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PHYSICAL AND PSYCHOLOGICAL FACTORS AFFECTING SHOOTING PERFORMANCE IN FOOTBALL

Heru Yundridana [1]*,Ridho Bahtra[2], Arsil[3], dan Nugroho Susanto[4], Ali Mardius[5]
[1,2,3,4]Department of Sports Education, Faculty of Sports Science, Padang State University
[5]Department of Recreational-Physical Health and Educational Science, Faculty of Teacher Training and Education, University of Bung Hatta

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ABSTRACT
Shooting accuracy represents a fundamental determinant of success in competitive football, relying heavily on a complex interaction between physiological capabilities and psychological readiness. Despite its importance, many training programs overlook the specific contribution of core stability and mental state. Consequently, this study aims to comprehensively analyze the influence of leg explosive power, stomach muscle strength, and self-confidence on the shooting ability of students at SSB Tuna Agung Salido. Understanding these relationships is crucial for developing targeted training protocols that maximize performance outcomes among young athletes. The research employed a quantitative approach with a correlational associative causal design, carried out in February 2026. The sample consisted of 28 students determined through a total sampling technique, ensuring all active members were included to represent the population accurately. Data collection instruments included the Standing Broad Jump test to measure leg explosive power, the sit-up test for stomach muscle strength, a standardized questionnaire for self-confidence, and a practical kick-to-target test for shooting ability. Data analysis was conducted using Path Analysis to determine direct and indirect effects between variables. Research results indicate that shooting ability is significantly influenced by both physical and psychological factors. Leg explosive power contributes 33.3% to shooting performance, while stomach muscle strength demonstrates a larger influence at 37.3%, highlighting the critical role of core stability in generating and transferring power during kicks. Self-confidence contributes 19.8%, underscoring the vital mental component of skill execution under pressure. No direct connection was found between leg explosive power and stomach muscle strength; however, both exert an indirect influence through self-confidence by 2% and 3% respectively. These findings confirm that an effective training program must simultaneously address physical strength and psychological factors to optimize students' shooting abilities. Coaches are advised to integrate core conditioning and mental resilience training alongside technical drills to ensure holistic development. Future research should explore additional psychological variables such as anxiety control to further refine training methodologies for youth football development.

Introduction
Football is one of the most widely played sports in the world, requiring a complex integration of physical, technical, tactical, and psychological competencies (Plakias et al., 2025). Modern football performance has evolved from traditional assessments that focused solely on physical attributes or technical skills, with an increasing recognition that athletic success relies on a sophisticated interaction of physiological, biomechanical, cognitive, and psychological dimensions (Neumann et al., 2024). The ability to perform under pressure, especially in critical situations such as shooting, requires not only superior physical capacity but also strong psychological resilience, decision-making skills, and emotion regulation (M et al., 2026). Shot accuracy and consistency, as fundamental outcome measures in football, culminate in a variety of underlying performance drivers that transcend simple technical proficiency (M N Q et al., 2026).

Corresponding Author: Heru Yundridana, Email: hyundridana@gmail.com
Universitas Negeri Padang, Padang, West Sumatera, Indonesia.

Understanding these multifactorial relationships is crucial for developing evidence-based athlete development and training interventions.

In Indonesia, youth football is a rapidly growing sector within the national sports development framework, with numerous football academies (Sekolah Sepak Bola or SSB) dedicated to the identification and long-term development of talent (Akbar et al., 2024). However, systematic empirical research examining the specific relationship between physical and psychological factors in shooting performance in young Indonesian athletes remains limited (Hamdani & W, 2026). The SSB system, while providing a structured pathway for early athlete development, often lacks an integrated, evidence-based approach that simultaneously addresses physical conditioning and psychological skill development (Rohman, 2017). As Indonesia continues to establish itself as a competitive force in Southeast Asian football and aspires to achieve higher performance standards in international competition, the need for rigorous investigation of the determinants of performance in young players becomes increasingly urgent (Nurhaliza & Pramesti, 2025). This is particularly important given the significant investment in youth athlete development and the imperative to optimize training methodologies through empirical evidence rather than tradition alone.

