

Effect of learning approach and motor skills on physical fitness

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Abstract:

Physical fitness is important for students to achieve optimal learning outcomes and better life quality. Moreover, low physical fitness usually causes less focus and lack of enthusiasm in the learning process, thereby leading to low learning outcomes. This is the reason the teachers need to understand the character or motor skills of each student and master several effective learning approaches. Therefore, this study aims to analyze and prove the effect of learning approaches in Physical Education and motor skills on the physical fitness of elementary school students. This involved using command-based and task-based learning approaches while the motor skills were classified as high and low. An experiment was conducted using a two-way factorial ANOVA design with a total of 64 male students in the state elementary school number 10, Padang city, Indonesia selected randomly used as the sample. This sample was divided into 4 treatment groups based on the learning approaches and motor skills levels, while data were collected based on the development of several existing test instruments. Physical fitness consists of body composition, hand muscle strength, endurance, flexibility, and cardiopulmonary endurance components while motor skills consist of balance, speed, agility, leg muscle explosive power, and accuracy components. Data were further analyzed using two-way ANOVA and Tukey follow-up test. The results showed that the task-based learning approach has a better effect than the command-based on students physical fitness outcomes (mean, 238.94 > 235.25). Moreover, the interaction between learning approaches and motor skills was also found to have a significant influence (F-count 30.65 > F-table 4.00). It was also observed that it is better to provide students having high motor skills with a task-based learning approach instead of a command-based to achieve the desired outcomes (mean, 251.31 > 240.19). Meanwhile, students with low motor skills provided with command-based learning have better outcome compared to the task-based approach (mean, 230.31 > 226.58). This simply means students with high motor skills require task-based learning while those with low motor skills need a command-based learning approach. Therefore, this study is expected to be useful for Physical Education teachers to master effective learning approaches by considering students motor skills in order to improve their physical fitness.

Keywords: physical fitness, motor skills, command, task, Physical Education, elementary school

Introduction

Physical Education (PE) is one subsystem of education taught in schools to promote a physically active lifestyle (Cassidy et al., 2015) and the main goals are to gain health, improve basic physical qualities, and enhance motor skills (Galan et al., 2017; Olena et al., 2017). Physical activities in education are beneficial to the mental health of students by reducing stress, creating feelings of happiness, increasing brain power, and increasing self-confidence (Alnedral et al., 2020). This means these physical activities are important to human life by assisting with the formation of a good body and soul (Syharastani, 2022). Briefly, PE aims to develop the potential in students including the cognitive, affective, and psychomotor aspects.

Physical fitness and motor skills are two inseparable aspects with an important role in PE learning. This is due to the fact that students with good physical fitness are expected to engage in productive daily activities (Gu et al., 2016; Moghaddam & Lowe, 2019). Moreover, fundamental motor skills are defined as movement patterns that involve large muscle groups and are also explained operationally as the “building blocks” of complex movements. These consist of object control or manipulative skills (throwing, catching, dribbling, and kicking the ball), locomotor skills (walking, running, jumping, and sliding), as well as balance or stability skills which are non-locomotor such as bending, dodging, one-leg balance, stretching, swinging, and twisting (Gallahue et al., 2011). Several terms have been widely used to describe fundamental motor skills such as motor skills (Robinson et al., 2015), fundamental motor patterns (Barnett et al., 2012), and fundamental movement skills (Barnett et al., 2015; Robinson et al., 2015). However, the definition of Gallahue et al. was adopted in this study because it is broader, frequently used by researchers, and reflects recent developments highlighting the inclusion of balance (stability) skills in measuring motor competence (Rudd et al., 2015).

