The association between healthy dietary habits and physical fitness among junior high school students: A rural school case study

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Received: 2025-09-28
Accepted: 2025-12-23
Published: 2025-12-30

A – Research concept and design
B – Collection and/or assembly of data
C – Data analysis and interpretation
D – Writing the article
E – Critical revision of the article
F – Final approval of article

ABSTRACT

Background: The health conditions of the community, particularly in relation to the physical fitness of junior high school students, require serious attention, especially in rural areas that differ significantly from urban areas. Previous research findings on dietary patterns and physical fitness still show inconsistent results.
Objectives: This study aims to investigate the relationship between healthy eating habits and physical fitness among junior high school students residing in rural areas.
Methods: This study used a quantitative design with a cross-sectional approach. The research subjects consisted of 27 students from public junior high schools in rural areas, selected through a balanced stratified random sampling process that involved all grade levels. Eating habits were measured using a 24-hour food recall, as it is an effective method for monitoring food intake over a short period. Physical fitness was measured using the Nusantara Student Fitness Test (TKPN), a national standard instrument. Data analysis was performed using descriptive statistics, Spearman's correlation, and linear regression.
Results: Most of the study participants were underweight with varied eating patterns. The analysis results showed no significant relationship between physical fitness and healthy eating patterns, as indicated by a correlation coefficient of 0.061 and a p-value of 0.764. The small effect size suggests that eating patterns did not have a significant impact on fitness levels in this group of participants.
Conclusions: The study shows that rural junior high school students achieve their physical fitness through exercise and their exercise-rest patterns and their inherited characteristics rather than their diet.

Keywords: adolescent health, healthy dietary habits, junior high school students, physical fitness, rural school, TKPN.

How to cite this article: Yunus, M., Hanief, Y. N., Ramadhan, M. P., & Sylvianingrum, E. A. (2025). The association between healthy dietary habits and physical fitness among junior high school students: A rural school case study. *Physical Education and Sports: Studies and Research*, *4*(3), 344-354. https://doi.org/10.56003/pessr.v4i3.665

INTRODUCTION

Physical fitness among adolescents has become a worldwide public health priority because it links to their present health condition and school achievements and future development of non-communicable diseases. Research conducted across different countries shows that most young people in the world have poor physical abilities which leads to higher chances of developing obesity and cardiovascular disease and metabolic disorders and negative impacts on their cognitive and psychosocial health (Akseer et al., 2020; Biswas et al., 2022). The developmental stage of adolescence requires people to establish their lifestyle choices about exercise and rest and eating habits which determine their physical fitness development and their future health status. The identification of multiple elements which affect adolescent physical fitness stands as a fundamental requirement for worldwide health and educational studies.

The worldwide environment produces different physical fitness levels among adolescents because their development depends on social economic status and their surroundings and their cultural background. The problems of physical inactivity and poor nutrition in Indonesia and other low and middle income countries become more complicated because these nations face different levels of access to active living spaces and healthy food sources and supportive environmental conditions. Research studies conducted across the nation have shown that Indonesian students demonstrate average to below average physical fitness abilities while their fitness scores decrease when they move from lower to higher academic levels (Suroto et al., 2024). The research conducted with junior high school students showed that physical exercise together with body mass index (BMI) and family income level affect physical fitness but physical exercise stands as the leading factor which affects physical fitness (Welis et al., 2023).

Students who do not have physical fitness experience multiple effects which affect their health status and their ability to learn and their readiness for work and their potential for future success (Adi et al., 2024; Andriana et al., 2025; Yunus et al., 2023). Students who do not have physical fitness will develop multiple health problems which lead to mental health issues that block their ability to succeed in school and their future career. Students who fail to meet fitness standards become more likely to develop noncommunicable diseases which include cardiovascular disease and diabetes and obesity because they spend most of their time being sedentary. Students who are unfit tend to show reduced self-efficacy when participating in physical activities which makes them stay away from sports and physical education activities (Davis, 2019).

Our dietary choices function as essential elements which determine our fitness outcomes and health status yet they remain variable factors that raise the chances of developing noncommunicable diseases (NCDs). People who eat unhealthy foods that lack essential nutrients and contain mostly processed foods will develop obesity along with multiple health problems. The yearly death statistics from diseases which include cardiovascular diseases and diabetes show 10 million fatalities because people eat unwholesome food (Grosso & Bonaccio, 2022). The 2019 mortality statistics in Bulgaria showed that unhealthy dietary habits caused 29% of all deaths according to Yaneva (2023).