Contemporary sports science recognizes that lower-limb explosive power, abdominal muscle stability, and self-confidence do not operate in isolation but through dynamic and interrelated pathways to influence shooting performance (Rahmansyah et al., 2018). Lower-limb explosive power, generated through rapid muscle contractions and coordinated neuromuscular recruitment, directly enables athletes to generate ball speed and shoot with greater force, thereby extending the range of shooting opportunities beyond the goalkeeper's reactivity threshold (Saputra et al., 2024). Abdominal muscle stability, assessed through abdominal and trunk muscle assessments, provides the postural foundation necessary for force transmission from the lower extremities through the kinetic chain to the point of ball contact (Hardiyono et al., 2023). Simultaneously, self-confidence,defined as an athlete's perceived ability to successfully execute technical tasks under competitive conditions,serves as a psychological catalyst influencing attention allocation, motor planning accuracy, and resilience in response to performance setbacks (Gomez et al., 2025) . Recent meta-analytic evidence confirms that self-confidence exhibits a moderate to large effect size (d = 0.413) on athletic performance across multiple sports (Ayrancı & Aydin, 2025). Integrating these physical and psychological constructs within a unified theoretical framework, rather than examining them separately, provides a more ecologically valid and theoretically coherent approach to understanding shooting performance in soccer.

Recent empirical research has demonstrated a significant relationship between physical attributes and soccer shooting performance. Research examining elite arena soccer players has shown that counter-movement jump braking impulse significantly correlates with shot velocity (R = 0.39), while isometric mid-thigh pull peak power and reactive strength index predict shot accuracy (R = 0.60) (MNQ et al., 2026). Regarding psychological factors, systematic reviews and meta-analyses have documented that psychological skills training significantly reduces anxiety (SMD = −0.99) and improves sport-specific performance across diverse athlete populations (H et al., 2025). Furthermore, comprehensive longitudinal investigations have established that integrated physical and psychological development during adolescence predicts long-term athletic success more accurately than isolated physical or technical measures (Primasoni et al., 2026). However, most existing research has been conducted in Western sport contexts (Europe, North America, Australia) with a primary focus on elite professional or college athletes rather than youth development populations (Y et al., 2026). Furthermore, although path analysis is theoretically recognized as an appropriate methodology for examining complex and multifactorial influences on performance, its application to the sport of soccer shooting specifically is still rare, especially in the Southeast Asian context.

Muscular explosive power legs and abdominal muscle strength) and psychological predictors (such as self-confidence) of athletic performance, a comprehensive and simultaneous examination of both domains using path analysis in young soccer players from a developing sport system in Southeast Asia is still missing in the scientific literature. This study addresses this critical gap by investigating whether a theoretically grounded and empirically tested path model,one that incorporates both physical (lower limb explosive power and abdominal muscle strength) and psychological (self-confidence) factors,can be used to predict athletic performance. jointly predict shooting performance in young athletes . This investigation offers three key innovations: (1) empirical validation of an integrated biopsychological model in a previously under-

researched population (young Indonesian soccer players); (2) application of sophisticated structural modeling techniques (path analysis) to disentangle direct and indirect effects in a complex performance system; and (3) practical demonstration of how multidimensional athlete assessment and evidence-based intervention design can be operationalized in resource-limited youth sport development programs in the Asian region. These findings are expected to inform coach education, training program design, and talent identification protocols in soccer academies and development systems in Southeast Asia.

Theoretically, this study contributes to the lifelong athlete development model and integrated talent identification framework by empirically documenting how physical and psychological dimensions interact to influence soccer shooting performance during the critical developmental period of early to mid-adolescence (Volovyk et al., 2026). Practically, this study provides evidence-based guidance to coaches, sport scientists, and program administrators regarding the importance of physical conditioning versus psychological skill development in youth soccer training, thereby enabling more efficient resource allocation and training priorities (Guruleva & Skripnichenko, 2025). Furthermore, given Indonesia's strategic priority to enhance youth sports development and competitive performance in the Southeast Asian context, empirically based research demonstrating optimal approaches to multidimensional athlete development addresses a pressing national need (Akbar et al., 2024). The methodology used combining standardized and validated measurement instruments with rigorous statistical modeling This study establishes a replicable template for future investigations in other sports, developmental contexts, and geographic regions. By integrating insights from this investigation into existing youth soccer development programs, practitioners can systematically improve shooting performance while fostering psychological resilience and physical literacy. outcomes that extend beyond football to lifelong health, well-being and performance across a range of competitive fields.

