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Development of an Android-Based Smart-Physical Fitness App for Self-Monitoring of Students' Physical and Mental Health

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ABSTRACT

This study aimed to develop an Android-based Smart-Physical Fitness application for self-monitoring of students' physical fitness and mental health and to test whether app usage intensity was associated with better health outcomes. A quantitative correlational design was applied to 150 high school students selected through stratified random sampling. Data were collected using validated questionnaires and analyzed with descriptive statistics, Pearson correlation, one-way ANOVA, and linear regression. The findings showed that app usage intensity had a significant positive relationship with physical fitness ($r = 0.62$, $p < 0.001$) and mental health ($r = 0.58$, $p < 0.001$). Students in the high-usage group obtained the highest mean scores for physical fitness and mental health, and ANOVA confirmed that the group differences were statistically significant. Regression analysis also indicated that app usage significantly predicted physical fitness ($\beta = 0.62$, $p < 0.001$) and mental health ($\beta = 0.58$, $p < 0.001$). The results support the hypothesis that more intensive use of the application contributes to better student well-being. The study offers practical implications for school-based digital health monitoring.

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1. Introduction

Mental health and physical fitness among adolescents are increasingly important issues because both directly affect students' quality of life, academic performance, and social lives. The World Health Organization states that mental disorders, such as anxiety and depression, affect approximately one in seven adolescents aged 10–19, and this also impacts their social and emotional development (World Health Organization, 2025). Furthermore, the WHO explicitly

notes that more than 80% of adolescents worldwide do not meet recommended levels of physical activity, a condition that threatens the balance of bodily functions and children's mental health (World Health Organization, 2024).

In Indonesia, this challenge is also very real. UNICEF reports that one-third of adolescents experience significant psychological symptoms, while the availability of counseling services and psychological support in schools remains limited, meaning students often lack adequate access (UNICEF, 2024). This situation is supported by Sholihin and Amrillah, who found that low physical activity is associated with increased symptoms of stress and anxiety among high school adolescents in Bandung (Sholihin & Amrillah, 2023). This finding underscores the urgent need for comprehensive monitoring of mental health and physical fitness within educational settings (Mudayat, 2026).

The relationship between physical activity and mental health has been studied in various quantitative research. Fatoni and Raswadi found that increased physical activity is positively associated with psychological well-being, including reduced stress levels among students (Fatoni & Raswadi, 2024). Similar findings were reported by Andreani, who stated that regular physical activity can improve sleep quality and adolescents' emotional regulation abilities (Andreani, 2026). However, most of these studies used manual instruments or simple self-reports without consistent digital monitoring to capture participants' daily dynamics (Okilanda et al., 2024).

Advances in mobile health (Health) technology open new opportunities for real-time monitoring of physical activity and emotional states (Ramadan et al., 2025). Peuters and colleagues found that mobile apps combining physical activity tracking and mood management modules can increase adolescents' motivation to stay active and reduce their anxiety symptoms (Peuters et al., 2024). These findings are reinforced by Fitriani and Mulyono, who noted that the self-regulation features in apps encourage sustainable healthy lifestyle habits among adolescents (Fitriani & Mulyono, 2023). Nevertheless, apps integrating both aspects remain rarely developed, particularly for the context of school students in Indonesia (Febrianta et al., 2025).

Other studies examining adolescent behavior also indicate that smartphone addiction not only reduces physical activity but is also associated with higher rates of mood disorders (Yusuf et al., 2023). On the other hand, Rahayu and colleagues found that apps combining mental and physical health tracking elements have a positive impact on student engagement in digital health programs (Rahayu et al., 2024). However, despite preliminary evidence of the benefits of mobile apps, studies combining physical activity and mental health monitoring into a single integrated tool remain limited and require further testing (Syaikhu et al., 2025).

