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Concentration and Kinesthetic Perception as Determinants of Futsal Playing Skills

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Abstract

Study purpose. This study aims to examine the role of concentration and kinesthetic perception as determinants of futsal playing skills among extracurricular players.

Materials and methods. This study employed a correlational research design with a survey approach. The participants consisted of 20 extracurricular futsal players selected through purposive sampling. Data were collected using the Concentration Grid Test (CGT) for concentration, the Vertical Linear Space Test for kinesthetic perception, and a standardized futsal playing skills test. Data were analyzed using multiple regression analysis with SPSS.

Results. The results showed that concentration had a significant effect on futsal playing skills ($t = -3.725$, $p = 0.002$), indicating its important role as a cognitive factor in performance. In contrast, kinesthetic perception did not show a significant partial effect ($t = 0.400$, $p = 0.694$). However, the simultaneous test revealed that concentration and kinesthetic perception jointly had a significant effect on playing skills ($F = 8.033$, $p = 0.003$), suggesting a combined contribution of cognitive and sensorimotor aspects.

Conclusions. Concentration plays a dominant role as a cognitive determinant of futsal performance, while kinesthetic perception acts as a complementary factor. These findings emphasize the importance of integrating psychological and sensorimotor training to improve futsal performance. However, given the relatively small sample size and the focus on a single extracurricular futsal setting, the findings should be interpreted with caution and may not be generalized to broader futsal populations.

Keywords: Concentration, Futsal Skills, Kinesthetic Perception, Extracurricular Players

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Introduction

Futsal is a dynamic sport that demands a high level of motor, cognitive, and sensory performance due to its fast-paced nature, limited space, and frequently changing situations that require quick and accurate decision-making. The development of sports has also been accompanied by increasingly sophisticated training methods and technological support (Gunawan Pratama et al., 2024). Athletic performance depends not only on technical skills and physical fitness but also on executive functions, attentional control, and cognitive abilities that distinguish expert performers from less skilled athletes (Ren et al., 2025; Williams & Ford, 2008). One of the key psychological aspects that plays an important role in futsal performance is concentration. Concentration refers to an athlete's ability to maintain focus on relevant stimuli in a match or training environment while ignoring internal and external distractions (Akbar et al., 2019). In fast-paced game situations, sustained attention is critical because even brief lapses in concentration may impair decision-making, technical execution, and overall match performance. Elite athletes consistently demonstrate superior perceptual-cognitive abilities, including attentional control and information-processing speed, which enable them to respond effectively to complex and dynamic game situations (Wu et al., 2025). Similar findings have been reported in soccer, where superior anticipation and decision-making abilities were associated with higher levels of expertise and performance (Roca et al., 2012). Furthermore, these cognitive abilities can be enhanced through training interventions that target perceptual and decision-making processes, highlighting their importance in sport performance development (Silva et al., 2021).

In addition to psychological aspects such as concentration, biomotor components also play an important role in supporting movement efficiency in futsal. One of these components is kinesthetic perception, which refers to an individual's sensory ability to perceive body position and movement through sensory input (Rosmi, 2017). Kinesthetic perception refers to an individual's ability to perceive body position and movement through sensory input, enabling accurate movement regulation and sensorimotor integration (Noto et al., 2024). Kinesthetic perception plays a crucial role in the execution of motor skills, as it enables athletes to process stimuli received from the environment and respond appropriately. The development of kinesthetic awareness has been shown to significantly contribute to motor skill proficiency in both male and female athletes (Kaur & Dahiya, 2025).

In the context of futsal, this ability allows players to interpret dynamic game situations, such as ball speed, trajectory, and spatial positioning, which are then processed by the brain to produce accurate and efficient movements (Bordonau & Viilanueva, 2018). Furthermore, kinesthetic perception is closely related to the body's ability to regulate movement through sensory feedback, enabling precise coordination and quick responses during gameplay (Ramadan et al., 2021; Noto et al., 2024). Therefore, effective performance in futsal is not only influenced by physical training and technical mastery but also by the integration of psychological factors, such as concentration, and sensorimotor abilities, such as kinesthetic perception. Recent findings have shown that perceptual-cognitive abilities, particularly anticipation and decision-making skills, are important contributors to successful performance in team sports and can be improved through targeted training interventions (Zhu et al., 2024).

