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THE SIX-MINUTE WALKING TEST FOR MEASURING VITAL LUNG CAPACITY AND VO2 MAX IN TEENAGERS IN THE NURSING ANESTHESIOLOGY DEPARTMENT

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ABSTRACT

Background: Technological advances are making activities easier. The convenience gained hurts daily life, such as laziness in exercise and reluctance to gather and communicate actively, especially among teenagers. Physical fitness is essential in improving cardiovascular health, including heart and blood vessel endurance and vital lung capacity. Maximum oxygen volume (VO2 max) can be used to assess a person's cardiorespiratory endurance. This study aimed to use a 6-minute walk test to measure VO2 max and the lungs' vital capacity.
Methods: The method used a pre-experiment with total sampling, namely 118 student respondents. These tools include emergency equipment, a stopwatch to calculate running time, colourful markers to indicate the path, and traffic cones for additional markers, using the Borg Breathing Difficulty Scale to check how difficult it is for respondents to breathe. Analysis used the Wilcoxon test because the normality assumption is not met.
Results: The results showed that the relationship between the distance of the 6-minute walk test and vital lung capacity was indicated by a p-value of 0.000 (P<0.05), and the relationship between the distance of the 6-minute walk test and VO2 max was marked by a p-value of 0.000 (P<0.05). Physical fitness is essential in improving cardiovascular health, including heart and blood vessel endurance and lung vital capacity.
Conclusion: This study concludes that there is a relationship between the 6-minute walk test and vital lung capacity and VO2 max.
Keyword : the six-minute walking test, vital capacity, VO2 max

INTRODUCTION

Technological developments make humans lazier in moving, gathering, and socialising (Novitasari & Khotimah, 2016). This change can be seen in various circles, both young and old. However, the effects of this technological progress are very noticeable in the age group of teenagers who actively follow modern developments, one of which occurs in students (Rahman, 2016). In children and teenagers, physical fitness is often forgotten. Physical fitness is very beneficial for supporting the physical work capacity of children, which in turn is expected to improve their achievements (Romero-Gallardo et al., 2022).

Basic Health Research notes that Indonesians over 10 are less physically active, from 26.1% in 2013 to 33.5% in 2018 (Republic of Indonesia, 2019). Research shows that 54.7% of adolescents have poor physical activity (Nurhidayat, 2015). Active and fit teenagers have a lower heart rate when resting and carrying out activities. Cardiovascular fitness, in this case, which is related to Maximum Oxygen Volume (VO2 max), will peak in adolescent boys at 18 and 20, while in girls, it will peak at 16 and 17 (Nurhayati & Hasnawati, 2024).

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Maximum Oxygen Volume (VO2 max) describes the ability of muscles to consume oxygen in metabolism combined with the ability of the cardiovascular and respiratory systems to deliver oxygen to muscle mitochondria (Hasyim, 2021).

The Six-Minute Walking Test (6MWT) is a reliable, valid, and responsive test for measuring functional lung capacity according to the recommendations of the American Thoracic Society. The 6-minute walk test is also a practical test to estimate cardiorespiratory fitness (Melliti et al., 2021). The distance walked is the main output in this test, which measures cardiorespiratory and musculoskeletal performance ability and can be used as a benchmark to monitor physical fitness (Kastiran & Amir, 2023).

This research aims to determine the vital capacity of the lungs and the VO2 max value, especially among Nursing Anesthesiology students at Aisyiyah Yogyakarta University. A novelty in the study is that the physical fitness check uses a 6-minute walk test to measure cardiorespiratory health.

RESEARCH METHOD

This study used total sampling with 118 second-semester students in anaesthesia nursing. The students did not have specific health problems, such as serious illnesses, fever, heart problems, open wounds due to heart surgery, uncontrolled diabetes, or very high heart rates or blood pressure. The researcher wanted to see how far the respondents could walk in six minutes.

These tools include emergency equipment, a stopwatch to calculate running time, a tape measure to mark a 15-meter path that is 30 cm wide on each side, colorful markers to indicate the path, and traffic cones for additional markers, using the Borg Breathing Difficulty Scale to check how difficult it is for respondents to breathe, The Borg scale was introduced in 1970 by Gunnar Borg and is widely used as an indicator of muscle fatigue, shortness of breath and effort in daily activities, a device to measure blood pressure, pulse counter, oximeter to check blood oxygen levels, and chairs to rest at the beginning, middle, and end of the track.

This research has conducted an ethical test with No.3692/KEP-UNISA/V/2024 at the University of Aisyiyah Yogyakarta. The normality test used Kolmogorov-Smirnov on the distance variables of the 6-minute walk test, lung vital capacity, and VO2 max. The data was abnormal, so the non-parametric statistical test used the Spearman rank test.

RESULTS

Respondent characteristics based on age and gender are presented in tables 1 and 2.

