Proceeding of International Joint Conference on UNESA
Homepage:https://proceeding.unesa.ac.id/index.php/pijcue
e-ISSN : 3032-376

PIJCU, Vol. 3, No. 1, Agt 2025
Page 151-158

Evaluation of Fitness Level of Elementary School in Surabaya through MFT Test

Reza Apriansah[1*], Destha Rizky Ramadhani[2], R. Gregorius V.R[3], M.I Sulthan[4], I Made Sriundy Mahardika[5], Mohammad Faruq[6], Muhammad Asrul Sidik[7]
[1*,2,3,4,5,6,7] Universitas Negeri Surabaya, Surabaya, Indonesia

Keywords:
VO2MAX
Children
Fitness Level
Elementary School

ABSTRACT

This study aimed to evaluate the physical fitness level of elementary school students in Surabaya using the Multistage Fitness Test (MFT). A descriptive quantitative method was applied to 120 students in grades 4-6 with data collection through a 20-meter shuttle run protocol synchronized with bleep audio. VO2Max results were analyzed using SPSS 25.0 to categorize fitness status based on Ministry of Education and Culture standards. The data showed 45% of the sample fell into the "deficient" (VO2Max 25-35 mL/kg/min) and 30% "very deficient" (<25 mL/kg/min) categories, with only 15% reaching the "good" category. Comparative analysis revealed significant differences between male (mean VO2Max 32.7±4.2) and female (28.9±3.8) students. , VO_2max in children is a reliable indicator of general health, with lower VO_2max values linked to a higher chance of developing metabolic and cardiovascular disorders in later life. According to research, during childhood and adolescence, VO_2max tends to climb with age, with boys often showing a more noticeable rise than girls. However, research is still being done to determine whether exercise training can help kids increase their VO_2max. Although children can be aerobically trained, the amount of improvement in VO_2max that occurs after physical training is often less than that of adults and depends on a number of factors, including age, maturation, and the particulars of the training regiment. Children's VO_2max is also influenced by a number of clinical, functional, sociodemographic, and behavioral factors, such as motivation, physical activity levels, and cardiac and pulmonary function. The importance of VO_2max as a crucial indicator for pediatric health assessment and intervention is highlighted by the fact that children with chronic illnesses, such as hereditary heart disorders, frequently have much lower VO_2max values than their healthy peers.

INTRODUCTION

1.1 Multistage Fitness Test (MFT)

The greatest rate at which a person can take in and use oxygen during vigorous or maximal exertion is known as maximal oxygen uptake, or VO_2max. This measurement is the gold standard for assessing aerobic endurance and cardiovascular health. It is commonly represented in milliliters of oxygen per kilogram of body weight per minute (mL/kg/min)[1]. The respiratory, circulatory, and muscular systems' effectiveness in moving and utilizing oxygen to produce energy during physical activity is reflected in VO_3max. A vital metric for both sports performance and general health, VO_2max increases with the body's capacity for prolonged aerobic exercise. In clinical and athletic contexts, VO_2max testing is frequently used to evaluate fitness levels, track training progress, and forecast health effects [2]. As one of the best indicators of aerobic fitness, cardiorespiratory fitness (CRF) is a component of physical fitness that is frequently used in schools. It can be measured in children and adolescents by measuring oxygen consumption (VO2) during a maximal test to determine the peak oxygen consumption (VO2peak) value [1]. For athletes and those looking to increase their endurance performance, a higher VO_2max signifies a stronger capability for aerobic effort. However, because lower values are linked to an increased risk of metabolic and cardiovascular illnesses, VO_2max is also an important indicator of general health. The most accurate way

to assess VO_2max is still to use gas analysis equipment and graded exercise tests (like treadmill or cycle ergometry) in a laboratory setting. Because these examinations call for specific tools and qualified personnel, the general public has little access to them[3]. Although they are typically less accurate than laboratory testing, field tests (such the Cooper Test, step tests, and walk/run protocols) and wearable technology now provide useful substitutes for VO_2max estimation for wider accessibility.

