Physical Fitness Development Regarding Maximum Pulse Rate: A Case of Indonesian Adolescents

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Abstract. This is a cross-sectional study which investigates the development of physical fitness regarding maximum pulse rate of secondary students (16-18 years old) viewed from different sexes in Cianjur city, Indonesia. Data were collected from the students’ birthday to get information about the students’ ages. The ages were then calculated using physical fitness formulation of (220- age) to get their maximum heartbeat. To analyze, the data of maximum heartbeat were presented into tables and graphs and compared regarding the students’ physical fitness development. Results show that the physical fitness development of boys of ages 16, 17, and 18 years old are 199.7%, 198.8%, and 195.7% respectively, while the girls development at the same range of age are 205.1%, 206.9%, and 205.8% respectively.

1. Introduction
The subject of physical education of sport and health is an integral part of education. It aims to develop aspects such as physical fitness, movement skills, social skills, reasoning, emotional stability, moral action, and health life style, sport and health, which are selected to reach the goals of national education and physical education.

The purpose of physical education in schools is to assist students improve physical fitness through the recognition and the cultivation of positive attitudes and the ability to move from various physical activities. Meanwhile, the functions of physical education presented in schools are to develop several aspects such as (a) organic, (b) neuro muscular, (c) perceptual, (d) social and (e) emotional [1]. The above description shows that Physical Education has roles to spur the growth and the development of physical, mental, emotional and social aspects of students which are in line with the effort to establish and develop students’ ability to move, embed values, improve attitudes and accustomed to having healthy lifestyle. In addition, physical education programs should provide opportunities for all students to improve and maintain their physical fitness, which commensurates with their activities for lessons in class for about 8 - 10 hours a day. Thus, they need to get a refreshment by having some exercises to maintain the level of physical fitness.

A student who has a high level of physical fitness or a good body condition will be able to perform learning activities well in a long time without experiencing significant fatigue [2]. In the schools where we observed in recent years, we found that the students’ desire to exercise is still weak than expected, especially for female students. This is because many students were less active in the learning process. Also, there was evidence that the sport teachers in that school give too much attention to have students with a variety of branches of sport rather than have students learn the values contained in the physical education as listed on the purposes of learning [3].

In this present study, we describes the trend of development of male and female students’ physical fitness aged between 16-18 years old in Cianjur city, Indonesia. In addition, we also analyze the difference between male and female students regarding their physical fitness.
1.1. Physical fitness/freshness
Freshness is classified into 3 groups: 1) Static Freshness: The condition of a person which is free from illness and disability or is called ‘healthy’. 2) Dynamic Freshness: one’s ability to work efficiently that does not require special skills, such as walking, running, jumping, lifting. 3) Motorist Freshness: one’s ability to work efficiently which requires special skills, for example, a runner is required to have a running technique correctly to win the race [4]. Physical freshness is important so it is expected that all students have good physical fitness so they can do physical activity in a relatively long time without any significant fatigue so they can enjoy the remaining leisure time.

1.2. Adolescents
Adolescence is a teenage man's time. In adolescence, someone cannot be considered as either adult or children. Adolescence is a period of human transition from children to adults that runs from the age of 12 to 21 years. According to psychology, adolescence is a period of transition from early childhood to early adulthood, which is entered at the age of about 10 to 12 years and ends at the age of 18 years to 22 years [5]. Adolescence begins with rapid physical changes, dramatic weight gains and height, body shape changes, and the development of sexual characteristics such as breast augmentation, waist and whiskers developments, and deeper voices. In this development, the attainment of independence and identity is very prominent (more logical, abstract, and idealistic) and the more time spent outside the family.

In English, adolescent means ‘teenager’. Teenager is someone whose age is in a development to become an adult. Therefore, parents and educators as parts of a more experienced community have an important role in helping the development of adolescence to maturity [6]. Adolescents also come from the Latin word “adolescence” which means to grow or grow into adulthood. The term ‘adolescence’ has a broader meaning that includes mental, emotional, social, and physical maturity [7]. Adolescents have a place among children and parents because they are not classified as children but not yet in adult or old age groups. Adolescents is defined as the developmental period of transition between childhood and adulthood that includes biological, cognitive, and social-emotional changes. The adolescent age commonly used by experts is between 12 to 21 years [8]. The teenage age range is usually divided into three, namely:
- Early adolescence, 12-15 years
- Mid-adolescence, 15-18 years
- The final adolescence, 18 - 21 years

1.3. Components of physical fitness
According to Nurhaan (2005:5-6) [9], the components of physical fitness encompass some aspects:
- Aspects of health: aerobic endurance, muscular strength, muscular endurance, flexibility, body composition.
- Aspects of skills: agility, balance, coordination, power, speed, and reaction time

1.4. Sex perspectives
Sex is the difference between women and men biologically from they were born. Sex relates to male and female bodies, where men produce sperm, while women produce egg cells and are biologically capable of menstruating, pregnant and lactating [10]. Biological differences and biological functions of men and women cannot be exchanged between the two, and the functions remain the same all races that exist on earth.