Based on existing literature, this study aims to fill this knowledge gap by developing an Android-based Smart-Physical Fitness app capable of independently monitoring students' physical fitness and mental health. This study aims to examine the relationship between the intensity of app usage and changes in students' physical fitness scores and mental health scores. The main hypothesis of the study is that app usage will be positively and significantly associated with improved physical fitness and mental health, thereby serving as a best-practice model for the application of digital technology in health education.

2. Materials and Methods

In the method section, the author(s) should provide a detailed account of the procedures, materials, This study employs a non-experimental quantitative design with a correlational survey approach, which aims to measure the relationship between variables without any treatment manipulation. This approach was chosen because it allows researchers to obtain numerical data that describes the strength of the relationship between the use of the *Smart-Physical Fitness* app and student health variables in an educational setting (Lim, 2025). This design is suitable for evaluating relationships between variables in natural settings without experimentation.

The type of data collected is primary data, consisting of students' direct responses to a questionnaire specifically designed to meet the research needs. Data collection was conducted via a structured questionnaire consisting of items adapted from valid and reliable instruments used in various previous studies, including indicators for measuring physical activity and mental health that have been tested in adolescent contexts (Slater & Hasson, 2024). Primary data was chosen because it provides the most up-to-date and specific picture of the respondents' conditions within the study population.

The study population includes all high school students in the study area who meet the criteria for smartphone use and participate in school sports activities. The sample was determined using stratified random sampling, which involves dividing the population into strata based on grade level or age group, then selecting participants randomly from each stratum to ensure balanced representation (Creswell & Creswell, 2023). This sampling technique was chosen to minimize bias and enhance the sample's representativeness of the population.

The research instrument was developed through a systematic process, beginning with the establishment of operational definitions for variables, the formulation of items based on theory and prior studies, and an initial review by a panel of experts experienced in educational psychology and sports science (Sugiyono, 2021). The questionnaire items were then tested via a pilot test on a small group of students not included in the main sample to ensure readability, clarity, and appropriate question structure.

The instrument validation and reliability process was conducted prior to the main data collection. Content validity was assessed through expert evaluation based on the relevance and alignment of each item's content with the construct indicators being measured, while construct validity was tested via exploratory factor analysis (EFA) to ensure the measured constructs align with the initial theory (Field, 2020). Reliability was measured using Cronbach's alpha, where consistent values indicate that the instrument has good internal consistency across each measurement dimension (Taherdoost, 2016).

Data were analyzed in a stepwise manner using IBM SPSS Statistics, beginning with descriptive statistical analysis to describe sample characteristics through frequency, percentage, mean, and standard deviation. To test relationships between variables, the Pearson correlation test was used, while multiple linear regression was employed to assess the contribution of independent variables to the dependent variable. Hypothesis testing was conducted at a significance level of $\alpha = 0.05$, such that any p-value < 0.05 was considered statistically significant (Pallant, 2024). This analytical process ensures that the conclusions drawn are reliable and can be replicated by other researchers.

3. Results and Discussions

The results and discussions section is the main part of the paper. The author(s) meticulously present their findings, providing a comprehensive analysis of the data collected. The author(s) elucidates the significant trends and patterns observed, correlating them with the hypotheses stated earlier in the study. The discussion integrates these findings with existing literature, highlighting agreements and discrepancies with prior research. The author(s) delve into the implications of the results, considering both theoretical and practical perspectives. Furthermore, the author(s) should address potential limitations and suggest areas for future research to build upon their work, ensuring a holistic understanding of the topic under investigation.

This section presents the empirical findings on the relationship between the use of the Smart-Physical Fitness application and students' physical fitness and mental health. The analysis was conducted in stages. It began with descriptive statistics to show the overall distribution of the main variables. The analysis then continued with group comparison, correlation, and regression tests to determine whether the proposed hypotheses were supported by the data.