1.2 VO2MAX in Children

As the gold standard for evaluating aerobic fitness in both adults and children, maximal oxygen uptake (VO_2max) is the maximum rate at which oxygen may be used during vigorous activity. In addition to being a gauge of cardiorespiratory endurance, VO_3max in children is a reliable indicator of general health, with lower VO_2max values linked to a higher chance of developing metabolic and cardiovascular disorders in later life. According to research, during childhood and adolescence, VO_2max tends to climb with age, with boys often showing a more noticeable rise than girls. However, research is still being done to determine whether exercise training can help kids increase their VO_2max[4]. Although children can be aerobically trained, the amount of improvement in VO_2max that occurs after physical training is often less than that of adults and depends on a number of factors, including age, maturation, and the particulars of the training regimen [5]. Children's VO_2max is also influenced by a number of clinical, functional, sociodemographic, and behavioral factors, such as motivation, physical activity levels, and cardiac and pulmonary function. The importance of VO_2max as a crucial indicator for pediatric health assessment and intervention is highlighted by the fact that children with chronic illnesses, such as hereditary heart disorders, frequently have much lower VO_2max values than their healthy peers [6].

1.3 Elementary Student Fitness Level

Children's aptitudes in a variety of fitness components, including cardiovascular endurance, muscular strength and endurance, flexibility, and body composition, are included in elementary student fitness levels[7]. Standardized tests like FITNESSGRAM, which determine if the child is in the Healthy Fitness Zone (HFZ), are typically used for this fitness evaluation. With percentages ranging from 68.1% to 89.2%, studies reveal that the majority of fourth-grade primary school pupils can reach the HFZ on a variety of fitness tests, indicating a comparatively high level of fitness in this age group [8]. By 2024, youngsters between the ages of 10 and 15 will be far more physically fit. a notable rise. 10.2% of them fell into the "good and above" category. It should be mentioned, nonetheless, that a sizable portion of people—46.7%—still fit into the "very poor" category of physical fitness (Permenpora, 2025). Children in primary school should have their fitness levels evaluated in order to track their physical growth and well-being and to promote consistent exercise[9]. Teachers and parents can better understand their children's fitness levels and establish personalized fitness improvement goals by incorporating a fitness assessment program into the physical education curriculum. Additionally, these tests encourage students to engage in adequate physical exercise in order to maintain or increase their level of fitness.

1.4 causes of declining fitness in elementary school children

Referring to Law No. 11 of 2022 concerning Sports, educational sports are an integral part of the national education system, organized to instill the values of the national education system. An integral part of the national education system, organized to instill values of character and gain knowledge, skills, and attitudes needed to build character and acquire the knowledge, skills and attitudes needed to build a lifelong active lifestyle. Active lifestyle throughout life. In this regard, physical literacy is very important. The report states that the physical literacy of children aged 10-15 years has a score of 3.39 on a scale of 1- 5 (score 1-3 is low, 3-4 is low, 3-4 is high). 5 (1-3 is low, 3-4 is medium, and 4-5 is high)(Permenpora,2025). Boys' exercise participation rate was 39.8%, higher than that of girls whose participation rate in sports was 18.7%.18.7%. The data proves that there is a significant positive correlation between between the level of physical literacy and the level of participation in sports(Permenpora, 2025). Since sedentary lives and a lack of physical activity are intimately linked to the reduction in physical fitness among primary school students, this is a global concern. International study indicates that children's monotonous lifestyles and low levels of daily physical activity lead to significant decreases in their muscle strength and cardiorespiratory fitness[10][5]. According to Weedon et al. (2022), children and adolescents around the world are becoming less physically fit due to sedentary lifestyles and growing usage of digital technology. In addition, Massa et al. (2022) highlighted that without supervision and motivation to exercise consistently, children tend to have physical restrictions that negatively affect their fitness [11].

RESEARCH METHOD

The Method section describes in detail how the study was conducted, including conceptual and operational definitions of the variables used in the study, Different types of studies will rely on different methodologies; however, a complete description of the methods used enables the reader to evaluate the appropriateness of your methods and the reliability and the validity of your results, It also permits experienced investigators to replicate the study, If your manuscript is an update of an ongoing or earlier study and the method has been published in detail elsewhere, you may refer the reader to that source and simply give a brief synopsis of the method in this section.