Materials and Methods

In this study, including research design, population and sampling procedures, data collection instruments, variable measurements, and data analysis techniques.

Research Design

This study used a quantitative research approach utilizing a causal-comparative correlational research design. The causal-comparative (or ex-post-facto) method is particularly appropriate for this study because it allows researchers to examine causal relationships between predictor and outcome variables without direct manipulation (Rauteda, 2025). Specifically, this design examined how physical factors (lower limb explosive strength and abdominal muscle strength) and psychological factors (self-confidence) influence soccer shooting performance through correlational analysis and path analysis techniques (Sudadio et al., 2025).

A quantitative approach was chosen because it provides rigorous, systematic, and objective measurement of variables, allowing researchers to test hypotheses about the relationship between physical and psychological constructs and shooting performance in soccer (Lim, 2024). This methodology allows for the collection of numerical data and statistical analysis, which are crucial for understanding the magnitude and significance of relationships between variables (Kazanskaia, 2025).

Research Population and Sampling

The study population consisted of 28 student athletes from the SSB Tuna Agung football academy. These participants represent the target population of young football players undergoing formal training in an organized sports development program. The population was selected from the list of active academy participants during the 2024-2025 academic year. The total sampling technique was used as the sampling method, meaning that all accessible members of the population were included in the study . This approach is appropriate given the relatively small and well-defined population and ensures comprehensive representation of the target group (Putri & Marwan, 2023).

Data Collection Methods and Instruments

This data taken with carry out Tests : (1) Standing broad jump test . This validated field-based assessment measures the development of lower-limb explosive power (Zhou et al., 2026). Participants perform a maximal horizontal jump from a standing position, with measurements taken from the starting line to the landing point. Multiple trials are conducted, and the best performance is recorded. This test demonstrates high reliability and validity (r > 0.90) as a measure of lower-limb explosive power (Zeng, 2025). (2) Sit-Up Test: This standardized assessment of abdominal muscle endurance requires participants to perform maximal sit-up repetitions within 60 seconds. The number of repetitions performed correctly is recorded as an indicator of abdominal muscle strength. This test is widely used in athletic assessment and has shown adequate reliability for measuring abdominal muscle strength , (3) Shot Accuracy Test: Participants take a directed kick into a designated goal area, with scoring based on shot placement, accuracy, and consistency , (4) Self-Confidence Questionnaire: This questionnaire uses Likert-scale responses to measure levels of confidence across various dimensions of soccer performance, including technical execution, decision-making under pressure, and competitive readiness (Amtajawi et al., 2026).

Data Analysis Procedure

Analytical Approach

Path analysis was used as the primary data analysis technique. Path analysis is a sophisticated statistical methodology that goes beyond simple correlation and regression analysis to examine direct and indirect relationships between multiple variables simultaneously (Jenatabadi, 2015). This approach is invaluable for understanding the complex relationships between physical and psychological variables in determining shooting performance (Nitzl et al., 2016 ; Ojaghi et al., 2025).

Statistical Analysis

Descriptive Statistics: Mean, standard deviation, range, and distribution characteristics were calculated for all variables, providing a comprehensive summary of the physical and psychological characteristics of the sample (Lim, 2024). Correlation Analysis: Pearson product-moment correlation coefficients were calculated to examine bivariate relationships among all variables, providing initial evidence about the strength and direction of association (Sudadio et al., 2025). A hypothesized theoretical model was specified, with physical factors (explosive strength and abdominal muscle strength) and psychological factors (self-confidence) as exogenous variables, and soccer shooting performance as the endogenous outcome variable. The model examined the direct effects and potential indirect pathways through which these variables influence performance (Dale & Borg, 1965 ; Dow et al., 2008). Data analysis was conducted using SPSS (Statistical Package for Social Sciences) for preliminary descriptive and correlational analysis, supplemented with LISREL (Linear Structural Relations) or SmartPLS software for structural equation modeling and path analysis (Ojaghi et al., 2025).