The low motor skills problem is influenced by several factors such as the lack of infrastructure and the absence of sensor technology-based measuring instruments, there by leading to rare evaluation of children's fundamental motor skills by teachers and parents (Komaini et al., 2021). Moreover, the overall amount of physical activities by adolescents is reported to be insufficient (Guthold et al., 2020), and this leads to an inactive lifestyle (Varma et al., 2017). It was also stated that only 12% of children with low fundamental motor skills fulfill the physical activities recommendations (Meester et al., 2018). The World Health Organization recommended that children engage in moderate to vigorous physical activities for at least 60 minutes every day (World Health Organization, 2010). This means it is very important for children to master different fundamental motor skills in order to enhance their physical health and develop more specific movement patterns. The importance of motor learning to the development of fundamental motor skills in PE and coaching in sports has been recognized in several studies. It was, however, discovered that there are relatively limited examples of effective performance or pedagogical practice despite the growing literature on sports coaching and PE through motor learning (Orangi et al., 2021). Therefore, it is important for researchers and practitioners in this field to understand and advance knowledge on the acquisition of effective and efficient performance skills by students.

Sports learning has long been a major concern for practitioners, researchers, and PE teachers (Hastie & Mesquita, 2016). This is in line with the demands of society to develop independent, critical, and responsible human beings with the ability to adapt to their environment. The teaching of PE in schools has shifted from an explicit and formal character to the instructional process as indicated by a shift from traditional teaching which is a teacher-centered approach to a student-centered PE curriculum (Collins, 2015). Moreover, fundamental motor skills are expected to be included in several interesting activities, tasks, and fun games to motivate the students engaged in PE (Corbin & Pangrazi, 2003). It is also important to note that the method used by teachers should be in line with the student's circumstances. This is important because physical activity involvement and learning outcomes are directly influenced by previous interactions, knowledge, interests, and learning strategies (Shen & Chen, 2006). The selection and implementation of appropriate learning strategies increase the activeness of students in learning as well as seek and evaluate each activity (Shen & Chen, 2006). The use of different teaching styles has the ability to increase the engagement and satisfaction of students in PE. Therefore, teachers need to adapt to the teaching style provided, combine it properly, and change it to create new teaching in order to achieve learning objectives (Cuellar & Moreno, 2016), which include the improvement of the students' physical fitness.

The national survey results conducted in Indonesia showed that the physical fitness level of students is very low as indicated by the 45.97%, 10.71%, 37.66%, and 5.66% considered to be poor, very poor, moderate, and good, respectively (Toho, 2007). These figures showed that physical fitness is a serious problem faced by students considering the fact that it is below average. It was also discovered from national mapping that students at the elementary school level and aged 10-12 years are less fit as indicated by 46.49% and 9.96% recorded to be in poor and very poor categories while the moderate, good, and very was only 37.48%, 5.93%, and 0.14%, respectively (Center for Physical Quality Development, Ministry of National Education, 2010). Another study also showed that the physical fitness level of students in West Sumatra in the poor and very poor categories are more than 50.00%. This is a serious problem with a direct effect on the lack of attention and interest of elementary school students in attending class lessons. However, it is important to reiterate that elementary school is a basic-level educational institution that plays an important role in growing attention, character, and motor skills.

Therefore, this study aims to analyze and prove the effectiveness of the learning approaches in PE by considering the motor skills level on the physical fitness of elementary school students. The learning approaches studied include command-based and task-based while the motor skills were classified into high and low. The findings are expected to be useful for PE teachers in mastering effective learning approaches with due consideration for the motor skills of students in order to enhance their physical fitness.

Materials & Methods

Study design

This is an experimental study conducted using a two-way factorial ANOVA design. The learning approaches (A) were classified into two which include the command-based (A1) and task-based (A2) and the motor skills (B) were also classified into two levels which are the high (B1) and low (B2).

Table 1. Two-way ANOVA design

Motor skills (B)	Learning approaches (A)	
	Command (A1)	Task (A2)
High (B1)	(A1B1)	(A2B1)
Low (B2)	(A1B2)	(A2B2)
Total	A1	A2

Table 1 shows 4 treatment groups which include command-based learning for students with high motor skills (A1B1), command-based learning for students with low motor skills (A1B2), task-based learning for students with high motor skills (A2B1), and task-based learning for students with low motor skills (A2B2).

