

A new vision of learning frequency in physical education subjects contributes to improved self-concept, physical fitness, and academic achievement

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Abstract:

This study aimed to determine the impact of modified study time in Physical Education (PE) subjects on improving self-concept, physical fitness, and academic achievement. This research was a quasi-experiment with Non-Equivalent Control Group Design. The population of this study involved 54 elementary schools in Malang City, Indonesia. Using purposive sampling, it was found that 4 elementary schools with a total of 144 students (age, 11.5 ± 1.2 years) were involved in the research activities. The research instruments used were (1) the Indonesian Physical Fitness Test (TKJI) for elementary schools aged 10 to 12 years. (2) Questionnaire to measure self-concept description using the Self-Description Questionnaire (SDQ I) and (3) Knowledge test in the field of subject study to measure academic achievement. Multivariate Test Analysis of Variance (MANOVA) was used to analyze the data. The results showed that modifying study time three times a week, 2 times a week, once a week plus a daily physical activity for 30 minutes, and once a week affected increasing physical fitness, self-concept, and academic achievement. In conclusion, increasing the frequency and intensity of learning movement through physical education subjects could improve physical fitness, by being involved in learning movement in groups, students would get a positive self-concept so that they could achieve academic achievement.

Keywords: modifying study time, achievement, self-concept, physical fitness

Introduction

Physical Education (PE) in Indonesia has not been considered an important subject, resulting in less time allocation for PE learning than other subjects such as Sciences, Mathematics, and also Social Sciences. In Norway, grades in PE must reflect a fair and objective assessment procedure as they serve as a selection instrument in progress toward higher education and employment when, usually, they are summed up with grades from other subjects (Leirhaug, 2016). Physical fitness is a very important aspect for a person, especially for children (Listyarini et al., 2021). Physical fitness, as an inherent and attainable attribute, can be defined as an individual's capacity to perform physical activity or exercise (Adi et al., 2022). PE which is synonymous with movement activities plays an important role in achieving students' fit. Physical fitness is indicated by increased strength, muscle endurance, flexibility, and maximum consumption of oxygen (Anna et al., 2020; Saputra et al., 2022). However, in recent years there has been an issue of decreasing levels of physical activity which has a direct impact on physical fitness (Grossman et al., 2017; Marconnot et al., 2021; Seger et al., 2022). Students who are not fit cannot optimize their ability to achieve academic achievement (Simms et al., 2014; Wolfenden et al., 2020). Teachers are required to solve this problem, not only complete the PE curriculum material. Students who are not fit tend to be inactive, which has the potential to cause obesity (Jakicic et al., 2018; Robinson et al., 2021). PE plays an important role in developing a child. In the context of group learning in PE, children who feel accepted and included have more positive self-concepts and more positive views of others; they behave more positively and openly towards other children than children who feel isolated and rejected (Grimminger, 2014).

According to Grimminger (2014) in his research, children's involvement in learning motion has a positive correlation with sports competence. That is, children who are accepted by their peer group will tend to be able to master movement learning (sports), and vice versa, children who are not accepted will feel ostracized which impacts the child's passive participation in learning movement. A positive self-concept needs to be created in the middle of PE learning to develop personality and achievement. Academic achievement is the main goal for students. There are many ways that students do to excel. Studies report that academic achievement is positively correlated with exercise. This was proven by Chomitz et al. (2009) whose study involved 3.900 students who investigated their lifestyle and academic achievement. Furthermore (Fox et al., 2010) investigated the effect of physical activity and sports involvement on 4.746 students on academic achievement and reported that the more physical activity and regular sports, the better the academic achievement. Teachers and researchers have worked to improve the quality of learning to promote fit students and academic achievement. However, it is not enough to achieve it. Some research also reports that to improve physical fitness, self-concept, and academic achievement, researchers use PE strengthening methods in China (Zhang et al., 2019), aerobic dance (Daley &