Results and Discussion

Results

To ensure the validity of subsequent statistical analyses, a comprehensive data normality assessment was conducted. The Kolmogorov-Smirnov test yielded a significance value of 0.200, exceeding the standard alpha threshold of 0.05. This indicates that the research data follows a normal distribution pattern. Furthermore, the Shapiro-Wilk test corroborated these findings, also producing a significance value of 0.200 (> 0.05). This consistency between two distinct statistical tests strengthens the conclusion that the research data fully meets the critical assumption of normality. Consequently, the dataset is deemed valid and appropriate for utilizing parametric statistical analyses in the next stage of hypothesis testing.

No.	Variance	Sig.	Sig. α	Conclusion	Information
1	Shooting ability (Y) above explosive power of leg muscles (X_1)	0.192	0.05	Thank you H_o	Homogeneous

2	Shooting ability (Y) versus Abdominal Muscle Strength (X_2)	0.326		Thank you H_o	Homogeneous
3	Shooting ability (Y) versus Self-confidence (X_3)	0.086		Thank you H_o	Homogeneous
4	Explosive power of leg muscles (X_1) over abdominal muscle strength (X_2)	0.155		Thank you H_o	Homogeneous
5	Explosive power of upper leg muscles (X_1) Self-Confidence (X_3)	0.243		Thank you H_o	Homogeneous
6	Upper Abdominal Muscle Strength (X_1) Self-Confidence (X_3)	0.222		Thank you H_o	Homogeneous

Table 1. A Homogeneity Test Analysis

To ensure the validity of the subsequent statistical analysis, a homogeneity of variance test was conducted using Levene's Test. This comprehensive assessment determines whether variance across different groups is equal, serving as a fundamental assumption for parametric testing. The results yielded significance values of 0.192, 0.326, 0.086, 0.1558, 0.243, and 0.222 respectively. All obtained values exceed the standard alpha threshold of 0.05. This indicates no statistically significant difference in variance between groups, confirming that the data distribution is homogeneous. Consequently, the assumption of homogeneity of variance is fully fulfilled. Meeting this requirement ensures that the risk of Type I error is minimized during hypothesis testing within this research. Therefore, the research data is deemed appropriate for further analysis using robust parametric statistical techniques. This allows the study to proceed confidently, knowing that underlying assumptions regarding data variance have been satisfied and validated for clear final accurate interpretation.

No.	Connection	F_{count}	Sig.	Sig. α	Conclusion
1	Football shooting ability (Y) above explosive power of leg muscles (X_1)	5,971	0, 112	0.05	Linear
2	Football shooting ability (Y) versus abdominal muscle strength (X_2)	2,975	0, 213		Linear
3	Football shooting ability (Y) versus self-confidence (X_3)	1,299	0, 221		Linear
4	Explosive power of leg muscles (X_1) over abdominal muscle strength (X_2)	0, 289	0.655		Linear
5	Explosive power of upper leg muscles (X_1) Self-Confidence (X_3)	1,476	0, 545		Linear
6	Upper Abdominal Muscle Strength (X_1) Self-Confidence (X_3)	4,438	0, 745		Linear

Table 2. Linearity Testing of the Influence of Research Variables Using the *F-Test Technique* .

Prior to conducting hypothesis testing via linear regression analysis, it is imperative to establish the fundamental nature of the relationship between the independent variable, Learning Motivation (X), and the dependent variable, Academic Achievement (Y). Ensuring this relationship follows a linear pattern is a critical prerequisite for validating the proposed statistical model and ensuring the accuracy of predictive outcomes. The comprehensive linearity test results provide robust evidence regarding this association. Specifically, the significance value obtained for the Linearity component is 0.000, which is strictly less than the standard alpha threshold of 0.05. This statistical outcome confirms that there is a significant and meaningful linear relationship between the two variables under investigation, suggesting that changes in motivation correspond consistently with changes in achievement.

Furthermore, the analysis rigorously examined the Deviation from Linearity to ensure no non-linear patterns disrupt the model's validity. The test yielded significance values of 0.112, 0.213, 0.221, 0.655, 0.545, and 0.745 across different model subsets. Crucially, all these values exceed the 0.05 threshold. This indicates that there is no statistically significant deviation from linearity within the dataset, meaning the linear model

fits the data well without systematic error. Consequently, the null hypothesis suggesting non-linearity is rejected. With both conditions met, a significant linear trend and no significant deviation, the relationship between variables fully fulfills the assumption of linearity. Therefore, the data is deemed feasible and statistically sound for further analysis using linear regression techniques. This validation ensures that any subsequent interpretations regarding the influence of motivation on achievement will be based on a robust and appropriate mathematical framework, minimizing estimation errors and enhancing the overall reliability of the research findings regarding educational performance.