Exercises focusing on physical improvement and mastery of basic game techniques in extracurricular futsal programs provide a fundamental foundation for the development of players' skills. The development of sport-specific skills has long been recognized as a key component of successful performance in invasion sports such as soccer and futsal (Huijgen et al., 2010). However, as highlighted in previous discussions, psychological and sensorimotor aspects, such as concentration and kinesthetic perception, also play a crucial role in supporting overall playing performance. Despite their importance, these aspects are often not systematically integrated into training programs, which tend to emphasize physical and

technical components. Therefore, there is a need to develop more comprehensive and balanced training approaches that incorporate physical, psychological, and sensorimotor elements to optimize performance and skill development.

Previous studies have examined the influence of psychological and sensorimotor factors on sports performance. However, most of these studies tend to investigate these variables separately or focus on specific technical skills rather than overall playing performance. In addition, research focusing on extracurricular futsal players, particularly at the high school level, remains limited. From a theoretical perspective, sports performance can be understood as the result of an interaction between cognitive processes and sensorimotor control, where attention and perceptual mechanisms play a central role in guiding movement execution (Schmidt & Lee, 2019).

Based on this gap, the present study aims to examine the combined role of concentration and kinesthetic perception in determining futsal playing skills among extracurricular players. The novelty of this study lies in the integration of cognitive (concentration) and sensorimotor (kinesthetic perception) factors within a single analytical model, providing a more comprehensive perspective on performance determinants in futsal. This study also proposes a simplified conceptual model in which concentration represents a dominant cognitive factor, while kinesthetic perception functions as a complementary sensorimotor component influencing playing performance. The findings of this study are expected to contribute both theoretically, by strengthening the understanding of performance determinants, and practically, by providing input for coaches in developing more integrated training programs that incorporate technical, psychological, and sensorimotor aspects.

Based on the motor learning and performance perspective proposed by Schmidt and Lee (2019), concentration can be viewed as an attentional process that helps players focus on relevant game information and make appropriate decisions during play. In contrast, kinesthetic perception supports body awareness and movement control, enabling players to execute motor actions accurately. Therefore, both variables are theoretically expected to contribute to futsal playing skills. Based on this rationale, the hypotheses of this study are: H1: Concentration significantly affects futsal playing skills; H2: Kinesthetic perception significantly affects futsal playing skills; and H3: Concentration and kinesthetic perception simultaneously affect futsal playing skills.

Materials and methods

Study participants

The population of this study consisted of 30 extracurricular futsal players at SMKN 1 Trenggalek. A total of 20 players were selected using purposive sampling. The participants were active members of the extracurricular futsal program at SMKN 1 Trenggalek and were willing and physically able to participate in all testing procedures. These criteria ensured that the participants had direct experience in futsal activities and were relevant to the purpose of the study. This study was approved by the Research, Community Service and Intellectual Property Rights Unit (UPPMH) XXXXXX (No. 129/STKIP PGRI/E.7/TL/2025). Permission was also obtained from the relevant education authority. All participants provided written informed consent prior to participation.

Research Design

This study employed a survey method with a correlational research design to examine the relationship between concentration, kinesthetic perception, and futsal playing skills. The correlational approach was used to determine the degree of association among the variables.

Study organization

The data collection process was conducted by administering all tests directly to the participants under controlled conditions. Each participant completed the concentration test, kinesthetic perception test, and futsal playing skills test according to standardized procedures.

Instruments

Data were collected using three standardized instruments. Concentration was measured using the Concentration Grid Test (CGT) developed by Harris and Harris (1984), which is commonly used to assess an individual's ability to maintain attention and focus. The instrument demonstrated a validity coefficient of 0.912 and a reliability coefficient of 0.803. Kinesthetic perception was measured using the Vertical Linear Space Test developed by Johnson and Nelson (1986), with a reported reliability coefficient of 0.98. Futsal playing skills were assessed using the Futsal Skills Test developed by Marhaendro, Saryono, and Yudanto (2009), with a validity coefficient of 0.67 and a reliability coefficient of 0.69.

Statistical analysis

Data were analyzed using SPSS version 21. Prior to hypothesis testing, assumption tests including normality and linearity were conducted to ensure the suitability of the regression model. Multiple regression analysis was employed to examine the relationship between concentration and kinesthetic perception and futsal playing skills. Partial effects were analyzed using the t-test, while simultaneous effects were tested using the F-test. Statistical significance was set at $p < 0.05$.

Results

1. Concentration Test Data

The concentration test results showed a mean score of 13.25 (SD = 3.72), with scores ranging from 7 to 21 Figure 1.

