Disaster Preparedness in Physical Aspect of students in Bantul and Balikpapan Indonesia

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Abstract. This study aims at identifying difference in physical fitness level between students in disaster-safe school in Bantul and in Balikpapan, Indonesia. This study is a quantitative descriptive study that adopted a comparative method. Data were collected through tests and measurement. Population of the study was all upper-grade students (105 students) of State Madrassa *Ibtidaiyah* (MI *Negeri*) 2 Bantul and all upper-grade students (102 students) of State Primary School (SD *Negeri*) 003 Balikpapan. Samples were selected using a purposive sampling technique with as many as 65 students of MI *Negeri* 2 Bantul and 87 students of SD *Negeri* 003 Balikpapan involved. Instrument of the study was the Indonesian Physical Fitness Test (TKJI) for children aged 10-12 years. Data were analyzed using a 2-sample t-test preceded by normality and homoscedasticity tests. Results indicate significant difference in physical fitness level between upper-grade students at MI *Negeri* 2 Bantul disaster-safe school and those at SD *Negeri* 003 Balikpapan. The t-test generated a t-value of 7.664 and t-distribution of 1.655 (df 150;5%) with significance level (*p*) of 0.000. With t-value being greater than t-distribution (7.664 > 1.655) and p-value being less than 0.05 (0.000 < 0.05), it is clear that physical fitness level of students in both schools differs significantly. It can also be concluded that physical fitness of students in Bantul (a mean of 12.40) is higher than that of students in Balikpapan (a mean of 9.93). Hence, it can be said that students in Bantul are more physically prepared for disaster than students in Balikpapan.

1. Introduction

Geographically speaking, Indonesia is situated in the Pacific Ring of Fire and is highly prone to disaster such as earthquake, volcanic eruption, tsunami and landslide. In addition, as a tropical country that is made up of forested areas and lives along with encroachment culture, the country is constantly faced with forest fires. Indonesia's geographical background and natural potential are among serious threats to Indonesians. One of the ways to cope with this threat is to make use of education to help people prepare for natural disasters, which can be done through, for example, Physical Education (PE). This subject provides students with opportunities to learn to move and to learn through movement as well as to create strong and healthy (both physically and mentally) characters. PE integrates motor skill, physical ability, knowledge and logic and teaches appreciation of attitudinal values and habituation of healthy lifestyle to stimulate balance growth and development. PE aims to help students improve their physical fitness and health. According to Suharjana, physical fitness indicates one's ability to perform daily activities without experiencing too much exhaustion and with some spare of energy to do other minor

tasks [1]. Physical fitness is crucial for human and therefore needs to be built since early age, through activities in both formal and informal settings. With physical fitness, it is expected that students can study well and live more healthily, which can eventually improve the quality of human resource.

Good physical fitness will affect students' learning activities as they become more excited in participating in learning process and more ready for receiving any given materials. Physical fitness or excellent physical conditions improve students' ability and willingness to learn. In other words, physical fitness will influence one's physical and mental readiness and ability to handle certain workload (learning activity) that is part of students' responsibility. Besides, this study specifically aims to build physical preparedness for emergencies, or in this case, disaster. It is incredibly important to be physically prepared for disaster. Being mentally ready is not enough; one should also maintain physical preparedness for disaster. It is expected that a person with excellent physical fitness and physical ability can survive longer than other people with poor physical fitness. Physical fitness can be improved through PE subject at school or other types of training.

Primary school is embodiment of government's effort to improve physical fitness since early age through formal education. According to data presented on InaRisk website compiled by the National Agency for Disaster Management (BNPB), Bantul is a regency with high potential for earthquake (94%) and has been nationally identified as red zone [2] while Balikpapan is constantly exposed with forest fires every year [3] Balikpapan is a city with fairly unique characteristics. Topographically, Balikpapan is a city whose altitude ranges from 0 to 80 meters above sea level, situated mostly along the coast and made up of hills (85%). Such conditions cause erratic rainfall and temperature in the city, making it prone to forest fires. With such circumstances, disaster-safe schools in Bantul and Balikpapan should ensure that students are physically prepared and fit for responding to emergencies [4].

