

# Improvement of Physical Fitness Through Management of Daily Physical Activity of Elementary School Students

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**Abstract**—Previous researches have discussed how learning Physical Education (PE) alone is not enough to improve students' physical fitness. For this reason, PE class serves as a tool for forming healthy lifestyles through active participation in physical activity (PA) and sports. This article aims to explain the improvement in student's physical fitness through the regulation of students' daily physical activities (DPA) in PE class and outside PE class. The research employed a randomized pretest-posttest design. The research subjects were selected using random cluster sampling from a population of 21 elementary schools. The student's DPA was monitored using a DPA card, while their physical fitness was measured using MFT. The data analysis employed descriptive statistics, t-tests, and ANCOVA. The results showed that group differences and increasing PA simultaneously affect physical fitness. While group differences do not affect physical fitness, PA significantly manages to be the moderator of increasing physical fitness.

**Keywords**—*physical fitness; monitoring; daily physical activity; PE.*

## I. INTRODUCTION

Health problems lead to the low quality of active human lifestyle, more specifically, the low participation rate in physical activity. WHO stated that Physical Inactivity is the fourth leading risk factor for global mortality (6% of deaths globally), behind high blood pressure (13%), tobacco use (9%) and high blood glucose (6%). Overweight and obesity are responsible for 5% of global mortality [1]. If there are no problems in the diet, one of the early signs of the low active participation in physical activity is obesity. Passive lifestyles such as watching television, playing video games, and playing computer are the main contributing factors to low active participation in physical activity [2]. It causes the body shape to be not ideal (obese), which in turn can result in low endurance when carrying out activities or getting tired too quickly [3].

In addition to obesity, low physical activity directly affects physical fitness. Physical activity and physical fitness are interrelated: physical fitness can only be achieved by doing regular and sufficient physical activity. One must at least carry

out physical activities by fulfilling the principles of physical exercise FITT (frequency, intensity, time, and type) with planned and sufficient arrangements [4]. The simple definition of physical fitness is a measure of "how well one performs physical activity." It can also be further explained as the body movements produced through muscle action that increases energy usage [5]. One's endurance in doing long physical activities and without experiencing fatigue can be taken as a sign of functional physical fitness. Every physical activity is carried out by utilizing muscle activity, which results in increased energy usage.

The benefits of physical fitness for humans have been widely examined, and many of the results of such a study clearly state that physical fitness is an essential factor in achieving a healthy lifetime [6]. There are positive associations of muscular strength, speed agility, and cardiorespiratory fitness with executive function in children with overweight and obesity. In addition to its impact on health, physical fitness has been shown to make a significant contribution to the level of academic achievement (math, English, and social studies) of school-age children; high academic achievement is associated with high physical fitness level [7]. Regarding the source of physical fitness—physical activity, research shows that physical activity is beneficial in several ways: those who have a high level of physical activity is still resistant to asthma even though they live in poor environmental conditions [8], have proper stress management thereby reducing depression levels [9], and is also one of the healthiest and safest ways to maintain a fit psyche [10].

Based on the importance of physical fitness, it is only right that physical fitness becomes one of the main objectives of the PE class in schools and is included in the official school curriculum. By including efforts to fulfill the physical activity adequacy rate of students in the school curriculum, it can help to improve physical fitness [11, 12]. Nevertheless, merely improving student's physical fitness through activities in PE class alone is not enough. Regular and directed additional physical activities outside PE class must be secured [13, 14]. Based on those researches, the core of the implementation of

PE learning in schools should be focused on achieving a sufficient number of the student's daily movement. Thus, enabling students to achieve a high level of physical fitness.

There is a need for a measure as a benchmark in determining the sufficiency of physical activity. The World Health Organization (WHO) has made a recommendation to maintain the physical activity for children aged 5-17 years to be at 60 minutes of MVPA, adults aged over 18 years to be a minimum of 150 minutes MPA or 75 minutes MVPA or other proportionally regulated combination [1]. A school program in Ontario also offers recommendations for schools to carry out PE learning as a support to get students to be active for 60 minutes [15]. The research also discussed DPA recommendations: 30 minutes at least four times a week or between 45-300 minutes a week [16]. Many of these recommendations can be the benchmarks for daily physical activity for adults or as a learning goal for students.