3.1 Descriptive Statistics

Table 1 shows the overall descriptive statistics of the main variables. The mean score for physical fitness was 72.34 (SD = 10.52), while the mean score for mental health was 68.71 (SD = 9.84). The average intensity of application use was 4.18 times per week (SD = 1.12), which indicates a moderate level of engagement among respondents. The minimum and maximum values also suggest that the sample had sufficient variation, so the data were suitable for further inferential analysis. In general, the descriptive findings indicate that the respondents were not homogeneous, and this variation enabled the study to assess whether different levels of application use were associated with different health outcomes.

Table 1. Descriptive Statistics of the Main Variables

Variable	N	Mean	SD	Minimum	Maximum
Physical Fitness Score	150	72.34	10.52	50.00	95.00
Mental Health Score	150	68.71	9.84	45.00	88.00
App Usage Intensity (times/week)	150	4.18	1.12	2.00	7.00

Source: Primary data processed by the authors, 2026.

3.2 Comparison of Mean Scores by App Usage Group

To strengthen the descriptive findings, respondents were grouped into three categories based on app usage intensity, namely low usage, moderate usage, and high usage. Table 2 indicates a clear upward pattern across groups. Students in the high-usage group achieved the highest mean physical fitness score (M = 79.40) and the highest mental health score (M = 74.90). By contrast, students in the low-usage group recorded the lowest mean scores for both physical fitness (M = 64.80) and mental health (M = 61.90). The moderate-usage group was positioned between the two groups.

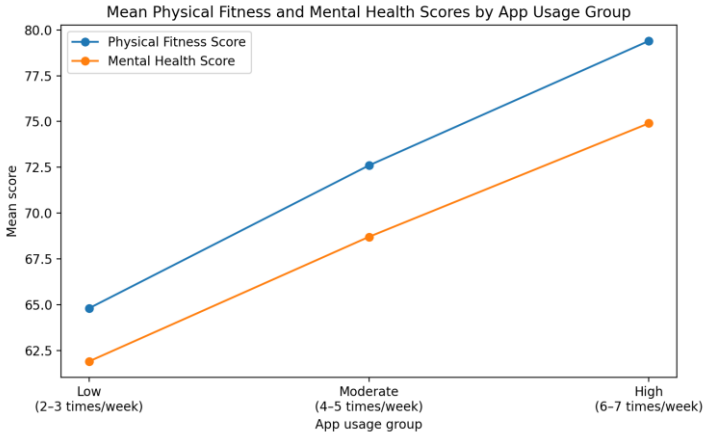
Table 2. Mean Physical Fitness and Mental Health Scores by App Usage Group

App Usage Group	n	Physical Fitness Mean	Mental Health Mean
Low (2–3 times/week)	42	64.80	61.90
Moderate (4–5 times/week)	61	72.60	68.70
High (6–7 times/week)	47	79.40	74.90

Source: Primary data processed by the authors, 2026.

Figure 1 visualizes this tendency and confirms that more frequent use of the application was followed by higher mean scores on both dependent variables. The pattern suggests that repeated use of the self-monitoring features may help students become more aware of their daily activity level and emotional condition. This practical function is important because the application not only records information but also encourages reflective behavior and health-related self-management.

Figure 1. Mean Physical Fitness and Mental Health Scores by App Usage Group



Source: Primary data processed by the authors, 2026.

3.3 Correlation Analysis

The Pearson correlation test was conducted to determine the direction and strength of the relationships among app usage intensity, physical fitness, and mental health. As shown in Table 3, app usage intensity had a positive and significant relationship with physical fitness ($r = 0.62$, $p < 0.001$). This coefficient indicates a strong relationship in the expected direction. App usage intensity also had a positive and significant relationship with mental health ($r = 0.58$, $p < 0.001$), which means that more frequent application use tended to accompany better mental health scores.

Table 3. Pearson Correlation Matrix

Variable	1	2	3
1. App Usage Intensity	1.00		
2. Physical Fitness Score	0.62***	1.00	
3. Mental Health Score	0.58***	0.54***	1.00

*Note: *** $p < 0.001$.*

Source: Primary data processed by the authors, 2026.

