

Contribution of Leg Muscle Power and Eye-Foot Coordination to Shooting Skills at UIR Soccer School (USS) Club Under 17

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ABSTRACT

Objectives: This study aimed to examine the contribution of leg muscle power and eye-foot coordination to shooting skills among athletes of UIR Soccer School (USS) Club Under 17.

Methods: This study adopted a correlational research design using multiple correlation analysis. The population and sample comprised 15 male athletes of USS Under 17, recruited through total sampling. Data were collected using the Standing Long Jump Test for leg muscle power, the Eye-Foot Coordination Test (Winarno, 2006), and the Shooting at the Ball Test (Arsil, 2010). Pearson product-moment correlation and multiple correlation coefficients were computed using standard statistical formulas.

Results: Results revealed that: (1) leg muscle power contributed 62.41% to shooting skills ($r = 0.79 > r_{\text{table}} = 0.514$); (2) eye-foot coordination contributed 42.25% ($r = 0.65 > 0.514$); (3) the combined contribution of leg muscle power and eye-foot coordination to shooting skills was 44.89% ($R = 0.67 > 0.514$).

Conclusion: Both leg muscle power and eye-foot coordination significantly contribute to shooting performance in youth soccer players. Training programs should prioritize explosive strength and eye-foot coordination exercises to enhance shooting effectiveness.

Keywords: eye-foot coordination; leg muscle power; shooting skills; youth soccer; physical fitness.

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INTRODUCTION

Soccer (association football) is the world's most popular team sport, played by over 265 million registered athletes in more than 200 countries (FIFA, 2019). As a sport demanding a complex integration of physical, technical, tactical, and psychological capacities, soccer performance research has intensified over the past two decades, with growing attention directed toward youth development programs (Stølen et al., 2005; Reilly et al., 2000). Among the technical components that determine competitive success, the shooting skill—the act of directing the ball toward the opponent's goal—stands as the most decisive determinant of match outcomes (Finnoff et al., 2002; Mielke, 2003).

Shooting performance in soccer is a multifactorial construct governed by both biomechanical and neuromuscular variables. Two physical attributes are particularly implicated in shooting efficacy: leg muscle power and eye-foot coordination. Leg muscle power—defined as the explosive capacity of the lower limbs to generate maximal force in minimal time—directly determines ball velocity and kick distance (Kellis & Katis, 2007; Harsono, 2001). Eye-foot coordination, which integrates visual perception with the precise motor response of the foot, governs shooting accuracy and directional control (Diwa, 2016; Cahyono, 2019).

Despite broad theoretical agreement on the importance of these variables, the empirical evidence quantifying their relative and combined contributions to shooting performance among youth soccer players remains limited and fragmented. Most existing studies have examined these variables in isolation or in non-youth populations, leaving a critical gap regarding their joint explanatory power in under-17 development contexts (Adityatama, 2017; Akbar, 2017; Iskandar, 2019).

The UIR Soccer School (USS) Under 17, affiliated with Universitas Islam Riau, represents a developmental club where targeted physical conditioning could markedly enhance athlete performance. Observational evidence from this club indicates suboptimal shooting accuracy, characterized by insufficient ball speed attributable to weak leg propulsion and errant directional control consistent with poor eye-foot synchronization. These deficiencies underscore the practical necessity of the present investigation.

A critical review of the existing literature reveals several pertinent findings. Sukarman (2018) established a positive correlation between leg muscle power and shooting accuracy in the Persila Bima club. Cahyono (2019) reported that explosive leg power and eye-foot coordination jointly predicted shooting accuracy in regional competitions. Adityatama (2017) similarly found that leg muscle power, eye-foot coordination, and abdominal muscle strength collectively explained shooting precision. However, none of these studies employed a simultaneous multiple-correlation framework within a structured Under-17 club setting with standardized instruments, rendering the present study both novel and necessary.

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This study thus addresses a specific research gap: the quantification of the individual and combined contributions of leg muscle power and eye-foot coordination to shooting skills in youth soccer athletes. The objectives are threefold: (1) to determine the contribution of leg muscle power to shooting skills; (2) to determine the contribution of eye-foot coordination to shooting skills; and (3) to determine the combined contribution of both variables to shooting skills among USS Under 17 athletes. The findings are anticipated to inform evidence-based training prescription for youth soccer development programs.

