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Physical Literacy, Mental Health, and Quality of Life: Analysis of Sports Students Based on Gender Differences

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Abstract

Introduction: Physical literacy is crucial for the mental health and quality of life of university sports students, yet a research gap exists in understanding how these constructs interact through a gender-sensitive lens, particularly within sports education programs where psychological distress is rising despite high physical competence. **Objectives:** This study aims to analyze the relationship between physical literacy, mental health, and quality of life among sports students, considering the role of gender as a covariate. The research design used is quantitative with a descriptive correlational approach. **Method:** The research sample consisted of 211 students from the Faculty of Sports and Health Education, Indonesia University of Education. The instruments used included the Perceived Physical Literacy Instrument (PPLI), Short Mental Health Scale (SKM-12), and WHOQOL-BREF. Data analysis was performed using descriptive statistics, classical assumption tests, multiple regression, and ANCOVA. **Result:** The results show that the average scores for physical literacy, mental health, and quality of life are in the moderate to high range with a normal and homogeneous data distribution. Multiple regression analysis shows that mental health has a significant effect on quality of life (B = 1.217; $p < 0.001$), while physical literacy has no significant effect (B = 0.171; $p = 0.072$). Simultaneously, both variables were able to explain 52.6% of the variation in students' quality of life ($R^2 = 0.526$; $p < 0.001$). ANCOVA analysis confirmed that the effect of mental health remained significant after controlling for gender, while physical literacy and gender differences were not significant. **Conclusion:** These findings indicate that mental health is the primary predictor of student athletes' quality of life, while physical literacy plays a more supportive role. Intervention recommendations focus on strengthening mental health integrated with improving physical literacy to comprehensively support student athletes' well-being.

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INTRODUCTION

Physical literacy is defined as “the motivation, self-confidence, physical competence, knowledge, and understanding to appreciate and take responsibility for lifelong engagement in physical activity,” which plays an important role in mental health and quality of life (Leung et al., 2025). Within higher education, sports students face distinctive challenges that demand optimal physical literacy to sustain both psychological well-being and overall life satisfaction. Recent studies demonstrate that physical literacy is positively associated with mental well-being in diverse populations, including university students (Gao et al., 2024). Student mental health has become a pressing global issue, particularly due to the high demands of academic, physical, and social adaptation in higher education environments. Gender differences in participation, motivation, and barriers to physical activity have been widely reported, with female students often displaying different psychosocial patterns compared to male counterparts (Akhmad et al., 2024; Lee, 2022).

Epidemiological data reveal a concerning rise in mental health problems among college students, with 35–40% reporting symptoms of anxiety or depression (Guo et al., 2021). Though there aren't many thorough studies looking at the connection between physical literacy and mental health among college students, recent data indicates that physical literacy is linked to mental well-being across a range of populations (Leung et al., 2025). Women exhibited distinct patterns in their approach to physical activity involvement, and gender disparities were noted in exercise routines, motivations for exercising, and quality of life (Matud & Díaz, 2020). Although several studies highlight the association between physical literacy and mental health, there remains a significant research gap regarding how these constructs interact among sports students a group expected to possess high physical competence yet experiencing increasing psychological distress. Furthermore, despite their superior physical abilities, 25–30% of sports students report low motivation and self-confidence, reflecting uneven development across physical literacy domains (Prabowo et al., 2023; Wang et al., 2025).Gender disparities further complicate this relationship, with female athletes reporting lower satisfaction in certain quality-of-life dimensions such as social connectedness and body image (Robinson & Lewis, 2016).

Recent models indicate that resilience and self-efficacy may mediate the relationship between physical literacy and mental health, accounting for nearly 45% of the variance in mental well-being (Cui et al., 2025). Gender-stratified evidence suggests that men tend to score higher in physical competence and mental health, while women report greater self-confidence and life satisfaction (Matud et al., 2022). Longitudinal findings confirm that early physical literacy contributes to stable mental health trajectories (Shanshan et al., 2025). However, despite growing empirical attention, few studies have examined the combined influence of physical literacy, mental health, and quality of life through a gender-sensitive lens, particularly in the context of sports education programs.