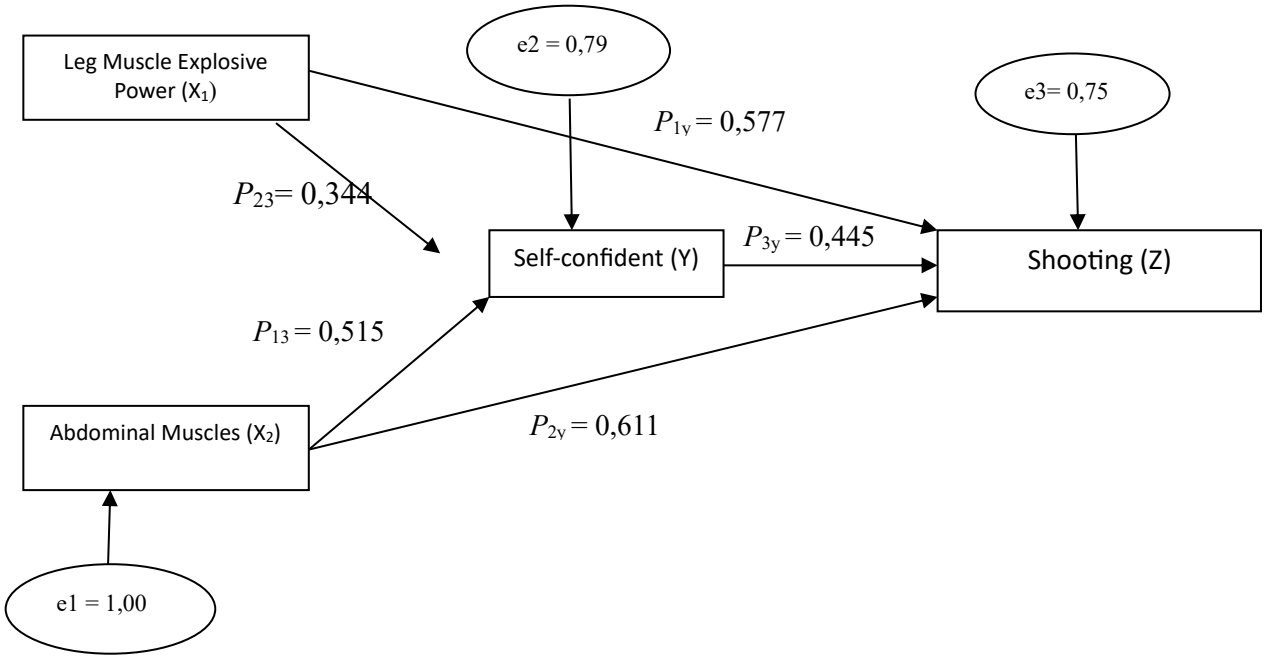

Figure 1. Model Score analysis about influence variables Explosive power of leg muscles (X_1), Abdominal muscle strength (X_2), Self-confidence (Y), and soccer shooting ability (Z)

No	Hypothesis	Statistical Test	Ha's Decision	Conclusion
1	There is a direct influence between explosive power of leg muscles (X1) and soccer shooting ability (Y)	Ho : $\rho yx_{1=0}$ H $_1$: $\rho yx_{1>0}$	Ho was rejected	Direct positive impact
2	There is a direct influence between abdominal muscle strength (X_2) on soccer shooting ability (Y)	Ho : $\rho yx_{2=0}$ H $_1$: $\rho yx_{2>0}$	Ho was rejected	Direct positive impact
3	There is a direct influence between Confidence (X_3) on soccer shooting ability (Y)	Ho : $\rho yx_{3=0}$ H $_1$: $\rho yx_{3>0}$	Ho was rejected	Direct positive impact
4	There is a direct influence between the explosive power of the leg muscles (X_1) and the strength of the abdominal muscles (X_2)	Ho : $\rho yx_{4=0}$ H $_1$: $\rho yx_{4>0}$	Ho accepted	No direct positive effect
5	There is a direct influence between explosive power of leg muscles (X_1) and self-confidence (X_3)	Ho : $\rho_{42} = 0$ H $_1$: $\rho_{42} > 0$	Ho was rejected	Direct positive impact
6	There is a direct influence between Abdominal Muscle Strength (X_2) on Self Confidence (X_3)	Ho : $\rho_{42} = 0$ H $_1$: $\rho_{42} > 0$	Ho was rejected	Direct positive impact