Regulations on how the objective of PE class is implemented in school curricula is quite clear. However, the impact of PE class seems questionable. In Indonesia, the impact of PE on students' physical fitness is still low; only 15% of the total population [17]. Also, the physical fitness of students in Indonesia is still at a poor level. In 2005-2006, no more than 11% of students in Indonesia were in good and excellent physical fitness levels [4]. However, in 2010 the situation got worse, as many as 94% of Indonesian students were in a medium, poor and very poor condition, only 6% of them were in the good and excellent category [18]. Unfortunately, in the following years, there has been no new research on physical fitness nationally, which is a big problem for PE in Indonesia.

Therefore, there is a critical need for action to reform the quality of PE learning to be able to have more impact on the core learning objectives of PE in the school curriculum. This article aims to describe the effect of managing the daily physical activity of the students as an effort to increase it by the use of DPA-Card (daily physical activity card) on physical fitness integrated into learning PE in schools. The management of physical activity using the DPA-Card is an attempt to monitor student's DPA using the self-report method. The goal of this research is for the teacher to find out the adequacy rate of DPA for the students who follow the recommendations. The recommended DPA used is 60 minutes per day. So that if the student's DPA level is found to be less than the recommendation or decreases, the teacher will immediately assign physical activity tasks outside of PE class to increase the number of student participation in physical activity.

#### *A. Physical Fitness*

Physical fitness is defined as the body's ability to carry out physical activities without experiencing significant exhaustion and still having energy reserves to do other activities. This is inseparable from the body's metabolism associated with the use of energy sources and oxygen. Physical fitness is defined as the body's ability to carry out strenuous activities without experiencing significant fatigue for a long time [4, 19].

Physical fitness is also expressed as the body's ability to absorb oxygen to the full and utilize it in aerobic metabolism [19]. Maximum oxygen absorption is called the maximum oxygen volume or VO<sub>2</sub>Max [4, 19].

Physical fitness can be obtained through physical exercise systematically and progressively. To maintain and improve physical fitness it is necessary to follow the principles of participation during exercise and physical activity, the principles are overload, frequency, intensity, time, specialization, and progression [20]. In addition, physical fitness can be improved through physical exercise done with sufficient frequency, intensity, and time [19, 21]. To improve physical fitness exercise must be carried out systematically, with the right repetition, with proportional, progressive time, and the burden is getting more and more. Based on the explanation above, there is no other way to improve physical fitness than physical activity [4].

For this reason, it can be concluded that physical fitness in terms of the body's ability to consume oxygen to the maximum can be expressed using VO<sub>2</sub>Max. The simplest way to find out VO<sub>2</sub>Max is to use the Multistage Fitness Test. MFT has proven to be valid and reliable in predicting fitness from the cardiorespiratory side [22].

#### *B. Daily Physical Activity*

Physical activity should be a student habit that is expected to be able to become an active living culture. Physical activity can be known by the teacher using the daily physical activity (DPA) card. It is believed that physical activity is positively related to physical fitness, the higher the physical activity of a person, the higher the person's physical fitness will be. For that reason, based on the problems that have been stated above, that students' physical fitness in Indonesia is low, it can be said that their physical activity is also low. This is the responsibility of schools through PJOK students should be able to meet the demands of minimal physical activity to maintain and improve physical fitness.

According to WHO, children aged 5-17 years at least actively move with moderate intensity upwards for 60 minutes with a frequency of at least 3 times a week [1]. This is recommended because it was also found that inactive living habits were included in the list of the ten biggest killers in the world besides cancer, and heart disease. In addition to WHO, the following are cited various recommendations for physical activity complete with duration, frequency, and intensity, as well as the benefits of one's participation in carrying out physical activities on a regular basis (see table 1 [16]).

**TABLE I. DIFFERENT RECOMMENDATIONS FOR DOING PHYSICAL ACTIVITY**

Organisation/ agency	Year of the recommendation	Minimum length of recommended physical activity	Minimum recommended intensity	Expected beneficial results
Center for Disease Control and Prevention and American College of Sport Medicine	1995	30 min most days of the week	Moderate	General health improvement
Surgeon General's Report on Physical Activity and Health	1996	30 min most days of the week	Moderate	General health improvement
American Collage of Sports Medicine	2001	150 min/week 200/300 min/week	Moderate Moderate	General health improvement Long-term maintenance of weight loss
Institute of Medicine	2002	60 min/day	Moderate	Avoid putting on weight and add other benefits for health independently of weight
International Association for the Study of Obesity	2003	45-60 min/day 60-90 min/day	Moderate Moderate	Prevent transition to overweight or obesity, avoid weight regain.