Buchanan, 1999), the application of cooperative learning for 8 weeks (Rivera-Pérez et al., 2021), and promotion of functional self-concept in PE for 10 weeks and promotion of functional self-concept in PE for 10 weeks (Schmidt et al., 2013). However, these studies are limited to improving one aspect such as academic achievement only, or self-concept alone, without jointly investigating self-concept, physical fitness, and academic achievement. Referring to these problems, researchers seek to improve physical fitness, self-concept, and academic achievement by modifying study time. In Indonesia, each school education level, whether elementary school, junior high school, or senior high school, only provides meetings once a week for physical education subjects. The modifications made are increasing the frequency of meetings to three times a week. This study will involve 114 students (age, 11.5 ± 1.2). Of all these students will be grouped into 4 groups with details of the first group will have 3 meetings a week, the second group will have two meetings a week, the third group will have one meeting a week plus a daily physical activity for 30 minutes, and groups of four will get one meeting a week.

Material & methods

To solve the problem, researchers used a pseudo-experimental method. At the same time, this research design is Non-Equivalent Control Group Design. This design was often used in real-world situations where groups could not be formed randomly. This can be recognized as a pretest-posttest design without randomization (Thomas, et.al., 2011). The experimental group and the control group were not selected randomly but were selected based on the characteristics of each group as closely as possible. This study consisted of three experimental groups (1, 2, 3) and one control (4). Before giving treatment, the four groups were measured (pretest) in the first week. Treatment was given to all experimental groups for 6 weeks, and then measurement (posttest) was carried out at 8 weeks.

The location where this research was carried out was in selected elementary schools in Kedungkandang District, Malang City. Meanwhile, the treatment time was two months (week 1 pretest, 2 to 7 treatments, week 8 posttest). The treatment given to the four treatment groups was the same, meaning that the physical education subject given was the same based on research guidelines. The amount of time given was also the same, that was 140 minutes except for experimental group 3 which was added to daily activities 5 times per week with a duration of 30 minutes for each meeting. The difference lied in the modification of study time, in the sense of a different frequency, namely in the experimental group. There was an experimental group that had three study times and there were two times per week and once per week plus daily activities, while the control group remained once per week.

Table 1. Research Design

Pretest	Treatment	Posttest
O1 Self-concept, physical fitness, and academic achievement	T1 Modification of physical education study time with three meetings per week	O2 Self-concept, physical fitness, and academic achievement
O3 Self-concept, physical fitness, and academic achievement	T2 Modification of physical education study time with two meetings per week	O4 Self-concept, physical fitness, and academic achievement
O5 Self-concept, physical fitness, and academic achievement	T3 Modify the physical education study time with one meeting per week plus a daily physical activity for 30 minutes	O6 Self-concept, physical fitness, and academic achievement
O7 Self-concept, physical fitness, and academic achievement	- Physical education study time with one meeting per week	O8 Self-concept, physical fitness, and academic achievement

Notes:

- O1, O3, O5, O7 = pretest experimental groups 1, 2, and 3, and the control group
 T1, T2, T3, = treatment of experimental groups 1, 2, and 3
 - = group without treatment
 O2, O4, O6, O8 = posttest experimental group 1,2,3 and control group

Participants

All elementary school students in Kedungkandang District, Malang City, which consists of 12 sub-districts, are the population in this study. The number of elementary schools is 54 schools. The basis for taking the sample is purposive sampling. The criteria for the samples involved were those with the same characteristics, including age, gender, and class level (only grade 5 was involved).

This research was conducted in elementary schools with a total sample of 4 elementary schools. Meanwhile, the sample was grade 5 students, with each school taking one class for the treatment group. Overall, the number of treatment groups was 3 classes with 36 students each. Meanwhile, as a control group, one elementary school and 1 class were taken with a total of 36 students. Thus, a total of 144 students were involved (age, 11.5 ± 1.2 years).

Ethics

The Ethics Commission of the State University of Malang approved this research (No: 085/KEPK/EC/2022). All subjects are willing to be involved in this study. The research procedure refers to the Declaration of Helsinki.

Research Instruments

The research instruments used were (1) the Indonesian Physical Fitness Test (TKJI) for elementary schools aged 10 to 12 years. (2) Questionnaire to measure self-concept description using the Self-Description Questionnaire (SDQ I) and (3) Knowledge test in the field of study to measure academic achievement. Subjects that were used as research objects are mathematics, Indonesian, sciences, and social sciences.

