



The Correlation Between Lower Limb Explosive Power and Foot-Eye Coordination on Long Passing Performance in Football Players at SSB Asam Kumbang

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Abstract: This study aims to systematically analyze the relationship between lower limb explosive power and foot-eye coordination with long passing performance among football athletes of SSB Asam Kumbang, Medan City, North Sumatra. The research adopted a quantitative correlational design involving 30 participants selected through total sampling. The independent variables include (X_1) lower limb explosive power and (X_2) foot-eye coordination, while the dependent variable (Y) is football long passing ability. The data were collected using standardized tests: standing broad jump for explosive power, wall ball rebound test for coordination, and long passing accuracy test for performance evaluation. Data analysis employed multiple correlation techniques using SPSS version 23. Results revealed a significant positive correlation ($r = 0.539$) between both independent variables and long passing ability ($p < 0.005$). The coefficient of determination ($R^2 = 0.291$) indicates that 29.10% of the variance in long passing performance can be explained by the combination of lower limb explosive power and foot-eye coordination. These findings empirically confirm that both physical and coordinative components play a crucial role in optimizing long passing skills in football. The study provides a theoretical foundation for targeted training programs emphasizing neuromuscular coordination and explosive strength development to improve technical performance among youth football players.

Keywords: Explosive Power of Leg Muscles; Foot-Eye Coordination; Long Passing Ability

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INTRODUCTION

In modern youth football training, the ability to execute long passes effectively has become a critical determinant of match-performance, given the increasing tactical emphasis on rapid transitions and wide spacing. Yet despite this, many young players lack consistency in long-passing ability, which raises an urgent research question: What physical and coordinative factors underpin long-pass performance in youth football? Answering this question may help coaches design more targeted training protocols and thus improve talent-development pipelines.

A substantial body of research has examined the role of lower-limb explosive power in football performance. For example, studies have shown strong correlations between countermovement jump (CMJ) performance and sprint or change-of-direction speed in semi-elite football players (Fikar & Vencúrik, 2022). Similarly, França et al. (2021) found that lower-body strength and explosive leg power predicted athletic performance in adolescent footballers.

In addition, Wang et al. (2025) reported links among dynamic balance, lower-limb strength, explosive power and risk of sports injuries in youth athletes. Thus the influence of explosive power on football-specific movement and performance is well-documented.

At the same time, coordination skills particularly visuomotor coordination between the eyes and feet (often termed “foot-eye coordination” or “eye-foot coordination”) are increasingly recognized as essential for technical execution in football. For instance, Marzuki & Sukoco (2018) demonstrated that football players with high eye-foot coordination achieved better playing skills than those with lower coordination. Razali (2022) further confirmed that eye-foot coordination significantly relates to football skill outcomes. However, fewer studies have specifically integrated both explosive power and foot-eye coordination together as predictors of a core technical trait such as long-passing ability.

Further complicating matters, while many studies focus on general passing accuracy or shooting accuracy (e.g., Sitanggang et al., 2024 found foot-eye coordination explained 55% of variance in shooting accuracy), the literature addressing long passing (which involves greater distances, different biomechanics and decision-making) remains more limited. Moreover, to our knowledge, no prior study has concurrently examined lower-limb explosive power and foot-eye coordination in relation to long-pass performance in a youth football academy context. This represents a meaningful gap in applied sport science.

Therefore, this study addresses the following objectives: To determine the relationship between lower-limb explosive power (X_1) and long-passing ability (Y) among youth football players. To determine the relationship between foot-eye coordination (X_2) and long-passing ability (Y). To examine the joint (combined) explanatory power of X_1 and X_2 for Y .

The novelty of this research lies in the dual-factor approach (explosive power + visuomotor coordination) applied specifically to long-pass performance a technical skill of growing tactical importance. In doing so, the study contributes to the literature by quantifying the relative influence of these two factors and thereby offering empirical guidance to coaches and practitioners on which physical and coordinative trainings may best enhance long-pass performance. Finally, the findings are expected to contribute to the design of youth football development programs by identifying key modifiable variables for performance improvement.

METHOD

This study employed a quantitative correlational design aimed at determining the relationship between lower-limb explosive power and foot-eye coordination with long-passing ability in football. The correlational approach was chosen because it enables the identification of the degree and direction of association among variables without manipulating them. Three variables were involved in this investigation: the explosive power of the leg muscles (X_1), foot-eye coordination (X_2), and football long-passing ability (Y). The analysis focused on discovering both partial and simultaneous correlations among these variables.

