Majalah Ilmiah Fisioterapi Indonesia
Indonesian Scientific Journal of Physiotherapy

Original Research Articles
ISSN (Print): 2303-1921
ISSN (Online): 2722-0443
Volume 13, Number 01, Pages 176-185 (2025)
DOI: https://doi.org/10.248437mifi.000639

Agility and Foot-Eye Coordination in Youth Soccer: A Cross-Sectional Study on Dribbling Skills

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Received 07 November 2024; Revised in revised form 25 December 2024; Accepted 27 December 2024; Published 01 January 2025

Abstract

Introduction: Dribbling is a fundamental soccer skill, often associated with agility and foot-eye coordination. However, the extent to which these factors contribute to dribbling skills requires further investigation. This study aims to analyze the relationship between these variables and dribbling skills in Soccer School (SSB) participants aged 10-12 years in Denpasar.

Methods: This analytical observational study employed a cross-sectional design and involved 78 SSB participants in Denpasar, selected through purposive sampling. Agility was measured using the Balsom Agility Test, foot-eye coordination using the Mitchell Soccer Test, and dribbling skills using the Dribbling Test. Normality testing was conducted using the Kolmogorov-Smirnov test, while correlations between variables were analyzed using Pearson and Spearman correlation tests and multiple regression analysis.

Results: The findings indicated a weak to moderate positive correlation between agility and dribbling skills ($r = 0.384$, $p = 0.000$), suggesting that higher agility is associated with better dribbling skills, albeit with a relatively weak relationship. Conversely, foot-eye coordination showed a weak, non-significant negative correlation with dribbling skills ($r = -0.174$, $p = 0.178$), indicating that better foot-eye coordination does not necessarily enhance dribbling skills. There was a slight tendency toward an inverse relationship, although weak.

Conclusion: Agility has a weak positive correlation with dribbling skills, whereas foot-eye coordination exhibits a weak, non-significant negative relationship. Factors like BMI, speed, and balance may also influence dribbling skills and should be explored in future research.

Keywords: agility, foot-eye coordination, dribbling, soccer school

Introduction

Soccer is a team sport that demands physical endurance, mental resilience, technical skills, and strategic thinking.[1] The game is played between two teams of eleven players, each striving to score points without using their hands or arms.[2] As one of the most popular sports, soccer has rapidly developed in Indonesia and has become a priority in athletic training.[3] This sport requires specific training and optimal physical conditioning to support skill development.[4]

Dribbling is crucial in maintaining the game's rhythm, allowing players to bypass defenders, evade tackles, retain ball possession, and create scoring opportunities.[5,6] The key physical attributes influencing soccer performance include speed, agility, and coordination, all essential for dribbling.[6,7] Soccer also contributes to children's physical and cognitive development, enhancing agility, strength, teamwork, and strategic intelligence.[8]

Successful dribbling is influenced by multiple factors, including coordination, ensuring smooth and precise movement execution from start to finish.[9] Foot-eye coordination is critical in soccer, as the eyes analyze the field conditions while the feet control the ball. Agility is another crucial factor in dribbling, enabling players to evade defensive pressure while maintaining ball control.[5,10]

Age is a relative factor affecting a child's ability to develop soccer techniques. During early puberty, boys who mature biologically tend to have advantages in body size and athletic ability.[11] As their transitional skills improve, most children aged 10-12 years are capable of mastering complex motor skills, including coordination, making them ready to learn advanced strategies and gameplay combinations.[12]

Several studies have examined factors influencing dribbling skills; however, research evaluating the relationship between agility, foot-eye coordination, and dribbling skills in children aged 10-12 years remains limited. The literature highlights that ages 10-12 represent a critical phase in motor skill development, particularly for children undergoing structured training. Interest in soccer among children and parental awareness of the importance of early structured sports training has also increased in Denpasar. Therefore, a deeper understanding of the factors optimizing fundamental soccer skills in children is needed.

This study aims to bridge the gap in understanding the contributions of agility and foot-eye coordination to dribbling skills in Soccer School (SSB) participants aged 10-12 years in Denpasar. The findings of this study are expected to assist coaches in designing and evaluating more effective training programs to enhance children's fundamental soccer skills. This study proposes the following hypotheses: H_0: There is no significant relationship between agility and dribbling skills; H_1: There is a significant positive relationship between agility and dribbling skills. For the second variable, H_0: There is no significant relationship between foot-eye coordination and dribbling skills; H_1: There is a significant positive relationship between foot-eye coordination and dribbling skills.

