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Training Field Size Matters: Impacts On Decision-Making Skills In Football

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Abstract

The study aimed to compare the impact of the small-sided versus large-sided game approach on the decision-making skills of U-17 male youth football trainees. A total of 52 players from two youth teams in Bahir Dar, Ethiopia, participated in a 10-week intervention. The study used experimental design with two comparative groups: the small field size trainee group, which trained on a 46m × 25m pitch using 6v6 games; and the large field size trainee group, which trained on an 80m × 40m pitch using 11v11 games. Both groups participated in two 70-minute sessions per week, focusing on decision-making in four key areas: passing, receiving, dribbling, and shooting. The study employed pre-and post-tests to assess decision-making skills, with data collected through video recordings and analyzed using decision-making indices. The data were analyzed using independent-sample t-tests to compare pre-test decision-making indices between the two groups. In the pre-test, both groups were comparable across all decision-making variables ($p > 0.05$), indicating no significant baseline differences. Following the 10-week training intervention, both groups demonstrated improvements in decision-making. However, the small-field size training group showed a significant improvement in shooting decision-making, with a decision-making index of 90.9% compared to 63.63% in the large-field size training group ($p = 0.020$). No significant differences were found between the groups in passing, receiving, or dribbling decision-making. The findings confirmed that the smaller, more intense environment of small-sided games may better facilitate rapid decision-making under pressure, especially in shooting situations. Based on the result of the study and the firm support from previous literature, it is concluded that the cognitive benefits of small-sided games, provide more frequent, high-intensity interactions that promote quick decision-making. In contrast, large-sided games offer more time and space, potentially reducing the urgency for quick decisions, particularly in actions like shooting. This study underscores the value of small-sided games in enhancing decision-making skills in youth football, particularly under pressure, and recommends that a balanced training approach incorporating both small and large-sided games may optimize player development.

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Introduction

Football is a multifaceted sport that requires players to perform a wide range of high-intensity physical exertions in combination with sophisticated perceptual and cognitive skills. Historically, physical performance has been the primary focus of training programs, with many studies underscoring its critical role in achieving elite performance levels (Andrzejeski et al., 2012; Carling, 2010; Faude et al., 2012). Coaches and practitioners often gear training primarily toward improving physical fitness, considering the sport's demanding nature (Francesco et al., 2018). However, contemporary football highlights the growing importance of tactical proficiency and cognitive development, which are now recognized as pivotal for the success of both players and teams (Elferink et al., 2004; Williams et al., 2011). This shift has led to increasing interest in the psychological and perceptual-cognitive aspects of performance, such as decision-making and anticipation skills (Ashford et al., 2021; Murr et al., 2021).

Decision-making is a particularly vital perceptual-cognitive skill that distinguishes elite players from their less-skilled counterparts. Players must frequently make quick and accurate decisions under pressure, a factor that often determines the outcome of matches (Machado et al., 2020; Silva et al., 2021). Recent advancements in computerized motion analysis and tactical performance assessments have demonstrated that individual and collective decision-making abilities are critical for achieving favourable match results. This recognition has spurred researchers and practitioners to explore effective methods to develop expert decision-making skills in players, particularly at the youth level (Ashford et al., 2021).

Evidence suggests that perceptual-cognitive abilities, including the ability to anticipate and decide rapidly, are more effective in differentiating skill levels than physical fitness measures (Williams & Reilly, 2000). Studies have found significant disparities in decision-making abilities between professional and amateur players, experienced and novice players, and junior and senior players, further emphasizing the importance of cognitive training in football (Farahani et al., 2020). Moreover, decision-making is inherently tied to tactical skills, as it involves selecting and executing optimal actions during gameplay. Thus, the development of cognitive mechanisms and tactical components is crucial for achieving higher

performance levels in modern football (Silva et al., 2021).