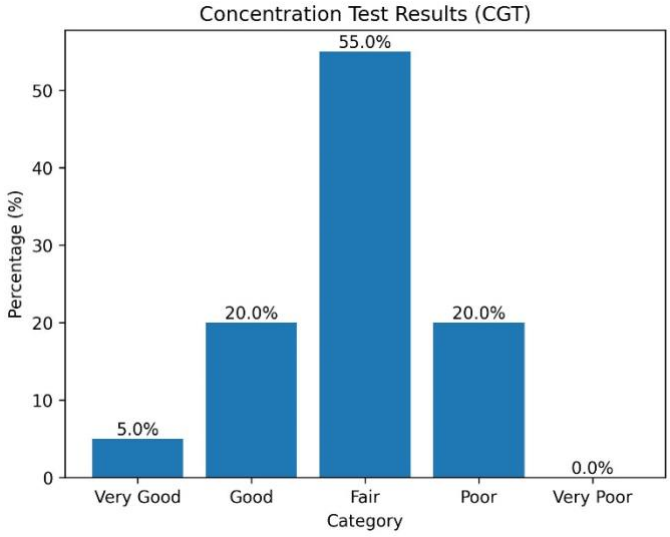

Figure 1. Concentration Test Graph

Figure 1 illustrates the distribution of players' concentration levels, where the majority were in the fair category (55%), followed by good and poor categories (20% each), and only 5% in the very good category.

2. Kinesthetic Perception Test Results

The kinesthetic perception test results showed a mean score of 0.55 inches (SD = 0.28), with values ranging from 0.10 to 0.98 inches. As inverse data, lower values indicate better kinesthetic perception Figure 2.

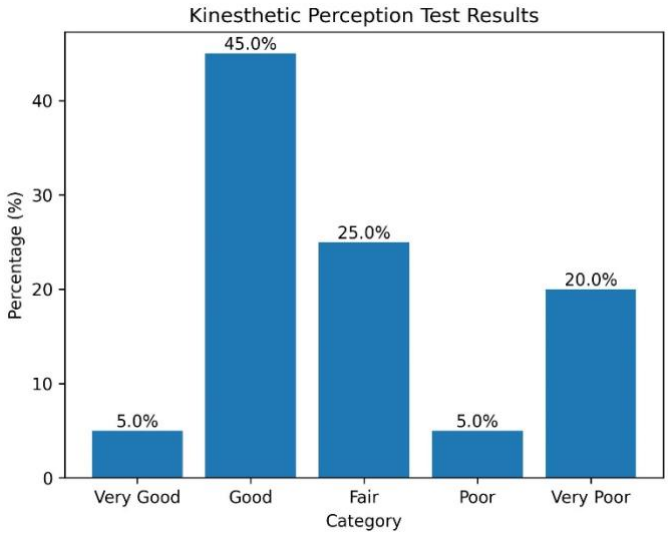

Figure 2. Kinesthetic Perception Test Graph

Figure 2 presents the distribution of players' kinesthetic perception levels. Most players were in the good category (45%), followed by fair (25%) and very poor (20%), while only 5% were categorized as very good and poor.

3. Futsal Skills Test Results

The futsal playing skills test showed a mean score of 92.70 seconds (SD = 11.24), with values ranging from 71.91 to 115.88 seconds. As inverse data, lower values indicate better playing performance Figure 3.

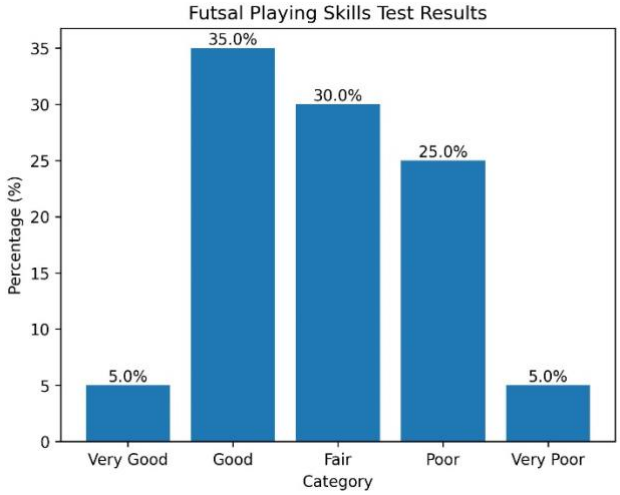

Figure 3. Futsal Playing Skills Test Graph

Figure 3 presents the distribution of players' futsal playing skills. Most players were in the good category (35%), followed by fair (30%) and poor (25%), while very good and very poor categories each accounted for 5%.

