

The Relationship between Physical Fitness and Academic Achievement in Physical Education, Sport, and Health

Wahyu Indra Bayu¹ and Puguh Satya Hasmara^{1,2}

¹Lecturer of Physical and Health Study Program of STKIP PGRI Jombang, Indonesia

²Doctoral Student of Doctoral Program of Sport Science of Unesa, Indonesia

wahyu.indra@stkipjb.ac.id

Keywords: Fifth Grade, Elementary School, Psychomotor, Cognitive, PESH.

Abstract: This study aims to determine the relationship between physical fitness (psychomotor) and academic achievement (cognitive) on the subjects physical education of sport and health. Data were obtained from 36 students in fifth grade (male: 16; female: 20). Body Mass Index data, 40 m run, pull-up, sit-up, vertical jump, and 600 m sprint obtained from physical education of sport and health teachers score test. The score of the final exam of semester PJOK subjects be measured in academic achievement. The result showed that there was a positive correlation between BMI and academic achievement ($r = 0,21$), while for 40 meter and 600 meter sprint there were negative correlation toward academic achievement ($r = -0,03$; $r = -0,02$). For pull-up, sit-up, and vertical jump there are positive relationship toward academic achievement ($r = 0.10$; $r = 0.12$; $r = 0.12$). The results of this study indicated that there was a correlation between health-related fitness components and academic achievement in the fifth grade of primary school students.

1 INTRODUCTION

As an integral part of education, the subject of Physical Education of Sport and Health have a very important role, because it develops aspects of health, physical fitness, critical thinking skills, emotional stability, and, social skills, reasoning, and morality. In fact, most of teacher of physical education of sport and health are unaware of the importance of the importance of the subject to the students. In accordance with the results of interview conducted on Friday, October 7, 2016 to the members of teachers working group of physical education of sport and health of elementary School in Gondang Mojokerto, 24 Teachers (75%) said that they taught the subject to the students so that they can refresh their self after studied many subjects in the classroom for a week. It influence on the main purpose of physical education of sport and health, especially on the aspects of physical fitness. Physical fitness is the body's ability to perform activities without experiencing significant fatigue and still reserves the energy to perform other activities. WHO categorize aspects of fitness into two, they are healthy and fit. Healthy is the release of the body both physically and mentally from any disease, while fit is the ability of a person to perform daily activities maximally, and still reserve the power without experiencing excessive fatigue. It can

be concluded that physical fitness is very important for students because it helps them to do their activity both in the school and home maximally. Physical fitness relates to the organs of a person's body to perform every day activities without experiencing fatigue and still have energy and strength to deal with sudden emergencies and can have his spare time. Mooren and Volker (2005) defines physical fitness as the ability to perform daily activities with passion and full of awareness, which is done without significant fatigue, and have energy to be able to enjoy fun time and reserve the power to face possible emergencies. As stated before that physical fitness is the ability to perform daily activities with passion and full of awareness, which is done without significant fatigue, with more energy to be able to enjoy fun time and reserve the power to face possible emergencies, it means that any individual who has physical fitness will be able to perform his activities efficiently without any significant tireless. Therefore it can be stated that a fit person is a person who is able to complete his physical task without experiencing significant fatigue and reserve their power to do other activity.

Ignoring the importance of physical education of sport and health affects the development of students' physical fitness. If physical fitness is not well developed then it will affect the student capability to study another subjects. This is reinforced by the

results of research that says that the brain requires 0.1 kcal / min to stay alive. If the brain is used to think hard then the brain requires energy of 1.5 kcal / min. The results showed that thinking also requires energy. Therefore physical education of sport and health has an important role to develop the physical fitness of students' readiness in doing their activities of learning both physical activity and cognitive. Keeley and Fox (2009) argue that before impacting on academic achievement, physical or fitness activity has allegations of some potential mechanisms, eg. specific high-level cognitive abilities such as concentration, memory, decision-making, alertness, and speed of thinking.