The inherent complexity of football requires players to make numerous decisions in rapid succession, particularly in scenarios involving frequent ball contacts and dynamic tactical situations. This underscores the importance of training regimens that emphasize cognitive functions alongside physical and technical skills. Small-sided games (SSGs) are a widely adopted training method for this purpose, as they replicate match-specific demands while concurrently enhancing tactical awareness, technical skills, and physical performance (Riboli et al., 2020). Unlike traditional training approaches, which often involve isolated drills, SSGs provide a realistic and economical alternative by simulating game-like scenarios with smaller pitch sizes, modified rules, and fewer players (Silva et al., 2014). Despite the widespread use of SSGs, there remains a gap in understanding how variations in pitch size and player numbers influence decision-making accuracy. Existing research has largely focused on comparing decision-making skills across performance levels, age groups, and positional roles (Murr et al., 2021; Dennis et al., 2021). For example, Silva et al. (2021) examined differences in decision-making abilities between high- and low-level players, as well as between older and younger players. Similarly, studies by Murr et al. (2021) and Dennis et al. (2021) explored how factors such as positional roles and international experience impact decision-making skills. While these findings provide valuable insights, the methods for effectively improving decision-making abilities in youth players remain underexplored.

To address this gap, this study investigates the impact of two distinct training regimens on the decision-making skills of youth football players: small-sided games on smaller pitches (6v6 on 46m×25m) and traditional large-sided games (LSG) (11v11 on 80m×40m). It is hypothesized that the smaller field SSG format will better enhance players' decision-making accuracy due to the increased frequency and complexity of decision-making scenarios. By comparing these training approaches, the study aims to provide evidence-based recommendations for optimizing youth training programs to develop the cognitive and tactical skills essential for success in modern football.

Generally, this research highlights the critical role of decision-making in football performance and emphasizes the need for tailored training regimens that reflect the demands of the game. Particularly for youth players, specific and scientifically informed

methods are essential to cultivate cognitive abilities and prepare them for the challenges of competitive football. This study contributes to the growing body of knowledge on effective training practices, with a focus on the interplay between pitch size, player numbers, and decision-making outcomes. Thus, the objective of the study was to compare the impact of small-sized and large-sided training in enhancing the decision-making skills of youth football players. Therefore, we hypothesized that two different field sizes may not have a significant impact on the decision-making of football training.

Methods and Materials

The study employed an experimental study design that comprised two experimental comparative groups where both of these groups received their regular football training in a different field size. One of the groups was provided a large field size (80mx40m) training with an 11 vs 11 players game approach; the other group was provided a small field size (46mx25m) training with a 6 vs players' game approach.

Table 1. The entire scheme of the training protocol for the comparative groups

	Small field size trainee	Large field-size trainee
Training weeks	10 weeks	10 weeks
Number of training sessions	2 days per week	2 days per week
Duration of training	70 minute	70 minute
Training intensity	Moderate	Moderate
Training time	5:00-6:10 pm	5:00-6:10 pm
Training pitch size	46m×25m	80m×40m
Number of players during a game	6 vs 6	11 vs 11

Participants and Sampling Techniques

The participants were U-17 youth male football players in Bahir Dar city. A total of 52 players who were injury-free and volunteered to participate were taken from two youth teams using comprehensive sampling. The players were then grouped into two groups proportionally using a stratified random sampling technique based on their playing position. Each group was composed of 26 players, with 2-3 players in each position. The intervention was different when one group trained on a large field size with 11 vs. 11 game training, and the other group trained on a small field with 6 vs. 6 game training. Considering the question of interest, each player from each group played 90 minutes both in the pre-test and post-test competitive games. In these testing conditions, the players' decision skill in terms of passing decisions, receiving decisions, dribbling decisions, and shooting decisions was measured through video analysis.

Source of data

The required data was gathered and organized using a 90-minute duration game on a 110-80m field. The same format of game and recording was used during the pre and post-tests. During the testing matches, the same procedure of warming up routines which involves 4 minutes of jogging, 5 minutes of mobility exercises, 4 minutes of dynamic stretching, and 5 minutes of 4-v-4 + 2 possession game on a 45X30m area.

Data Collection Instruments

The data was collected through field game performance of passing decisions, receiving decisions, dribbling decisions, and shooting decisions of the players. Using a standardized rating index (table 1), the accuracy level of the players was observed and quantified. During the pre and post-test, the competition was filmed using a video camera (i.e. CANON 5D mark IV) at above 10 meters of height and decision-making skills were counted and tallied by football experts.