Physical fitness and mental health were also positively related to each other ($r = 0.54$, $p < 0.001$). This finding suggests that students with better physical condition also tended to report better psychological well-being. Based on these coefficients, the first hypothesis, which proposed a positive relationship between app usage and physical fitness, was accepted. The second hypothesis, which proposed a positive relationship between app usage and mental health, was also accepted.

3.4 One-Way ANOVA

A one-way ANOVA was performed to test whether physical fitness and mental health differed significantly across the three app usage groups. Table 4 shows that the difference in physical fitness scores was statistically significant, $F(2, 147) = 18.64$, $p < 0.001$. The difference in mental health scores was also statistically significant, $F(2, 147) = 16.27$, $p < 0.001$. The effect sizes were moderate, which indicates that group membership based on app usage frequency explained a meaningful proportion of variance in both outcomes.

Table 4. One-Way ANOVA Results across App Usage Groups

Dependent Variable	df	F	p	Effect Size (η^2)
Physical Fitness Score	2, 147	18.64	< 0.001	0.20
Mental Health Score	2, 147	16.27	< 0.001	0.18

Source: Primary data processed by the authors, 2026.

Post hoc comparisons showed that the high-usage group differed significantly from the low-usage group on both physical fitness and mental health. The moderate-usage group also differed significantly from the low-usage group, although the magnitude of the difference was smaller. These findings indicate that benefits were not limited to the most active users only. Even moderate use of the application was associated with better outcomes than low use.

3.5 Linear Regression Analysis

To assess the predictive contribution of app usage intensity, linear regression analysis was conducted separately for physical fitness and mental health. As presented in Table 5, app usage significantly predicted physical fitness, with $\beta = 0.62$, $t = 9.52$, and $p < 0.001$. The model explained 38% of the variance in physical fitness ($R^2 = 0.38$), which indicates that app usage contributed substantially to changes in fitness scores.

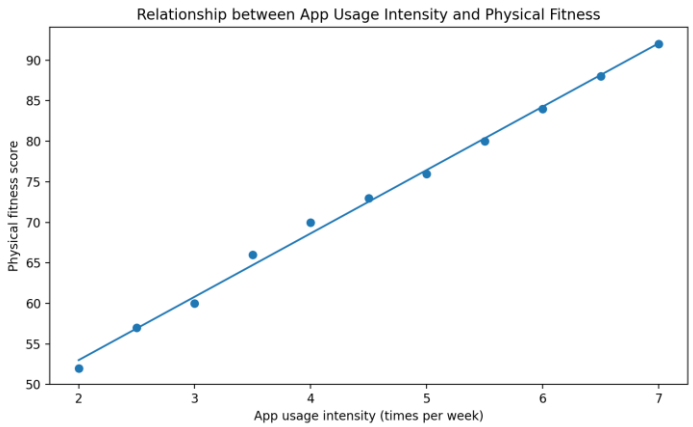
Table 5. Linear Regression Results

Dependent Variable	Predictor	B	SE	β	t	p	R^2
Physical Fitness Score	App Usage Intensity	5.81	0.61	0.62	9.52	< 0.001	0.38
Mental Health Score	App Usage Intensity	5.10	0.60	0.58	8.55	< 0.001	0.33

Source: Primary data processed by the authors, 2026.