Methods

This study employed an observational analytic method with a cross-sectional approach, utilizing data collected simultaneously to analyze variable relationships without intervention. Ethical approval for this study was granted by the Research Ethics Committee of Udayana University on March 13, 2024, under approval number 0779/UN14.2.2.VII.14/LT/2024. The research was conducted in Denpasar, targeting soccer schools (*Sekolah Sepak Bola*, SSB) that were actively operating during the study period from March to December 2024. A preliminary survey identified three soccer schools representing three districts in Denpasar—North Denpasar, West Denpasar, and South Denpasar. However, no active soccer schools were found in East Denpasar during the study period.

Following identifying eligible soccer schools, the researchers sought permission from each school's management to conduct the study with participants who met the subject criteria. Informed consent was explained to the parents or guardians of the participants. Both the parents and the participants signed it, as the participants were not yet legally eligible to provide informed consent independently. The study process involved several stages: initial screening, agility measurement, foot-eye coordination assessment, and dribbling skills evaluation. The initial screening was conducted to verify participant identity and eligibility criteria. Agility and foot-eye coordination were measured as independent variables, while dribbling skills were assessed as the dependent variable.

Subject selection was conducted during the initial screening through an interview-based identity recording process to determine eligibility for inclusion in the study. The inclusion criteria were male gender, aged 10-12 years, and participation in regular soccer training for at least six months. The exclusion criteria included participation in other sports that could influence the measurement outcomes and a history of severe upper or lower extremity injuries—such as fractures or anterior cruciate ligament (ACL) injuries—that resulted in prolonged training absences. These criteria were established to minimize bias and maintain consistency in the characteristics of study participants.

A total of 78 participants met the inclusion criteria through total purposive sampling. This sample size was representative, as the selected group possessed characteristics aligned with the study's objectives. At the same time, the available population in each SSB was relatively limited, with approximately 30 children per school. However, the researchers acknowledged that a larger sample size would enhance the validity and generalizability of the findings, as the current sample size remained below the recommended 85-90 participants for correlation tests. Therefore, the interpretation of results in this study was approached with caution. Future studies are advised to use a larger sample size and broader sampling methods to achieve more accurate, representative, and generalizable results.

Before measurement, participants were instructed to perform a warm-up to optimize performance and reduce the risk of injury during and after data collection. Data were collected using validated measurement instruments: agility was assessed using the Balsom Agility Test (validity: 0.64; reliability: 0.91), six foot-eye coordination was measured using the Modified Mitchell Soccer Test (validity: 0.86; reliability: 0.871),[1] and dribbling skills were evaluated using the Dribbling Test (validity: 0.65; reliability: 0.77).[13] The validity and reliability values were obtained from previous studies. To ensure consistency in data collection, the assessment team was provided with detailed explanations of the study procedures. Physiotherapists and coaches from each SSB supervised the evaluation process, while the principal investigator did not participate in data collection to prevent subjectivity.

Each participant was allowed to perform a test retest three times, with the best score recorded as the final result. A two-minute rest period was allowed before transitioning between tests. Each participant required approximately 15-20 minutes to complete all assessments, from agility measurement to dribbling skills evaluation, including rest intervals between stations. The study session concluded with a cooldown period, performed independently by the participants.

The collected data were analyzed using univariate analysis to assess data distribution and characteristics and bivariate analysis to examine relationships between independent and dependent variables. Statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 24.0, incorporating all available data, as no missing values were reported (complete cases). The univariate analysis examined characteristics such as age, duration of regular training, agility, foot-eye coordination, and dribbling skills.

The bivariate analysis began with a normality test using the Kolmogorov-Smirnov test, which is typically applied to larger sample sizes (>50 participants) and assesses the conformity of data distribution to population parameters. Depending on the normality test results, Pearson correlation was used for normally distributed data, while Spearman correlation was applied for non-normally distributed data. A multivariate analysis was planned to examine potential interactions if a significant relationship was found between variables.

Results

Characteristics of Study Subjects

The selection of study subjects was conducted using a total purposive sampling method. This method was chosen because the relatively small population in each soccer school (SSB) met the study criteria.14 The subjects in this study were male participants from soccer schools in the Denpasar area, aged 10–12 years, who had been training

regularly for more than six months, had no history of severe injuries to the upper or lower extremities, and had no visual impairments. The subject identification process is illustrated in Figure 1.