For this reason, physical activity is very important. PJOK as a vehicle for children to move in school should be maximized to get positive benefits from physical activity. The level of community participation in sports activities is the main key to getting a complete health degree. Individuals who have an active habit of engaging in physical activity can improve health and prevent the onset of diseases including heart disease, type 2 diabetes, and osteoporosis, forms of cancer, obesity, and injury. Many benefits can be achieved by getting used to being involved in physical activity.

Based on the explanation above, physical activity is the key to achieving healthy living through an active lifestyle. The results showed that physical activity can reduce the risk of all causes of death, including reducing the risk of being overweight, reducing symptoms of depression, and improving the quality of life associated with being overweight for a longer period [6, 9]. These results explain that the physical activity carried out regularly and sufficiently can reduce the impact of a person's poor health condition. In order to become a lifestyle, physical activity needs to be familiarized from an early age. The results showed that activity habits at an early age can be predictors of exercise habits and physical activity in adults [23]. For this reason, the promotion of physical activity to school-age children is important so that they have active habits so that they can carry it for life.

## II. METHOD

### A. Subject

The subjects of this study were grade 5 elementary school students in two different schools in one teacher community in Karang Pilang subdistrict, Surabaya city, East Java province, Indonesia. The control group consisted of 29 students (17 male and 12 female). While the experimental group consisted of 31

students (17 male and 12 female). Two different PE teachers taught the two PE classes.

### B. Procedure

1. Pretest. The pretest was done by measuring students' physical fitness. The components used in determining physical fitness are aerobic fitness, muscular strength, muscular endurance, flexibility, and body composition

[7]. It is worth noting that physical fitness referred to in this article is cardiorespiratory fitness [24].

2. Class treatment. The program was given in the form of DPA-Card to measure student's participation in daily physical activity [25]. The student records in the DPA-Card were put into a scoring sheet, which was then analyzed to obtain information about the adequacy of the student's DPA. Data entry on DPA-Card student records was done every day. Furthermore, the analysis of the scoring sheet was evaluated by the teacher and reported to students once a week during PE class. The results of the evaluation by the teacher would then be used to provide students' self-management exercises in order to increase DPA on an ongoing basis. For students who have a low or decreasing DPA, they are called to get a further explanation about their DPA rate. Then, they would get additional assignments in the form of physical activity. PE class was as conducted as required by the curriculum, but traditional game material was taught during the six weeks of research.
3. Class control. Each student was given a self-report form to report their daily physical activity. PE learning was carried out using the traditional game.
4. Posttest. It was carried out in the same manner as the pretest.

### C. Instrument

1. Physical fitness. Measurements of physical fitness were performed on cardiorespiratory fitness using the multistage fitness test (MFT), which is reliable to measure children's cardiorespiratory fitness [22].
2. Daily Physical Activity (DPA). DPA-Card developed by Suciati was employed to monitor and assign physical activities to students [25]. The implementation of this program was integrated into the implementation of PE class.

### D. Analysis

1. DPA. Analyzed using scoring sheets in the Microsoft Excel program. The statistics used were mean, highest value, and lowest.
2. Physical fitness. It was analyzed using descriptive statistics.

3. Differences and relationships between variables were analyzed using t-tests and ANCOVA.

**III. RESULTS AND DISCUSSION**

This section will explore three issues: the condition of students' daily physical activity, improvement of physical fitness, and the relationship of differences in treatment, DPA, and increase in physical fitness.

*A. Conditions of student's daily physical activity*

Daily physical activities reported by students are all types of activities, including moving around, which is the minimum requirement, up to the type of activity that is MVPA. The student reported the amount of activity and duration. The amount of activity consisted of all forms of physical activity that are carried out repeatedly in a day. A student may move a lot even though they only did one type of movement when it was done in many sessions. Thus, the amount of activity could also be defined as a repetition of movement in one day. Meanwhile, duration was the length of time in which students carry out their activities. The results of the analysis of student reports regarding daily physical activity are in table 2.