Participant

A total of 64 male students in the state elementary school number 10, Padang city, Indonesia, were selected randomly as samples based on stratified proportional random sampling (37.00%). They are between the ages of 10 and 12 years and in grades four, five, and six.

Procedure

The attribute variables were tested using a motor skill test and the scores were ranked from the highest to the lowest before the treatments were grouped into a two-way factorial design. The top and bottom data sequences are called the high and low motor skills groups, respectively. However, each group of high and low motor skills was matched into cells to ensure the data for each treatment cell does not have a significant average difference.

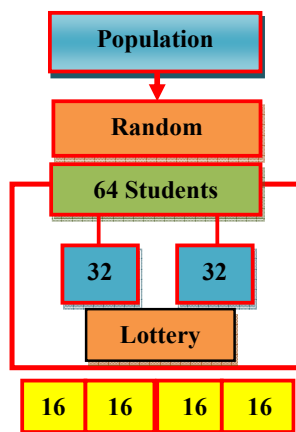


Figure 1. Procedure to divide the treatment groups

Figure 1 shows the 4 treatment groups which include the command-based learning approach group for students with high motor skills, command-based learning approach group for students with low motor skills, task-based learning approach group for students with high motor skills, and task-based learning approach group for students with low motor skills, and each has 16 students.

Instrument

The physical fitness and motor skills were tested based on several existing instruments (Ministry of National Education, 2010; Mathews, 1978; Ozmun & Gallahue, 2006). The results obtained from the tests conducted on the instruments developed are as follows.

Table 2. Validity and reliability

Developed instruments	Validity	Reliability	Category/level	
			Validity	Reliability
Physical fitness	0.631	0.653	Adequate	Adequate
Motor skills	0.570	0.983	Adequate	Very high

Table 2 shows that the instruments developed for physical fitness have a validity of 0.631 (adequate) and reliability of 0.653 (adequate) while those for the motor skills have 0.570 (adequate) and 0.983 (very high) respectively. This means the instruments are suitable to be applied to elementary school students aged 10-12 years.

Table 3. Physical fitness test

Component	Indicator	Instrument	Test sequence
Body composition	BMI (kg/m ²)	SMIC Scale	1
	Fat content (%)	Skinfold caliper	2
Hand muscle strength	Muscle strength (kg)	Grip strength	3
Muscle strength endurance	Muscular endurance (number within 30 seconds)	Push up	4
Flexibility	Flexibility (cm)	Flexiometer	5
Cardiopulmonary endurance	Cardiovascular endurance (minutes)	Run 800 meters	6

Students physical fitness test consists of body composition (BMI and fat content), hand muscle strength, muscle strength endurance, flexibility, and cardiopulmonary endurance as indicated in Table 3. While the motor skills test consists of coordination, balance, speed, dexterity, leg muscle explosive power, and accuracy as presented in Table 4.

Table 4. Motor skills test

Component	Test	Goals	Score
Coordination	Skipping 60 seconds	Overall coordination	Number of repetitions
Balance	Standing one foot on the block	Dynamic balance	Time (seconds)
Speed	Sprint 18.29 m	Speed	Time (seconds)
Dexterity	Shuttle run 6.10 m	Latent development and agility	Time (seconds)
Leg muscle explosive power	Jump straight	Leg muscle explosive power	Kg/m/sec
Accuracy	Throw a softball	Throwing accuracy	Number of incoming targets

Statistics analysis

Data were analyzed using a two-way analysis of variance (ANOVA) test. The discovery of amajor effect of the independent variable (learning approaches) on the dependent variable (physical fitness) and interaction with motor skills, further led to the application of the Tukey test to determine the groups with significant differences or better results on students physical fitness.

Result

The physical fitness outcomes after the experiment are presented in the following Table 5.

