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The Relationship of Physical Activity to Cardiorespiration Endurance in Children Aged 10-12 Years

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ABSTRACT
Cardiorespiratory endurance is a measure of the functional ability of the heart and lungs to supply oxygen in the blood throughout the body. Physical activity affects cardiorespiratory endurance related to increased lung function by increasing forced expiratory volume in 1 second, forced vital capacity and lung volume. The purpose of this study was to determine the relationship between physical activity and cardiorespiratory endurance in children aged 10-12 years. This study uses a cross sectional correlation research method with a sample of 40 people. Measurement of physical activity using PAQ-C, while the measurement of cardiorespiratory endurance using the KPR Test. The results of the Pearson product moment correlation test (p=0.000, r=-0.730) showed a negative correlation between physical activity and cardiorespiratory endurance. The conclusion of this study is that there is a relationship between physical activity and cardiorespiratory endurance in children aged 10-12 years.

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INTRODUCTION

Children aged 10-12 years are still experiencing the process of growth and development. Some of the main aspects of the development of children aged 10-12 years are physical-motor, cogynistic, socio-emotional, language and religious moral aspects (Khaulani et al., 2020). Children aged 10-12 years are recommended to be at least physically active for 90 minutes or more per day, 60 minutes of that time can be used to carry out daily activities and is recommended for at least 12,000 steps/day (Rütten & Pfeifer, 2016).

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After the COVID-19 pandemic, the government implemented social restrictions on outdoor activities. This results in a decrease in the child's chances of physical activity. Based on the results of a systematic review conducted by Kemal and Darrin (2021), the results of 8 studies in various countries including the U.S, Germany, Spain, Canada, Australia ,and Latin America explained that there was a decrease in physical activity in the child population and an increase in sedentary living habits due to the effects of the COVID-19 pandemic. In addition, a study conducted in Sidoarjo, Indonesia also explained the impact of the COVID-19 pandemic on children, namely children experiencing changes in physical activity patterns in the form of decreasing exercise habits and reducing the frequency of physical activity (Tamimy, 2021).

Changes in behavior during the COVID-19 pandemic that result in reduced levels of physical activity of children can affect physical fitness levels. Physical fitness is influenced by several factors, including age, gender, genetics, food and physical activity. There are several components in physical fitness, one of which is cardiorespiratory endurance.

Cardiorespiratory endurance is a measure of the functional ability of the lungs and heart to supply oxygen in the blood throughout the body when doing physical activity (Febrianta & Sriyanto, 2019). This study aims to determine whether there is a relationship between physical activity and cardiorespiratory endurance of children aged 10-12 years.

MATERIALS AND METHODS

In this study, the cross sectional correlation method was used with one independent variable and one dependent variable. This research was conducted at SD Negeri 9 Padangsambian, West Denpasar District, Denpasar City. The population in this study was all students aged 10-12 years at SD Negeri 9 Padangsambian which amounted to 60 people. Samples are selected based on inclusion and exclusion criteria. The inclusion criteria in this study were children aged 10-12 years by showing a family card, the child was in good physical and spiritual health. The exclusion criteria in this study were that children had cardiorespiratory disorders, had musculoskeletal disorders of the lower extremities and had a history of chronic infectious and non-communicable diseases. Based on these criteria, a sample of 40 people was obtained. Physical activity measurement using the Physical Activity Questionnaire for Older Children (PAQ-C) and cardiorespiratory endurance measurement using the Kasch Pulse Recovery Test (KPR Test). A descriptive analysis is carried out on the physical activity and cardiorespiratory endurance of the child. In this study, a linearity test was carried out using the Test for Linearity and a hypothesis test using the Pearson Product Moment test.