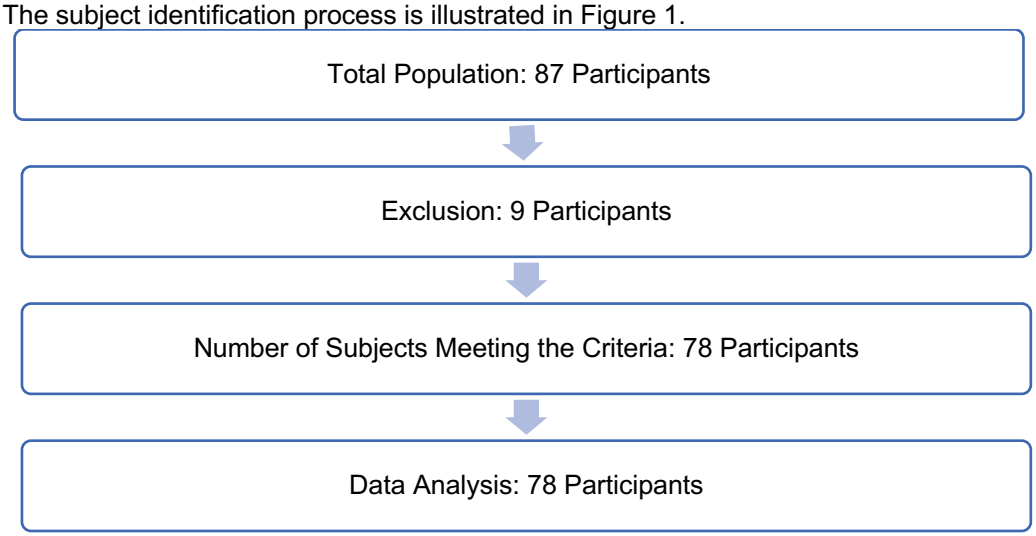

Figure 1. Stages of Subject Identification in the Study

Based on Figure 1, the total number of subjects who proceeded with the study procedures was 78. This study had no dropout criteria and was conducted using a cross-sectional design. However, subjects present on the study day but met any exclusion criteria were omitted. The distribution of subject characteristics is detailed in Table 1.

Table 1. Frequency Distribution of Study Subject Characteristics

Characteristic	Frequency (n)	Percentage (%)
Age (years)		
10	36	46.2
11	9	11.5
12	33	42.3
Duration of Regular Training (years)		
0.5–1	33	42.3
>1–2	20	25.6
3–4	17	21.8
5–6	6	7.7
>6	2	2.6
Agility (s)		
≥10–12	10	12.9
>12–14	50	64.1
>14–16	18	23.0
Eye-Foot Coordination (number of rebounds)		
10–15	5	6.4
16–20	17	21.8
21–25	23	29.5
26–30	27	34.6
31–35	6	7.7
Dribbling Skills (s)		
≤10	23	29.5
>10–12	34	43.6
>12–15	18	23.1
>15–18	3	3.8
Total	78	100

Table 1 presents the frequency distribution of the study subjects' characteristics. In terms of age, the study included subjects aged 10, 11, and 12 years. The highest frequency was among 10-year-olds, with 36 subjects (46.2%), followed by 12-year-olds, with 33 subjects (42.3%). The lowest percentage was among 11-year-olds, with only nine subjects (11.5%).

Regarding the duration of regular training, the highest number of subjects (33; 42.3%) had been training for 0.5–1 year, followed by those training for >1–2 years (20 subjects; 25.6%). The smallest number of subjects (2; 2.6%) had been training for more than six years, representing the most extended duration group.

For agility, most subjects (50; 64.1%) completed the agility test in >12–14 seconds. Regarding eye-foot coordination, the highest distribution in the 26–30 rebound range was achieved by 27 subjects (34.6%). Lastly, most subjects (34; 43.6%) recorded times within the >10–12 second range in dribbling skills. The distribution characteristics of the three study variables are further illustrated in the following KDE histogram.