Physical preparedness can be built through PE subject taught at school. Data from a research on physical fitness level among students in volcanic-disaster-prone zone indicated the lack of preparedness [5]. There is a test namely Tes Kesegaran Jasmani Indonesia (TKJI) as an Indonesian Physical Fitness Test to measure students' physical fitness. In a physical fitness workshop conducted in 1984, TKJI was appointed an instrument that is valid for nationwide use as it was arranged and tailored to suit the conditions of Indonesian minors. TKJI is divided into four age groups including 6-9 years, 10-12 years, 13-15 years, and 16-19 years. This test is to measure and determine physical fitness level among Indonesian minors (based on their own age groups). This study involved students aged 10-12 years old and collected data from upper-grade primary school students. Involvement of primary school aged respondents was due to factors such as low activity level of children in Bantul[6] and an indication of poor physical fitness in Martapura and Banjar Baru, areas with similar geographic characteristics to Balikpapan [7], [8]. Prior to this study, MI Negeri 2 Bantul and SD Negeri 003 Balikpapan had never used TKJI to measure physical fitness of their students. Therefore, results of this study can be source of data/information for PE teachers. In addition, from the results, physical fitness of students in disaster-prone zone can be identified to prepare for emergencies that might occur. Referring to the problem stated, the objective of this study is to identify difference in physical fitness levels between students in disaster-safe school in Bantul and students in disaster-safe school in Balikpapan.

2. Method

2.1. Participants

This quantitative study adopted a comparative descriptive method and compared physical fitness level among upper-grade students in disaster-safe schools. This study took place in two different disaster-safe schools namely MI *Negeri* 2 Bantul and SD *Negeri* 003 Balikpapan in November 2019. Population of this study was all upper-grade students (grade IV, V and VI) in both schools, totaling 207 students. Meanwhile, samples of the study were 152 students selected using purposive sampling technique with such criteria as: primary schools in earthquake-prone zone in Bantul regency and fire-prone zone in Balikpapan municipality, upper-grade students (grade IV, V and VI), age ranging from 10 to 12 years old, being present during TKJI and being physically and mentally healthy, willing to or allowed by the schools to participate in the study.

Table 1. Total number of students in disaster-safe schools in Bantul and Balikpapan involved in this study

No.	School	Grade	Total
1.	MI N 2 Bantul	IV	15
		V	22
		VI	28
	Total		65
2.	SD *Negeri* 003 Balikpapan	IV	22
		V	34
		VI	31
	Total		87

2.2. Data Collection

Instrument used to measure physical fitness in this study was the TKJI 2010 for children aged 10 to 12 years old [9] TKJI was chosen as it has been appointed as a reference and designed to suit the conditions of children in Indonesia. Besides, this test is not only relatively easy to use but has also been proven valid and reliable for data collection. This study that adopted TKJI conducted five different tests, which included 40-meter sprint, pull up, sit up, vertical jump, and 600-meter running. Data were collected using test and measurement using the Indonesian Physical Fitness Test (TKJI). The initial stage of this study included test preparation that ranged from providing students with understanding about the test, preparing equipment and other necessities for TKJI, preparing track by dividing it into five sequential posts to assigning personnel to conduct TKJI. This stage was followed by execution of the physical fitness test using TKJI that comprised of some items including (1) 40-meter sprint, (2) pull-up, (3) sit-up, (4) vertical jump, and (5) 600-meter running. Following this, the test began by summoning students in the field, preparing all the necessities, conducting warming-up session, and providing students with explanation related to TKJI. Afterwards, students were called one by one based on their number and class to do all tests in sequence while being guided by two officers in each post. Each student took turn to do the test sequentially, starting from 40-meter sprint, pull-up, sit-up, vertical jump to 600-meter running. Data collected from each student were then recorded and converted in TKJI table as presented in Table 2 and 3.