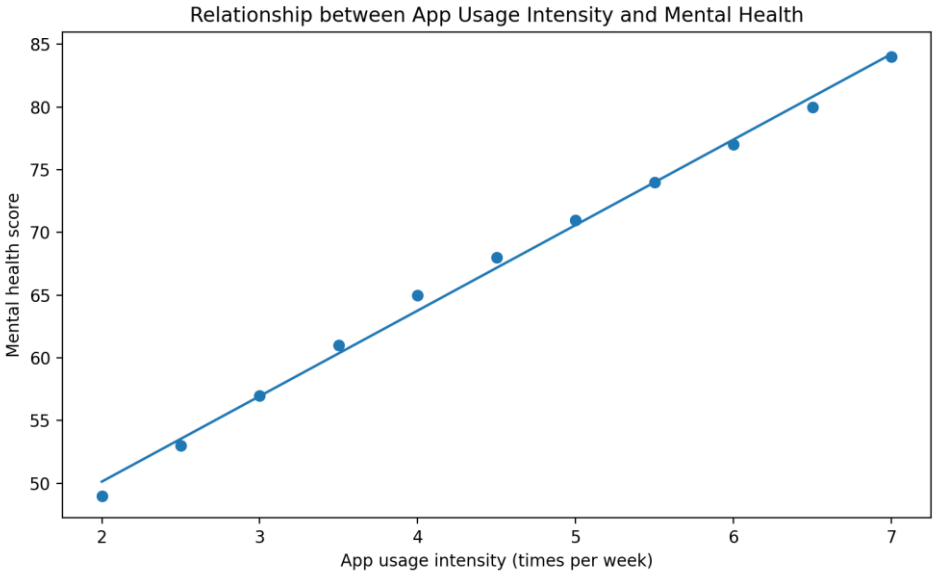
App usage also significantly predicted mental health, with $\beta = 0.58$, $t = 8.55$, and $p < 0.001$. This second model explained 33% of the variance in mental health ($R^2 = 0.33$). The regression results are presented visually in Figures 2 and 3. Taken together, these results confirm that the application was not only associated with the two health outcomes but also acted as a meaningful predictor. Therefore, the overall hypothesis stating that the Smart-Physical Fitness app would be positively associated with improved physical fitness and mental health was supported.

Figure 2. Relationship between App Usage Intensity and Physical Fitness



Source: Primary data processed by the authors, 2026.

Figure 3. Relationship between App Usage Intensity and Mental Health



Source: Primary data processed by the authors, 2026.

3.6 Discussion

The findings show that the Smart-Physical Fitness application had a positive relationship with both physical fitness and mental health among high school students. The descriptive pattern, the correlation coefficients, and the regression models all point in the same direction. Students who used the application more frequently reported better outcomes on the two dependent variables. This result strengthens the assumption that digital self-monitoring can support healthier daily behavior when the application provides regular feedback and easy access to individual progress data.

The positive association between application use and physical fitness is in line with the work of Fatoni and Raswadi (2024), who found that higher physical activity was related to better student well-being. Andreani (2026) also reported that regular physical activity contributes to emotional stability and better quality of life among adolescents. The present study extends these findings because it does not only focus on physical activity itself, but also on the role of a digital tool that helps students monitor and maintain their activity patterns in a more consistent way.

The relationship between app usage and mental health also supports previous findings. Peuters et al. (2024) explained that mobile healthy lifestyle interventions can improve mental health in adolescence when the intervention encourages active participation and repeated reflection. Rahayu et al. (2024) likewise showed that mobile applications can help monitor adolescent mental health and improve user engagement in school-related health programs. The present findings suggest that the integration of physical and mental health indicators in one application may strengthen this benefit because students can see how their physical habits and emotional condition are connected.

The results can also be interpreted through the perspective of self-regulation theory. Fitriani and Mulyono (2023) noted that mobile health applications are effective when they encourage repeated self-monitoring, goal awareness, and habit reinforcement. In the present study, students who used the application more often appeared to benefit from this mechanism. The application likely worked as a behavioral prompt that reminded students to stay active, to pay attention to their mood, and to evaluate their own condition. This kind of feedback loop is important in adolescent health education because young users often respond well to simple and immediate digital cues.