The COVID-19 pandemic has further exacerbated mental health issues, intensifying anxiety and depression among university populations (Kapoor et al., 2024; Worsley et al., 2025). Economic pressures and lifestyle changes have compounded these challenges (Eisenberg et al., 2007). This urgent context underscores the necessity of evidence-based frameworks integrating physical literacy enhancement as a mental health promotion strategy. Nonetheless, previous research predominantly isolates physical or psychological outcomes, offering limited insights into the comprehensive interplay among physical literacy, mental well-being, and quality of life. Moreover, gender-specific mechanisms underlying these associations remain theoretically and empirically underexplored (Ma et al., 2021).Cultural and contextual factors that influence gender differences in physical literacy development and mental health outcomes have received minimal attention, particularly in diverse educational settings (Makrooni et al., 2025) Intervention studies targeting physical literacy improvement as a mental health promotion strategy are still rare, with most existing programs lacking gender-responsive design elements. Physical literacy is understood as a multidimensional construct encompassing motivation, self-confidence, physical competence, knowledge, and understanding for lifelong physical activity (Boldovskaia et al., 2023; Whitehead, 2010).

From a measurement standpoint, validated tools such as the Perceived Physical Literacy Instrument (PPLI), the Physical Literacy Assessment for Youth (PLAY), and the WHOQOL-BREF (World Health Organization Quality of Life Assessment) provide multidimensional insights into these variables (Harper et al., 1998; K. W. R. Sum et al., 2018). However, few studies have integrated these assessments simultaneously to capture how gender differences shape their interrelationships. This research gap forms the basis for the present study's novelty, which lies in developing a gender-based analytical framework to elucidate the pathways linking physical literacy, mental health, and quality of life among sports students. The importance of evaluating these variables lies in their theoretical and practical implications: (1) identifying gender-specific determinants of mental well-being in physically active populations; (2) guiding the design of gender-responsive interventions that enhance both physical literacy and psychological resilience; and (3) advancing a comprehensive model that integrates physical, mental, and social dimensions of student health.

Therefore, this study aims to analyze the relationship between physical literacy, mental health, and quality of life among sports students, with particular attention to gender-related mechanisms. Specifically, the objectives are to assess physical literacy levels, evaluate mental health and quality of life, test gender mediation and moderation effects, and construct an integrative theoretical model that informs evidence-based interventions promoting holistic well-being in sports education.

METHOD

Research Design

This study uses a quantitative research design with a correlational descriptive approach. Since the primary goal of the study is to ascertain the link between independent and dependent variables without administering direct treatment to the subjects, this design was used. Physical literacy (X1) and psychological well-being (X2) are the study's independent variables, and quality of life (Y) is the dependent variable. To determine the degree to which independent factors partially and simultaneously affect dependent variables, the connection between the variables was examined using multiple regression and ANCOVA. As a result, this strategy gives researchers an empirical picture of how students' quality of life is impacted by psychological health and physical literacy.

Population and Sample

The population in this study consisted of 211 students from the Faculty of Sports and Health Education (FPOK), Universitas Pendidikan Indonesia. Although the total population was relatively moderate in number, the faculty consists of six different study programs with varied characteristics, learning focuses, and levels of student engagement in sports-related activities. Therefore, purposive sampling was used to ensure that the selected participants met the inclusion criteria relevant to the research objectives. The inclusion criteria involved active undergraduate students who were officially registered in the current semester and actively involved in sports learning activities. This sampling technique was chosen to obtain representative data that truly reflected the characteristics required for the study's variables. Total sampling was not applied because the heterogeneous nature of the six study programs made it necessary to select only those participants who met the specific inclusion criteria, ensuring the sample's relevance and consistency with the research aims.