2. Methods
This research is a developmental research using cross-sectional studies which describes the development of physical fitness of adolescents with age 16-18 years. A developmental cross-sectional study is a part of descriptive research, which is not intended to examine a particular hypothesis, but describes about a
variable, its phenomena or its situation [11]. In this present study, we involved all the students registered in the database of educational centre of Cianjur city with several groups of students with different ages.

3. Results and discussion

3.1. Physical fitness of adolescent boys in Cianjur city

The results report the measurement of physical fitness of teenage boys aged 16 years to 18 years in the city of Cianjur. By using formula “220-age children”, it is expected to represent the average physical fitness of teenage boys in the city of Cianjur.

The measurement shows that at the age of 16 years, the boys physical fitness condition was around 199.67, while at the age of 17 years, the boys physical fitness condition was around 198.80. At the age of 18 years, on the other hand, the boys physical fitness was 195.72. From the results, it can be stated that at the age between 16 years to 17 years, the graph describing those results show an insignificant change, still straight or stable, while at the age of 18 years, the graph began to decline. Thus, the physical fitness condition of the 18-year-old boy in the city of Cianjur shows a drastic decrease compared to the age of 16 to 17 years [12].

3.1.1. Physical fitness of adolescent girls in Cianjur city

Furthermore, the calculation measures the physical fitness of teenage girls of age between 16-18 years [13]. Using the same formula as used for adolescent boys, we obtained several results. At the age of 16 years, the girls physical fitness condition was around 205.06, while at the age of 17 years and 18 years, it shows about 206.86 and 205.79 respectively. Thus, at the age of 16 years to 17 years, the graph showing this situation shows an increasing change of physical fitness that is not insignificant. However, at the age of 18 years, the graph began to decline.

3.2. Differences between the physical fitness of adolescent girls and boys

Below we describe the difference of physical fitness level between boys and girls, and its development from the age of 16 years, 17 years and 18 years. The results show that the differences in physical fitness levels of adolescent boys and girls in Cianjur are quite varied. At the age of 16 years, the adolescents have an average physical fitness of 199.67, whereas at the same age, adolescent girls have physical fitness of 205.06. Furthermore, at the age of 17 years, the adolescent boys have physical fitness of 198.80, while the adolescent girls have physical fitness of 206.86. At the age of 18 years, the level of physical fitness of the adolescent boys is 195.72, while the level of physical fitness of the adolescent girls 205.79. These findings show that the physical fitness of boys was relatively better than that of girls. Regarding the development of physical fitness for each age, the physical fitness of adolescent boys at the age of 16 years to 17 years decreased, while that of adolescent girls increased. Furthermore, while the physical fitness of both boys and girls decreased at the age between 17 to 18 years, it shows that boys’ physical fitness declined more drastically than that of the girls’ physical fitness [14].

4. Conclusion

The data descriptions of research results showed that the physical fitness boys in Cianjur city declined more drastically than that of the girls’ physical fitness. This difference may be influenced by several factors such as genetic factors, nutrition, environment, and physical activity performed by each adolescent. A good genetic factor is supported by adequate nutrition and a good environment. These are to support an optimal physical fitness development of adolescent. The opportunities possessed by teenagers to perform physical activity is also very influential on the development of their physical fitness. Teenagers who have a great opportunity to do physical activity will likely have better physical fitness development than those who do not have enough physical activity opportunities. Thus, the results of this study provide valuable information for all parties involved in the world of sports, physical education and can be used as input materials in learning strategies for teachers and train the trainers so that will be achieved maximum physical freshness on teenagers, particularly in Indonesia.
The period of adolescence is at the age of secondary school. Therefore, the role of teachers in schools and particularly physical education teachers is very important to provide educational guidance. The role of physical education teachers, for example, is to emphasize their influence to develop students’ psychological and social characteristics, so that they can encourage an expected development of their students’ physical fitness. This is in line with the suggestion of Bar-Or (1987, p.306) arguing that the programs supporting this development may include some aspects: (1) multidisciplinary, which regards to the unified behavioral changes, nutrition teaching, and physical activity, (2) structured physical activity, which regards to the suggestion for teenager to get exercise 4 or 5 times a week, (3) team approach, which regards to the participation of school nurses, extension workers, lunchroom supervisors, and sports instructors, and (4) parental involvement, which regards to the effort of gaining a sustainability and a coordination from family support for the development of adolescents’ new behaviors.

For coach, this study suggest several points. First, it is expected that the coach can provide a suitable portion of training or exercise for adolescents so that their maximum physical fitness can be achieved. Second, the coach is also expected to check regularly regarding their physical fitness. Third, they also need to provide information on nutritious foods to support the adolescents’ maximum physical fitness.

We suggest to conduct further studies regarding physical fitness more deeply, particularly about the method of collecting data, and selecting participants with more various background. Also, further studies also need to review and explore the current study of sports science dimensions, especially on the development of physical fitness.

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