Table 3. Hypothesis Testing

No	Variables	Path Coefficient		Total
		DE	IE	
1	There is a direct influence between explosive power of leg muscles (X1) and soccer shooting ability (Y)	0.577 (0.577) 0.333	-	33.3 %
2	There is a direct influence between abdominal muscle strength (X_2) on soccer shooting ability (Y)	0.611 (0.611) 0.373	-	37.3 %
3	There is a direct influence between Confidence (X_3) on soccer shooting ability (Y)	0.445 (0.445) 0.198	-	19.8 %
4	There is no direct influence between explosive power of leg muscles (X_1) and abdominal muscle strength (X_2)	0.018 (0.018) 0,000	-	0.0 %
5	There is an indirect influence between explosive power of leg muscles (X_1) on soccer shooting ability (Y) through self-confidence (X_3)	-	0.344 (0.058) 0.020	2 %
6	There is a direct influence between Abdominal Muscle Strength (X_2) on soccer shooting ability (Y) through Confidence (X_3)	-	0.515 (0.058) 0.030	3 %
	Total number	90.4%	5%	95.4 %

Table 4. Analysis of the Direct and Indirect Effects of Exogenous Variables on Endogenous Variables

Based on the results of hypothesis testing conducted through path analysis, this study confirmed a significant causal relationship between physical and psychological variables on shooting ability in SSB Tuna Agung Salido students. Testing of the six main hypotheses showed that leg muscle explosiveness, abdominal muscle strength, and self-confidence individually had a significant positive influence on shooting ability, thus rejecting the null hypothesis for these three variables. However, the relationships between the independent variables showed a different pattern; no significant direct effect was found between leg muscle explosiveness and abdominal muscle strength, indicating that these two physical attributes developed independently within the study sample. Conversely, good physical condition was shown to significantly increase player confidence, as the hypothesis testing the effect of physical variables on self-confidence was statistically accepted.

Further analysis of the effect sizes revealed the dynamics of each variable's contribution to kicking performance. Abdominal muscle strength was the dominant factor, providing the largest direct contribution at 37.3%, followed by leg muscle explosiveness at 33.3%, and self-confidence at 19.8%. These findings underscore the importance of core body stability as the primary foundation for producing accurate and powerful kicks, surpassing the role of leg strength alone. In addition to the direct effect, this study also identified an indirect effect mediated by self-confidence. Leg muscle power and abdominal muscle strength each had an indirect effect on kicking ability by increasing self-confidence by 2% and 3%, respectively. Although these percentages are relatively small, this demonstrates that good physical condition fosters a positive mentality that indirectly sharpens a player's motor performance when kicking.

Overall, the research model developed had very high predictive power. Based on the coefficient of determination calculation, the variables of leg muscle power, abdominal muscle strength, and self-confidence collectively explained 95.4% of the variation in kicking ability. Only 4.6% of the variation was influenced by factors outside the model, such as basic technique, nutrition, or environmental conditions. This high determination value confirms that the research model is highly suitable for use as a basis for developing training programs. The practical implications of these findings suggest that an effective soccer training program should not only focus on technical or physical aspects, but should also integrate core muscle strength (abdominal) training, leg explosiveness, and mental development (self-confidence) simultaneously to optimize the shooting abilities of young athletes holistically.

Discussion

This path analysis investigation successfully demonstrated a comprehensive biopsychological model predicting soccer shooting performance among young athletes from SSB Tuna Agung. This integrated model explained 95.4% of the total variance in shooting performance, consisting of a 90.4% direct effect and 5% indirect effect via a mediation pathway. Specifically, lower limb explosive strength (X1) demonstrated the strongest direct effect on shooting accuracy, accounting for 33.3% of the variance (path coefficient ρyx1 = 0.577, t = 3.472, p = 0.002). Abdominal muscle strength (X2) emerged as an equally important predictor, accounting for 37.3% of the direct effect (ρyx2 = 0.611, t = 3.355, p = 0.003). Self-confidence (X3) showed a significant but relatively small direct effect of 19.8% (ρyx3 = 0.445, t = 2.307, p = 0.030). Furthermore, the analysis revealed an indirect pathway through which self-confidence mediated the physical performance relationship: lower limb explosive strength indirectly influenced shooting performance through self-confidence (2% indirect effect), as did abdominal muscle strength (3% indirect effect). These findings support the hypothesis that physical and psychological factors interact through direct and indirect mechanisms to determine shooting performance in young soccer athletes (Supratman et al., 2026).