Research Instruments

The research instruments in this study were adopted and adapted from several international instruments that have been proven to have high validity and reliability. The main instrument used to measure perceptual physical literacy is the Perceived Physical Literacy Instrument (PPLI) developed by (R. K. W. Sum et al., 2018) and older adults (Liu et al., 2022) . This instrument consists of nine statements with a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), covering three main dimensions: sense of self and self-confidence, self-expression and communication with others, and knowledge and understanding. The test results show Composite Reliability (CR) values between 0.70–0.78 and Average Variance Extracted (AVE) values between 0.43–0.54, indicating good construct validity.

Mental health variables were measured using the Mental Health-12 Scale (MHS-12), which was adapted from Aziz et al., (2021), as a result of modifications to the Mental Health Inventory by Veit & Ware, (1983), as a result of the modification of the Mental Health Inventory by This instrument consists of 12 statement items representing two main dimensions:

psychological well-being and psychological distress. The results of the Confirmatory Factor Analysis (CFA) test indicate that this instrument has high reliability with a Cronbach's Alpha value above 0.80. Meanwhile, the quality of life variable was measured using the WHOQOL-BREF (World Health Organisation Quality of Life – Brief Version) developed by (Harper et al., 1998) . This instrument covers four main domains: physical, psychological, social relationships, and environment, with internal reliability coefficients (α) ranging from 0.66 to 0.84.

These three instruments were adopted considering their suitability for the research context and the characteristics of the respondents, and they have been widely used in various cross-cultural studies. Therefore, the use of these three instruments was deemed appropriate and feasible for measuring the variables under investigation in a population of 211 sports students, using a purposive sampling technique to ensure that all members of the population had an equal opportunity to participate in the study.

Data Analysis

This study's data analysis was carried out in phases. In order to characterize the features of the data for every variable, such as the mean, standard deviation, and data distribution, the first step started with descriptive analysis. Following that, standard assumption tests were performed, such as testing for heteroscedasticity and residual normality, as well as tests for multicollinearity, homogeneity, and normality. The tests for normality and homogeneity were used to determine whether the data was normally distributed, the multicollinearity test looked at the relationship between independent variables, the residual and heteroscedasticity tests checked the accuracy of the regression model, and the normality test sought to determine whether the data was normally distributed. In order to properly use regression and ANCOVA analyses, a linearity test was also performed to make sure that the relationship between the independent variables and the dependent variable was linear.

The next stage is hypothesis testing using multiple regression analysis and ANCOVA. Multiple regression analysis is used to determine the effect of physical literacy and psychological well-being on quality of life, both simultaneously and partially. Meanwhile, ANCOVA is used to test the effect of the two independent variables on quality of life by considering demographic variables (gender) as covariates. The hypotheses tested include: (1) the simultaneous effect of physical literacy and psychological well-being on quality of life, (2) the partial effect of physical literacy on quality of life, (3) the partial effect of psychological well-being on quality of life, and (4) differences in quality of life based on gender after controlling for physical literacy and psychological well-being.