Table 2. Indonesian Physical Fitness Test (TKJI) Score for Male Students Aged 10 to 12 Years Old

40-meter Sprint	Pull-up	30-second Sit-up	Vertical Jump	600-meter Running	Score
Up to – 6.3”	≥ 51”	≥ 23	≥ 46	Up to – 2’09”	5
6.4” – 6.9”	31” – 50”	18 – 19	38 – 45	2’10” – 2’30”	4
7.0” – 7.7”	15” – 30”	12 – 17	31 – 37	2’31” – 2’45”	3
7.8” – 8.8”	05” – 14”	04 – 11	24 – 30	2’46” – 3’44”	2
8.9” – etc.	04” etc.	0 – 03	23 etc.	3’45” – etc.	1

Source: [9] Kemendiknas (2010)

Table 3. Indonesian Physical Fitness Test (TKJI) Score for Female Students Aged 10 to 12 Years Old

40-meter Sprint	Pull-up	30-second Sit-up	Vertical Jump	600-meter Running	Score
Up to – 6.7"	≥ 40"	≥ 20	≥ 42	Up to – 2'32"	5
6.8" – 7.5"	20" – 39"	14 – 19	34 – 41	2'33" – 2'54"	4
7.5" – 8.3"	08" – 19"	07 – 13	28 – 33	2'55" – 3'28"	3
8.4" – 9.6"	02" – 07"	02 – 06	21 – 27	3'29" – 4'22"	2
9.7" – etc.	0" – 0.1"	0 – 01	20 etc.	4'23" – etc.	1

Source: [9] Kemendiknas (2010)

2.3. Data Analysis

Data in this study were analyzed using 2-sample t-test. t-test is a parametric statistical technique to compare ratio or interval of data [10]. Before conducting a t-test, basic assumption test, including normality and homoscedasticity tests, was conducted.

3. Result

This study used TKJI for students aged 10-12 years old, which involved: (a) 40-meter sprint, (b) pull-up, (c) sit-up, (d) vertical jump, and (e) 600-meter running. Each result was then converted into T-score and summed. Results of analysis of difference in physical fitness level between upper-grade students at MI *Negeri* 2 Bantul and upper-grade students at SD *Negeri* 003 Balikpapan are presented in Table 4.

Table 4. Data on Physical Fitness Level of Upper-Grade Students in Disaster-Safe Schools in Bantul and Balikpapan

Statistics	**MI *Negeri* 2 Bantul**	**SD *Negeri* 003 Balikpapan**
N	65	87
Mean	12.40	9.93
Median	12.00	10.00
Mode	12.00	10.00
Std. Deviation	2.01	1.93
Minimum	9.00	5.00
Maximum	17.00	15.00
Sum	806.00	864.00

Difference in physical fitness level between students at MI *Negeri* 2 Bantul and SD *Negeri* 003 Balikpapan is considered significant if t-value is greater than t-distribution (t-value > t-distribution) and if p-value is less than 0.05 (Sig < 0.05). From results of the analysis, it can be seen that fitness level of students at MI *Negeri* 2 Bantul and students of SD *Negeri* 003 Balikpapan differs significantly. In addition, it is also found that the means of physical fitness of students in Bantul and in Balikpapan are 12.40 and 9.93 respectively. These numbers indicate that physical fitness of students in Bantul is higher than that of students in Balikpapan and therefore answers Hypothesis 2 of the study. The results are presented in the Table 5.

Table 5. Summary of Analysis of Difference in the Means of Physical Fitness Level between Students in Disaster-Safe Schools in Bantul and Balikpapan

Disaster-Safe Schools	Mean	t-test for Equality of Means			
		t-value	t-distribution	*p*	Difference
MI *Negeri* 02 Bantul	12.40	7.664	1.655	0.000	2.47
SD *Negeri* 003 Balikpapan	9.93				

4. Discussion

Results demonstrate significant difference in the level of physical fitness between students at MI *Negeri* 2 Bantul and students at SD *Negeri* 003 Balikpapan. Referring to difference in mean (2.47), students at MI *Negeri* 2 Bantul demonstrate better physical fitness than students at SD *Negeri* 003 Balikpapan.