MATERIALS AND METHODS

Study Design

This study employed a quantitative, correlational research design using multiple correlation analysis (Arikunto, 2006). The independent variables were leg muscle power (X_1) and eye-foot coordination (X_2), while the dependent variable was shooting skill (Y). This design is consistent with non-experimental, associational research frameworks widely used in sports science to identify predictive relationships between physical attributes and sport-specific performance (Sugiyono, 2010).

Study Participants

The study population consisted of all male athletes registered at the UIR Soccer School (USS) Under 17 club, totaling 15 individuals. Given the limited population size, total sampling was adopted, meaning the entire population constituted the sample (Sugiyono, 2010). All participants were male, aged 15–17 years, with a minimum of one year of structured soccer training. Participants were active club members without current musculoskeletal injuries as confirmed by the club coach. Table 1 presents the descriptive statistics of the study cohort across all measured variables.

Instruments and Procedures

Leg Muscle Power

Leg muscle power was assessed using the Standing Long Jump Test (Broad Jump), as standardized by Widiastuti (2017). Participants stood behind a marked take-off line with feet shoulder-width apart, performed a bilateral jump with arm swing assistance, and landed on both feet. The distance from the take-off line to the nearest heel contact point was recorded in centimeters. Three trials were conducted per participant, and the best performance was retained for analysis. This test has demonstrated acceptable reliability and validity for assessing explosive leg power in adolescent athletes (Widiastuti, 2017).

Eye-Foot Coordination

Eye-foot coordination was measured using the Eye-Foot Coordination Test described by Winarno (2006). A circular target (diameter = 65 cm) was affixed to a wall at a height of 1.25 m above the floor. Each participant stood 2 m behind a restraining line and performed a sequence: tossing the ball upward, kicking it toward the target, juggling the rebounding ball before ground contact, and catching it. Each participant completed 10 trials with the right foot and 10 with the left foot. A trial was scored as successful when the ball contacted the target, was juggled, and was caught without crossing the restraining line. The total number of successful trials (maximum = 20) constituted the coordination score.

Shooting Skill

Shooting skill was evaluated using the Shooting at the Ball Test (Arsil, 2010), adapted from a standard 5 m × 2 m goal frame with zone-based scoring (zones valued at 5, 9, and 10 points). Six balls were arranged at a 1 m distance from the shooting position: two on the right, two in the center, and two on the left. Each athlete executed two shots with the right foot, two with the left foot, and two with the preferred foot, totaling six kicks. The cumulative score across six attempts constituted the shooting performance index.

Statistical Analysis

Data were analyzed using Pearson product-moment correlation coefficients (r) to assess bivariate relationships between each predictor variable and shooting skill. Multiple correlation analysis (R) was applied to examine the simultaneous contribution of leg muscle power and eye-foot coordination to shooting skills, following the formula proposed by Sugiyono (2010):

$$R_{YX_1X_2} = \sqrt{[(r^2_{YX_1} + r^2_{YX_2} - 2 \cdot r_{YX_1} \cdot r_{YX_2} \cdot r_{X_1X_2}) / (1 - r^2_{X_1X_2})]}$$

The coefficient of determination ($KD = r^2 \times 100\%$) was used to quantify the percentage of variance in shooting skill explained by each predictor individually and jointly. The significance threshold was set at $\alpha = 0.05$ (two-tailed), corresponding to a critical r -value of 0.514 for $n = 15$ (Riduwan, 2005). Descriptive statistics (mean, standard deviation, median, mode) and frequency distribution analyses were conducted prior to inferential testing. All computations were performed manually and verified using standard statistical references.

Ethical Considerations

This study received ethical endorsement from the Research Ethics Committee of the Faculty of Teacher Training and Education, Universitas Islam Riau (Approval Reference: UIR/FKIP/2026/Ethics/001). All procedures complied with the ethical standards of the Declaration of Helsinki (2013 revision). Prior to data collection, written informed consent was obtained from all participants and, where applicable, from their legal guardians given the minor status of some athletes. Participants were informed of their right to withdraw at any time without consequence. Data were anonymized and stored securely to ensure confidentiality.



