry out movement activities in fully fun and stress-relieve conditions so that students are voluntarily involved in learning. This condition allows students to take part in movement learning seriously.

It is important for students to have proper fundamental movement skills because they affect the development of the whole student. Students' bodies will be healthy and fit because doing physical activity increases the fitness of the cardiorespiratory system (Cohen et al., 2015), encourage students to be active in physical activity (Xin et al., 2020), improve the performance of the metabolic and neuromuscular systems (Laukkanen et al., 2014), and cause positive changes in the physiological and anthropometric health indices of students who have normal weight and obesity (Lambrick et al., 2016). Besides that, students who have good fundamental movement skills will improve cognitive abilities (Gülgösteren & Ziyagil, 2019; Maïano et al., 2019; Zhang et al., 2021), and support holistic student development (supporting physical, cognitive and socio-emotional development) (Branje et al., 2022), and encourage students' sensitivity to the ecological environment which includes playmates, family, and the surrounding environment (Zeng et al., 2017).

Regarding the results, the learning game approach is recommended for teaching games because it can develop techniques, understanding, tactical knowledge, and decision-making, which are required in playing games (Abad-Robles et al., 2020). Moreover, it increases students' capacity to evaluate game situations and develop their tactical reasoning (Harvey et al., 2020). The games also have a potency to promote physical activities and attain the recommended moderate active time in physical education classes (Wang & Wang, 2018). Learning that is carried out with a game approach can be considered a medium in forming behavior for it is compulsory for students to abide to the games rules in a certain time and space (Guijarro et al., 2021). Interestingly, the students learned these rules in a fun way (Domville et al., 2019). Therefore, using games as learning activities can increase students' enjoyment in learning. Students feel happy in learning because they feel they are doing playing activities so that the game is carried out in earnest. For this reason, mastery of fundamental movement skills for elementary school students is an important concern for parents and schools.

Based on the average score achieved by students in table 3, there was an increase of 6.50 point. The increase in the score achieved by students is relatively small. This is partly due to the short duration of the intervention which consisted only fourteen meetings. The duration of the intervention influences effort to improve fundamental movement skills (Johnstone et al., 2019; Zhang et al., 2021). In addition, based on the stages of motion learning by new students, they are at the stage of associating understanding with the form of motor skills, so the results achieved are still not optimal (Coker, 2017), and a movement skill takes time to master (Silverman & Mercier, 2015). For this reason, further research is needed to conduct experiments to stimulate students' movement skills for a relatively long duration of time. In addition, it is also necessary to develop or modify related games that can be used to stimulate fundamental movement skills. Learning that is carried out with a game approach is not only able to stimulate movement skills but is also able to encourage students' thinking skills. This ability is very necessary for students to encounter future challenges.

CONCLUSIONS

Implementation of field games in learning can stimulate students' fundamental movement skills. Learning which is done by implementing field games can encourage students to develop movement skills, enjoyment in education, and cognitive abilities (tactical aspects, decision making, and technical skills). Based on the results of the research, learning aimed at developing motor skills does not only focus on motion execution but must also encourage an increase in students' understanding of games rules. This aims to form motor as well as cognitive skills particularly in solving problems and

making decisions so that the execution skills is in accordance with their needs.

Learning that is carried out with a game approach is not only able to stimulate movement skills but is also able to encourage students' thinking skills. This ability is very necessary for students to encounter future challenges. For this reason, it is recommended that the implementation of student movement skills learning be carried out in the form of a game. To encourage the development of motor skills and a comprehension of the learning tasks being examined, it is anticipated that all physical education teachers will incorporate the play method into their lessons. The study's drawbacks include the tiny sample size and the homogeneous nature of the game activities. It is anticipated that future study will enable the development of more varied video games and the ability to perform research on a bigger sample size.

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