Table 5. Description of the physical fitness outcomes in the treatment groups

		Learning approaches (A)				Total	
		Command (A1)		Task (A2)			
Motor skills	High (B1)	n_{11}	16	n_{21}	16	n_{b_1}	32
		$\sum X_{11}$	3842	$\sum X_{21}$	4021	$\sum X_{b_1}$	7863
		$\sum X^2_{11}$	14768649	$\sum X^2_{21}$	1011295	$\sum X^2_{b_1}$	15779944
		$X_{.11}$	240.19	$X_{.21}$	251.31	X_{b_1}	245.75
	Low (B2)	n_{12}	16	n_{22}	16	n_{b_2}	32
		$\sum X_{12}$	3685	$\sum X_{22}$	2719	$\sum X_{b_2}$	6404
$\sum X^2_{12}$		849211	$\sum X^2_{22}$	616273	$\sum X^2_{b_2}$	1465484	
	$X_{.12}$	230.31	$X_{.22}$	226.58	X_{b_2}	228.44	
Total	n_{k_1}	32	n_{k_2}	32	n_t	242.63	
	$\sum X_{k_1}$	7527	$\sum X_{k_2}$	6740	$\sum X_t$	14267	
	$\sum X^2_{k_1}$	15617860	$\sum X^2_{k_2}$	1627568	$\sum X^2_t$	17245428	
	X_{k_1}	235.25	X_{k_2}	238.94	X_t	222.92	

It was discovered that the overall mean in the groups of students provided with command and task-based learning is 235.25 and 238.94, respectively while those with high and low motor skills have 245.75 and 228.44. Moreover, the groups with high motor skills and provided with command and task-based learning have 240.19 and 251.31 respectively while those having low motor skills and provided with command and task-based learning have 230.31 and 226.58 respectively.

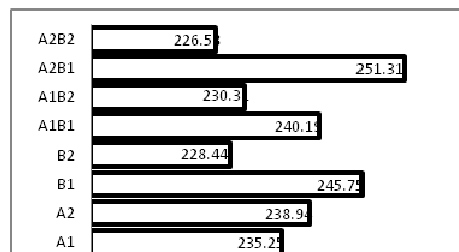


Figure 2. The overall mean score for the treatment groups

Figure 2 shows that the group of students with high motor skills and provided with a task-based learning approach has an average score of 251.31 and this is better than the score for the other groups.

Table 6. Summary of ANOVA results

Source of variance	dk	JK	KT	Fh	Ft=0,05
Mean Treatment	1	3584395.56	3584395.56		
A (Learning approaches)	1	185.56	185.56	5.14	4.00
B (motor skills)	1	5292.56	5292.56	146.76	4.00
A.B (Interaction)	1	1105.56	1105.56	30.65	4.00
Experimental error	60	2163.75	36.06		
Number	64	3593084			

The two-way ANOVA results in Table 6 showed that the F-count 5.14 > F-table 4.00 and this means there is a significant difference between the groups of students provided with command and task-based learning in relation to physical fitness. Moreover, the mean score of physical fitness outcomes for the groups of students with the task and command-based learning was found to be 238.94 and 235.25 respectively. This indicates the task-based learning approach provided a better performance on physical fitness than the command-based approach since 238.94 > 235.25. The results also indicated that F-count 30.65 > F-table 4.00 and this means that the interaction between the learning approaches and motor skills influenced students physical fitness outcomes. Therefore, the Tukey test analysis needed to be conducted in order to determine the groups with a significant difference, and the results are presented in the following Table 7.