Many studies have been published by international journals related to the influence and relationship of physical fitness toward academic achievement. Fisher, et al (2011) founds that physical education of sport and health intervention significant positively affects the concentration of student attention. Chomitz, et al (2008) suggested that based on the results of his research the value of Mathematics and English tests are increased when the students' physical fitness is also increased. Other research conducted by Carlson, et al (2008) revealed that with the added time of 35 minutes / week for physical education of sport and health have a positive effect on academic achievement aspect of reading on kindergarten female student initial level, but this does not affect both positive and negative to male students. Meanwhile, Trudeau et al. (2008) obtain the result that the added of allocation time for 1 hour per day for physical activity did not negatively affect the achievement of elementary students, and had a positive relationship on students' intellectual ability. Furthermore, according to Dwyer, et al (2001) physical activity increase academic achievement. All these studies show a positive relationship between physical fitness and academic achievement. But all the research was done abroad and was not to physical education of sport and health subjects. Therefore the researchers are interested to conduct a similar study whether the result also have a similar impact in Indonesia, especially in SDN Bakalan Gondang Mojokerto. In line with some reasons previously, this research raised question: how is the influence / relation of physical fitness toward student academic achievement especially in subject of physical education of sport and health? From the research question, the purpose of this research is to know the influence / relationship of physical fitness toward the students' academic achievement, especially in the subjects of physical education of sport and health.

2 METHODS

2.1 Participants

The sample is determined based on cluster random sampling, there are 36 students in fifth grade of Bakalan Gondang elementary School, Mojokerto, East Java

2.2 Measures

Academic achievement. Academic achievement is measured by using the final semester exam sheet, it was conducted on December 9, 2016 consist of 50 questions on physical education of sport and health subjects

Physical fitness. Physical fitness is measured using the Indonesian Physical Fitness Test for 10-12 years old consist of a 40 m run, pull-up, sit-up, vertical jump, and a 600m sprint.

Body mass index (BMI). BMI is an appropriate indicator to describe body composition (Castro-Piñero et al., 2010). Liao, et al., (2013) describes how to determine BMI by weight (in kilograms) divided by squared height (in meters). The assessment standard used refers to the Anthropometric Standards for the Assessment of the Nutritional Status of Children enforced by the Ministry of Health of the Republic of Indonesia in 2010.

2.3 Data Analysis

Descriptive statistics are used to describe data in general. Pearson's Product Moment Correlations is used to examine the relationship between health-related physical fitness (IMT, m. 40 m, pull-up, sit-up, vertical jump, and 600 m run) and academic achievement.

3 RESULTS AND DISCUSSION

3.1 Result

Table 1: Descriptive statistic of research variable.

Variable	Overall Sample		Male		Female	
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD
Age	36	10,83 ± 0,56	16	10,94 ± 0,57	20	10,75 ± 0,55
BMI	36	18,27 ± 4,51	16	16,66 ± 3,15	20	19,56 ± 5,07
40 m run (second)	36	7,94 ± 1,06	16	7,38 ± 0,94	20	8,39 ± 0,95
Pull-Up 60 second	36	20,22 ± 12,29	16	25,13 ± 12,54	20	16,30 ± 10,85
Sit-Up 30 second (amount)	36	11,08 ± 5,16	16	13,75 ± 5,18	20	8,95 ± 4,12
Vertical Jump (cm)	36	31,22 ± 5,64	16	33,94 ± 5,51	20	29,05 ± 4,85
600 m run (minute)	36	3,26 ± 0,80	16	2,84 ± 0,69	20	3,60 ± 0,73
Academic Achievement	36	77,39 ± 4,02	16	76,50 ± 3,06	20	78,10 ± 4,60

Descriptive statistics are shown in Table 1. The correlation values between physical fitness variables and academic achievement for the overall sample, separated between men and women are presented in Table 2.

All samples

The result showed that there was a positive correlation between BMI and academic achievement ($r = 0,21$), while for 40 meter and 600 meter sprint there were negative correlation with academic achievement ($r = -0,03$; $r = -0,02$). For pull-ups, sit-ups, and vertical jumps there is a positive relationship with academic achievement ($r = 0.10$; $r = 0.12$; $r = 0.12$).

Analysis for Male and female

The relationship between BMI and academic achievement showed that there was significant relationship in boys than girls.

Table 2: Score of correlation between variable.