Decision-making skill coding and valuing techniques

Decision-making for each variable was given 1 point for accurate decision-making and 0 points for poor decision-making skills. Accurate decision-making in passing is regarded as the player making a good accurate decision when the pass goes to an open teammate and it directly or indirectly creates a shot attempt or goes to a teammate who was in a better position than the passer. Poor decision-making in passing is regarded, if the pass was made to a player who was closely guarded or when there was a defensive player positioned in the passing line, or intercepted or turned over, or made to an area of the field where no teammate was positioned, or kicked out of the field of play.

An accurate decision-making in receiving regards if the player made a good accurate receiving when the players receive, and then preparing the ball for the next action. Whereas, poor decision-making in receiving is regarded if the player made a poor accurate decision when the ball was taken by an opponent teammate, or was taken off balance and received out of play. An accurate decision-making in dribbling is regarded if the player created a space for teammates, a scoring opportunity, or a space for the dribbler. A poor accurate decision in dribbling is if the defenders were in a good defensive position, or if he dribbled into a supporting defender that was in a good position, and this did not create space for the dribbler or teammates, or if he dribbled out of the field of play, or if the immediate defender was in a good position to defend the dribble, or if he dribbles without a purpose (e.g. not going anywhere). A good accurate decision in

shooting is regarded when the player is open for the shot and it is uncontested. Whereas, a poor decision in shooting is if the shot was blocked, was taken off balance, was taken when one or more defensive players were in a good position, or was taken when it was contested.

Test reliability and validity

The data was collected by an experienced cameraman and high-quality video camera (i.e. CANON 5D Mark iv) above the floor at a 10-meter height for each visible action of the training. However, the recorded pre and post-intervention analysis was counted and tallied by three experienced football experts to minimize bias individual actions were counted wisely and agreed decisions were decided by maximum vote.

Training protocol

Fourthly, 6-v-6 small-sided games on a 46m × 25m pitch were provided to the small field size groups on Tuesdays and Thursdays for 10 weeks, a total of 20 SSG sessions during the ten-week intervention (April, May, and June 2022). Similarly, 11-v-11 large-sided games on an 80m × 40m pitch were provided to the large field size trainee groups on Tuesdays and Thursdays for 10 weeks, also a total of 20 LSG sessions, following the same schedule as the small field size group. Both groups were treated equally and performed selected decision-making skills, focusing on the training session variables (passing, receiving, dribbling, and shooting decisions).

Method of data analysis

The data were analyzed using IBM SPSS Statistics (version 26), with results presented as mean and standard deviation (SD) for each decision-making variable (passing, receiving, dribbling, and shooting). An independent sample t-test was conducted to compare the decision-making index (DMI) between the small field size and large field size groups. The t-test assessed whether the differences in means were statistically significant, with a p-value less than 0.05 indicating a significant difference.

Ethical considerations

Before starting the research, the researcher obtained consent from the coach and all players' parents, who were fully informed about the study's purpose, protocol, and potential risks and benefits. Key ethical considerations included ensuring participants' well-being, prioritizing their dignity, and obtaining informed consent from parents. Participants were also made aware that they could withdraw from the study at any time without consequence. Additionally, participants' privacy was safeguarded throughout the research.

Results

Demographic characteristics of study participants

Table 2. General Characteristics of Study Participants

Group	N	Sex	Age (Year)	Weight (kg)	Height (m)	BMI (kg/m2)	Training age (year)
			Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
SFSTG	26	M	16 ± 0	55± 3.93	1.65 ± 0.33	20.16 ± 0.90	2 ± 0
LFSTG	26	M	16 ± 0	54± 4.30	1.65 ± 0.41	19.82 ± 0.95	2 ± 0

Note, SD = standard deviation, BMI = body mass index, SFSTG = small field size trainee group, LFSTG = large field size trainee group

Table 2 outlines the general characteristics of the study participants, which consist of two groups of male U-17 football players one is SFSTG and the other is LFSTG. A total of 52 participants (26 in each group) were considered for this analysis.