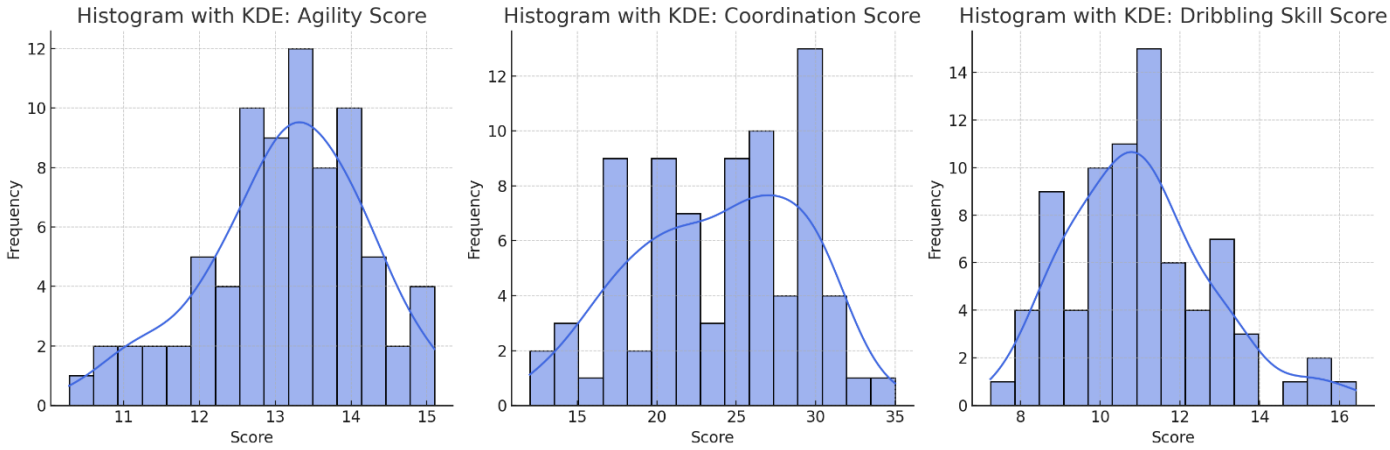

Figure 2. Histogram and Kernel Density Estimation (KDE) of Variable Distribution

Figure 2 illustrates the distribution of three variables: agility and foot-eye coordination as independent variables and dribbling skills as the dependent variable. The Kernel Density Estimation (KDE) histogram represents the data distribution pattern, assessing whether the data follows a normal distribution, is skewed to the right or left, or contains outliers. Adding KDE to the histogram provides a smoother representation of the data distribution. The X-axis represents the variables, while the Y-axis represents the frequency.

The leftmost histogram shows the distribution of the agility variable. The agility scores exhibit a pattern that approximates a normal distribution, with slight right skewness. The most common score is around 13, with some individuals scoring better (around 10–11) and others performing slower (around 15). The middle histogram represents the foot-eye coordination variable. The distribution of scores in this variable appears more varied compared to agility, with a slight right skewness. Most scores range between 20 and 30, with some outliers at higher scores.

The rightmost histogram represents the dribbling skills variable. The distribution of dribbling scores shows a clear peak around 12. A slight left skewness indicates that more individuals have higher dribbling scores than lower ones. This is confirmed by the distribution curve, which declines sharply on the right. The distribution patterns suggest that agility and dribbling scores follow a more normal distribution than foot-eye coordination scores.

Table 2. Normality Test Results Using the Kolmogorov-Smirnov Test

Variable	p-Value	Interpretation
Agility	0.200	Normal
Foot-Eye Coordination	0.006	Not normal
Dribbling Skills	0.076	Normal

This study employed the Kolmogorov-Smirnov normality test, as the sample size was greater than 50. The agility variable obtained a p-value of 0.200, which exceeds the decision threshold ($p > 0.05$), indicating that the data is usually distributed. Similarly, the dribbling skills variable obtained a p-value of 0.076, confirming a normal distribution. However, the foot-eye coordination variable yielded a p-value of 0.006, less than 0.05, indicating its abnormal distribution. Subsequent analyses were conducted based on these normality test results.

Analysis of the Relationship Between Agility and Dribbling Skills

The relationship between agility and dribbling skills was analyzed using the parametric Pearson correlation test, as the data followed a normal distribution. The results are presented in the following table:

Table 3. Correlation Between Agility and Dribbling Skills

Variable	Pearson Correlation	p-Value
Agility and Dribbling Skills	0.384	0.001

From this test, the p-value for agility in dribbling skills is 0.001, indicating a significant correlation between the two variables. The strength of this correlation is determined by the Pearson correlation coefficient, which is 0.384. This suggests a weak positive correlation, meaning that greater agility is associated with better dribbling skills, but the strength of this relationship is relatively low.