RESULTS AND DISCUSSION

The results of the study are displayed in the form of frequency distribution tables, descriptive analysis, linearity tests and hypothesis tests. The results of the study are displayed as follows:

Table 1. Characteristics of the sample by age, gender, physical activity and cardiorespiratory endurance

Characteristics	Amount (n)	Percentage (%)
Age		
10	5	12.5
11	10	25
12	25	62.5
Physical Activity		
Low	11	25.7
Moderate	29	72.5
Cardiorespiratory Endurance		
Good	16	40
Sufficient	13	32.5
Poor	11	27.5

Based on the sample characteristic data in table 1, it is known that the sample with the 10-year-old group amounted to 5 people (12.5%), the 11-year-old group amounted to 10 people (25%), the 12-year-old group amounted to 25 people (62.5%).

Based on the physical activity value, the results of 40 samples were obtained, there were 11 samples with low physical activity values and 29 samples with moderate physical activity values. Based on the results of cardiorespiratory endurance measurements, it shows that out of 40 samples, there are 16 samples that have cardiorespiratory resistance in the good category, 13 samples in the sufficient category and 11 samples in the poor category.

Table 2. Descriptive Statistical Analysis of Physical Activity and Cardiorespiratory Endurance

Variable	N	Min	Max	Median	Mean	Standard Deviation
Physical Activity	40	1.0	4.2	2.700	2.535	.7468
Cardiorespiratory Endurance	40	106	154	127.50	125.73	12.880

Based on table 2 of descriptive statistical analysis of physical activity, the average value (mean) of 2.535 was obtained with the lowest value (minimum) of 1.0 and the highest value (maximum) of 4.2 standard deviation of 0.7468. The results of the descriptive statistical analysis of cardiorespiratory endurance obtained an average value (mean) of 125.73 with the lowest value (minimum) of 106 and the highest value (maximum) of 154 standard deviations of 12.880.

Table 3. Linearity Test

			df	F	Sig
Cardiorespiratory Endurance * Physical Activity	Between Group	(Combinned)	20	2.154	.050
		Linearity	1	33.127	.000
		Deviation	19	.524	.916

	from Linearity	
Within Groups	19	
Total	39	

The linearity test in this study used the Test for Linearity. Based on table 3 of the linearity test, the significance value in the deviation from linearity row shows a value of 0.916 (p>0.05), so it can be said that physical activity and cardiorespiratory endurance have a linear relationship.

Table 4. Hypothesis Test

Pearson Product Moment

		Physical Activity	Cardiorespiratory Endurance
Physical Activity	Pearson Correlation	1	-.730**
	Sig. (2-tailed)		.000
	N	40	40
Cardiorespiratory Endurance	Pearson Correlation	-.730**	1
	Sig. (2-tailed)	.000	
	N	40	40

The hypothesis test used in this study is Pearson Product Moment because the results of the normality test are normally distributed. Based on table 4 of the Pearson product moment test, a significance result was obtained, namely 0.000 (p<0.05) which showed a correlation between physical activity and cardiorespiratory endurance. The number on the correlation coefficient shows a value of -0.730 which means that the correlation of physical activity with cardiorespiratory endurance is strong towards negative which means that the higher the level of physical activity, the lower the pulse value per minute after performing the kasch pulse recovery test (the cardirespiratory endurance level is higher). This answers the hypothesis made by researchers, namely the relationship between physical activity and cardiorespiratory endurance of children aged 10-12 years.

In this study, researchers took samples of children aged 10-12 years at SD Negeri 9 Padangsambian. Judging from table 1. there were 5 10-year-old samples, 10 11-year-old samples and 25 12-year-old samples. In the 10-year-old sample, 1 of the 5 samples had a low level of physical activity and 2 out of 5 samples had a cardiorespiratory resistance level in the sufficient category. In the 11-year-old sample, 3 out of 10 children had low levels of physical activity and 3 out of 10 children had cardiorespiratory endurance levels in the poor category. In the 12-year-old sample, 7 out of 25 samples had low levels of physical activity and 8 out of 25 samples had cardiorespiratory resistance in the poor category. In children aged 10-12 years there is physical growth characterized by the child becoming taller, heavier and stronger to do physical activities such as jumping, running and other outdoor activities (Khaulani et al., 2020: 53). Physical activity in children aged 10-12 years is said to be able to improve lung function in healthy children by increasing lung volume, increasing the volume of forced expiratory in 1 second (forced expiratory volume in 1 s, FEV1) and forced vital capacity (FVC) (Dimitri et al., 2020: 1036).