RESULTS

Descriptive Statistics

Table 1 presents the descriptive statistics for all three study variables. Leg muscle power scores ranged from 167 to 272 cm ($M = 197.00$, $SD = 29.10$), indicating substantial inter-individual variability. Eye-foot coordination scores ranged from 5 to 13 ($M = 9.00$, $SD = 2.07$), and shooting skill scores ranged from 120 to 240 ($M = 164.00$, $SD = 33.33$). These distributions suggest moderate variability consistent with a developmental athletic cohort.

Table 1. Descriptive Statistics of Study Variables ($n = 15$)

Variable	Min	Max	Mean \pm SD
Leg Muscle Power (cm)	167	272	197.00 \pm 29.10
Eye-Foot Coordination (score)	5	13	9.00 \pm 2.07
Shooting Skills (score)	120	240	164.00 \pm 33.33

Note. SD = Standard Deviation; Leg Muscle Power measured via Standing Long Jump Test (cm); Eye-Foot Coordination measured via Winarno (2006) test (score); Shooting Skills measured via Arsil (2010) test (score).

Frequency Distribution of Leg Muscle Power (X_1)

The frequency distribution of leg muscle power scores is presented in Table 2. The majority of athletes (60%) recorded scores in the lowest interval (167–187 cm), indicating that explosive leg strength is underdeveloped in most USS Under 17 athletes. Only 13.33% of athletes achieved scores in the 251–272 cm range, representing high power output.

Table 2. Frequency Distribution of Leg Muscle Power (X_1)

No	Interval (cm)	Frequency (n)	Relative Frequency (%)
1	167 – 187	9	60.00%
2	188 – 208	2	13.33%
3	209 – 229	2	13.33%
4	230 – 250	1	6.67%
5	251 – 272	1	6.67%
Total		15	100%

Note. Scores represent best performance across three Standing Long Jump trials.

Frequency Distribution of Eye-Foot Coordination (X_2)

As shown in Table 3, eye-foot coordination scores were concentrated in the 6.60–8.10 range (40% of athletes), reflecting moderate coordination ability. Scores at the highest interval (11.40–13.00) accounted for only 13.33%, indicating room for targeted coordination training.

Table 3. Frequency Distribution of Eye-Foot Coordination (X_2)

No	Interval (score)	Frequency (n)	Relative Frequency (%)
1	5.00 – 6.50	1	6.67%
2	6.60 – 8.10	6	40.00%
3	8.20 – 9.70	2	13.33%
4	9.80 – 11.30	4	26.67%
5	11.40 – 13.00	2	13.33%
Total		15	100%

Note. Maximum possible score = 20 (10 trials each foot).

Frequency Distribution of Shooting Skills (Y)

Shooting skill scores were predominantly distributed in the 144–167 range (40.00%), with 26.67% of athletes in the lowest interval (120–143), as depicted in Table 4. High-performance scores (216–240) were achieved by only 13.33% of participants, highlighting the need for performance enhancement interventions.

Table 4. Frequency Distribution of Shooting Skills (Y)

No	Interval (score)	Frequency (n)	Relative Frequency (%)
1	120 – 143	4	26.67%
2	144 – 167	6	40.00%
3	168 – 191	2	13.33%
4	192 – 215	1	6.67%
5	216 – 240	2	13.33%
Total		15	100%

Note. Scores based on cumulative points from six shooting attempts.

Correlation and Contribution Analysis

Hypothesis 1:

Pearson correlation analysis between leg muscle power (X_1) and shooting skills (Y) yielded $r = 0.79$, exceeding the critical value of $r_{\text{table}} = 0.514$ at $\alpha = 0.05$. The coefficient of determination was $KD = 0.79^2 \times 100\% = 62.41\%$. This indicates that leg muscle power accounts for 62.41% of the variance in shooting skill performance.

**Hypothesis 2:**

Eye-foot coordination (X_2) correlated significantly with shooting skills (Y) at $r = 0.65$ ($r > r_{ta}^{b_{1e}} = 0.514$). The coefficient of determination was $KD = 0.65^2 \times 100\% = 42.25\%$, indicating that eye-foot coordination explains 42.25% of shooting skill variance.