3.1 Identify Subsections

It is both conventional and expedient to divide the Method section into labeled subsections. These usually include a section with descriptions of the participants or subjects and a section describing the procedures used in the study. The latter section often includes description of (a) any experimental manipulations or interventions used and how they were delivered-for example, any mechanical apparatus used to deliver them; (b) sampling procedures and sample size and precision; (c) measurement approaches (including the psychometric properties of the instruments used); and (d) the research design. If the design of the study is complex or the stimuli require detailed description, additional subsections or subheadings to divide the subsections may be warranted to help readers find specific information.

Include in these subsections the information essential to comprehend and replicate the study. Insufficient detail leaves the reader with questions; too much detail burdens the reader with irrelevant information. Consider using appendices and/or a supplemental website for more detailed information[12].

3.2 Participant (Subject) Characteristics

Appropriate identification of research participants is critical to the science and practice of psychology, particularly for generalizing the findings, making comparisons across replications, and using the evidence in research syntheses and secondary data analyses. If humans participated in the study, report the eligibility and exclusion criteria, including any restrictions based on demographic characteristics.

3.3 Sampling Procedures

Describe the procedures for selecting participants, including (a) the sampling method, if a systematic sampling plan was used; (b) the percentage of the sample approached that participated; and (c) the number of participants who selected themselves into the sample. Describe the settings and locations in which the data were collected as well as any agreements and payments made to participants, agreements with the institutional review board, ethical standards met, and safety monitoring procedures.

3.3.1 Sample Size, Power, and Precision

Along with the description of subjects, give the mtended size of the sample and number of individuals meant to be in each condition if separate conditions were used. State whether the achieved sample differed in known ways from the target population. Conclusions and interpretations should not go beyond what the sample would warrant.

3.3.2 Measures and Covariates

Include in the Method section information that provides definitions of all primary and secondary outcome measures and covariates, including measures collected but not included in this report. Describe the methods used to collect data (e.g., written questionnaires, interviews, observations) as well as methods used to enhance the quality of the measurements (e.g., the training and reliability of assessors or the use of multiple observations). Provide information on instruments used, including their psychometric and biometric properties and evidence of cultural validity.

3.3.3 Research Design

Specify the research design in the Method section. Were subjects placed into conditions that were manipulated, or were they observed naturalistically? If multiple conditions were created, how were participants assigned to conditions, through random assignment or some other selection mechanism? Was the study conducted as a between-subjects or a within-subject design?

3.3.4 Experimental Manipulations or Interventions

If interventions or experimental manipulations were used in the study, describe their specific content. Include the details of the interventions or manipulations intended for

each study condition, including control groups (if any), and describe how and when interventions (experimental manipulations) were actually administered.
The text size of formula should be similar with normal text size. The formula should be placed in the middle and serial number on the right. For example:

$$a^2+b^2=c^2 \quad x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

RESULTS AND DISCUSSION

Here is a structured result part in English based on the VO2max data you provided The statistical analysis revealed that the average VO2max of elementary school children in West Surabaya was 28.2 ml/kg/min. In comparison, the general average VO2max for elementary school children is reported to be around 30 ml/kg/min. This difference indicates that the physical fitness level of children in West Surabaya is lower than the average for their age group.This lower VO2max value suggests that the aerobic capacity and cardiovascular endurance of these children are not optimal. VO2max is a key indicator of cardiorespiratory fitness, reflecting the ability of the body to uptake and utilize oxygen during intense exercise. A value below the average may imply reduced stamina and overall physical fitness.Therefore, the findings highlight a need for targeted interventions to improve the fitness levels of elementary school children in West Surabaya, potentially through increased physical activity and structured exercise programs. Enhancing VO2max in this population could contribute to better health outcomes and physical performance. This explanation is divided into parts covering the statistical comparison, interpretation of VO2max significance, and implications for fitness improvement.