Research studies demonstrate that diet serves as a vital factor for health maintenance and physical fitness but scientists have not discovered any dependable evidence which explains how teenage food selections impact their athletic abilities. Research studies involving secondary school students demonstrate that students who maintain healthy dietary choices will obtain superior physical fitness outcomes (Nuryastuti et al., 2021; Rochman, 2024). Studies conducted with athletes have not established any connection between their dietary choices and their athletic abilities because their physical abilities seem to result from exercise intensity and their bodies' responses to training (Muharam, 2019). Research studies about diet and physical fitness show different results because their findings depend on particular study conditions and research methods and the types of participants involved.

Research studies have studied urban populations through dietary assessment methods which include food frequency questionnaires and self-reported dietary perceptions but these tools fail to measure daily dietary changes. Research studies about rural areas continue to be limited because society believes rural students maintain better physical health because they lead more active lives in their natural environment (Cahyono, 2013; Melati, 2021; Yulianto et al., 2021). The research has not proven these assumptions through empirical studies which used detailed dietary intake assessments to validate them.

The research does not show how well 24-hour food recall dietary assessment matches actual diet of rural junior high school students who eat healthily based on their physical fitness levels. Scientists must perform this research to understand how food consumption affects athletic performance while identifying which factors between physical activity and rest and human biological systems affect its results. The research investigates how rural junior high school students who consume healthy foods impact their physical fitness test results to identify different factors which affect adolescent physical fitness.

METHODS

Study Design and Participants

The research design used quantitative correlational methods with cross-sectional analysis to study the relationship between dietary health and physical fitness during a single measurement period. The research participants were students who attended State Junior High School 3 Tugu located in Trenggalek Regency.

The researchers used equal stratified random sampling to select participants who represented all three grade levels (grades 7, 8 and 9) at equal numbers. The study began with thirty students who included five males and five females from each grade level. The researchers excluded three participants from the study because they failed to provide complete dietary information and they missed the physical fitness evaluation which left 27 students for the analysis.

Ethical approval statement

The research follows Declaration of Helsinki ethical guidelines and received approval from the Malang State University Ethics Committee (Protocol No. 04.11.03/UN32.14.2.8/LT/2025).

Research Instruments

The 24-hour food recall served as a dietary assessment tool to evaluate healthy eating patterns because this method enables researchers to measure short-term nutrition consumption which scientists frequently apply to study adolescent nutrition. The method enables people to track their complete food and drink intake throughout one day while showing reliable results when participants receive specific instructions.

The Nusantara Student Fitness Test (TKPN) served as the tool to measure physical fitness because it represents a standardized and validated fitness assessment for Indonesian schoolchildren. The TKPN assessment tool measures different physical fitness elements which researchers have used extensively in their educational and public health studies.

Data Analysis

The research team applied descriptive statistics to analyze participant data through mean values and standard deviations and frequency and percentage calculations for all measured variables. The Shapiro–Wilk normality test was used to check data distribution before performing any inferential analysis. The analysis used Spearman's rank correlation coefficient because the data failed to satisfy the requirements for normal distribution to study the relationship between dietary health and physical fitness. The study used $p < 0.05$ as its statistical significance threshold. The research team performed all statistical calculations through SPSS software.

RESULTS

The number of students involved was 27 students from State Junior High School 3 Tugu, Trenggalek Regency, whose characteristics can be seen in Table 1.

Table 1. Student Characteristics

Variable	N = 27			
	n (%)	Minimum	Maximum	$\bar{x} \pm$ SD
Gender				
Male	13 (48)	-	-	-
Female	14 (52)			
Age (year)				
13	5 (18,6)			
14	11 (40,7)	13	15	14,22±0,75
15	11 (40,7)			
Nutritional Status (kg/m^2)				
Underweight (IMT < 18,5)	16 (59,26)			
Normal (IMT 18,5-22,9)	9 (33,33)			
Overweight (IMT 23-24,9)	0 (0)	15,24	26,67	19,09±2,98
Obesity I (IMT 25-29,9)	2 (7,41)			
Obesity II (IMT ≥30)	0 (0)			
Height (cm)	-	145	166	155,24±6,45
Weight (kg)	-	34	60	45,93±6,83