Data Analysis Technique

The test used was the Multivariate Analysis of Variance Test (MANOVA). MANOVA was a statistical technique that can be used simultaneously to explore the relationship between several categories of independent variables (usually in the form of treatments) and two or more dependent variables (Hanief & Himawanto, 2017). The author used SPSS 23 software.

Results

Data on Self-Concept, Physical fitness, and Academic Achievement in the experimental and control groups

Table 2 explains the results of the best average difference in physical fitness were obtained in experiment 3 of 3.00, the results of the best average difference in self-concept were obtained in experiment 1 of 13.278, and the results of the best average difference in academic achievement were obtained in experiment 1 of 34.157.

Table 2. The analysis average difference in the pretest-posttest of all variables

Variable	Experimental group 1	Experimental group 2	Experimental group 3	Control group
1. Self-Concept	13.278	2.833	4.861	1.500
2. Physical fitness	2.167	1.528	3.00	0.583
3. Academic Achievement	34.157	11.381	22.782	2.130

Results of the Data Normality Test and Homogeneity Test

Normality test results (Table 3) using the One-Sample Kolmogorov-Smirnov Test, obtained the results of significance pretest fitness 0.02, posttest fitness 0.03, pretest self-concept 0.97, posttest self-concept 0.99, pretest academic achievement 0.88, and posttest academic achievement 0.13. When compared, the overall results were greater (>) than the significance of 0.01, so it could be concluded that the data were in the normal category.

Table 3. Results of the Data Normality Test

	Pretest of Physical Fitness	Posttest of Physical Fitness	Pretest of Self-Concept	Posttest of Self-Concept	Pretest of Academic Achievement	Posttest of Academic Achievement	
N	144	144	144	144	144	144	
Normal Parameters ^a	Mean	11.785	13.521	168.777	174.396	284.925	302.013
	Std. Dev.	1.867	2.119	19.178	21.363	46.136	45.914
Most Extreme Differences	Absolute	.128	.119	.040	.035	.049	.098
	Positive	.128	.119	.038	.027	.036	.046
	Negative	-.090	-.090	-.040	-.035	-.049	-.098
Kolmogorov-Smirnov Z		1.538	1.426	.483	.415	.584	1.175
Asymp. Sig. (2-tailed)		.018	.034	.974	.995	.885	.127

The results of the Homogeneity Test (Table 4) from the Box's test, obtained an F value of 1.283 and a significance of 0.187. The significance value was in the category greater (>) than 0.05 so it could be concluded that all data was in the homogeneous category.

Table 4. Result of Homogeneity Test

<i>Box's Test of Equality of Covariance Matrices^a</i>	
<i>Box's M</i>	24.030
<i>F</i>	1.283
<i>df1</i>	18
<i>df2</i>	69261.350
<i>Sig.</i>	.187

To find out whether there was an effect of learning modification on self-concept, physical fitness, and academic achievement, an analysis of Tests of Between-Subjects Effects (Table 5) was performed. Table 5 describes the F scores for physical fitness, self-concept, and academic achievement.

Table 5. Tests of Between-Subjects Effects on Physical Fitness, Self-Concept, and Academic Achievement

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power
Corrected Model	Physical Fitness	112.583 ^a	3	37.528	7.563	.000	22.69	.985
	Self-Concept	3022.465 ^c	3	1007.48	5.313	.002	15.94	.926
	Academic Achievement	20842.861 ^d	3	6947.62	7.158	.000	21.47	.980
Intercept	Physical Fitness	476.694	1	476.69	96.06	.000	96.06	1.00
	Self-Concept	4545.007	1	4545.00	23.96	.000	23.97	.998
	Academic Achievement	44668.82	1	44668.8	46.02	.000	46.02	1.00
Kelompok	Physical Fitness	112.583	3	37.528	7.563	.000	22.69	.985
	Self-Concept	3022.465	3	1007.48	5.313	.002	15.94	.926
	Academic Achievement	20842.86	3	6947.62	7.158	.000	21.47	.980
Error	Physical Fitness	694.722	140	4.962				
	Self-Concept	26547.52	140	189.62				
	Academic Achievement	135890.85	140	970.64				
Total	Physical Fitness	1284.000	144					
	Self-Concept	34115.000	144					
	Academic Achievement	201402.54	144					
Corrected Total	Physical Fitness	807.306	143					
	Self-Concept	29569.99	143					
	Academic Achievement	156733.71	143					

Based on Table 5, the F value for the physical fitness variable was 7.56, the F value for self-concept was 5.31, and the F value for academic achievement was 7.16 with a significance value of 0.00. It means that each variable had a significantly smaller (<) than 0.05. In conclusion, the modification of study time affected increasing each variable of fitness, self-concept, and academic achievement.