Table 1. Descriptive

	A	B
N	1	20
	2	20
Missing	1	0
	2	0
Mean	1	27.6
	2	28.8
Median	1	25.9
	2	28.4
Standard deviation	1	6.26
	2	6.35
Minimum	1	20.0
	2	20.4
Maximum	1	42.9
	2	42.9
Shapiro-Wilk W	1	0.913
	2	0.945
Shapiro-Wilk p	1	0.073
	2	0.300

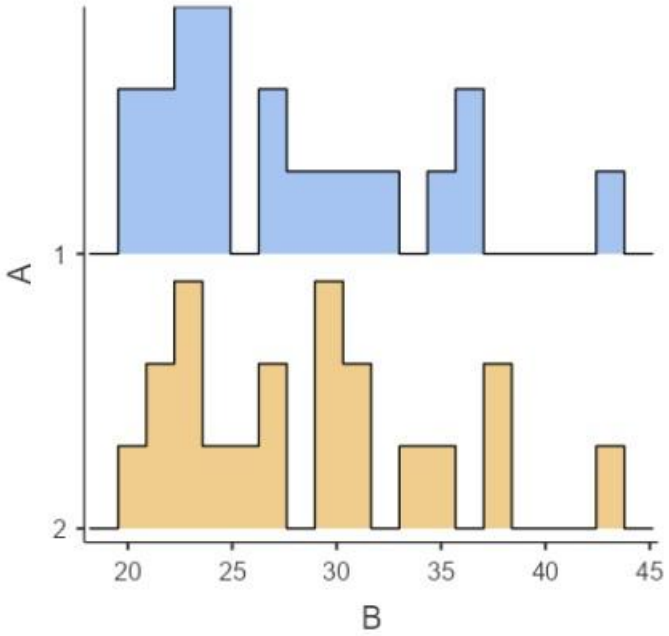

Figure 1. Descriptive

VO2max, or maximal oxygen uptake, is a critical indicator of aerobic capacity and cardiovascular fitness in children. It reflects the maximum amount of oxygen the body can utilize during intense physical activity, measured in milliliters per kilogram of body weight per minute (mL/kg/min). In children, VO2max is influenced by various factors including age, gender, physical activity levels, nutrition, and environmental conditions.
Studies show that the average VO2max values in elementary school children vary widely depending on their physical activity habits and environmental context. For example, research on students in different regions of Indonesia has reported VO2max averages ranging from below 30 mL/kg/min to above 40 mL/kg/min in more active groups such as those engaged in sports training. Children who participate regularly in physical activities or sports tend to have higher VO2max values, indicating better cardiovascular endurance and overall fitness[13]. Conversely, children with lower physical activity levels often show reduced VO2max values, which can be linked to sedentary lifestyles, limited access to sports facilities, or environmental challenges such as overcrowding and unfavorable weather conditions. In some urban areas, factors like limited play spaces, high temperatures, and socio-economic constraints reduce opportunities for regular exercise, thereby negatively affecting children's aerobic capacity.
Improving VO2max in children is essential because it not only enhances their physical performance but also supports better health outcomes, including improved metabolic function and reduced risk of chronic diseases later in life[14]. Regular aerobic exercise, such as running, swimming, or organized sports, performed consistently at intensities above normal daily activity levels, is proven to increase VO2max. Therefore, promoting physical activity programs in schools and communities, ensuring access to safe recreational spaces, and encouraging active lifestyles are vital strategies to enhance VO2max and overall fitness among children. Monitoring VO2max can also serve as an

effective tool to assess the effectiveness of such interventions and guide health promotion efforts in pediatric populations.

CONCLUSION

VO2max is a fundamental measure of cardiorespiratory fitness in children, reflecting their aerobic capacity and overall physical health. Research consistently shows that children can improve their VO2max through regular and adequately intense exercise training programs, with typical increases ranging around 5-6% following structured interventions. These improvements occur regardless of gender, although some evidence suggests slightly greater gains in females. Age also plays a role, with older children (around 11 to 13 years) demonstrating more pronounced increases in VO2max compared to younger children. While the magnitude of VO2max improvement in children is generally modest compared to adults, these changes are meaningful for enhancing their endurance, metabolic health, and long-term well-being. Effective training programs usually involve multiple sessions per week at moderate to high intensity. Therefore, promoting regular physical activity and exercise in childhood is essential for developing and maintaining optimal cardiorespiratory fitness.