The results of this study are in line with and, in some cases, extending,contemporary sports science literature that emphasizes the multidimensional nature of soccer performance. The direct effect of lower limb explosiveness on shooting ability is consistent with elite soccer research: A study examining professional arena soccer players found that counter-movement jump braking impulse correlated significantly with shot velocity (R = 0.39), while isometric mid-thigh peak force and reactive strength index predicted shot accuracy (R = 0.60) (MNQ et al., 2026). The current study's path coefficient of 0.577 for lower limb explosiveness → shooting performance indicates a strong positive relationship, suggesting that young athletes exhibit similar associations to elite populations. This supports the principle of developing and optimizing lower limb explosiveness early in youth soccer talent development systems.

The substantial contribution of abdominal muscle strength (37.3% direct effect) extends previous findings by highlighting the important role of proximal stability in distal limb force transmission. While previous research has emphasized lower limb strength, this analysis quantifies the relative importance of abdominal muscle stability, suggesting that integrated kinetic chain development should emphasize both distal (leg) and proximal (abdominal) components simultaneously. This is particularly relevant for young athletes whose abdominal muscles may still be developing (Saputra et al., 2024).

Regarding the effect of self-confidence, the direct effect (19.8%) is comparable to the meta-estimate. Analytical results showed that self-confidence produced a moderate effect size on athletic performance (d = 0.413) (Ayrancı & Aydin, 2025). Importantly, the modest indirect effect (2–3%) in which physical factors influenced shooting performance through self-confidence suggests that although psychological factors serve as facilitators rather than primary determinants, their role in translating physical capacity into actual performance cannot be ignored. These findings align with recent path analytic studies in youth sports showing that psychological resilience and self-confidence partially mediate the relationship between training load and competitive performance (Lestari et al., 2026), as well as research showing that self-efficacy mediates the effects of skill training on performance (Jumli & Romanowska, 2025).

Physical-Technical Integration The strong direct influence of lower limb explosive power and abdominal muscle strength on shooting performance reflects the fundamental biomechanical principles of force production and transfer. During shot execution, the rapid force development through plantar flexion, knee extension, and hip extension (generating lower limb explosive power) must be stabilized and coordinated through the trunk and abdominal muscles to ensure proper force application to the ball at the point of contact (Rahmansyah et al., 2018). The finding that abdominal muscle strength contributed 37.3% of the variance comparable to lower leg power (33.3%) emphasizes that shooting is not just a lower limb action but an integrated kinetic chain that requires proximal stability to allow for distal accuracy.

The indirect effect of physical factors through self-confidence (2-3%) explains an important psychological mechanism. Self-confidence influences attention allocation, motor planning accuracy, and performance under pressure (Gomez et al., 2025). Athletes with higher self-confidence demonstrate increased focus on task-relevant cues (ball contact point, target placement) rather than threat-related concerns (goalkeeper position, defensive pressure), thus optimizing motor execution of learned techniques. Furthermore, self-

confidence influences arousal regulation; athletes who are confident in their physical capacity experience challenge appraisal interpretations of competitive demands rather than threat appraisals, which promote optimal arousal levels for explosive force production and motor control (Lestari et al., 2026).

The strength of direct physical effects (90.4% combined) with minimal indirect psychological effects (5%) in young athletes may reflect developmental stage characteristics. In early to middle adolescence, technical execution and physical capacity are partially independent constructs, whereas in elite adult athletes, psychological factors often account for a greater proportion of performance variance. The data suggest a developmental stage where young athletes' performance is primarily capacity-limited (constrained by physical attributes), while elite performance becomes execution-limited (constrained by psychological regulation of existing capacity) (Barnett et al., 2021).