According to statistics, of 65 students from MI *Negeri* 2 Bantul and 87 students from SD *Negeri* 003 Balikpapan, 5 MI *Negeri* 2 Bantul students (7.69%) of and 31 SD *Negeri* 003 Balikpapan students (35.63%) fall under "very poor" category. It shows a significant difference (27.94%) in the number of students falling under "very poor" category between two schools: MI *Negeri* 2 Bantul and SD *Negeri* 003 Balikpapan. One factor that influenced SD *Negeri* 003 Balikpapan students' poor performance is their lack of seriousness and enthusiasm while doing each of the tests.

In the meantime, 36 (55.38%) and 51 (58.62%) students of MI *Negeri* 2 Bantul and SD *Negeri* 003 Balikpapan fall under "poor" category respectively. According to statistics, there is a difference of 3.24% in the number of students under "poor" category with SD *Negeri* 003 Balikpapan being higher than its counterpart. One factor that contributed to the high number of students under "poor" category is fatigue. It is because students are not used to performing activities nonstop.

Results also indicate that 24 MI *Negeri* 2 Bantul students (36.92%) and 5 SD *Negeri* 003 Balikpapan students (5.75%) fall under "fair" category. A significant difference of 31.17% between MI *Negeri* 2 Bantul and SD *Negeri* 003 Balikpapan in this category demonstrates that physical fitness level of students of MI *Negeri* 2 Bantul is higher than their counterpart. One contributing factor to higher number of MI *Negeri* 2 Bantul students under "fair" category is related to environmental factor. Living in village area, students of MI *Negeri* 2 Bantul are allowed to engage in daily activities that require active physical moves such as playing traditional games or helping parents at home or in the field after school.

Surprisingly, 0% of students in both schools fall under "good" and "very good" categories. This is mainly caused by students' internal factor that includes failure to perform at satisfactory level during physical fitness test. Besides, it is also caused by the lack of regular sport practices outside PE subject and the fact students had never known TKJI before the test was conducted, making this test unfamiliar to them. In general, data suggest that physical fitness level of MI *Negeri* 2 Bantul students is higher than their counterpart due to factors that influence their physical fitness. According to Suharjana (2013: 9-10), physical fitness is influenced by factors including: (1) age, (2) sex, (3) genes, (4) diet, (5) regular sleeping schedule, and (6) exercise. MI *Negeri* 2 Bantul and SD *Negeri* 003 Balikpapan differ in environmental conditions. For this reason, students of both schools may demonstrate different physical fitness levels.

MI *Negeri* 2 Bantul is located at Jl. Imogiri-Siluk Km 3, Kebonagung, Imogiri, Bantul. Most students of MI *Negeri* 2 Bantul live near the school and most of them prefer to walk or ride bicycle to get to school. Nevertheless, with the advancement of technology and various characteristics among students, parents of MI *Negeri* 2 Bantul often use motor vehicles to take their children to school. These children, however, will walk home together after school as their houses are fairly close to school. Students of MI *Negeri* 2 Bantul are used to playing traditional games together after school. They also help their parents at home or in the field.

SD *Negeri* 003 Balikpapan is located at Jl. Jend. A. Yani RT 49, Gunungsari Ilir, Central Balikpapan Subdistrict, Balikpapan Municipality, East Kalimantan Province. This school is situated in urban area with most parents working in formal sectors. However, as the city is located near the beach, some other parents work as fishermen. Most SD *Negeri* 003 Balikpapan students live pretty far away from school while some others live nearby. Most students take motor vehicles, together with their parents, to get to

school while some other students living nearby prefer to bike. Students of SD *Negeri* 003 Balikpapan do not get used to playing together at school. They go home and play, watch TV, or play with their gadget at home after school. However, there are also students who do the homework right after school. This finding is in line with results of the study conducted by Fikri [11] arguing that physical fitness is influenced by a number of factors including: (1) physical activities and sports in daily basis, (2) food intake, and (3) technological advancement. In addition, uninteresting physical fitness test conducted by teachers also contributes to the lack of interest in physical activities. This is in line with results of previous study where students expressed some bad experiences with physical fitness test caused by poor practices [12].