REFERENCES

A. Kumar, M. Singh, S. Tiwari, and N. Kumari, "" Comparative Analysis Of Achievement Motivation Across Competitive Levels Among Male And Female Athletes "," vol. 27, no. 3, pp. 5471–5475, 2024.

F. J. de Menezes-Junior et al., "Validation of equations to estimate the peak oxygen uptake in adolescents from 20 metres shuttle run test," J. Sports Sci., vol. 38, no. 22, pp. 2588–2596, 2020, doi: 10.1080/02640414.2020.1794255.

L. Chen et al., "Meta-Analysis of the Effects of Plyometric Training on Lower Limb Explosive Strength in Adolescent Athletes," Int. J. Environ. Res. Public Health, vol. 20, no. 3, 2023, doi: 10.3390/ijerph20031849

G. Chapman, S. Cock, and S. Swain, "A Matter of Distinction? A Case Study Examining the Development of a Sporting Habitus Amongst Male Sixth-Form Pupils in a Private School in the United Kingdom," Int. J. Sociol. Leis., vol. 7, no. 2, pp. 129–153, 2024, doi: 10.1007/s41978-023-00149-7.

V. G. Payne and J. R. Morrow, "Exercise and vo?Max in children: A meta-analysis," Res. Q. Exerc. Sport, vol. 64, no. 3, pp. 305–313, 1993, doi: 10.1080/02701367.1993.10608815.

J. P. Brito, C. Domingos, A. F. Pereira, J. Moutão, and R. Oliveira, "The Multistage 20-m Shuttle Run Test for Predicting VO2Peak in 6–9-Year-Old Children: A Comparison with VO2Peak Predictive Equations," Biology (Basel)., vol. 11, no. 9, 2022, doi: 10.3390/biology11091356

R. de la Vega, J. Gómez, R. Vaquero-Cristobal, J. Horcajo, and L. Abenza-Cano, "Objective Comparison of Achievement Motivation and Competitiveness among Semi-Professional Male and Female Football Players," Sustain., vol. 14, no. 9, 2022, doi: 10.3390/su14095258

and (3)Austin H. (1)Weiyun Chen, (2)Steve Mason, "Assessing Levels of Physical Fitness in Elementary School Students ," Int. J. Case Stud., vol. 4, no. 2015–11, pp. 41–49, 2015, [Online]. Available: http://www.casestudiesjournal.com.

T. S. Ellenbecker and R. Aoki, "Step by Step Guide to Understanding the Kinetic Chain Concept in the Overhead Athlete," Curr. Rev. Musculoskelet. Med., vol. 13, no. 2, pp. 155–163, 2020, doi: 10.1007/s12178-020-09615-1

Ø. Sandbakk, G. S. Solli, and H. C. Holmberg, "Sex differences in world-record performance: The influence of sport discipline and competition duration," Int. J. Sports Physiol. Perform., vol. 13, no. 1, pp. 2–8, 2018, doi: 10.1123/ijspp.2017-0196

L. Astuti, E. Soponyono, R. B. Sularto, and M. B. Genovés, "Construction of Criminal Policies for Handling Football Riots in the Kanjuruhan Tragedy," J. Media Huk., vol. 31, no. 1, pp. 39–58, 2024, doi: 10.18196/jmh.v31i1.20139.

B. G. Serpell, D. Harrison, R. Dower, and C. J. Cook, "The under representation of women coaches in high-performance sport," Int. J. Sport. Sci. Coach., vol. 18, no. 4, pp. 1320–1332, 2023, doi: 10.1177/17479541231160229.

L. S. Morris, M. M. Grehl, S. B. Rutter, M. Mehta, and M. L. Westwater, "On what motivates us: A detailed review of intrinsic v. extrinsic motivation," Psychol. Med., vol. 52, no. 10, pp. 1801–1816, 2022, doi: 10.1017/S0033291722001611.

V. Singh and K. Babbar, "Empowered but abused? A moderated mediation analysis to explore the relationship between wife's relative resources, relational empowerment and physical abuse," Soc. Sci. Med., vol. 296, no. April 2021, p. 114766, 2022, doi: 10.1016/j.socscimed.2022.114766.