RESULT AND DISCUSSION

Result

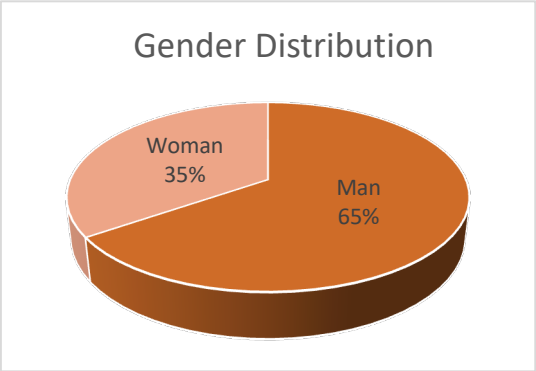

Figure 1. Gender Distribution

This study involved 211 respondents who were students at the Faculty of Physical Education and Sports Science, Indonesia University of Education. The gender distribution showed that the majority of respondents were male (65%), while female respondents accounted for 35%. This indicates that male students participated more dominantly than female students in this study. Based on the results of descriptive analysis, the Physical Literacy variable had a minimum value of 20 and a maximum of 45, with a mean value of 34.19 and a standard deviation of 5.87. The Psychological Well-being variable shows a minimum value of 22 and a maximum of 51, with an average of 38.22 and a standard deviation of 6.47. Meanwhile, the Quality of Life variable has a score range of 78 to 127, with an average of 100.24 and a standard deviation of 11.26. The results of the normality test using Kolmogorov-Smirnov, with a sample size of more than 50 respondents, show that the Physical Literacy variable has a significance value of 0.090, while Psychological Well-being and Quality of Life are 0.200 each. Since all significance values are greater than 0.05, it can be concluded that the data from the three variables are normally distributed. This means that the data are suitable for analysis using parametric statistical techniques.

Table 1. Descriptive Statistics and Normality Test

Variable	Minimum	Maximum	Mean	Std. Deviation	Kolmogorov-Smirnov Sig.	Distribution Details
Physical Literacy	20	45	34.19	5.871	0.09	Normal
Mental Health	22	51	38.22	6.467	0.200*	Normal
Quality of Life	78	127	100.24	11.264	0.200*	Normal

The results of the Levene Test for variance homogeneity show that the three variables, namely physical literacy, mental health, and quality of life, have significance values of 0.638, 0.134, and 0.592 ($p > 0.05$), respectively. This indicates that the variance of data between groups is homogeneous, so that the assumption of homogeneity is fulfilled and further analysis can be carried out.

Furthermore, the results of the One Way ANOVA test indicate that there are no significant differences in the three variables between groups. For the physical literacy variable, the F value was 0.615 with p = 0.434, while mental health obtained an F value of 1.755 with p = 0.187. For the quality of life variable, the F value obtained was 0.007 with p = 0.936. All of these results were greater than 0.05, which means that the differences between groups were not significant. In fact, the effect size (eta-squared) obtained for the three variables was also in the very small category, so it can be concluded that the variation between groups did not contribute practically to the differences in the values of the variables tested.

The linearity test results indicate that the relationship between quality of life and mental health is linear. The linearity F value of 252.314 with p < 0.001 indicates a highly significant relationship between the two variables. Although there is a slight deviation from the perfect linear pattern, as indicated by a deviation from linearity value of 1.901 (p = 0.007), the effect of linearity is far more dominant. Thus, it can be concluded that the assumption of linearity is fulfilled, so that the requirements for proceeding to the ANCOVA analysis stage are deemed feasible.

Table 2. ANCOVA Prerequisite Test

Prerequisite Test	Variable	Statistik Uji	Sig. (p)	Description
Homogenitas (Levene Test)	Physical Literacy	p = 0,638	> 0,05	Homogeneous variance
	Mental Health	p = 0,134	> 0,05	Homogeneous variance
	Quality of Life	p = 0,592	> 0,05	Homogeneous variance
One Way ANOVA	Physical Literacy	F = 0,615 ; p = 0,434	> 0,05	There was no significant difference between groups (very small effect).
	Mental Health	F = 1,755 ; p = 0,187	> 0,05	There was no significant difference between groups (very small effect).
	Quality of Life	F = 0,007 ; p = 0,936	> 0,05	There was no significant difference between groups (very small effect).
Linearitas	Quality of Life - Mental Health	F = 252,314 ; p < 0,001	< 0,05	The linear relationship is highly significant.
	Deviation from Linearity	F = 1,901 ; p = 0,007	< 0,05	There is a slight deviation, but linearity remains dominant → assumption fulfilled

The results of the multiple regression prerequisite test show that the model meets most of the classical assumptions, although there are limitations in several aspects. The multicollinearity test shows a Tolerance value of 0.942 and a VIF of 1.062 for both Physical