Table 1. Gender

Variable	Frequency	Percentage (%)
Male	30	25.4
Female	88	74.6
Total	118	100

The research results in table 1 show that of the 118 samples, the majority were female, namely 88 (74.6%).

Table 2. Age

Variable	Frequency	Percentage (%)
18	61	51.7
19	50	42.4
20	6	5.1
21	1	8
Total	118	100

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Table 2 shows characteristics by age; most respondents were 19 years old (42.4%).

Table 3. Results of the normality test of the research variables. The normality test results using the Kolmogorov-Smirnov test (Sample >50) show that all variables are not normally distributed because the p value is <0.05. The data is said to be normally distributed if the p-value is >0.05.

Table 3. Normality Tests

Variable	Kolmogorov-Smirnova (Sig.)	Shapiro-Wilk (Sig.)
Walking distance	0.000	0.000
Vital lung capacity	0.000	0.002
Vo2max	0.000	0.000

The results of the study in Table 4 show the results of the analysis using the Spearman rank test, which indicates that there is a relationship between the distance of the 6-minute walk test and the vital capacity of the lungs as indicated by the p-value of 0.000 (P<0.05) with a positive correlation direction and a reasonably strong relationship with a value of 0.373. The average distance of the 6-minute walk test, which is 549.41 in the respondents, shows a very low category, and the vital lung capacity, with an average of 1790.28, shows an inferior category.

Table 4. Relationship between walking distance and vital lung capacity

Variable	Average	*p* value	Correlation Coefficient
Distance of Six-Minute Walking Test	549.41	0.000	0.373
Vital Capacity of the Lungs	1790.28		

Table 5. uses the Spearman rank test, which shows a relationship between the distance of the 6-minute walk test and VO2 max, indicated by a p-value of 0.000 (P<0.05) with a positive correlation direction and a strong relationship of 0.649. The average 6-minute walk test distance of 549.41 in the respondents indicates a very low category, and VO2 max, with an average of 21.23, indicates an inferior category.

Table 5. Distance Relationship 6-minute walk test with VO2 max

Variable	Average	*p* value	Correlation Coefficient
Distance of Six-Minute Walking Test	549.41	0.000	0.649
VO2 Max	21.23		

The 6-minute walk test measures how far one can walk in 6 minutes. This distance is critical to understanding how strong a person's body is when using maximum oxygen or VO2 max. The better a person walks for 6 minutes, the more oxygen the body can use.

DISCUSSION

Physical fitness is a physical condition related to the body's ability to function optimally at work (Purwanti et al., 2020). Optimal fitness ensures an adequate oxygen supply throughout the body to remain concentrated and not get tired quickly at work (Dewi & Rohmah, 2023).

Physical fitness improves cardiovascular health, including heart and blood vessel endurance and lung vital capacity (Romadhoni et al., 2022). With good lung vital capacity, a person can perform respiratory ventilation properly to maintain good physical condition

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and fitness (Juarfianti et al., 2015). The distance travelled in a 6-minute walk test has proven to be a valuable marker for the severity and progression of obstructive pulmonary disease (Sonya, 2020).

Measuring vital lung capacity (vital capacity) provides facts about the strength of the respiratory muscles and several aspects of respiratory function. So, the measurement results will explain the magnitude of the lungs' vital capacity and reveal the lungs' ability to deliver oxygen (O2) to all muscles and cells to burn food substances into energy to carry out physical activities. The fitness level is what is intended in this study (Durmic et al., 2017). Physical fitness is an ability that emphasises physiological functions, namely the ability of the heart, blood vessels, lungs, and muscles to function at optimal efficiency (Milanović et al., 2019).

Maximum oxygen volume (VO2 max) can be used to assess a person's cardiorespiratory endurance. (Nugroho, 2020). The volume capacity in a person's body reflects how quickly the body experiences fatigue after physical activity. (Rahmadi, 2021). A person's level of physical endurance is influenced by the ability to take in the oxygen needed by the body (Ubuane et al., 2018). Among other things, the lungs and heart function to deliver the oxygen carried by haemoglobin (Chotimah, 2015).

Maximum aerobic capacity (VO2 max) is the maximum amount of oxygen used in the muscle metabolic system. A person's functional capacity, or ability to engage in essential physical activity, significantly impacts health-related quality of life and strongly predicts morbidity and mortality rates (Kastiran & Amir, 2023). VO2Max is not only a parameter of the body's ability to breathe oxygen. It also sends it to the working muscles and helps eliminate metabolic waste, which is not all. VO2 Max is also a factor supporting performance (Salman, 2018). A person with good endurance and stamina has a high VO2 max value. So, someone with poor endurance and stamina will have an insufficient VO2Max level (Blanco Pérez et al., 2019).

CONCLUSION

This study concluded that there is a relationship between the distance of the 6-minute walk test, lung vital capacity, and VO2 max.

RECOMMENDATIONS

The study's results are expected to change unhealthy behaviour in the community due to the lung vital capacity and VO2 max produced in this study.

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