The research involved 27 participants who were 13 male students (48%) and 14 female students (52%) according to Table 1. The research participants spanned from 13 to 15 years old while their average age reached 14.22 ± 0.75 years. The student

population consisted mainly of 14 and 15-year-olds who made up 40.7% of the total number. The Body Mass Index (BMI) assessment revealed that 16 students (59.26%) were underweight while 9 students (33.33%) had normal weight and 2 students (7.41%) were obese I. The study found no participants who fell into the overweight or obese II categories. The participants' average BMI measured 19.09 ± 2.98 kg/m² while their BMI range spanned from 15.24 to 26.67 kg/m². The study participants measured 155.24 ± 6.45 cm in height on average while their weights averaged at 45.93 ± 6.83 kg. The research results show that participants maintained poor nutritional health which would impact their physical exercise capabilities.

The data in Table 2 indicates that participants distributed their consumption scores between high and low levels because 9 students (33.3%) fell into each of these categories. The low category included 22.2% of students who totalled six students while the moderate category contained 11.1% of students who numbered three. The high category showed the highest average consumption score at 362.4 ± 182.73 while the low category had the lowest score at 198.9 ± 121.35. The minimum and maximum consumption scores ranged from 90 to 980. The research shows that students maintain different buying habits because their consumption patterns include both low and insufficient categories. The results indicate that certain students lack proper eating habits which would help them meet their dietary requirements and maintain their physical condition.

Referring to Table 3, it is known that the p-value = 0.764 > 0.05, which means that the relationship between diet and physical fitness is not significant at a 95% confidence level. A correlation value of 0.061 indicates a very weak positive relationship between diet and physical fitness. A small effect size (0.201) confirms that the influence of diet on physical fitness is minimal in this sample.

Table 2. Frequency Distribution of Food Types

Consumption Score	n (%)	Minimum	Maximum	$\bar{x}$ ± SD
High (>384)	9 (33.3%)	110	980	362.4 ± 182.73
Moderate (306–384)	3 (11.1%)	105	885	358.2 ± 185.65
Low (228–306)	9 (33.3%)	100	770	285.7 ± 167.42
Very low (<228)	6 (22.2%)	90	520	198.9 ± 121.35

Table 3. Spearman's Correlations Test Results

	Spearman's rho	p	Effect size (Fisher's z)	SE Effect size
Healthy Dietary Habits - Physical Fitness	0.061	0.764	0.061	0.201

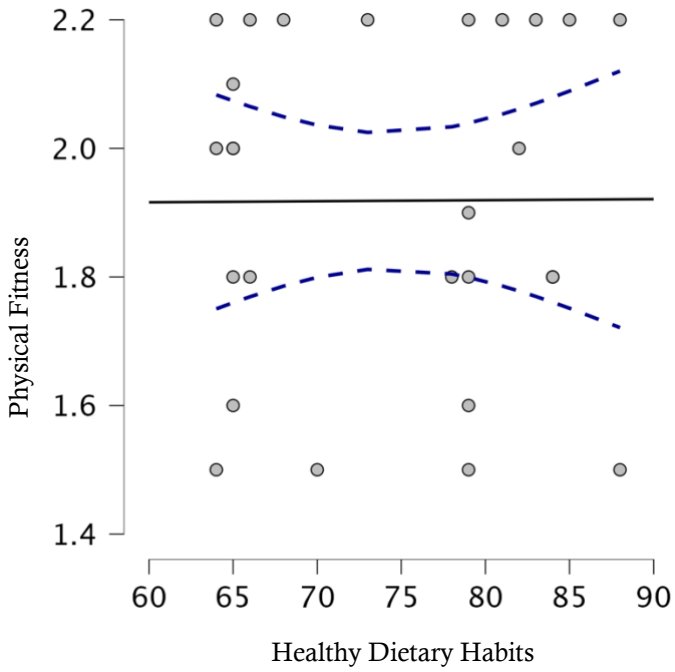

Figure 1. Scatter Diagram between Diet and Physical Fitness

Referring to Figure 1, it can be seen that the data points are scattered without a clear linear or monotonic pattern, supporting the results of a very weak correlation. Therefore, from the results of this data analysis, it can be concluded that based on the Spearman correlation test, a value of $\rho = 0.061$ with $p = 0.764$ was obtained. These results indicate that there is no significant relationship between diet and physical fitness in junior high school students. The relationship found is very weak and does not show any particular trend.

DISCUSSION

The research findings indicate that students' eating habits for health and their physical fitness levels do not show a statistically significant connection at the rural junior high school. Student physical fitness results from various factors that extend beyond their dietary habits, according to the research findings.