Variable	BMI		Academic Achievement	
	N	r	N	r
BMI				
Total			36	0.21
Male			16	-0.55
Female			20	0.39
Sprint 40 m				
Total	36	0.37	36	-0.03
Male	16	0.22	16	-0.66
Female	20	0.29	20	0.12
Pull-Up 60 second				
Total	36	-0.38	36	0.1
Male	16	-0.13	16	0.56
Female	20	-0.41	20	-0.02
Sit-Up 30 second				
Total	36	-0.40	36	0.12
Male	16	-0.29	16	0.76
Female	20	-0.34	20	-0.07
Vertical Jump				
Male	36	-0.48	36	0.12
Female	16	-0.45	16	0.74
Female	20	-0.39	20	-0.05
Sprint 600 m				
Total	36	0.51	36	-0.02
Male	16	0.22	16	-0.69
Female	20	0.54	20	0.14
Academic Achievement				
Total	36	0.21		
Male	16	-0.55		
Female	20	0.39		

3.2 DISCUSSION

The results showed that there was a significant relationship between physical fitness (psychomotor) and academic achievement (cognitive) on physical education of sport and health subject. This indicates that the importance of fitness condition of student is monitored maximally in the educational process to support the academic achievement of learners.

Academic achievement is an individual success gained in educational activities at school for all subjects expressed in quantitative values in the form of numbers inscribed on the report card. While for physical fitness is an important indicator of healthy status in children and adolescents, and certainly a good predictor of health status in life (Cveji , Pejovi , and Ostoji , 2013). From some literature it is written that there is a positive relationship of physical fitness and cognitive ability, the results can be explained both from physiological and psychological mechanisms (Chomitz, et al., 2009), where physical activity stimulates the development

of brain tissue (Studenski, et al., 2006;), improves circulation, improves blood flow to the brain, maintains levels of norepinephrine and endorphins which together lower stress, elevates mood, stimulates calm after exercise, and enables improved academic achievement (Taras, 2005; Fleshner, 2000). In addition, a high level of physical fitness allows for a link with improved neurocognitive processes in children (Hillman, Castelli, and Buck, 2005) and additional physical activity can improve the "active" behavior of learners at school (Mahar, et al., 2006). This is supported by the results of a study conducted by Wittberg, Northrup, and Cottrel (2009) indicating that there is a significant relationship between aerobic exercise and general fitness training on academic ability. The point is that when the students think, the brain needs substances to perform thinking activities.

In the literature, it is consistently reported that the amount of time spent on physical education of sport and health in schools has no detrimental effect on more "academic" subjects and can even improve academic achievement (Hillman, Castelli, and Buck, 2005; Coe, et al., 2006; Donnelly, et al., 2009). With excellent physical capabilities, these needs can be met. Because physical education of sport and health has a unique role compared to other fields of study, through the learning of physical education of sport and health students will also develop their cognitive and affective aspects in a harmonious and balanced, and also develop their physical and or psychomotor aspects.

4 CONCLUSIONS

The result of the study conclude that there is a significant relationship between physical fitness and academic achievement in physical education of sport and health subject. In particular, it can be observed at primary school level, there is a difference in the relationship between the two variables by sex. By providing an understanding to teachers of the importance of students' physical fitness, it is advisable for future research to measure changes in students' academic achievement resulting from the more active of physical education of sport and health learning program. This can be achieved by increasing physical education of sport and health learning time, increasing the active participation of time during physical education of sport and health learning, encouraging active rest periods, and maximizing before and after school time for physical activity.