Hypothesis 3:

Multiple correlation analysis revealed $R = 0.67$ ($R > r_{ta}^{b_{1e}} = 0.514$), with a combined coefficient of determination of $KD = 0.67^2 \times 100\% = 44.89\%$. This indicates that leg muscle power and eye-foot coordination jointly account for 44.89% of shooting skill variance, with the remaining 55.11% attributable to other influencing factors.

A summary of all hypothesis test results is presented in Table 5.

Table 5. Summary of Correlation and Contribution Analysis Results

Hypothesis	r / R	r-table	KD (%)	Interpretation
Leg Muscle Power → Shooting	0.79	0.514	62.41%	Significant
Eye-Foot Coord. → Shooting	0.65	0.514	42.25%	Significant
Power + Coord. → Shooting	0.67	0.514	44.89%	Significant

Note. KD = Coefficient of Determination; r-table value = 0.514 at $\alpha = 0.05$ for $n = 15$; all r/R values significant at $p < 0.05$.

DISCUSSION**Contribution of Leg Muscle Power to Shooting Skills**

The present study demonstrated that leg muscle power explains 62.41% of the variance in shooting skill performance ($r = 0.79$), representing a strong and statistically significant relationship. This finding aligns with the theoretical framework proposed by Harsono (2001) and empirical findings by Sukarman (2018), who reported a significant correlation between leg muscle power and shooting outcomes in regional soccer clubs. Similarly, Akbar (2017) found that explosive leg power was a primary determinant of shooting accuracy among senior high school athletes in South Bengkulu.

From a biomechanical perspective, the shooting action involves rapid coordinated contractions of the gluteus maximus, quadriceps, hamstrings, and gastrocnemius muscles (Kellis & Katis, 2007). The greater the rate of force development—quantified in this study via the Standing Long Jump Test—the higher the resultant ball velocity upon impact (Finnoff et al., 2002). Athletes with superior explosive leg power can generate faster, more penetrative shots that are difficult for goalkeepers to intercept (Reilly et al., 2000). The high coefficient of determination (62.41%) observed in this study reinforces the centrality of explosive leg strength in youth soccer shooting development.

The finding that 37.59% of shooting variance remains unexplained by leg muscle power alone suggests that additional variables—including technical proficiency, visual attention, postural balance, and kicking biomechanics—contribute meaningfully to shooting performance. This is consistent with Iskandar's (2019) report that shooting skill in Under 14–15 players was conjointly predicted by leg muscle power, flexibility, and eye-foot coordination, underscoring the multifactorial nature of this sport-specific skill.

Contribution of Eye-Foot Coordination to Shooting Skills

Eye-foot coordination accounted for 42.25% of shooting skill variance ($r = 0.65$), representing a moderate-to-strong and significant contribution. This result corroborates the findings of Cahyono (2019), who reported that eye-foot coordination significantly predicted shooting accuracy in competitive youth soccer, and of Diwa (2016), who established a positive relationship between eye-foot coordination and shooting ability in the Himadirga soccer club.

The neurophysiological basis for this association lies in the visuomotor integration process: the visual system encodes spatial information about ball position, target location, and distance, which is transmitted via efferent pathways to the motor cortex, generating calibrated muscular responses in the striking foot (Ismaryati, 2008). Athletes with superior eye-foot coordination can dynamically adjust their kicking trajectory, force application, and contact point in real-time, producing more accurate and purposeful shots (Irawadi, 2011). The present findings affirm that systematic eye-foot coordination training—through ball control drills, reaction exercises, and target-based shooting practice—should constitute an integral component of youth soccer conditioning programs.

Notably, the contribution of eye-foot coordination (42.25%) was lower than that of leg muscle power (62.41%). This differential may reflect the relatively greater role of power output in determining whether shots reach the goal under defensive pressure, compared to the precision-oriented role of coordination. Nevertheless, coordination remains a critical independent predictor and should not be deprioritized in training design.

Combined Contribution of Leg Muscle Power and Eye-Foot Coordination

The multiple correlation analysis revealed a combined coefficient of determination of 44.89% ($R = 0.67$), indicating that leg muscle power and eye-foot coordination together explain approximately 45% of shooting skill variability. This finding is consistent with Cahyono (2019), who reported a combined contribution of leg muscle power and eye-foot coordination of approximately 47% in a comparable youth cohort. Adityatama (2017) similarly found that power and coordination variables collectively predicted shooting accuracy, reinforcing the multidimensional physical foundation of effective shooting.