The research results from this study differ from those of Lugowska et al. (2020). The research conducted by Lugowska et al. (2020) demonstrated that Polish children who followed healthy eating habits at age 10 developed superior physical fitness, according to their findings. The research showed that students who joined organized physical education activities consumed more fish, milk, and vegetables, and their physical fitness results exceeded those of students who followed standard classroom schedules. The research findings from this study differed from those of previous studies because the relationships between physical fitness and diet appear to depend on specific elements, including population characteristics, environmental conditions, and different age groups.

The research results require explanation through multiple vital elements that researchers must understand. The research participants consisted of 12 to 15-year-old junior high school students who were undergoing early adolescent development at that age. Physical fitness is a complex factor that depends on diet and three additional

elements: exercise patterns, recovery time, and total body wellness. Research indicates that physical exercise produces better fitness results than diet does for adolescents, although diet serves as an additional factor for support.

The research findings require analysis through the established physical fitness elements, which have been validated. In previous studies, Research indicates that children and adolescents who achieve better sleep quality tend to develop superior physical fitness, enhance their physical abilities, and improve their recovery processes during extended periods of sleep (Fonseca et al., 2021). Physical activity serves as the primary factor that determines fitness, as it explains most of the individual differences that exist between people regarding their aerobic capacity, muscular strength, and body composition (Schutte et al., 2016). Studies show that physical fitness traits have strong genetic components, as inherited factors account for more than half of the differences in muscle strength and flexibility (Silventoinen et al., 2021). The research participants exhibited dietary habits that scientists had identified, as other variables had yielded similar findings.

The research results show no statistical significance because the researchers used specific research methods which could have affected their results. The research team conducted a 24-hour food recall to assess dietary consumption but this method might not precisely show how adolescents normally eat because their eating habits differ between days. The research participants showed identical eating habits because most participants were underweight which prevented researchers from finding any relationship between their diet and their athletic abilities. The research study included only a few participants which made it difficult to determine important findings because the statistical power remained low. The research methods of this study require exact result interpretation because they demonstrate no meaningful connection between diet and physical fitness.

The findings of this study are consistent with the results of experimental studies on obese individuals in Southeast Asia, which show that a combination of circuit training and dietary intervention does not always have a significant impact on all body composition indicators (Rahim & Nasrulloh, 2025). Although circuit training interventions—particularly those using free weights—combined with an OCD diet have been shown to result in significant weight loss, changes in body fat percentage and body mass index (BMI) did not show statistical significance. These results suggest that weight loss is not always accompanied by proportional improvements in fitness or body composition, particularly during relatively short intervention periods, thereby reinforcing the findings of this study, which indicate a weak relationship between lifestyle factors and physical fitness indicators.

The research results from this study offer essential practical uses which schools can apply to create their physical fitness programs. The research findings show that students must perform physical exercise and get enough rest while practicing complete wellness habits and making dietary changes to achieve fitness improvement. Regular physical activity enables people to develop their aerobic abilities while building muscle strength and achieving better physical appearance. Their body will achieve its highest physical potential when they get enough sleep and rest properly. School-based fitness programs which combine different elements will produce better results than diet-only programs because physical fitness requires multiple elements to succeed.

Limitations of the study

The researchers need to recognize multiple research limitations which appear in this study. The researchers used a single 24-hour food recall to measure dietary intake but this method might not show the entire pattern of food consumption which occurs at different times. The research design prevents scientists from understanding how various dietary patterns influence human physical fitness outcomes. The analytical model produced no significant results because it did not include physical activity levels, sleep quality, health status and genetic background as variables which could influence the results.

Research into the future needs studies which use either longitudinal or experimental designs to track physical fitness development through time while establishing exact variable connections. The research produced better results because it used multiple dietary assessment methods and integrated physical activity data with sleep quality assessments and evaluations of genetic and psychosocial elements. The development of evidence-based youth health and fitness strategies requires multivariate analysis methods because they serve as essential tools for their creation.

CONCLUSIONS

The research results indicate that diet does not create any measurable impact on physical fitness among students who attend junior high school. The research shows that student physical fitness results from multiple elements which include their eating habits and their physical exercise and their ability to sleep and their possible inherited traits. The study results show that physical fitness improvement needs more than diet because people must perform exercise and maintain a complete healthy way of life.