Literacy and mental health variables, which are within safe limits, so it can be concluded that there is no multicollinearity problem. Furthermore, the Kolmogorov-Smirnov test for residual normality produced a significance of < 0.001, which statistically indicates that the residuals are not normally distributed. However, with a large sample size (N = 211), this test is very sensitive to small deviations, so the findings are not considered substantially disruptive, especially when reviewed through a visual test that does not show extreme patterns. The results of the heteroscedasticity test show that the Physical Literacy variable significantly affects the residuals (p = 0.038), while mental health is not significant (p = 0.738), indicating heteroscedasticity in the model. Nevertheless, the analysis can still be continued with the caveat that the results are interpreted with caution, as the model is still able to provide meaningful information about the relationship between variables.

Table 3. Multiple Regression Prerequisite Test with Classical Assumption Test

Assumption	Value
Multicollinearity	Tolerance = 0,942 VIF = 1,062
Residual Normality	Kolmogorov-Smirnov: Sig. < 0,001 N = 211
Heteroscedasticity	Physical Literacy: p = 0.038 (significant) Mental Health: p = 0.738 (not significant)

The results of multiple regression analysis show that the research model constructed with Physical Literacy and mental health predictors is able to explain 52.6% of the variation in Quality of Life (R^2 = 0.526; Adjusted R^2 = 0.522). The multiple correlation coefficient value (R = 0.725) indicates a strong relationship between the two predictor variables and Quality of Life. The model significance test using ANOVA produced an F value of 115.443 with p < 0.001, which means that the regression model is suitable for predicting Quality of Life. Partially, Physical Literacy has a regression coefficient of 0.171 with a significance of p = 0.072 (> 0.05), so it does not have a significant effect on Quality of Life. Conversely, mental health has a regression coefficient of 1.217 with significance p < 0.001, indicating a positive and significant effect. This confirms that the higher a person's mental health, the better their quality of life.

On the other hand, the ANCOVA analysis results indicate that the model involving Physical Literacy, mental health, and gender as covariates is overall significant in explaining the variation in quality of life (F = 77.901; p < 0.001) with a contribution of 53% (R^2 = 0.530; Adjusted R^2 = 0.523). Partially, mental health had a very significant effect on quality of life (F = 204.461; p < 0.001), while Physical Literacy (X1) had no significant effect (F = 2.897; p = 0.090). Similarly, gender did not show a significant effect on quality of life (F = 1.861; p = 0.174). Thus, it can be concluded that the dominant factor contributing to the quality of life of respondents in this study is mental health, while physical literacy and gender differences do not have a significant effect.

Table 4. Hypothesis Testing

Variable / Model	Multiple Regression (B, t, Sig.)	Remark	ANCOVA (F, Sig.)	Remark
Physical Literacy	B = 0.171; t = 1.805; p = 0.072	Not significant	F = 2.897; p = 0.090	Not significant
Mental Health	B = 1.217; t = 14.312; p = 0.000	Significant	F = 204.461; p = 0.000	Significant
Gender (Covariate)	–	–	F = 1.861; p = 0.174	Not significant
Model	R^2 = 0.526; F = 115.443; p = 0.000	Model significant	R^2 = 0.530; F = 77.901; p = 0.000	Model significant

Discussion

This section discusses the key findings by emphasizing how physical literacy, mental health, and quality of life interact among sports students and how gender dynamics influence these relationships. The results reveal that mental health serves as the strongest predictor of quality of life, whereas physical literacy although positively associated does not exert a statistically significant direct effect. This indicates that the contribution of physical literacy to quality of life is likely indirect, mediated through psychological factors such as resilience and self-efficacy. This interpretation aligns with the framework proposed by Cui et al., (2025), which demonstrated that resilience and self-efficacy together account for nearly 45% of the variance linking physical literacy and mental health. Therefore, physical literacy can be understood not merely as physical capability but as a psychological foundation operating through adaptive and motivational mechanisms.