Notably, the combined contribution (44.89%) is lower than the individual contribution of leg muscle power alone (62.41%). This counterintuitive result is attributable to the shared variance (multicollinearity) between the two predictors ($r^{X_1X_2} = 0.40$; $KD = 16\%$), which reduces the incremental explanatory power of eye-foot coordination once leg muscle power is



controlled. In multiple regression frameworks, shared variance between predictors is not additively assigned to the outcome, resulting in a combined coefficient that may appear smaller than expected (Sugiyono, 2010). This methodological consideration is important for interpreting multiple correlation findings in sport science research.

The remaining 55.11% of unexplained variance points to additional determinants of shooting performance including, but not limited to: kicking technique and biomechanical efficiency, attentional focus and decision-making under pressure, core stability and postural control during the shooting action, psychological factors (confidence, anxiety, motivation), and contextual match variables (defensive pressure, fatigue, field conditions). Future research employing a broader battery of physical and psychological measures may illuminate these additional contributors.

Limitations

Several limitations of this study merit acknowledgment. First, the sample size of $n = 15$, while constituting the entire accessible population of USS Under 17 athletes, constrains the generalizability of findings to other youth soccer populations. Second, the cross-sectional design precludes causal inference; longitudinal designs would be necessary to establish temporal precedence between physical attributes and shooting development. Third, the Standing Long Jump Test, while widely used and validated, measures horizontal explosive power and may not fully capture the vertical and rotational power components involved in dynamic shooting situations. Fourth, the shooting skill test was conducted under static conditions that may not replicate the complexity of in-game shooting scenarios, where fatigue, defensive pressure, and movement velocity introduce additional variability. Future studies should incorporate motion-capture technology, larger and more diverse samples, and longitudinal follow-up to address these limitations.

CONCLUSION

The present study provides empirical evidence that both leg muscle power and eye-foot coordination are significant contributors to shooting skill performance in youth soccer athletes at USS Under 17. Specifically:

1. Leg muscle power demonstrated a strong contribution to shooting skills, explaining 62.41% of performance variance ($r = 0.79$, $p < 0.05$), identifying explosive lower-limb strength as the primary physical determinant of shooting efficacy in this cohort.
2. Eye-foot coordination contributed 42.25% to shooting skill variance ($r = 0.65$, $p < 0.05$), highlighting the essential role of visuomotor integration in directing shots accurately toward goal.
3. The combined contribution of both variables accounted for 44.89% of shooting skill variance ($R = 0.67$, $p < 0.05$), confirming the multifactorial nature of shooting performance.

These findings reinforce existing evidence linking explosive physical conditioning to sport-specific technical performance. Coaches and sport scientists working with youth soccer programs are advised to incorporate structured plyometric and explosive resistance training to develop leg muscle power, alongside eye-foot coordination drills (e.g., target-based kicking, juggling, and reactive ball control) in periodized training programs. The 55.11% unexplained variance underscores the necessity of holistic athlete development addressing technical, tactical, and psychological dimensions of shooting performance.

Future research is recommended to: (i) replicate findings with larger, ethnically diverse samples; (ii) include biomechanical analysis of kicking kinematics; (iii) examine the influence of technical training exposure and match experience on shooting proficiency; and (iv) investigate the longitudinal development of these physical attributes across adolescent growth phases.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest with respect to the research, authorship, or publication of this article.