Analysis of the Relationship Between Foot-Eye Coordination and Dribbling Skills

The relationship between foot-eye coordination and dribbling skills was analyzed using the non-parametric Spearman correlation test, as the normality test indicated that the data was not normally distributed. The results are presented in the following table:

Table 4. Correlation Between Foot-Eye Coordination and Dribbling Skills

Variable	Spearman Correlation	p-Value
Foot-Eye Coordination and Dribbling Skills	-0.174	0.128

The correlation test for foot-eye coordination as an independent variable and dribbling skills as a dependent variable shows a p-value of 0.128. This indicates that there is no significant correlation between the two variables. The

direction of the relationship is demonstrated by the Spearman correlation coefficient, which is -0.174, suggesting a negative correlation. This means that better foot-eye coordination is weakly associated with poorer dribbling skills, although the strength of this relationship is very low.

Multivariate Analysis

A Multiple Regression analysis was conducted in this study to determine the simultaneous effect of agility and foot-eye coordination on dribbling skills while controlling for age and training duration at the club. This analysis also aimed to assess the contribution of each independent variable to the dependent variable.

Table 5. Model Summary

Model	R	R2	Adjusted R2	Std. Error of the Estimate
1	0.552a	0.305	0.267	1.54668

The regression model yielded a correlation coefficient (R) of 0.552, indicating a moderate relationship between the predictor variables and dribbling skills. The R Square (R^2) value of 0.305 suggests that 30.5% of the variation in dribbling skills can be explained by agility, foot-eye coordination, age, and training duration at the club.

The Adjusted R Square value of 0.267 indicates that after adjusting for the number of variables in the model, the predictors still account for approximately 26.7% of the variance in dribbling skills. The Standard Error of the Estimate (1.54668) represents the extent of deviation in the model's predictions from the actual dribbling scores.

Table 6. ANOVA Test Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	76.524	4	19.131	7.997	0.000b
	Residual	174.633	73	2.392		
	Total	251.157	77			

The ANOVA test confirms that the regression model is statistically significant in predicting dribbling skills (F = 7.997, p < 0.001). The Sum of Squares for regression (76.524) and residuals (174.633) suggest that a significant portion of the variance in dribbling skills remains unexplained by the model.

With degrees of freedom (df) of 4 for regression and 73 for residuals, the Mean Square value for regression is 19.131, while that for residuals is 2.392. The significance value (p = 0.000) indicates that at least one predictor variable significantly influences dribbling skills, making the regression model suitable for further analysis.

Table 7. Multiple Regression Coefficients

Model	Unstandarized Coefficients		Standarized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Age	-0.613	0.193	-0.321	-3.183	0.002	0.937	1.068
Training Duration	-0.010	0.010	-0.101	-1.003	0.319	0.931	1.074
Agility Score	0.591	0.170	0.343	3.472	0.001	0.975	1.025
Foot-Eye Coordination Score	-0.046	0.034	-0.132	-1.331	0.187	0.969	1.032

The multiple regression analysis results show that agility significantly and positively influences dribbling skills (B = 0.591, p = 0.001). This indicates that higher agility scores are associated with better dribbling performance. Conversely, foot-eye coordination has a weak and non-significant negative effect on dribbling skills (B = -0.046, p = 0.187), suggesting that this variable is not a strong predictor in the model.

Age significantly negatively affects dribbling skills (B = -0.613, p = 0.002), meaning that their dribbling scores tend to decrease as individuals age. Meanwhile, training duration does not significantly influence dribbling skills (B = -0.010, p = 0.319). No multicollinearity issues were detected in this regression model, as indicated by the Variance Inflation Factor (VIF) values, all below 10. Thus, the regression model is considered valid for analyzing the factors influencing dribbling skills.

Dummy Variable Analysis for Age Group Influence on Dribbling Skills

A dummy variable test was conducted to analyze the effect of age groups on dribbling skills. In this study, the U10 group was set as the reference category (dummy), while Usia_2 represents the 11-year-old group, and Usia_3 represents the 12-year-old group.