The strong predictive role of mental health in this study also supports (Ryff, 1989) multidimensional model of psychological well-being, which highlights self-acceptance, positive relationships, life purpose, autonomy, environmental mastery, and personal growth as fundamental elements of well-being. Similar findings have been reported by (Guo et al., 2021), who emphasized that mental health substantially contributes to academic resilience, emotional balance, and social functioning among students. Within the sports education context, these dimensions become critical as students must simultaneously manage physical performance pressures and academic demands. Moreover, the mental health challenges intensified during the COVID-19 pandemic (Kapoor et al., 2024; Worsley et al., 2025) further underscore the urgency of integrating mental health support as a central strategy for sustaining students' holistic development.

The non-significant direct influence of physical literacy on quality of life contrasts with earlier studies (Boldovskaia et al., 2023; Whitehead, 2010).) that identified it as a core determinant of overall well-being. A plausible explanation lies in the homogeneity of the sample, as sports students typically possess uniformly high levels of physical competence,

reducing the variance required for statistical significance. Furthermore, as highlighted by Cui et al., (2025) the influence of physical literacy may only become significant when mediated by psychological factors such as intrinsic motivation, resilience, or self-efficacy. These mediators enable individuals to translate physical competence into sustainable improvements in life satisfaction and mental wellness, suggesting that physical literacy functions as an indirect yet essential enabler within this framework.

Another noteworthy finding concerns the absence of significant gender differences in the relationships among the studied variables. This outcome diverges from Matud et al., (2022), who found that men typically exhibit higher physical competence and mental health, while women report greater self-confidence and life satisfaction. The current result may be attributed to the homogeneous academic and athletic context of sports education, where both male and female students share similar training routines, learning experiences, and institutional expectations. As Makrooni et al., (2025) noted, contextual and cultural homogeneity can neutralize gender-based variations, particularly in environments emphasizing equality and collaborative learning experiences.

From a theoretical standpoint, this study advances the development of a gender-based analytical framework that clarifies the interrelationships among physical literacy, mental health, and quality of life. The findings extend current understanding by demonstrating that gender differences may diminish in structured educational environments, thereby emphasizing the centrality of psychological mechanisms over biological or sociocultural determinants. Practically, these results highlight the necessity of integrating gender-responsive and psychologically oriented interventions into sports education curricula. Programs such as mindfulness training, resilience-building workshops, and self-efficacy enhancement can be implemented to strengthen both the psychological and physical dimensions of literacy.

Future research should expand this model by incorporating mediating and moderating variables such as social support, exercise intensity, and cultural orientation to obtain a more comprehensive understanding of how physical literacy and mental health interact to influence life quality. Overall, this study underscores mental health as the psychological core of sports students' quality of life, while positioning physical literacy as a supportive foundation that enables sustained well-being through adaptive psychological processes.

CONCLUSION

This study concludes that mental health is the most significant determinant of sports students' quality of life, explaining more than half of the model's variance ($R^2 \approx 0.53$). Mental health has a strong and positive influence ($B = 1.217$; $p < 0.001$), while physical literacy and gender show no significant effects ($p > 0.05$). These findings address the research problem by confirming that psychological mechanisms, rather than physical competence or gender, play

a dominant role in shaping well-being. The proposed gender-based analytical framework demonstrates that gender does not directly moderate the relationship among the studied variables; instead, mental health serves as the primary mediating factor connecting physical literacy and quality of life. Theoretically, this study advances understanding of how mental health integrates physical, psychological, and social dimensions within sports education. Practically, it highlights the importance of embedding structured interventions such as resilience, mindfulness, and self-efficacy programs into the curriculum to strengthen both physical literacy and psychological well-being. Future research should expand this model by including more diverse populations and incorporating mediating or moderating variables (motivation, resilience, social support, and cultural context) to develop a more comprehensive and generalizable explanation of sports students' quality of life.

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