4. Assumption Testing

To ensure the suitability of the data for regression analysis, assumption tests including normality and linearity were conducted. The results are presented in Table 1.

Table 1. Normality

Variable	Sig. (p-value)	Conclusion
Concentration	0.134	Normal
Kinesthetic Perception	0.200	Normal
Futsal Playing Skills	0.156	Normal

Table 1 shows that all variables have p-values greater than 0.05, indicating that the data are normally distributed. Therefore, the normality assumption required for regression analysis is fulfilled. To further examine the relationship between variables, a linearity test was conducted. The results are presented in Table 2.

Table 2. Linearity

Variable Relationship	Sig. (p-value)	Conclusion
Concentration → Playing Skills	0.210	Linear
Kinesthetic Perception → Playing Skills	0.178	Linear

Table 2 indicates that the relationships between the independent variables and futsal playing skills are linear ($p > 0.05$). Thus, the data meet the assumptions required for regression analysis.

5. Regression Test

To test the proposed hypothesis, multiple regression analysis was conducted to examine the relationship between concentration, kinesthetic perception, and futsal playing skills. The results are presented in Table 3.

Table 3. Regression (Partial)

Regression (Partial)	t	t	*p-value*	*Sig.*
Concentration	> 2,093	-3.725	< 0,05	0,002
Kinesthetic Perception	> 2,093	0,400	< 0,05	0,694

Table 3 shows that concentration had a significant effect on futsal playing skills ($t = -3.725$, $p = 0.002$), indicating that concentration is a significant predictor of performance. In contrast, kinesthetic perception did not show a significant effect ($t = 0.400$, $p = 0.694$), indicating that it does not independently influence playing skills.

Table 4. Regression (simultaneous)

Regression (simultaneous)	f	f	*p-value*	*Sig.*
Concentration and Kinesthetic Perception	> 3,52	8.033	< 0,05	0,003

Table 4 shows that the regression model was statistically significant ($f = 8.033$, $p = 0.003$), indicating that concentration and kinesthetic perception jointly have a significant effect on futsal playing skills.

Discussion

The results of this study indicate that concentration has a significant effect on futsal playing skills, while kinesthetic perception does not show a significant partial effect, although both variables jointly contribute to performance. This result is understandable considering the nature of futsal, where players must react quickly to constantly changing game situations. During a match, players are required to stay focused, recognize opportunities, anticipate opponents' movements, and make decisions within a short period of time. Players with better concentration are more likely to maintain their focus on the game and avoid distractions, which can help them perform technical skills more effectively.

Therefore, concentration appears to play an important role in supporting futsal playing performance. This interpretation is supported by evidence showing that psychological readiness, concentration, and cognitive abilities are closely associated with performance quality in futsal, particularly in situations requiring rapid reactions and accurate decision-making (Saputra et al., 2026; Homsombat et al., 2025). The importance of concentration may also be associated with broader executive functions. Recent evidence indicates that athletes generally demonstrate stronger executive functions, including inhibitory control, working memory, and cognitive flexibility, compared with non-athletes. These cognitive abilities support attention regulation and decision-making during sports performance (Ren et al., 2025). Consistent with this view, executive functions have been shown to be closely associated with successful performance and competitive success among elite soccer players (Vestberg et al., 2017; Vestberg et al., 2012). This finding is also consistent with the view that successful performance in team sports depends on athletes' ability to identify relevant information and make appropriate decisions in rapidly changing situations, allowing them to respond more effectively during competition (Godbout & Gréhaigne, 2022).

The present findings are consistent with previous studies reporting that concentration is closely associated with successful performance in futsal and other sport settings. In line with the present study, Taufik (2019) found that higher levels of concentration were associated with better futsal playing skills, reinforcing the importance of cognitive factors in supporting performance. Similar findings have been reported by Younus (2025), who demonstrated that mental training can improve concentration and facilitate the development of sport-specific skills, highlighting the important role of psychological factors in athletic performance. More broadly, evidence from a meta-analytic review suggests that athletes tend to demonstrate superior cognitive abilities compared with non-athletes, further emphasizing the contribution of cognitive functioning to sport performance (Voss et al., 2010).