Table 8. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.560a	0.313	0.276	1.53711

The Model Summary results indicate a correlation (R = 0.560) between the predictor variables (age, agility, and foot-eye coordination) and dribbling scores. The R Square value (0.313) suggests that the model explains 31.3% of the variance in dribbling scores. In contrast, the Adjusted R Square value (0.276) shows that the model still accounts for 27.6% of the variation in dribbling scores after adjusting for predictors. The Standard Error of the Estimate (1.537) indicates the extent of prediction errors.

Table 9. ANOVA Test Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	78.679	4	19.670	8.325	0.000b
	Residual	172.477	73	2.363		
	Total	251.157	77			

The ANOVA test results indicate that the regression model, which includes age, agility, and foot-eye coordination as predictors, significantly influences dribbling scores ($F = 8.325$, $p < 0.001$). This means the model effectively explains the variability in dribbling scores.

Table 10. Dummy Variable Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.250	2.361		2.224	0.029
	Agility	0.567	0.171	0.329	3.316	0.001
	Foot-Eye Coordination	-0.041	0.034	-0.120	-1.204	0.233
	Usia_2 (11-year-olds)	-1.436	0.596	-0.256	-2.409	0.019
	Usia_3 (12-year-olds)	-1.313	0.376	-0.362	-3.495	0.001

The results show that Usia_2 has a significant negative coefficient ($B = -1.436$, $p = 0.019$), indicating that individuals in this group tend to have lower dribbling scores than the reference group, with an average decrease of 1.436 points. Similarly, Usia_3 exhibits a significant adverse effect ($B = -1.313$, $p = 0.001$), suggesting that this group has dribbling scores approximately 1.313 points lower than the reference group. These findings highlight differences in dribbling skill scores across age groups. Overall, agility remains the most influential positive factor, while age negatively impacts dribbling ability.

Discussion

Characteristics of Research Subjects

Participants aged 10–12 years demonstrated development in agility, eye-foot coordination, and dribbling skills. Children refine their manipulative abilities at this age, enabling them to participate in sports such as soccer while reaching a peak interest in athletic activities.[14] Training programs like soccer schools (SSB) help enhance agility and other physical aspects, including speed, coordination, and balance.[15]

Agility is the body's ability to move quickly and change direction accurately in response to environmental stimuli.[16] The ages of 10–12 represent a crucial period for agility development, which improves with age and appropriate physical training.[17] A study conducted by Oktaviano et al. examined agility levels in children aged 9–10 using the Illinois Agility Run. The results indicated that most boys exhibited high agility levels, suggesting that children in this age group generally possess good agility skills.[18]

Similarly, Mauladan et al. investigated agility in children aged 9–10 using the 4x6 Shuttle Run method. Their findings revealed that most boys had agility levels ranging from moderate to high. This further supports the idea that children aged 10–12, even without structured physical training, tend to have relatively good agility.[19] Additionally, research by Ozcan et al. assessed the agility of 10–12-year-old soccer players using the Illinois Agility Test. The study found that agility levels increased with age, with 12-year-olds achieving the best scores, followed by 11-year-olds, and finally 10-year-olds.[20]

Furthermore, an experimental study demonstrated that regular, structured, and focused training significantly improves agility in children aged 9–10, with notable effects observed after eight weeks of training, including enhanced speed and reaction time.[21] In the present study, agility measurements indicated that children who regularly trained at SSB displayed good agility, with the fastest recorded score being 10.38 seconds and the slowest 15.10 seconds. Most participants fell within the >12–14 second range, classified as very good, reasonable, or moderate.

Eye-foot coordination refers to synchronizing visual stimuli with foot movements involving the nervous system, muscles, and vision. At ages 10–12, this coordination develops alongside neuromuscular and physical maturation, with boys typically exhibiting better object control.[22] A study found that boys' coordination skills improved with age, showing a strong correlation between age and reduced coordination time.[23]

An experimental study demonstrated that the type of sport influences eye-foot coordination development, with ball sports leading to faster reaction times compared to rhythmic sports and inactive groups.[24] Findings from the present study indicate that participants' eye-foot coordination ranged from moderate to high. Six participants scored between 31 and 35 bounces on the Mitchell Soccer Test, with an average of 24 bounces, categorized as fairly good despite inconsistencies in ball control.