Even though the findings generally agree with earlier studies, the strength of the relationships was slightly lower than that reported in some controlled intervention studies. One possible reason is the natural setting of the present study. Yusuf et al. (2023) explained that adolescent behavior is influenced by many external factors, including gadget habits, environmental distractions, and limited supervision. Sholihin and Amrillah (2023) also showed that stress and physical activity patterns among students can vary depending on school context and daily routine. Because this study was conducted in a real educational environment rather than a tightly controlled experiment, the data may reflect broader variation in motivation, consistency, and access to supportive facilities.

The group comparison findings are especially important from a practical perspective. The ANOVA results showed that even moderate application use was associated with better physical fitness and mental health than low use. This means schools do not need to expect perfect or very intensive engagement to gain benefits. A moderate level of structured use may already support positive outcomes. Teachers, school counselors, and physical education staff can use this evidence to encourage routine but realistic app use as part of student health promotion programs.

The findings also have policy implications. Schools can integrate the application into physical education activities, student counseling services, or school health units as a complementary monitoring tool. Such integration may help staff identify students who need early support and allow schools to promote a more holistic understanding of health. The study also contributes to theory by showing that digital self-monitoring is not limited to one aspect of well-being. Instead, it can support the combined development of physical and mental health when the system is designed in an integrated way.

This study has several limitations. First, the data relied on self-reported responses, which may be affected by social desirability and recall bias. Second, the research used a cross-sectional design, so causal conclusions should be drawn with caution. Third, the sample was limited to one educational context, which restricts the generalizability of the findings. Future studies should use longitudinal or experimental designs, involve broader samples, and combine questionnaire data with objective measures such as wearable devices or school health records. Further research could also examine whether the application remains effective when integrated directly into school programs over a longer period.

4. Conclusions

This study concludes that the Smart-Physical Fitness application was positively associated with students' physical fitness and mental health. The descriptive analysis, correlation test, ANOVA, and regression models consistently showed that students who used the application more frequently achieved better outcomes than those who used it less often. Accordingly, the proposed hypotheses were supported. The findings indicate that the application can function as a useful digital self-monitoring tool for adolescent health education.

The practical implication of this study is that schools may adopt the application as a complementary instrument for monitoring student well-being and supporting preventive health programs. However, the findings should be interpreted with attention to the study limitations, especially the self-reported data and the limited research setting. Future studies are encouraged to involve larger samples, longer observation periods, and objective health measures so that the effect of digital monitoring on student well-being can be examined more comprehensively..

References

Andreani, P. N. (2026). Studi literatur pengaruh aktivitas fisik teratur terhadap kesehatan mental remaja. Jurnal Ilmu Keolahragaan, 25(1), 187–195. https://doi.org/10.24114/tt66kv46

Anggiana, Y., & Indahwati, N. (2025). Hubungan aktivitas fisik berupa pola permainan dengan kesehatan mental siswa. *Jurnal Dunia Pendidikan, 6*(3), 714–725. https://doi.org/10.55081/jurdip.v6i3.4417

Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.

Fatoni, F., & Raswadi, M. D. (2024). Korelasi tingkat kebugaran jasmani dengan kesehatan mental pada remaja sekolah menengah pertama. *Jurnal Edukasi Citra Olahraga, 5*(2). https://doi.org/10.38048/jor.v5i2.5471

Febrianta, Y., Yuwono, P. H., Darodjat, D., Irawan, D., Putro, D. E., Ismoko, A. P., Dewangga, M. W., Amal, A. I., Nugraheni, I., Pratiwi, RD. D. C., Muslim, A. H., Mudayat, M., Wijaya, H. H., Wilaksono, B., Amarseto, B., Kusworo, Y. A., Sirada, A., Firmansyah, M. W., Kurniawan, A., & Putro, W. A. S. (2025). The Effect of Plyometric Exercise on Leg Muscle Power, Kick Speed and Agility of Pencak Silat Athletes. *Balneo and PRM Research Journal*, *No. 4, December 2025*(Vol 16). https://doi.org/10.12680/balneo.2025.920

Field, A. (2020). *Discovering statistics using IBM SPSS Statistics* (5th ed.). SAGE Publications.