It is clear that difference in characteristics between students of MI *Negeri* 2 Bantul and students of SD *Negeri* 003 Balikpapan affects their physical fitness. Irianto defined environment as a place where someone lives for a long time. It is related to not only physical but also socioeconomic conditions [13]. Environmental condition, job, habit, and economic condition are all contributing factors to one's physical fitness. Gill et al argued that children in rural areas were physically fitter than those in urban areas [14]. Joens-Marten et al claimed that physical fitness level among subjects in rural areas was higher than that in urban areas with mean of VO2 max of 28.54 ± 1.79 ml/kg/minute compared with 21.57 ± 1.79 ml/kg/minute [15] . Nevertheless, school-aged children in both rural and urban areas demonstrated poor physical fitness with VO2 max of 30 ml/kg/minute based on sex and weight. Mexitalia claimed that environment is one of factors contributing to children's health [16]. Differences in geographical location, socioeconomic condition, and lifestyle between people in rural and urban areas can influence children's health level. A dichotomy between rural and urban also relates to education, income, and health levels, with people in rural areas living with lower socioeconomic and health levels than those in urban areas. It was reported that poverty and health level in rural areas in the US was lower than those in the cities in 2015.

Physical fitness is influenced by a number of factors such as environment. In other words, schools' environmental condition, such as being located in disaster-safe zone, plays important role in students' physical fitness. As can be seen from the bar chart in Figure 1, many students from both MI *Negeri* 2 Bantul and SD *Negeri* 003 Balikpapan fall under "poor" category. According to statistics, physical fitness of students from both schools remains low. Therefore, it is important to practice sport regularly through PE subject at schools and to engage in other physical activities. Physical education can be a mean for physical activities and sports to develop preparedness for disaster, particularly physical preparedness through development of motor skills, physical abilities, knowledge and logic as well as habituation of healthy lifestyle to stimulate balance growth and development [17]. Physical Education that refers to collective practice of physical activities at school is a strong predictor of physical fitness, particularly cardiovascular fitness, and by implementing this subject, schools can play role in boosting habituation of physical activities that are favored and last until adulthood [18]. Good physical fitness in disaster-safe schools is important to prepare school personnel physically for emergencies, particularly disaster. With excellent physical abilities obtained through physical preparedness, one can survive longer in the event of emergency. In other words, one can use his physical ability to save himself by heading towards safer zone. In contrast, a person with poor physical fitness will lack of physical preparedness and therefore lack of ability to save himself and evacuate to safer area in case of emergency or disaster. This is in line with results of the study conducted by Nopembri, Saryono & Rithaudin stating that engagement in physical activities is the most effective as well as the safest way to obtain physical fitness as it helps to improve fitness and leads to better concentration level [19]. In general, results indicate that physical fitness level of MI *Negeri* 2 Bantul students is higher than that of SD *Negeri* 003 Balikpapan students. Hence, if disasters (with the same scale) occur in both disaster-prone areas, students in Bantul will survive better as they are equipped with better physical preparedness (indicated by TKJI results) than students in Balikpapan.

5. Conclusion

Referring to data analysis results, description, result tests, and discussion, it can be concluded that physical fitness level of upper-grade students in disaster-safe school in Bantul differs significantly from that of upper-grade students in disaster-safe school in Balikpapan with upper-grade students in disaster-safe school in Bantul demonstrating better physical fitness than students in disaster-safe school in Balikpapan. Referring to this finding, it can be said that students of MI Negeri 2 Bantul are more physically prepared for natural disasters than students of SD Negeri 003 Balikpapan.

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