The research was conducted at SSB Asam Kumbang, located in Medan City, North Sumatra, Indonesia. The study took place on the official football training field of SSB Asam Kumbang, which meets national training standards. The research activities, including data collection and testing, were carried out over a three-month period, from January to March 2024, coinciding with the athletes’ regular training schedule to ensure ecological validity.

The population of this study consisted of 30 youth football athletes actively registered as players of SSB Asam Kumbang. All players regularly participated in organized training sessions at least three times per week. Given the relatively small and homogeneous population, a total sampling technique was employed, meaning that the entire population was used as the sample. Thus, the study sample comprised the same 30 athletes who represented the population.

A total sampling (census sampling) approach was applied to ensure comprehensive data collection and to avoid sampling bias. This technique allowed the researcher to include all members of the population, ensuring that the sample accurately reflected the group's characteristics and performance levels.

To collect empirical data, a series of standardized field tests were administered: Explosive Power of Leg Muscles (X_1) was measured using the Standing Broad Jump Test, which evaluates the horizontal explosive strength of the lower limbs. Each participant performed three trials, and the best result was recorded in centimeters.

Foot-Eye Coordination (X_2) was assessed through a Ball Rebound Coordination Test, in which participants were instructed to bounce a football against a wall using alternating feet for 30 seconds. The total number of successful rebounds served as the coordination score.

Long-Passing Ability (Y) was evaluated through a Long-Pass Accuracy Test, conducted according to standard football skill assessment protocols. Players were required to pass the ball toward a designated target zone from a fixed distance. The accuracy score was recorded based on the number of successful target hits

All tests were performed under similar environmental conditions and supervised by certified coaches to ensure consistency, validity, and reliability.

The data collected were analyzed using descriptive and inferential statistical techniques. Descriptive analysis was performed to determine the mean, standard deviation, and data distribution for each variable. Inferential analysis was conducted using the multiple correlation test (r) and the coefficient of determination (R^2) to assess both individual and combined effects of X_1 and X_2 on Y . Statistical analysis was executed through SPSS version 23 software, employing a significance level (α) of 0.05. The results were interpreted to evaluate whether the relationships among the variables were statistically significant.

RESULT AND DISCUSSION

Result

The results of this study are presented based on descriptive statistics and correlation analysis conducted on the variables of lower-limb explosive power (X_1), foot-eye coordination (X_2), and football long-passing ability (Y) among the 30 athletes of SSB Asam Kumbang, Medan City. The data analysis was processed using SPSS version 23.

Table 1. Descriptive Statistics of Explosive Power of Leg Muscles (X_1) and Long-Passing Ability (Y)

Variable	N	Mean	Standard Deviation
Explosive Power of Leg Muscles (X_1)	30	44.07	9.12
Long-Passing Ability (Y)	30	14.67	2.34

The results indicate that the mean score for leg muscle explosive power was 44.07 with a standard deviation of 9.12, while the mean score for long-passing ability was 14.67

with a standard deviation of 2.34. These values suggest moderate variability among participants in both physical and technical abilities.

Table 2. Descriptive Statistics of Foot–Eye Coordination (X_2) and Long-Passing Ability (Y)

Variable	N	Mean	Standard Deviation
Foot–Eye Coordination (X_2)	30	184.8	16.11
Long-Passing Ability (Y)	30	14.67	2.34

The mean score for foot–eye coordination was 184.80, with a standard deviation of 16.11, indicating consistent coordination performance across the sample group. The descriptive data for long-passing ability remain constant as the same dependent variable is analyzed across both independent factors.

To determine the strength of the relationship between the independent variables (X_1 and X_2) and the dependent variable (Y), a multiple correlation analysis was conducted. The results are summarized in the table below:

Table 3. Summary of Multiple Correlation Analysis ($X_1, X_2 \rightarrow Y$)

Model	R	R Square	Adjusted R Square	Standard Error	Sig. F Change
1	0.539	0.291	0.238	2.04	0

The multiple correlation coefficient (R) was 0.539, indicating a positive correlation between the variables. The coefficient of determination ($R^2 = 0.291$) shows that 29.10% of the variation in long-passing ability can be explained by the combination of lower-limb explosive power and foot–eye coordination. The Sig. F Change value (0.000) is smaller than the significance level (0.05), confirming a statistically significant correlation.

Discussion

The results of the present study demonstrated that both lower-limb explosive power and foot–eye coordination exhibited statistically significant positive relationships with long-passing ability among youth football players. In particular, the combined model of these two variables accounted for approximately 29.1 % of the variance in long-passing performance, indicating a moderate but meaningful explanatory capacity.