The demographic and physical characteristics of the two groups were quite similar across various measures. The average age of participants in both the SFSTG and LFSTG was 16 years with no significant variation (16 ± 0 years for both groups). There was negligible difference in height between the two groups. The SFSTG had an average height of 1.65 ± 0.33 meters, while the LFSTG averaged 1.65 ± 0.41 meters. The minor standard deviations in both groups suggest that the height distribution was similar. The average weight was also similar across groups, with the SFSTG participants averaging 55 ± 3.93 kg and the LFSTG averaging 54 ± 4.30 kg. The small variation in weight within both groups (standard deviation) indicates a relatively homogeneous group composition. The BMI of participants was comparable between groups, with SFSTG showing a mean of 20.16 ± 0.90 kg/m² and LFSTG showing a mean of 19.82 ± 0.95 kg/m². This small difference in BMI further supports the similarity between the two groups in terms of body composition. Both groups had the same training experience, with an average training age of 2 ± 0 years. This suggests that both groups were at a similar stage of development in terms of their football training history.

The descriptive statistics reveal that the SFSTG and LFSTG participants were very similar in terms of age, height, weight, BMI, and training age. This comparability helps control for confounding variables when assessing the impact of field size on performance or other outcomes in the study. In addition, the researcher conducted independent sample t-tests to compare pre-

test results for each variable between the two groups. Given the similarity in baseline characteristics, any observed differences in outcomes between the groups can likely be attributed to the training conditions (i.e., small vs. large field size) rather than pre-existing differences between the participants. This strengthens the internal validity of the study's conclusions.

Table 3. Independent t-test Results for Pre-test Decision-Making Index: Comparison between Small Field Size and Large Field Size Trainee Groups

Decision-making Variables	Group	Mean	SD	DMI (%)	P-value
	SFSTG	.7907	.09912	87.44%	.839
Passing	LFSTG	.7264	.10013	80.48%	
	SFSTG	.7838	.19278	87.47%	.750
Receiving	LFSTG	.6492	.21819	70.44%	
	SFSTG	.7495	.08091	91.05%	.863
Dribbling	LFSTG	.7000	.07992	90.42%	
	SFSTG	.6925	.14886	87.5%	.058
Shooting	LFSTG	.5673	.00358	85.71%	

Note, SD = standard deviation, DMI = decision making index, SFSTG= small field size trainee group, LFSTG= large field size trainee group

Decision-making index (%) = $\frac{aa}{aa+ai} \times 100$

aa= appropriate actions

ai= inappropriate actions. The formula adapted from (Memmert and Harvey 2008)

The results of the independent t-test comparing the pre-test decision-making indexes (DMI) of small field size and large field size trainee groups are presented in Table 3. The table includes the mean, standard deviation (SD), decision-making index (DMI) percentage, and p-value for each decision-making variable: passing, receiving, dribbling, and shooting.

In passing skill, the mean DMI for the small field size group was 87.44%, compared to 80.48% for the large field size group. Although the small field size group showed a higher percentage, the p-value for passing was 0.839, which is greater than the 0.05 significance threshold. This indicates that the difference between the groups is not statistically significant.

In receiving, the small field size group also showed a higher DMI (87.47%) compared to the large field size group (70.44%). The p-value for receiving was 0.750, which similarly indicates no significant difference between the two groups.

In dribbling, the DMI for the small field size group was 91.05%, while the large field size group had a DMI of 90.42%. This slight difference in dribbling decision-making also did not reach statistical significance, with a p-value of 0.863.

In shooting skills, the small field size group had a DMI of 87.5%, while the large field

size group was slightly lower at 85.71%. The p-value for shooting was 0.058, which is close to the 0.05 threshold but still does not indicate a significant difference.

The p-values for all decision-making variables (passing, receiving, dribbling, and shooting) exceed the conventional alpha level of 0.05, meaning there are no statistically significant differences between the small field size and large field size trainee groups in their pre-test decision-making abilities. The results show that both groups were equivalent in their decision-making performance before the intervention, as evidenced by the absence of significant differences across all variables.