Dribbling skills in soccer involve controlling the ball with the lower extremities to maneuver past opponents. Studies have shown that 57.6% of participants had moderate dribbling skills, while 42.4% were considered fair.[25] Another study with a similar population found that 43.34% of children had moderate dribbling skills, 30% good, 20% poor, and 6.67% very poor, with none achieving an excellent rating.[26] The present study revealed a broad distribution of dribbling abilities, with most scores falling within the >10–12 second range. The fastest recorded score was 7.24 seconds, while the slowest was 16.41 seconds, indicating considerable variation but remaining consistent with previous research findings.

Relationship Between Agility and Dribbling Skills

The Pearson correlation test produced a Sig. (2-tailed) value of 0.001 < 0.05, indicating a relationship between agility and dribbling skills. The correlation coefficient of 0.384 suggests a weak positive correlation, meaning that better agility tends to be associated with better dribbling skills, though the relationship is not strong. Literature states that agility facilitates orientation control regarding opponents and the environment, playing a crucial role in dribbling, which requires rapid and precise changes in speed and direction.[26]

A previous study by Widodo et al. identified a significant positive relationship between agility and dribbling skills, showing that more agile players tend to dribble faster and more efficiently.[26] Similarly, research by Marta & Oktarifaldi also demonstrated a positive correlation, with agility contributing 41.7% to dribbling skills, while the remaining 58.3% was influenced by other factors such as speed. Therefore, it is recommended that agility training be combined with structured speed training programs.[27]

Similar findings were reported by Nurkadri et al. (2021), who observed a significant positive correlation between agility and dribbling skills in children aged 10-12 years who regularly trained at soccer schools (SSB). Training intensity, field conditions, speed, endurance, explosive power, and balance may also influence dribbling skills. This study found a weak correlation between the two variables, likely influenced by individual physical and motor development variations.[28] Predisposing factors such as experience and motor learning also play a role.[29]

The findings of this study confirm the initial hypothesis that agility has a positive relationship with dribbling skills. However, the strength of the correlation is weak due to several predisposing factors. The practical implication of this research is that coaches should design agility training programs integrated with structured speed training to enhance dribbling skills, ultimately improving children's soccer performance.

This study did not include body mass index (BMI) measurements, which could have influenced the agility test results. While boys tend to be more agile, it is undeniable that higher BMI is correlated with lower agility.[30] Differences in measurement outcomes could also be attributed to the choice of agility tests, as the Zig-Zag Test, Agility T-Test, and Illinois Agility Test are more sensitive compared to the Balsom Agility Test.[21]

Although a positive relationship exists between agility and dribbling skills, the correlation is weak. This can be explained by factors such as excluding other motor variables, individual growth rate differences, the potential mismatch between the selected measurement tools, and the complexity of dribbling skills. For future research, it is recommended to consider additional variables such as controlling or testing the influence of BMI, speed, balance, and other motor factors. Additionally, more sensitive measurement instruments tailored to the target population are advised to ensure more accurate results.

Analysis of the Relationship Between Eye-Foot Coordination and Dribbling Skills

This study employed the Spearman correlation test to analyze the relationship between eye-foot coordination and dribbling skills. The results showed no significant correlation between these variables, with a Sig. (2-tailed) value of 0.128 (>0.05) and a weak negative correlation of -0.174. This suggests that better eye-foot coordination is unexpectedly associated with lower dribbling skills among the subjects.

These findings contradict the initial hypothesis that eye-foot coordination positively correlates with dribbling skills. They also contrast with previous studies. Marta & Oktarifaldi (2020) found that eye-foot coordination partially influenced dribbling skills in soccer school (SSB) participants aged 9-12 years, with ages 11-13 optimal for developing coordination skills. Similarly, Widodo et al. (2021) reported a strong positive correlation between eye-foot coordination and dribbling skills in SSB participants aged 10-12 years.[26,27]

This discrepancy may be attributed to the complexity of dribbling, which requires integrating motor skills and neuromuscular coordination.[23] Children with good eye-foot coordination might struggle to incorporate this ability into dribbling, requiring more time to master the skill. Kokstejn et al. (2019) emphasized the importance of learning fundamental motor skills before progressing to more complex soccer techniques. Additionally, the combination of motor and cognitive tasks in dribbling may impose an additional cognitive load, reducing ball control accuracy.[31]

During the study, it was observed that subjects with good eye-foot coordination struggled to control the ball during the dribbling test. This could indicate a lack of familiarity with the dribbling test instruments. At the same time, the eye-foot coordination measurement tool may have been too simple, which presents a limitation of this study. Although most children demonstrated good dribbling skills, a significant gap existed between their performance and measured eye-foot coordination.