Table 7. Summary of Tukey test results

Compared groups	F-count	F-table ($\alpha=0,05$)	Conclusion
A1B1 and A2B1	7.41	3.00	Significant
A1B2 and A2B2	3.50	3.00	Significant

The Tukey test analysis conducted on A1B1 and A2B1 showed that F-count 7.41 > F-table 3.00 and this means there is a significant difference between the physical fitness outcomes of groups of students having high motor skills treated with command-based learning and those treated with task-based learning as indicated by the mean score of 240.19 and 251.31 respectively. This indicates that those provided with a task-based learning approach have better physical fitness outcomes than those with a command-based approach since 251.31 > 240.19. Moreover, A1B2 and A2B2 also have F-count 3.50 > F-table 3.00 and this shows there is a significant difference between the physical fitness outcome for groups of students having low motor and treated with command-based learning and those with task-based learning as indicated by the mean score of 230.31 and 226.58 respectively. This means those provided with command-based learning have better physical fitness outcomes than those with the task-based approach as indicated by the 230.31 > 226.58.

Discussion

The findings showed that the groups of students provided with task-based learning have better physical fitness outcomes compared to those with a command-based approach. It was also discovered that the interaction between learning approaches and motor skills influenced students physical fitness outcomes. This was indicated by the fact that the group of students having high motor skills and provided with task-based learning have better physical fitness outcomes compared to those with command-based approach. Meanwhile, the group of students having low motor skills and provided with a command-based learning has better physical fitness outcomes than those taught with task-based approach. Elementary school students are always happy to play, engage in activities, and make simple rules adapted to their circumstances and development. These results are consistent with a previous study that the use of more varied teaching styles in PE can increase student engagement and activeness, there by providing a better experience (Cuellar & Moreno, 2016). This means teachers need to get used to and master different teaching styles as well as think about the ways to combine and change these styles with creativity to create new teaching toward achieving the learning objectives. Moreover, it was reported that the effect of different teaching styles on teaching behavior can affect students motivational, cognitive, and affective climates (Morgan et al., 2005). Some of the teaching styles analyzed include the command, task assignment, reciprocal, and guided discovery, and the last two were observed to have less focuson behavior but are more suitable for cognitive and affective responses than the command and task assignment teaching style. The reciprocal, self-check, and command teaching styles were also discovered to have an influence on the extrinsic-intrinsic motivation, satisfaction, and motivational climate of the students. It was indicated that the self-check style triggers a significantly greater increase in intrinsic motivation, identified regulation, and enjoyment compared to the reciprocal and command teaching style (Pitsi et al., 2015). There by leading to a decrease in external motivation. These are in line with the observation from this study that students' character needs to be considered in order to achieve the learning objectives of PE. This means the application of learning approaches that are in accordance with the characteristics of students in PE in elementary schools can have a significant effect on students physical fitness. Furthermore, an interesting PE learning process can increase the activeness of

students in conducting physical activities and issuing new ideas, there by leading to enthusiasm about participating in the learning process.

The task-based learning used in this study is an approach in PE that requires delivering learning materials based on face-to-face tasks through the guidance of teachers. The tasks can be provided directly to individuals, with friends, and in groups according to the learning objectives in the form of games. This is due to the fact that elementary school students are usually happy and excited about PE materials designed in the form of games. These observations are consistent with a previous study that the game modification learning model is effective in improving students' physical fitness (Khairuddin, 2014). The task-based learning involves providing students with more responsibilities which include making some decisions regarding task execution (Mosston & Ashworth, 2008). Therefore, the approach is believed to be more student-centered and the tasks are usually previously understood by the students. However, teachers need to consider the time available for the learning process in giving these tasks to avoid interfering with the face-to-face meetings in other fields of study. These tasks are usually directed to a particular goal, either individually, with friends, or in groups. The application of this approach in the PE of elementary schools is focused on making students more active in conducting activities, performing more movements, and expressing their opinions during discussions. Students are allowed to perform different movements and simple rules to ensure optimal achievement of the learning objectives which include increasing physical fitness, developing thinking skills, and forming attitudes. Meanwhile, the command-based learning approach in PE is based on orders with all the decisions being made by teachers (Mosston & Ashworth, 2008). It involves demonstrations and practicing of certain movements accompanied by explanations. Teachers are allowed to decide the form, tempo, sequence, intensity, assessment, and placement of learning objectives while students respond to all the decisions and this means they both share the decisions (Mosston & Ashworth, 2008). The command-based learning approach ensures that teachers provide examples of each movement through demonstration to deliver the messages and treatment to students.