Table 4. Independent t-test Results for Post-Test Decision-Making Index: Comparison between Small Field Size and Large Field Size Trainee Groups

Decision-making Variable	Group	Mean	SD	DMI (%)	P-value
	SFSTG	.8366	.08142	89.35%	.514
Passing	LFSTG	.7693	.11703	86.14%	
	SFSTG	.6937	.28277	77.18%	.381
Receiving	LFSTG	.7130	.19111	75.95%	
	SFSTG	.6861	.11253	89.61%	.301
Dribbling	LFSTG	.6578	.06453	84.48%	
	SFSTG	.5051	.08271	90.9%	.020
Shooting	LFSTG	.5213	.00267	63.63%	

Note, SD = standard deviation, DMI = decision making index, SFSTG= small field size trainee group, LFSTG= large field size trainee group

Decision-making index (%) = $\frac{aa}{aa+ai} \times 100$

aa= appropriate actions

ai= inappropriate actions.

The formula adapted from (Memmert and Harvey 2008)

The results of the independent t-test for the post-test decision-making indexes (DMI) between the small field size and large field size trainee groups are summarized in Table 4. The table presents the mean, standard deviation (SD), decision-making index (DMI) percentages, and p-values for the variables of passing, receiving, dribbling, and shooting.

In passing skills, the mean DMI for the small field size group was 89.35%, compared to 86.14% for the large field size group. While the small field size group had a higher percentage, the p-value for passing was 0.514, indicating no statistically significant difference between the two groups.

In receiving skills, the small field size group showed a DMI of 77.18%, slightly higher than the large field size group at 75.95%. The p-value for receiving was 0.381, which also suggests that the difference between the groups is not statistically significant.

In dribbling skills, the DMI for the small field size group was 89.61%, compared to 84.48% for the large field size group. Although the small field size group performed better, the p-value for dribbling was 0.301, indicating no significant difference between the two groups.

In shooting skills, the small field size group had a significantly higher DMI of 90.9%, while the large field size group had a much lower DMI of 63.63%. The p-value for shooting was 0.020, which is below the 0.05 significance threshold, indicating a significant difference between the two groups.

For most decision-making variables (passing, receiving, and dribbling), the p-values exceed the 0.05 significance level, showing that there were no significant differences between the small field size and large field size trainee groups in their post-test decision-making. These results indicate that both groups demonstrated similar performance in these decision-making areas after the intervention.

However, for shooting, the small field size group exhibited a significantly higher DMI than the large field size group, with a p-value of 0.020. This result shows that the small field size group had notably better decision-making when it came to shooting during the training, compared to the large field size group. The substantial difference in shooting decision-making skills may reflect the specific impact of small-field training on this particular skill.

Discussion

The study aimed to compare the impact of small-sized and large-sided training in enhancing the decision-making skills of youth football players. Decision-making in football is crucial, as it directly impacts the quality of play in areas such as passing, receiving, dribbling, and shooting. The findings from the pre-and post-test decision-making index (DMI) revealed that while both groups (small field-size trainees and large field-size trainees) exhibited some improvements across various decision-making skills, significant differences were only observed in the shooting decision-making variable. The small field size group demonstrated a marked improvement in shooting ($p < 0.05$) compared to the large field size group. This discussion will explore the implications of these results, compare them with existing literature, and provide scientific justifications for the observed differences.

The small field size group showed notable improvement in decision-making, especially in shooting (90.9%) compared to the large field size group (63.63%), which aligns with existing literature that emphasizes the cognitive benefits of small-sided games. Small-sided games have been

widely recognized for promoting higher intensity and more frequent interactions per unit of time compared to larger field games (Hill-Haas et al., 2011). The reduced space in SSGs forces players to make quicker decisions under pressure, which in turn enhances their reaction times and ability to process game-related information (Vilar et al., 2014). The high-density nature of small-sided games leads to increased touches per player, encouraging the development of quick passing, ball control, and decision-making skills in confined spaces (Vazou et al., 2015).

