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# The Effect of Special Exercises on the Development of Cognitive Abilities, Kinesthetic Skills, and Football Dribbling Proficiency

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**Abstract**

**Objectives.** The primary aim of the study was to evaluate the impact of special exercises on developing cognitive abilities and kinesthetic skills, particularly in dribbling football. It also sought to compare the outcomes between two groups (experimental and control) after the intervention.

**Materials and Methods.** The research was conducted using an experimental approach. The research population consisted of 146 fifth-grade students at Khank School for Boys. The sample was selected through a lottery process, and a total of 32 students were chosen, divided into experimental and control groups of 16 students each. The experimental group used special exercises focusing on motor sensation, while the control group followed traditional methods (skill exercises only). The educational programs were implemented over eight weeks, with each group receiving two educational units per week, each lasting 40 minutes.

**Results.** The results indicated that the educational programs implemented for both groups positively impacted the development of certain cognitive abilities and kinesthetic skills related to football. The experimental group, which used specialized exercises focusing on motor sensation, showed better improvement than the control group, which employed the traditional method. The experimental group demonstrated significant development in cognitive abilities, which translated to better performance in learning the dribbling skill in football.

**Conclusions.** The study concluded that the special exercises applied to the experimental group had a positive impact on both cognitive and kinesthetic abilities, leading to improved learning of the dribbling skill in football. The researcher recommended emphasizing the synchronization of cognitive development with the learning of basic football skills, as well as focusing on the development of cognitive abilities in young athletes. Further studies should investigate the impact of cognitive abilities development on learning basic skills in other sports and age groups.

**Keywords: Cognitive Abilities, Kinesthetic, Dribbling Skill, Football.**

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## Introduction

Kinesiology is an essential science that directly relates to the learning of various motor and technical skills, as well as the development of several physical abilities in athletes. These developments play a crucial role in helping athletes learn skills more efficiently and with less effort. This has led to a significant interest from specialists and researchers in producing scientific studies aimed at enhancing learners' performance in different sports activities. This is especially true in the field of football, one of the most popular and widely practiced team sports worldwide.

Optimal motor performance in football, especially in skills like dribbling, requires more than just visual or auditory perception. It must be accompanied by kinesthetic awareness that helps the learner control their performance and internalize the movement patterns effectively. This kinesthetic awareness is developed through motor practice, where muscles do not only perform movements, but also sense the effort, balance, and coordination required for proper execution. It involves understanding the tension and relaxation in the body's muscles and joints. This is particularly evident in learners who are still in the early stages of learning, where their kinesthetic awareness is not yet fully developed.

The development of cognitive and kinesthetic abilities in learners is primarily influenced by the methods and educational exercises used, as well as the learners' responses to them (Ericsson & Karlsson, 2014). According to Chang et al. (2020), "The learner interacts with the environment through visual, auditory, and motor sensations when paying attention to the stimuli received during performance. This interaction requires the learner to interpret these stimuli based on their previous skills and experiences and to overcome challenges."

Kudinova et al. (2021) assert that "Understanding and perceiving movement and forming a clear mental image of movement or skill has a significant impact on learning different skills." Furthermore, Erickson & Erickson (2017) highlight the role of movement perception in improving motor ability and facilitating the understanding of various motor skills. They argue that "Perception of movement eases the process of linking actions, especially when performing complex tasks."

In football, dribbling is a vital skill, crucial for breaking the offside trap, creating opportunities for teammates to move, and organizing offensive plays. Dribbling also helps in deceiving opponents and managing the pace of the game (Nusri et al., 2024). Mastery of dribbling not only improves performance but also helps players make the most efficient use of their energy and time.

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Motor skill is defined as "the ability to perform motor tasks with precision, ease, control, and efficiency" (Rello Pambudi & Widiyanto, 2019). Football players, particularly in high-stakes situations, need excellent motor perception and physical abilities to navigate challenges on the field confidently (Sarajärvi et al., 2024). The ability to think quickly and make the right decisions in the right moments is crucial to achieving success in football, as stated by Bonney et al. (2019): "The right thinking and appropriate solutions come from a good awareness of the conditions and elements a player faces on the field."

Specialists in sports focus on developing players who possess high cognitive and mental abilities, enabling them to make the right decisions at critical moments, solve problems efficiently, and create opportunities for their team. Duda & Khramov (2018) argue that "Knowledge and awareness are essential not only for learning and implementing skill performance but also for solving problems encountered during play."