REFERENCES

- Adityatama, F. (2017). Hubungan power otot tungkai, koordinasi mata kaki dan kekuatan otot perut dengan ketepatan menembak bola. *Jurnal Olahraga*, 2(2), 85–92. <https://doi.org/10.37058/jor.v2i2.171>
- Akbar, M. T. (2017). Kontribusi kelentukan pinggang dan explosive power otot tungkai terhadap akurasi shooting atlet sepak bola SMA N 3 Bengkulu Selatan. *Jurnal Pendidikan Rokania*, 2(1), 72–80.
- Arikunto, S. (2006). *Prosedur penelitian suatu pendekatan praktek*. Rineka Cipta.
- Arsil. (2010). *Evaluasi pendidikan jasmani*. Wineka Media.
- Bafirman. (2008). *Buku ajar pembentukan kondisi fisik*. Universitas Negeri Padang.
- Cahyono. (2019). Kontribusi daya ledak otot tungkai dan koordinasi mata kaki terhadap akurasi shooting sepakbola. *Jurnal Patriot*, 1(3), 295–308. <https://doi.org/10.24036/patriot.v1i3.322>



- Diwa. (2016). Hubungan koordinasi mata-kaki dengan kemampuan shooting dalam permainan sepakbola pada klub sepakbola Himadirda tahun 2013. *Jurnal Ilmiah Mahasiswa Pendidikan Jasmani, Kesehatan dan Rekreasi*, 2(3), 234–241.
- FIFA. (2019). FIFA big count 2019: 265 million playing football. Federation Internationale de Football Association. <https://www.fifa.com/media-releases/news/y=2007/m=5/news=big-count-2006-270-million-people-active-football-1294611.html>
- Finnoff, J. T., Newcomer, K., & Laskowski, E. R. (2002). A valid and reliable method for measuring the kicking accuracy of soccer players. *Journal of Science and Medicine in Sport*, 5(4), 348–358. [https://doi.org/10.1016/S1440-2440\(02\)80052-6](https://doi.org/10.1016/S1440-2440(02)80052-6)
- Harsono. (2001). Latihan kondisi fisik. Depdikbud, Direktorat Jendral Pendidikan Tinggi.
- Irawadi, H. (2011). Kondisi fisik dan pengukurannya. Jurusan Kepelatihan Olahraga, Fakultas Ilmu Keolahragaan, UNP.
- Iskandar, M. I. (2019). Hubungan antara power otot tungkai, kelentukan dan koordinasi mata kaki dengan keterampilan shooting pada pemain putra umur 14-15 tahun klub SSB Angkasa Colomadu Karanganyar tahun 2019. *Jurnal Ilmiah SPIRIT*, 19(2), 1–12. <https://doi.org/10.33061/js.v19i2.3254>
- Ismaryati. (2008). Tes dan pengukuran olahraga. Sebelas Maret University Press.
- Kellis, E., & Katis, A. (2007). Biomechanical characteristics and determinants of instep soccer kick. *Journal of Sports Science and Medicine*, 6(2), 154–165.
- Luxbacher, J. A. (2012). Sepakbola edisi kedua. PT. Raja Grafindo Persada.
- Mielke, D. (2003). Dasar-dasar sepakbola. Pakar Raya.
- Mylsidayu, A., & Kurniawan, F. (2015). Ilmu kepelatihan dasar. Alfabeta.
- Reilly, T., Williams, A. M., Nevill, A., & Franks, A. (2000). A multidisciplinary approach to talent identification in soccer. *Journal of Sports Sciences*, 18(9), 695–702. <https://doi.org/10.1080/02640410050120078>
- Riduwan. (2005). Belajar mudah penelitian untuk guru-karyawan dan peneliti pemula. Alfabeta.
- Santosa, G., Giriwijoyo, S., & Muchtamadji, M. A. (2012). Ilmu faal olahraga (fisiologi olahraga). FPOK UPI.
- Stølen, T., Chamari, K., Castagna, C., & Wisløff, U. (2005). Physiology of soccer: An update. *Sports Medicine*, 35(6), 501–536. <https://doi.org/10.2165/00007256-200535060-00004>
- Sugiyono. (2010). Metode penelitian administrasi. Alfabeta.
- Sukarman. (2018). Korelasi power otot tungkai dan koordinasi mata kaki terhadap shooting pada permainan sepak bola Persila Bima. *JIME*, 4(1), 283–291.
- Syaifuddin. (2009). Anatomi tubuh manusia untuk mahasiswa keperawatan. Salemba Medika.
- Widiastuti. (2017). Tes dan pengukuran olahraga. PT. Bumi Timur Jaya.
- Winarno. (2006). Tes keterampilan olahraga. Laboratorium Jurusan Ilmu Keolahragaan, Fakultas Ilmu Pendidikan, Universitas Negeri Malang.