The absence of a significant relationship between eye-foot coordination and dribbling skills in this study might be due to the specificity and relevance of the measurement tools used for children's soccer dribbling situations. Instruments such as the *Soccer Wall Volley Test* provide a more dynamic and soccer-specific evaluation by assessing the synchronization between vision, foot movement, and ball control, simulating game-like scenarios better than static tests.[32] Given these findings, coaches are encouraged to vary eye-foot coordination training by incorporating different dribbling techniques. Training should be conducted dynamically, involving interactions with teammates or coaches to enhance skill transfer and effectiveness. Future research should consider psychological factors influencing children's movement execution due to the complexity of dribbling skills. Additionally, selecting more specific and relevant measurement tools is crucial for improving result accuracy.

Multivariate Analysis

Overall, the regression model used in this study explains part of the variation in dribbling skills. Agility had the most significant and positive influence, while eye-foot coordination and club duration did not show a significant effect. The negative impact of age suggests further investigation to understand the factors contributing to this outcome. The considerable influence of age as a control variable on dribbling skills in the multivariate regression analysis led researchers to examine this relationship further across age groups (10, 11, and 12 years) using a dummy variable method. The results indicated that children aged 11 and 12 performed worse in dribbling tests compared to the reference group (10 years old).

Relative age and biological maturity are unmodifiable factors that influence player performance. Biological maturation includes puberty's status, tempo, and timing, which vary among individuals despite having the same chronological age. Genetic factors influence these variations and can directly or indirectly affect soccer performance.[11] However, environmental factors, playing experience, training intensity, and training quality also contribute to player development. Late-maturing players can still develop effectively with appropriate training programs. The negative relationship between age and dribbling skills observed in this study requires further investigation. Future studies should explore why age negatively affects dribbling performance and how training can mitigate this effect. Researchers are also advised to narrow the age range in future studies to reduce variability in results.

Conclusion

This study found a positive but weak relationship between agility and dribbling skills, indicating that while agility contributes to dribbling, it is not the primary determining factor. Conversely, no significant relationship was found between eye-foot coordination and dribbling skills, with a slight indication of a weak negative correlation. This suggests that the relationship between eye-foot coordination and dribbling skills remains uncertain in terms of both direction and strength.

Based on these findings, coaches are advised to implement more dynamic agility and eye-foot coordination training to enhance the dribbling skills of youth soccer players aged 10-12. Training programs can include reaction drills, combined dribbling exercises with directional changes, and match-simulation drills to improve decision-making while dribbling. Additionally, incorporating dynamic coordination training methods may help enhance eye-foot coordination, improving the accuracy of fundamental soccer skills such as dribbling and shooting. Regular evaluations of training effectiveness are also recommended to monitor players' progress and optimize their development. Players are encouraged to train consistently and utilize coach feedback to refine their dribbling techniques more effectively.

Future research should consider additional factors influencing dribbling skills, such as body mass index (BMI), balance, strength, endurance, and psychological aspects like confidence and playing strategies. Using more specific measurement instruments, such as agility tests tailored to dribbling skills, could help improve result accuracy. Furthermore, future studies should include larger sample sizes or adopt more robust research designs, such as longitudinal studies or experimental approaches, to better understand the relationships between these variables.

Author Contribution

Tjokorda Istri Agung Rosanthi Pradnyani: Conceptualization, methodology, data collection, data analysis, and manuscript drafting.

Indah Pramita: Supervision, guidance on research design, and critical review of the manuscript.

Ni Wayan Tianing: Supervision, validation, and manuscript editing.

Ni Komang Ayu Juni Antari: Supervision, methodological consultation, and final manuscript review.

Acknowledgments

The authors would like to express their gratitude to the Faculty of Medicine, Universitas Udayana, for providing the academic support and facilities necessary for conducting this study. We sincerely thank the community leaders and residents of Mengwitani Village for their cooperation and participation. Special appreciation is extended to the supervisors for their continuous guidance, constructive feedback, and valuable insights throughout the research process.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study.

Funding Sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethics Statement

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was not required as the study involved only non-invasive procedures (blood pressure measurement and questionnaire surveys) and posed minimal risk to participants. Informed consent was obtained from all participants prior to their inclusion in the study, and confidentiality was strictly maintained.

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