ACKNOWLEDGMENTS

The research team expresses their appreciation to the Faculty of Medicine at Malang State University for their financial support which made this research possible. The research study operates under the Faculty of Medicine Decentralized Research Scheme. The research team expresses their appreciation to State Junior High School 3 Tugu and Trenggalek Regency and all participants who took part in this research.

DATA AVAILABILITY

All data supporting the findings of this study are included in the article and its supplementary materials. Additional datasets are available from the corresponding author upon reasonable request.

FUNDING

This research received funding from the Faculty of Medicine, State University of Malang under the Faculty of Medicine Decentralization scheme.

CONFLICT OF INTEREST

The author hereby declares that this research is free from conflicts of interest with any party.

REFERENCES

Adi, S., Hanief, Y. N., Widiawati, P., Panganiban, T. D., & Muslim, B. A. (2024). Association Between Physical Fitness, Body Fat, BMI, and Physical Activity Level with Learning Outcomes in Elementary School Students. *International Journal of Disabilities Sports and Health Sciences, 7*(2), 335-341. https://doi.org/10.33438/ijdshs.1382608

Akseer, N., Mehta, S., Wigle, J., Chera, R., Brickman, Z. J., Al-Gashm, S., ... & Bhutta, Z. A. (2020). Non-communicable diseases among adolescents: current status, determinants, interventions and policies. *BMC public health, 20*(1), 1908. https://doi.org/10.1186/s12889-020-09988-5

Andriana, L. M., Ashadi, K., Wijaya, F. J. M., & Antoni, M. F. . (2025). Low-impact specialized pilates is better than low intensity steady state for increasing fitness level. *Physical Education and Sports: Studies and Research, 4*(2), 139-151. https://doi.org/10.56003/pessr.v4i2.575

Arias, J. V., Guerrero, C. C., Espinoza, L. G., Jácome, M. Á. E., & Arizala, J. F. C. (2025). Healthy eating and nutrition, a review of the theoretical aspects of a healthy diet. *AG Salud*, *3*, 112. https://doi.org/10.62486/sic2025112

Biswas, T., Townsend, N., Huda, M. M., Maravilla, J., Begum, T., Pervin, S., ... & Mamun, A. (2022). Prevalence of multiple non-communicable diseases risk factors among adolescents in 140 countries: A population-based study. *EClinicalMedicine, 52*. https://doi.org/10.1016/j.eclinm.2022.101591

Cahyono, Y. (2013). Perbandingan Tingkat Kesegaran Jasmani Antara Siswa Putra Yang Berasal Dari Desa Dan Kota (Studi Pada Siswa Kelas XI SMK I Antartika Sidoarjo). *Jurnal Pendidikan Olahraga Dan Kesehatan*, *1*(3), 580–583. https://ejournal.unesa.ac.id/index.php/jurnal-pendidikan-jasmani/article/view/4685

Davis, S. (2019). *High School Student Attributions, Interest, and Self-Efficacy in Fitness Testing*. Old Dominion University.

Dreher, M. L. (2018). Whole Plant Foods in Aging and Disease. In *Dietary Patterns and Whole Plant Foods in Aging and Disease* (pp. 59-116). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-59180-3_3

Fadilah, T., & Adriani, D. (2023). Peran kadar hemoglobin pada kebugaran jasmani remaja. *Jurnal Penelitian Dan Karya Ilmiah Lembaga Penelitian Universitas Trisakti*, *8*(2), 199–214.

Fonseca, A. P. L. M., Azevedo, C. V. M. de, & Santos, R. M. R. (2021). Sleep and health-related physical fitness in children and adolescents: a systematic review. *Sleep Science*, *14*(04), 357–365. https://doi.org/10.5935/1984-0063.20200125

Grosso, G., & Bonaccio, M. (2022). Nutritional and non-nutritional dietary factors affecting obesity and chronic related disorders. *European Journal of Public Health*, *32*(Supplement_3), ckac129-356. https://doi.org/10.1093/eurpub/ckac129.356

Lugowska, K., Kolanowski, W., & Trafialek, J. (2020). Eating Behaviour and Physical Fitness in 10-Year-Old Children Attending General Education and

Sports Classes. *International Journal of Environmental Research and Public Health*, *17*(18), 6467. https://doi.org/10.3390/ijerph17186467

Melati, S. (2021). Perbandingan kesegaran jasmani antara siswa yang tinggal di kota dan desa. *Edu Sportivo: Indonesian Journal of Physical Education*, *2*(1), 1–10. https://doi.org/10.25299/es:ijope.2021.vol2(1).6121