To find out whether each experimental group experienced an increase or not, the results of the Estimated Confidence Interval are needed (Table 6).

Table 6. Estimated Confidence Interval Self-Concept, Physical Fitness, and Academic Achievement

Dependent Variable	Kelompok	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Self-Concept	Experiment 1 (O1)	13.278	2.295	8.740	17.815
	Experiment 2 (O3)	2.833	2.295	-1.704	7.371
	Experiment 3 (O5)	4.861	2.295	.324	9.399
	Control (O7)	1.500	2.295	-3.037	6.037
Physical Fitness	Experiment 1 (O1)	2.167	.371	1.433	2.901
	Experiment 2 (O3)	1.528	.371	.794	2.262
	Experiment 3 (O5)	3.000	.371	2.266	3.734
	Kontrol (O7)	.583	.371	-.151	1.317
Academic Achievement	Experiment 1 (O1)	34.157	5.193	23.891	44.423
	Experiment 2 (O3)	11.381	5.193	1.115	21.647
	Experiment 3 (O5)	22.782	5.193	12.516	33.048
	Control (O7)	2.130	5.193	-8.136	12.396

Table 6 on the self-concept variable resulting from the 95% Confidence Interval estimation at the lower limit (lower bound) of experiment 1 (O1), there was a minimum increase of 8.740, and in experiment 3 (O5) there was a minimum increase of 2.266 meaning that modification of study time had a positive effect on increasing self-concept in both experimental groups. While experiment 2 (O3) obtained -1.704 results and the control group (O7) was -3.037, meaning that there was no effect.

In the physical fitness variable shows the results of the estimation of the 95% Confidence Interval at the lower limit (lower bound) of experiment 1 (O1) there was a minimum increase of 1.433, experiment 2 has a minimum increase of 0.794, and experiment 3 there was a minimum increase of 2.266 meaning time modification positive learning affected increasing physical fitness in the three experimental groups. Whereas in the control group (O7) the result was -0.151, meaning there was no effect.

In the academic achievement variable, the estimation results of the 95% Confidence Interval at the lower limit (lower bound) of experiment 1 (O1) had a minimum increase of 23.891, experiment 2 (O3) had a minimum increase of 1.115, and experiment 3 (O5) had a minimum increase of 12.516 meaning that the modification of study time had a positive effect on increasing academic achievement in the three experimental groups. Whereas in the control group (O7) the result was -8.136, meaning there was no effect. The improvement of physical fitness, self-concept, and academic achievement after post-treatment modification of physical education learning time can be seen in Figure 1.