In this study, while the small field size group demonstrated improvements in passing, receiving, and dribbling decisions, the most pronounced difference was seen in shooting. One possible explanation is that small-sided games force players to make quicker, more purposeful actions, including shooting, often with limited time to deliberate on their options. This intensity may have contributed to better accuracy and decision-making effectiveness in shooting, as these situations require sharp decision-making under pressure (Hill-Haas et al., 2011). In particular, small-sided games can simulate match-like conditions where players are required to make split-second decisions about whether to pass or shoot, fostering sharper decision-making skills (Vilar et al., 2014).

Furthermore, small-sided games place players in situations where shooting opportunities arise more frequently and need to be capitalized upon quickly. The small playing area and fewer players on the field may increase the frequency of shooting situations, thereby offering more opportunities for practice and refinement of shooting decision-making. This heightened frequency of decisions under pressure likely contributed to the improved shooting performance observed in the small field size group (Vilar et al., 2014).

In contrast, the large field size group did not exhibit significant improvement in shooting decision-making (63.63%), and only marginal improvements were observed in passing, receiving, and dribbling decisions. One explanation for this lack of improvement could be the inherent dynamics of larger-sided games. While LSGs (typically 11 vs. 11) simulate the conditions of a full game, they also introduce increased complexity in terms of space and player numbers. This larger environment could reduce the frequency of high-pressure, individual decision-making moments, such as shooting, which are more prominent in small-sided games (O'Hara et al., 2014).

The increased space and time available in large-sided games might reduce the urgency that often enhances decision-

making performance in smaller, more constrained environments (Hill-Haas et al., 2011). For instance, in full-field games, players may have more time to assess their options before taking a shot, which, while potentially beneficial in some contexts, can also lead to indecisiveness or poor decision-making. The larger field's less compact nature might have contributed to fewer contested shooting situations, which could explain why the large field group did not show the same level of improvement in shooting compared to the small field group. Additionally, large-sided games often require players to focus on broader tactical and team-oriented decisions, such as defensive positioning or team organization. This shift in focus may divert players' attention away from specific individual actions like shooting. As Vilar et al. (2014) noted, large-sided games promote a more holistic, team-oriented tactical understanding, which may limit the development of individual skills under pressure, such as quick decision-making in shooting scenarios.

Although there were no significant differences between the groups in passing, receiving, and dribbling decision-making, these findings can be contextualized. The training intervention in this study was consistent across both groups in terms of intensity (moderate) and duration (70 minutes per session). This ensures that differences in physical conditioning or fatigue were unlikely to confound the results (Vazou et al., 2015). Moreover, the similarity in demographic characteristics (age, height, weight, BMI, and training experience) between the groups further strengthens the argument that the observed differences in decision-making were due to the nature of the field size itself, rather than other external factors.

It is also possible that the lack of significant differences in passing, receiving, and dribbling can be attributed to the nature of the training drills used. As O'Hara et al. (2014) pointed out, small-sided games are often designed to enhance specific skills, such as close control and passing, but the differences between the training conditions may not have been large enough to impact more fundamental decision-making tasks. These basic technical skills, including passing and dribbling, are likely to be practiced in both small- and large-sided settings, leading to similar improvements across both groups. This is consistent with findings from Vilar et al. (2014), who suggested that while small-sided games can be highly beneficial for certain skills, such as quick passes and close control, they may have less of an impact on broader tactical decision-making.

The findings of this study underscore the importance of integrating both small-sided and large-sided games into youth football training programs. Small-sided games seem particularly effective in improving quick decision-making skills under pressure, especially in areas such as shooting, passing, and dribbling in tight spaces. On the other hand, large-sided games may be more beneficial for fostering broader tactical awareness, improving defensive organization, and promoting team coordination (Vazou et al., 2015).

Future research could explore the optimal balance between SSGs and LSGs in youth football development, tailoring training to specific developmental stages and skill sets. Longitudinal studies could further investigate the long-term impact of small and large field training on cognitive and tactical decision-making, providing deeper insights into how these training methods contribute to overall player development.

Conclusion

This study concludes that small-sided games enhance decision-making skills, particularly in high-pressure situations such as shooting. The significant improvement in shooting decision-making observed in the small field size group shows that SSGs are highly effective in promoting quicker, more accurate decisions in game-like conditions. By understanding the differential impacts of small and large-sided games, coaches can better design training programs that target both individual skill development and tactical awareness.

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