Concentration in sports requires sustained attention, making it essential in various sporting activities. Previous studies have shown that concentration and visual perception tend to decline under fatigue conditions, which can negatively affect athletic performance (Valayi et al., 2024). Similarly, Trecroci et al. (2021) reported that cognitive functions required for rapid decision-making are significantly impaired under physical fatigue. These findings support the present study by suggesting that concentration is an important factor in maintaining performance during dynamic game situations such as futsal.

In addition to psychological aspects, biomotor components such as kinesthetic perception also play an important role in supporting movement efficiency. Kinesthetic perception refers to an individual's ability to perceive body position and movement through sensory input (Rosmi, 2017). It contributes to the development of coordination, balance, and motor control, which are essential in sports performance (Syahputri & Sukoco, 2020). However, although theoretically important, its role may not always be directly observable when analyzed independently in statistical models.

In contrast, kinesthetic perception did not show a significant relationship with playing skills in the partial test. One possible explanation is that futsal performance is influenced by

multiple factors that interact during competition. Although kinesthetic perception contributes to body awareness, movement control, and coordination, playing performance also depends on technical skills, experience, and decision-making abilities. As a result, its contribution may be less apparent when examined independently. Nevertheless, kinesthetic perception remains an important component of athletic performance. Previous studies have highlighted the importance of perceptual-motor efficiency in supporting athletic performance, indicating that sensorimotor abilities remain relevant even when their direct statistical contribution is not clearly observed (Wilkerson et al., 2021). Likewise, perceptual-cognitive expertise has been identified as an important characteristic of successful athletes, particularly in sports that require rapid perception and action under changing environmental conditions (Mann et al., 2007). Recent evidence suggests that perceptual-based training can improve decision-making skills and sport-specific performance, indicating that perceptual factors may contribute indirectly when integrated with technical and cognitive training (Guo et al., 2025). Additionally, previous studies have shown that training involving varied visual and sensory stimuli can effectively improve perceptual abilities and complex skill performance in futsal players (Mohammed et al., 2025). This suggests that kinesthetic perception may still contribute indirectly to performance when integrated into comprehensive training programs.

Despite the non-significant partial effect, the simultaneous test results indicate that concentration and kinesthetic perception together have a significant influence on futsal playing skills. This finding is consistent with the study of Paranoan et al. (2024), which reported that concentration and kinesthetic perception jointly affect passing accuracy in futsal players. Therefore, these results emphasize that futsal performance is multidimensional, involving the integration of cognitive and sensorimotor components.

Overall, the findings suggest that futsal playing skills are influenced by multiple interacting factors. Concentration appears to play a more prominent role because players must remain focused and make rapid decisions throughout the game. Although kinesthetic perception was not a significant predictor in the partial analysis, it remains important in supporting movement control and coordination. These findings indicate that successful futsal performance is achieved through the integration of cognitive and sensorimotor processes rather than through a single factor alone. This interpretation aligns with the view that successful performance in team sports depends not only on movement execution but also on the ability to make effective decisions and select appropriate motor responses under dynamic conditions (Lola, 2021).

The present study supports a simplified conceptual model of futsal performance in which concentration functions as a primary cognitive factor, while kinesthetic perception serves as a complementary sensorimotor component. This model contributes to the literature by highlighting the importance of cognitive factors, particularly concentration, in influencing futsal playing skills among extracurricular athletes.

Several limitations of this study should be acknowledged. First, the study involved a relatively small number of participants drawn from a single extracurricular futsal program, which may limit the generalizability of the findings. Second, only two predictor variables were examined, whereas futsal performance may also be influenced by other factors such as playing experience, physical fitness, motivation, and tactical understanding. Therefore, future studies are encouraged to involve larger and more diverse samples and to consider additional variables in order to provide a more comprehensive understanding of the factors influencing futsal playing skills.

Conclusions

This study found that concentration has a significant contribution to futsal playing skills, whereas kinesthetic perception did not show a significant effect when examined separately. However, concentration and kinesthetic perception together contributed significantly to futsal

playing performance among extracurricular players. These findings suggest that concentration plays an important role in supporting performance during futsal games.

From a practical perspective, coaches should pay attention not only to technical and physical training but also to the development of players' concentration. Although kinesthetic perception was not found to have a significant independent effect, it remains important in supporting movement control and coordination during play.

Future studies are encouraged to involve larger samples and include other factors that may influence futsal playing skills. This will help provide a broader understanding of the factors that contribute to player performance.

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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