Muharam, R. R. (2019). Hubungan antara pola makan dan status gizi dengan tingkat kebugaran atlet Dayung. *JOSSAE (Journal of Sport Science and Education)*, *4*(1), 14–20. https://doi.org/10.26740/jossae.v4n1.p14-20

Nuryastuti, T., Tinamba, S., & Chandra, H. (2021). Hubungan Pola Makan dan Status Gizi dengan Tingkat Kebugaran Jasmani (Studi Komparasi Pada Siswa MAN Insan Cendekia Halmahera Barat dan SMA Negeri 11 Tidore Kepulauan). *Jurnal Ilmiah Wahana Pendidikan*, *7*(6), 269–278. https://doi.org/10.5281/zenodo.5602791

Rahim, A. M., & Nasrulloh, A. . (2025). The synergistic effects of circuit training and diet on weight loss, body fat percentage, and BMI in obese Indonesian females: a randomized controlled trial. *Indonesian Journal of Research in Physical Education, Sport, and Health*, *3*(1), 35–44. https://doi.org/10.17977/um086v3i12025p35-44

Rochman, M. N. (2024). *Hubungan Antara Pola Makan Dan Aktivitas Fisik Dengan Tingkat Kesegaran Jasmani Peserta Didik Kelas X SMAN 1 Sleman*. Universitas Negeri Yogyakarta.

Schutte, N. M., Nederend, I., Hudziak, J. J., de Geus, E. J. C., & Bartels, M. (2016). Differences in Adolescent Physical Fitness: A Multivariate Approach and Meta-analysis. *Behavior Genetics*, *46*(2), 217–227. https://doi.org/10.1007/s10519-015-9754-2

Shan, Z., Wang, F., Li, Y., Baden, M. Y., Bhupathiraju, S. N., Wang, D. D., Sun, Q., Rexrode, K. M., Rimm, E. B., & Qi, L. (2023). Healthy eating patterns and risk of total and cause-specific mortality. *JAMA Internal Medicine*, *183*(2), 142–153. https://doi.org/10.1001/jamainternmed.2022.6117

Silventoinen, K., Maia, J., Jelenkovic, A., Pereira, S., Gouveia, É., Antunes, A., Thomis, M., Lefevre, J., Kaprio, J., & Freitas, D. (2021). Genetics of somatotype and physical fitness in children and adolescents. *American Journal of Human Biology*, *33*(3). https://doi.org/10.1002/ajhb.23470

Sugiharto, S., Chung Hey, C., Supinganto, A., & Uly, N. (2021). Healthy eating: A concept analysis. *Healthy Eating: A Concept Analysis*, *4*(1), 18–27. https://doi.org/10.33024/MINH.V4I1.3857

Suroto, S., Yustanti, W., Prakoso, B. B., Priadana, B. W., & Febriyanti, I. (2024). Assessment of the Potential of Elementary School Students in Terms of Physical Fitness. *Mimbar Sekolah Dasar*, *11*(2), 357–367. https://doi.org/10.53400/mimbar-sd.v11i2.71731

Welis, W., Yendrizal, D., & Mario, D. T. (2023). Physical fitness of students in Indonesian during the COVID-19 period: Physical activity, body mass index, and socioeconomic status. *Physical Activity Review*, *11*(1), 77–87. https://doi.org/10.16926/PAR.2023.11.10

Yaneva, R. (2023). Unhealthy Diet as A Behavioral Risk Factor For Socially Significant Diseases And Premature Mortality. *MEDIS–International Journal of Medical Sciences and Research*, *2*(1), 53–58.

Yulianto, A., Risyanto, A., Mudian, D., & Haris, I. N. (2021). Profil Tingkat Kebugaran Jasmani Antara Siswa yang Bersekolah di Kota (SMPN 1 Purwakarta) dan di Desa (SMPN 2 Cibatu) di Kabupaten Purwakarta. *Biormatika: Jurnal Ilmiah Fakultas Keguruan Dan Ilmu Pendidikan*, *7*(2), 137–146. https://doi.org/10.35569/biormatika.v7i2.1102

Yunus, M., Hanief, Y. N., Sari, G. M., Panganiban, T. D., & Ferdinandus, M. E. (2023). Association between physical activity and body mass index with physical fitness in first-year sport students. *Journal of Science and Education (JSE)*, *4*(1), 58-64. https://doi.org/10.56003/jse.v4i1.299