REFERENCES

- Carlson, S.A., Fulton, J.E., Lee, S.M., Maynard, L. M., Brown, D.R., Kohl, H.W., Dietz, W.H. 2008. Physical Education and Academic Achievement in Elementary School: Data From the Early Childhood Longitudinal Study. *American Journal of Public Health*. 98 (4):721-727.
- Castro-Piñero, J., Ortega, F.B., Artero, E.G., Girela-Rejón, M.J., Mora, J., Sjöström, M., Ruiz, J.R. 2010. Assessing Muscular Strength in Youth: Usefulness of Standing Long Jump as a General Index of Muscular Fitness. *Journal of Strength and Conditioning Research*. 24 (7): 1810–1817.
- Chomitz, V.R., Slining, M.M., McGowan, R.J., Mitchell, S.E., Dawson, G.F., Hacker, K.A. 2009. Is There a Relationship Between Physical Fitness and Academic Achievement? Positive Results From Public School Children in the Northeastern United States. *Journal of School Health*. 79 (1):30-37.
- Coe, D.P., Pivarnik, J.M., Womack, C.J., Reeves, M.J., Malina, R.M. 2006. Effect of Physical Education and Activity Levels on Academic Achievement in Children. *Journal of the American College of Sports Medicine*, 38 (8): 1515-1519.
- Cveji, D., Pejovi, T., Ostoji, S. 2013. Assessment of Physical Fitness in Children and Adolescents. *Physical Education and Sport*. 11 (2): 135-145.
- Dauer, V.P., Pangrazi, R.D. 1995. *Dynamic Physical Education for Elementary School Children*. Macmillan: Allyn and Bacon Inc.
- Donnelly, J.E., Greene, J.L., Gibson, CA., Smith, B.K., Washburn, R.A., Sullivan, D.K., DuBose, K., Mayo, M.S., Schmelzle, K.H., Ryan, J.J., Jacobsen, D.J., Williams, S.L. 2009. Physical Activity Across The Curriculum (PAAC): A Randomized Controlled Trial to Promote Physical Activity and Diminish Overweight and Obesity in Elementary School Children. *Preventive Medicine*, 49 (4): 336-341.
- Dwyer, T., Sallis, J.F., Blizzard, L., Lazarus, R., Dean, K. 2001. Relation of Academic Performance to Physical Activity and Fitness in Children. *Human Kinetics Publisher Inc, Pediatric Exercise Science*. 13:225-237.
- Fisher, A., Boyle, J.M.E., Paton, J.Y., Tomporowski, P., Watson, C., McColl, J.H., Reilly, J.J. 2011. Effects of a physical education intervention on cognitive function in young children: randomized controlled pilot study. *Licensee BioMed Central Ltd distributed under the terms of the Creative Commons Attribution License* <http://www.biomedcentral.com/1471-2431/11/97>.
- Fleshner, M. 2000. Exercise and Neuroendocrine Regulation of Antibody Production: Protective Effect of Physical Activity on Stress-induced Suppression of the Specific Antibody Response. *International Journal Sports Medicine*. 21: 4-19. doi:10.1055/s-2000-1454.
- Hillman, C.H., Castelli, D.M., Buck, S.M. 2005. Aerobic Fitness and Neurocognitive Function in Healthy Preadolescent Children. *Medicine & Science in Sports & Exercise*. 37 (11): 1967-1974.

- Keeley, T.J.H., Fox, K.R. 2009. The Impact of Physical Activity and Fitness on Academic Achievement and Cognitive Performance in Children. *International Review of Sport and Exercise Psychology*. 2 (2): 198-214.
- Liao, Y., Chang, S., Miyashita, M., Stensel, D., Chen, J., Wen, L., Nakamura, Y. 2013. Associations Between Health-Related Physical Fitness and Obesity in Taiwanese Youth. *Journal of Sports Sciences*. 31 (16): 1797-1804.
- Mahar, M.T., Murphy, S.K., Rowe, D.A., Shield, A.T., Raedeke, T.D. 2006. Effect of a Classroom-Based Program on Physical Activity and On-task Behavior. *Medical Science Sport Exercise*. 38 (12): 2086-2094.
- Mooren, F.C., Volker, K. 2005. Molecular and Cellular Exercise Physiology. *Human Kinetics*. United States of America.
- Studenski, S., Carlson M.C., Fillit H., Greenough W.T., Kramer A., Rebok G.W. 2006. From Bedside to bench: Does Mental and Physical Activity Promote Cognitive Vitality in Late Life?. *Science of Aging Knowledge Environment*. 28 (10): 21. doi: 10.1126/sageke.2006.10.pe21.
- Taras, H. 2005. Physical Activity and Student Performance at School. *Journal of School Health*. 75 (6): 214-218.
- Trudeau, F., Shephard, R.J. 2008. Physical education, school physical activity, school sports and academic performance. *International Journal of Behavioral Nutrition and Physical Activity*. 5 (10): 1-12.
- Wittberg, R.A., Northrup, K.L., Cottrel, L. 2009. Children's Physical Fitness and Academic Performance. *American Journal of Health Education*. 40 (1): 30-36.