TABLE II. DAILY PHYSICAL ACTIVITY REPORT

Group	Statistic	Daily Physical Activity	
		Amount of Activity	Duration (minutes)
Treatment	Mean±SD	21.8±9.6	90.2±52.0
Control	Mean±SD	19.9±7.1	87.9±58.1

Students who got treatment on average carry out physical activity in a day as many as  $21.8 \pm 9.6$  movements for  $90.2 \pm 52.0$  minutes. Meanwhile, students in the control group did physical activity as much as  $19.9 \pm 7.1$  movements for  $87.9 \pm 58.1$  minutes a day. Referring to the recommendations by WHO and some of the results of research, the students fell into these conditions [1], [15], [16]: the two groups in this study had sufficient physical activity in the duration criteria for carrying out physical activity. However, based on the average amount and duration of physical activity, the treatment group had a higher magnitude compared to the control group.

*B. Increased Physical Fitness*

Physical fitness was measured using MFT physical fitness test to determine cardiorespiratory fitness at the pretest and posttest in the form of VO2Max. Data analysis using t-test was carried out to determine the significance of students' physical fitness improvement before and after the treatment. The results of the analysis can be seen in table 3.

TABLE III. IMPROVEMENT OF PHYSICAL FITNESS

Group	Test	Mean	t-test results		
			t	p	Conclusion
Treatment	Pre	23.2	3.22	0.003	pre<post
	Post	24.6			
Control	Pre	23.1	1.03	0.311	pre=post
	Post	23.5			

Changes in VO2Max values occurred from pretest to posttest. The VO2Max value of students in the treatment class at pretest was 23.2 to 24.6 at the posttest. The increase was declared significant ( $p < 0.05$ ). Changes in VO2Max scores also occurred in the VO2Max scores of students in the control class at pretest at 23.1 to 23.5 at the posttest. However, the increase was declared not significant ( $p > 0.05$ ). Providing treatments in the form of physical activity fulfillment guaranteed that students will carry out physical activities independently without teacher supervision. This program is similar to SPARK, which had proven that fulfilling daily physical activity could improve physical fitness [13]. Providing this program can trigger teachers to continue using PE class to move more. Not only that, but the SPARK program was also proven to increase the activeness of students in participating in the class [14]. Other programs that can increase students' physical activity in PE class are SHARP (Stretching while moving; High repetition of motor skills; Accessibility through differentiation; Reducing sitting and standing, and Promoting in-class physical activity) [26]. In essence, if the teacher has a willingness to improve the physical quality of students outside of PE class, it can also have an impact by making PE class activities to become increasingly active. Unfortunately, this research still did not provide comprehensive data related to the quality of PE learning based on students' physical activity in learning.

*C. The Relationship Between Differences in Treatments, DPA, and Gain of Physical Fitness*

The following are the results of the ANCOVA analysis to find out the relationship of differences in treatments, DPA, and gain of physical fitness.

Based on Ancova result, the corrected model shows that there is a simultaneous effect of the difference in treatment and duration of DPA on the gain of physical fitness,  $F(1, 58) = 4.41, p = 0.020$ .

TABLE IV. DAILY PHYSICAL ACTIVITY REPORT

Source	F	Sig.	ηp2
Corrected Model	4,41	0,02	0,74
Group differences	3,73	0,06	0,48
Duration of DPA	5,44	0,02	0,63

*Dependent Variable: Gain of Physical Fitness*

Furthermore, group deferences indicated that group differences did not affect changes in physical fitness ( $p > 0.05$ ). The duration of the DPA variable showed a different result;

there was a significant relationship between the gain of physical fitness and the duration of DPA ( $p < 0.05$ ). The explanation above showed that group differences did not affect changes in physical fitness. Physical activity variables had a significant influence on changes in physical fitness. So, it can be concluded that changes in physical fitness will be achieved by increasing daily physical activity.

#### IV. CONCLUSION

Various studies have shown that physical fitness contributes to many aspects of life, from health to academic performance. It is a real challenge for PE practitioners always to try to deliver quality PE classes to improve physical fitness through increased physical activity. Physical activity in PE class alone clearly will not improve physical fitness. However, the addition of physical activity outside the learning hours is essential, especially for those who have much free time.

#### ACKNOWLEDGMENT

The writer would like to thank the Dean of the Faculty of Sport Science of Universitas Negeri Surabaya who has supported this research.

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