Increased physical fitness influences the development of students movements and ensures they direct their attention to a more specific skill which is the foundation to excel in a sport. Meanwhile, an improvement in motor skills can be affected by three fundamental movements which include locomotor, non-locomotor, and manipulative movements which serve as the basis to enhance children's skills in activities. These movements can be developed starting from low grade (fundamental) by providing a learning approach liked by students such as games. This is in line with the previous studies that games allow children to learn fundamental motor skills and increase their physical activities (Castelli, 2019; Gallahue et al., 2011; Valentini et al., 2016). It has also been previously reported that higher levels of physical activities and active play can improve fundamental motor skills for preschool and school-age children (Adamo et al., 2016; Johnstone et al., 2017; Lee et al., 2020). Moreover, the fundamental motor skills were found to be related and complementary to physical activities in childhood and adolescence (Jaakkola et al., 2015; Logan et al., 2015; Robinson et al., 2015). They also correlate weight status to health-related fitness such as body composition, muscle endurance, and muscle strength (D'Hondt et al., 2014). The factors observed to be triggering less attention in children are heredity and related to the environment as well as considered important to their development (Hinshaw & Ellison, 2016; Wirth et al., 2019).

Students with high motor skills are always more active in their activities and quick to perform the movement tasks provided by teachers. They are also always polite, honest, sporty, punctual, and liked by their peers inside and outside school. It is important to restate that the command-based learning approach requires commands, examples, and instructions provided by teachers and this reduces the enthusiasm of students to participate as usually observed in the binding cues activity. This reduces the development of their creativity and physical fitness. This means it is better to apply task-based learning to students having high motor skills in order to have better physical fitness. Meanwhile, students with low motor skills are those who do not like challenges, want to easily achieve something, are lazy to move, not enthusiastic, and often sick. These students need direction, guidance, assistance, and instruction from their teachers and friends in the PE learning process. This is necessary because they usually find it difficult to develop themselves both in PE and other fields of study. This means these students need to be taught using the command-based learning approach.

Different learning approaches are needed for personality development in children and students (Abbas et al., 2011). Teachers also need to be aware of motivation and understand the elements contributing to the mastery of these skills as well as the conditions positively related to students learning outcomes (Sinelnikov & Hastie, 2010). From a motive perspective, this study agrees with Byra et al, that the command-based learning approach is the most appropriate teaching style when teachers aim to provide a continuous pattern in the activity (Byra et al., 2013). The structure of the spectrum is assumed to reflect two basic human capacities and this leads to the categorization of the teaching styles into two groups which can be combined to develop innovative methodologies to ensure students are active and motivated (Mosston & Ashworth, 2002).

Some limitations were observed in this study and these are associated with the application of only two learning approaches in PE for elementary school students which include the command-based and task-based approaches. It is suggested that further studies involve other approaches to prove their effectiveness on students' physical fitness outcomes. The sample also consists of only male elementary school students without any attention to the female junior and senior high school students, therefore, it is recommended that the sample size be expanded.

Conclusions

The results showed that an effective learning approach which considers students motor skills level is important to improve physical fitness in PE. This is in accordance with the observation that the group of students having high motor skills and provided with task-based learning has better physical fitness outcomes than those treated with command-based approach as indicated by a mean of 251.31 > 240.19. Meanwhile, students having low motor skills and provided with command-based learning have better physical fitness outcomes than those with task-based approach as observed in the mean score of 230.31 > 226.58. These findings are expected to be useful for PE teachers to master effective learning approaches by considering students motor skills in order to enhance their physical fitness. However, there is a need for further studies in this area to confirm and expand the results by involving other learning approaches and indicating the roles of teachers in PE.

Conflict of Interest- The authors declare no potential conflicts of interest

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