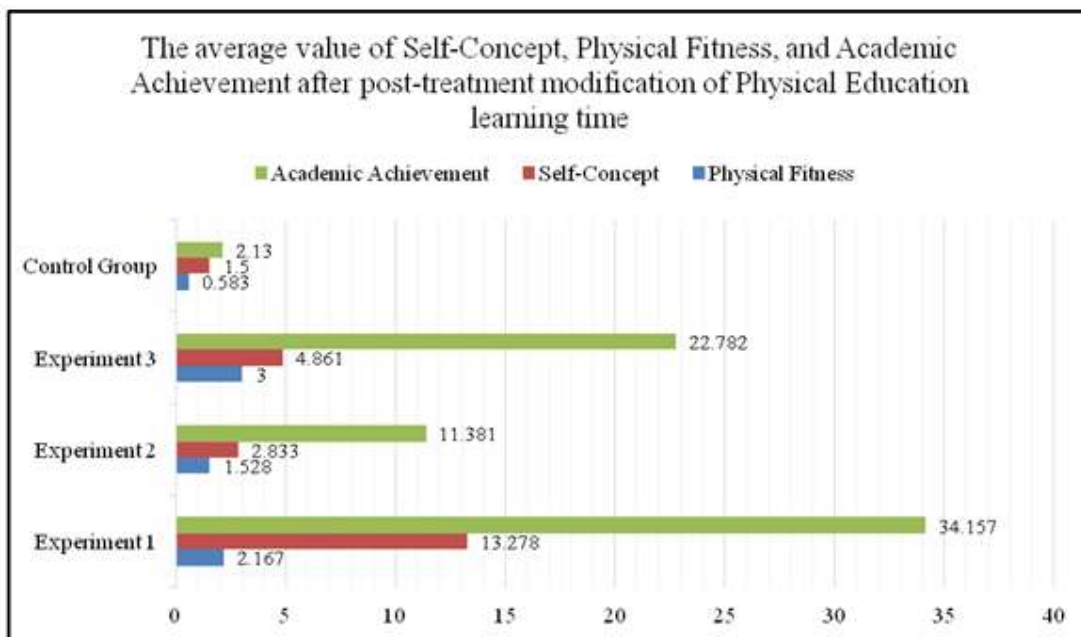


Figure 1. The average value of post-treatment modification of Physical Education learning time on improving Self-Concept, Physical Fitness, and Academic Achievement

Experimental groups 1 and 3 have high average scores on aspects of academic achievement and self-concept. While for the aspect of the average value on the physical fitness component, it was obtained maximally by experimental group 3, which modified the learning time of physical education subjects, namely once a week and additional physical activity outside of class hours for 30 minutes.

Dicussion

This study aimed to determine the impact of modified study time in Physical Education (PE) subjects on improving self-concept, physical fitness, and academic achievement. The findings showed that modification of study time in physical education affected increasing physical fitness, self-concept, and academic achievement. Modifying physical education study time with three meetings per week and one meeting per week plus a daily physical activity for 30 minutes could improve students' self-concept. This finding at the same time confirmed the results of previous studies which reported that PE supported achievement and self-concept (Simms et al., 2014). In addition, the 10-week intervention in physical education also increased not only the resilience and strength of self-concept but also the truthfulness of those who previously underestimated or exaggerated (Schmidt et al., 2013).

Modification of study time once, twice, and three times a week emphasized students to be physically active and actualize their expressions through movement. The frequency of study time in PE promoted physical activity as a means to improve self-concept (Schneider et al., 2018). Positive self-concept among young women was associated with participation both during and outside PE learning (Beasley & Garn, 2013). Students in PE had many opportunities to try new skills, display their physical abilities in front of others, received feedback on their performance, and experienced success and failure (Beasley & Garn, 2013). Therefore, PE is an educational environment that has an impact on the development of physical self-concept (Gehris et al., 2010; Goodwin, 1999).

Research results report that physical activity through PE learning increases a person's physical fitness level which will also affect the quality of life (Baldonado et al., 2022; Vaquero-Solis et al., 2021). In this sense, we suggest paying attention to the intensity of physical activity among students for a better quality of life (Baldonado et al., 2022; Vaquero-Solis et al., 2021).

On the other hand, studies also report that the intensity of PE learning is closely related to academic achievement and healthy food choices (Simms et al., 2014). Participating in PE reinforcement for two semesters also had a significant positive effect on high school students' overall academic performance, especially in Chinese and English scores (Zhang et al., 2019). The level of participation in PE classes not only affects academic achievement (Aquino & Reyes, 2022) but also better school and psychosocial (psychological global well-being) satisfaction among vocational students (Almeida & Fernandes, 2019).

The findings in this study might be expected to be one of the considerations for modifying the number of PE subject meetings in a week for stakeholders, to improve student quality (academic achievement, physical fitness, and self-concept).

Conclusions

The findings showed that modifying study time once, twice, or three times a week can improve the components of self-concept, physical fitness, and academic achievement. Schools needed to support teachers to encourage students to continue increasing their physical activity through PE learning. However, this study also had limitations, one of which was that researchers did not strictly control other variables that could affect self-concept, physical fitness, and academic achievement. Students might be involved in extracurricular activities and took additional study hours outside of PE learning.

Conflicts of interest

There is not conflict of interest.

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