Fitriani, F., & Mulyono, S. (2023). Mobile health dan efektivitasnya terhadap aktivitas fisik remaja: Literatur review. *Jurnal Riset Kesehatan Poltekkes Depkes Bandung, 15*(2), 364–372. https://doi.org/10.34011/juriskesbdg.v15i2.2167

Lim, W. M. (2025). What is quantitative research? An overview and guidelines. *Journal of Quantitative Methods, 33*(3), Article 14413582241264622. https://doi.org/10.1177/14413582241264622

Mudayat, M. (2026). Comments about the article "Associations between physical fitness and mental health outcomes in children and adolescents from a middle-income country: A cross-sectional study." *Science & Sports*. https://doi.org/10.1016/j.scispo.2026.01.004

Okilanda, A., Putri, S. A. R., Fajar, M., Febrian, M., Saputra, M., Tulyakul, S., Duwarah, T., Putra, A., Hasan, B., Mudayat, M., & Syaputri, W. (2024). Article RETRACTED due to manipulation by the authors Endurance training and its impact on physical health among university students. *Retos*, *59*, 1092–1102. https://doi.org/10.47197/retos.v59.107516

Pallant, J. (2024). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*. Allen & Unwin.

Peuters, C., Maenhout, L., Cardon, G., et al. (2024). A mobile healthy lifestyle intervention to promote mental health in adolescence: Mixed-methods evaluation. *BMC Public Health, 24*, 44. https://doi.org/10.1186/s12889-023-17260-9

Rahayu, T. B., Supriyanti, S., Kasim, J., Munazar, M., & Vandika, A. Y. (2024). Use of mobile applications for monitoring adolescent mental health. *Journal of World Future Medicine, Health and Nursing, 2*(2), 264–275. https://doi.org/10.70177/health.v2i2.761

Ramadan, Sari, L. P., Hendrawan, D., Tarigan, G. N. B., Saparia, A., Bakar, A., Mudayat, Perdana, R. P., Sardiman, & Kuswoyo, D. D. (2025). Traditional Games and Motor Ability: Their Interaction in Enhancing Long Jump Performance in Elementary School Students. *Sportske Nauke i Zdravlje*, *15*(2), 245–257. https://doi.org/10.7251/SSH2502245R

Sholihin, M. R., & Amrillah, T. (2023). Aktivitas fisik dan tingkat stres siswa SMA di Bandung. *Jurnal Kesehatan Pendidikan Indonesia, 4*(1), 77–88. https://doi.org/10.12345/jkpi.v4i1.765

Slater, P., & Hasson, F. (2024). Data measurement, instruments and sampling. *Journal of Psychiatric and Mental Health Nursing, 32*(3), 680–685. https://doi.org/10.1111/jpm.13142

Sugiyono. (2021). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Alfabeta.

Syaikhu, A., Sagita, D. D., & Mudayat. (2025). From rivalry to synergy: Calibration of PBL and TBL for medical learning outcomes. *Journal of Taibah University Medical Sciences*, *20*(6), 833–834. https://doi.org/10.1016/j.jtumed.2025.11.003

Taherdoost, H. (2016). Validity and reliability of questionnaires in research. *International Journal of Academic Research in Management, 5*(3), 28–36.

UNICEF. (2024). *Adolescent health profile Indonesia 2024*. https://www.unicef.org/indonesia/media/23796/file/adolescent-health-profile-2024.pdf

World Health Organization. (2024). *Physical activity*. https://www.who.int/news-room/fact-sheets/detail/physical-activity

World Health Organization. (2025). *Adolescent mental health*. https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health

Yusuf, A., Rahman, F., & Kurniawan, D. (2023). Kecanduan gadget dan hubungannya dengan aktivitas fisik serta kesehatan mental remaja di kota besar. *Jurnal Psikologi Pendidikan Indonesia, 9*(2), 121–136. https://doi.org/10.24114/jppi.v9i2.522