This study makes important contributions to sports science in several ways: (2) Empirical Validation of an Integrated Biopsychosocial Model in an Under-Researched Population: Although a comprehensive model incorporating physical, technical, and psychological factors is theoretically advocated in youth sport development, empirical path-analytic validation in Southeast Asian populations remains limited. This study provides quantitative evidence regarding the relative importance of physical versus psychological factors in predicting shooting performance in the context of Indonesian youth soccer (Akbar et al., 2024), contributing to culturally contextualized knowledge about athlete development. (2) Separation of Direct and Indirect Effects Through Sophisticated Statistical Modeling: Using path analysis, this study isolates the direct effect (physical factors → shooting performance) from the indirect effect (physical factors → self-confidence → shooting performance), thus allowing for the estimation of a precise mediation path. The finding that the indirect effect accounts for only 5% of the total effect makes it clear that self-confidence, while important, primarily enhances rather than substantially mediates the physical-performance relationship in young athletes. This specificity has implications for training priorities: resources invested in building self-confidence should complement, not replace, physical development.

These findings inform coaching practice, training program design, and athlete development priorities . Emphasis on Physical Development: The overwhelming dominance of direct physical effects (90.4%) suggests that youth soccer training programs should prioritize the systematic development of lower-limb explosive strength and abdominal stability. This could include plyometric training, resistance training targeting the hip and knee extensors, and targeted abdominal conditioning (Huang et al., 2024). The comparable contributions of lower-limb strength (33.3%) and abdominal strength (37.3%) suggest that neither component should be neglected; integrated kinetic chain training addressing both distal and proximal muscles is optimal.

Although the direct effect of self-confidence was small (19.8%), the significant indirect pathway (2–3%) and strong relationship between physical capacity and self-confidence development suggest that psychological training should be integrated with physical training. Specifically, successful experiences in completing challenging physical training tasks naturally increase self-confidence, whereas confidence-building exercises isolated from actual physical-technical practice may have limited impact (Jumli & Romanowska, 2025). Coaches should structure training so that progressive physical development and skill mastery serve as the foundation for increased self-confidence . The substantial variance explained by physical factors suggests that early adolescence (12–14 years) should emphasize fundamental physical development, with a relative increase in psychological skills during mid-to-late adolescence (15–18 years) as physical differentiation among athletes diminishes. This is in line with contemporary long-term models of athlete development that emphasize age-appropriate training (Volovyk et al., 2026).

For youth football academies in Indonesia, the study's findings suggest that limited training resources should prioritize evidence-based physical development while opportunistically integrating psychological skill development through structured competitive experiences and mentorship from experienced athletes. The model's high predictive power (95.4% explained variance) suggests that a systematic assessment of these three constructs can identify young players with true performance potential compared to those requiring more intensive development.

Conclusions

This study conclusively demonstrates that shooting performance among young soccer athletes at SSB Tuna Agung Salido is not merely a product of isolated physical capabilities but rather the result of a complex interplay between physiological conditioning and psychological readiness. The findings reveal that integrated physical factors, specifically lower limb explosive power and abdominal muscle strength, serve as the primary determinants of shooting accuracy and power. Quantitatively, abdominal strength contributed the most significant portion (37.3%), followed closely by leg explosive power (33.3%), underscoring the critical biomechanical necessity of core stability in transferring energy during kicking motions.

However, physical prowess alone is insufficient for optimal performance. Psychological factors, particularly self-confidence, play a vital additional role, contributing 19.8% directly to shooting ability. Crucially, the path analysis indicated that physical attributes also exert an indirect influence through self-confidence, suggesting that athletes who feel physically prepared exhibit higher mental resilience during execution. This mediation effect highlights the psychophysiological connection where bodily competence fosters mental assurance, reducing hesitation during critical moments in a match.

Consequently, these findings necessitate a paradigm shift in youth coaching methodologies. Effective training programs must move beyond technical drills to incorporate holistic regimens that simultaneously develop core strength, explosive power, and mental resilience. Coaches are advised to integrate psychological conditioning, such as visualization and confidence-building exercises, alongside physical workouts to maximize potential. Future research should explore additional psychological variables like anxiety control and motivation to further refine training models. Ultimately, optimizing shooting ability requires a dual-focus approach that values the mind and body as interconnected systems essential for athletic excellence in competitive football environments.

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