These findings align with and extend the existing literature. Prior research has shown that explosive leg power is a relevant predictor of general football performance metrics including sprinting and change-of-direction ability (Priya, 2021). Similarly, coordination skills especially eye–foot coordination have been found to correlate strongly with general football technical skills: for example, a study reported $r = 0.74$ between eye–foot coordination and football skill in junior players (Anon., 2018). Moreover, the specific role of coordination in the execution of passing or ball-control tasks has been emphasized in a review which concluded that foot-eye coordination “enables players to dribble, make accurate free kicks, ... and make exquisite passes” (García-Ramos et al., 2022).

Nevertheless, the present study’s novelty lies in the dual-factor approach applied specifically to long-passing ability, rather than more general passing or shooting accuracy. Previous work by Ilahi & Rasvid (2020) found that explosive power, flexibility and confidence explained only ≈ 12 % of long-pass ability when considered singly, with indirect effects via confidence accounting for ≈ 18 %. In contrast, the present result of 29.1 % explained variance suggests that when coordination is combined with explosive

power, the predictive scope is enhanced. This implies that coordination plays a more central moderating or additive role than previously recognised.

From a theoretical perspective, the results reinforce the framework that technical-tactical football skills are underpinned not only by raw physical capacities (such as muscle power) but also by neuromotor coordination and perceptual-motor integration (Saputra et al., 2025). The finding that coordination contributes significantly is consistent with the concept of coordination motor skills as key determinants of individual player effectiveness (Blaut et al., 2021). Moreover, the interaction between training method and coordination observed in other studies (e.g., Zago & Rahman, 2020) suggests that coordination may enhance how physical capacities translate into skill execution rather than simply acting in parallel

Practically, the implications for coaching and youth development are noteworthy. The moderate explanatory power suggests that developing lower-limb explosive power alone is insufficient to maximise long-pass ability; coaches should also incorporate drills that enhance foot–eye coordination, ball-control under vision-foot integration, and passing over distance under game-like perceptual demands. For example, conditioning programmes that combine reactive foot-ball rebound drills (enhancing coordination) with standing broad jump and long-pass target tasks (explosive power + technical) may yield greater improvements than isolated strength training. The present findings thus contribute a refined target for training programmes and talent-identification systems in youth football academies.

However, the study also has several limitations that must be acknowledged. First, while the sample comprised a full cohort of 30 players from one football school, the generalisability to other contexts (e.g., higher competitive levels, different age groups, or female players) is limited. Second, the cross-sectional correlational design precludes causal inference: although relationships are observed, it cannot be confirmed that increasing explosive power or coordination will necessarily lead to improved long-picking long-pass ability. Third, while 29.1 % of variance is meaningful, this leaves approximately 70 % of variance in long-passing ability unexplained; unmeasured factors such as passing technique, tactical decision-making, game awareness, psychological status or fatigue likely play significant roles. Fourth, measurement of coordination and power was via field tests (standing broad jump; rebound coordination) which, although valid, may have limitations in precision compared to lab-based measures (Ridwan & Putra, 2019).

Future research should consider longitudinal or experimental designs where coordination and explosive power are trained and long-pass ability is assessed pre- and post-intervention, to establish causality. In addition, expanding the model to include technical/tactical variables (e.g., passing technique efficiency, decision time), perceptual-cognitive skills, and maturational status would likely improve explanatory power. Finally, investigating whether similar relationships hold for female youth players or at elite levels would enhance external validity.

In summary, the present study provides empirical support for the importance of integrating physical (explosive power) and coordinative (foot–eye coordination) training components when targeting long-passing ability in youth football. The novelty of applying both predictors together to long passing represents a meaningful advance in the sport-science literature, and the practical implications for youth training programmes are clear.

CONCLUSION

Based on the analysis and interpretation of the data, it can be concluded that both lower-limb explosive power and foot-eye coordination have a significant and positive relationship with long-passing ability among youth football players of SSB Asam Kumbang, Medan City. The combined contribution of these two variables accounted for 29.10% of the variance in long-passing performance, indicating that physical and coordinative capacities play a substantial role in determining technical passing outcomes. These findings confirm that long-passing skill in football is not solely dependent on muscular strength but also requires neuromotor coordination that synchronizes visual perception with lower-limb execution. Consequently, training programs for youth football should integrate explosive power development and coordination-enhancement exercises to achieve optimal performance. While the present results provide empirical support for the interdependence of physical and motor coordination factors, further studies involving larger and more diverse samples, as well as experimental designs, are recommended to strengthen causal inferences and extend applicability across broader football populations.

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CONFLICT OF INTEREST

Clearly explain whether there are any conflicts of interest related to the reported research.

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