Based on hypothesis testing using the pearson correlation test shows a significance value of 0.000 so that the value of p<0.05 which means that there is a correlation between physical activity and cardiorespiratory endurance and the correlation coefficient number shows a value of -0.730 which means the correlation between physical activity and cardiorespiratory endurance is strong in the negative direction which means that the higher the level of physical activity, the lower the pulse value per minute after performing kasch pulse recovery test (the level of cardiorespiratory endurance is getting higher).

The results of data analysis that stated that there was a correlation between physical activity and cardiorespiratory endurance in line with the results of similar studies conducted by Agre et al. (2019: 363) which stated that an increase in screen time in children aged 10-12 years affected children's cardiorespiratory endurance, this is because an increase in screen time will result in a decrease in children's time to do physical activity (r =-0.77). Supported by the results of research conducted by Lestari et al (2020: 34) stated that several factors that affect the maximum oxygen volume level are body mass index, percentage of total body fat and physical activity (p = 0.00; r = 0.851). In addition, the results of a similar study conducted by Ørntoft et al. (2018:6) also showed that children who participated in sports club activities in their prime time had better cardiorespiratory endurance compared to children who did not participate in sports clubs (p<0.05). This is due to the difference in the level of physical activity in children who participate in sports club activities and those who do not participate in sports club activities. Research by Ridwan et al. (2017: 84) with subjects of children aged 10-12 years showed different results, namely the absence of a relationship between the level of physical activity and cardiorespiratory endurance in children (p = 0.297). The difference in the results of this study can occur because in the study conducted by Ridwan et al. (2017) there is no variation in the level of physical activity so that there is no comparison between physical activity levels, besides that the method used to measure the level of physical activity is also different, in this study using a PAQ-C questionnaire while in ridwan et al.'s research (2017) used a physical activity recall formula. This can also happen because there are several other factors that affect the level of cardiorespiratory resistance such as body mass index and total body fat percentage.

Based on several similar studies above, most of them show that there is a relationship between physical activity and cardiorespiratory endurance of children aged 10-12 years. When a person routinely engages in physical activity, it will cause lung volume to increase so that the surface plane of the alveolar capillaries becomes larger, there will be an increase in oxygen diffusion capacity (Junusul Hairy, 2001 in Faridah, 2013: 21). In addition, when doing strenuous physical activity, the level of energy needs for muscles will also be greater, so the heart that serves as a blood pumper that circulates foodstuffs and oxygen must work even harder to meet these needs. A stronger and faster heart rate when doing sports activities will cause the heart muscle to hypertropy and will generally be followed by an increase in capillary density, so that the heart muscle will become stronger and improve the quality of the heart pump, so the heart does not need to work hard anymore to meet the energy needs to the muscles (Murbawani, 2017: 79). This results in people who do exercise regularly can do physical activity longer compared to people who do not do physical activity regularly.

In every study, of course, nothing is perfect and there are still many shortcomings that must be corrected. The limitations in this study are the condition of the COVID-19 pandemic which has resulted in the teaching and learning process in schools being carried out several times online and not allowed to go to school, there are many factors that affect cardiorespiratory endurance, but in this study focused on one of the factors, namely

physical activity, and this study was in the form of a cross sectional that only examined the relationship.

CONCLUSION

Based on the results of research and discussion, it can be concluded that there is a relationship between physical activity and cardiorespiratory endurance of children aged 10-12 years. The higher the level of physical activity, the lower the pulse value per minute after performing the kasch pulse recovery test (the cardiorespiratory endurance level is higher).

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