The ability to score goals with precision, power, and accuracy—while handling the ball effectively in the right place and time—makes a player a crucial asset to the team, particularly in difficult matches (Artanayasa & Giri, 2019). Thus, developing cognitive abilities and mastering football dribbling are key to improving individual performance and contributing to the overall success of the team.

Given the significance of these skills, the study focuses on the potential for improving cognitive abilities and dribbling skills among fifth-grade primary school students. Football requires a wide range of skills, which demand complex movements involving the legs, head, arms, and trunk. These movements require a high level of cognitive abilities to be performed optimally.

## Materials and Methods

### Study Participants.

The research sample consisted of fifth-grade students from Khanak School for Boys during the academic year (2023-2024), with a total population of 146 students distributed across four sections. The sample was randomly selected using a lottery method, resulting in the selection of students from Divisions (B) and (D), yielding a final sample size of 62 students. To ensure the validity of the study, 32 students were selected for the main experiment, divided into two groups (experimental and control) of 16 students each. Additionally, a separate sample of students from Division (A) was used for the exploratory and stability experiments. The final research sample represented 21.917% of the original community.

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**Study organization.**

The researcher employed an experimental design with two randomly assigned equivalent groups: the experimental group and the control group. The study was conducted over an eight-week period, beginning from March 4, 2024, to April 29, 2024, with two educational units per week for each group. Each educational unit lasted 40 minutes. The experimental group followed a program involving special exercises designed to enhance both kinesthetic abilities and the dribbling skill, while the control group engaged in a traditional skill exercise program.

Exploratory experiments were conducted before the main experiment to address any obstacles and refine the methodology. The main experiment focused on developing cognitive kinesthetic abilities and dribbling skills through structured exercises.

**Statistical analysis.**

Data were analyzed using the SPSS statistical software package, employing a range of statistical techniques to ensure comprehensive and accurate interpretation. These included the calculation of means, standard deviations, and percentages, as well as the application of the Pearson simple correlation coefficient, independent samples t-test, and paired samples t-test. Additionally, the coefficient of self-honesty was examined to support the integrity of the responses. Throughout the analysis, scientific principles related to test validity, reliability, and objectivity were carefully considered to uphold the quality of the research instruments. The coefficients for the tests used to measure cognitive kinesthetic abilities and dribbling skills are presented in Table 1.

**Table 1. Validity, Reliability, and Objectivity Coefficients of the Tests for Measuring Cognitive Kinesthetic Abilities and Dribbling Skills**

| No. | Statistical Process Tests | Measurement Unit | Stability Coefficient | Self-honesty | Objectivity |
|---|---|---|---|---|---|
| 1 | dominant foot Sensation | cm. | 0.93 | 0.964 | 0.915 |
| 2 | Time Perception (10 seconds) | Sec. | 0.915 | 0.956 | 0.945 |
| 3 | Balance Perception (60 seconds) | Sec. | 0.875 | 0.935 | 0.927 |
| 4 | Dribbling | Sec. | 0.955 | 0.977 | 0.935 |

**Results**

The results of this study are presented to highlight the differences observed between pre- and post-tests for both the experimental and control groups in terms of cognitive kinesthetic abilities and football dribbling skills. The analyses were conducted to determine the extent to which the special exercises influenced the development of the targeted abilities. The findings are structured to show improvements within each group over time, as well as to

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compare outcomes between the two groups. This section includes detailed statistical data—means, standard deviations, T-test values, and significance levels—to substantiate the conclusions drawn from the intervention. The results are organized into several tables that illustrate the effect of the exercises on dominant foot sensation, time perception, balance perception, and dribbling performance.

The analysis of the experimental group's data revealed statistically significant improvements across all measured cognitive kinesthetic abilities. Table 2 demonstrates notable reductions in the mean scores for dominant foot sensation, balance perception, and time perception in the post-test compared to the pre-test. The calculated T values of 9.544, 23.366, and 36.213 respectively, accompanied by significance levels well below 0.05, clearly indicate that the applied special exercises contributed effectively to the development of these abilities.

**Table 2. The Differences Between Pre- and Post-Tests of the Experimental Group in the Development of Several Cognitive Kinesthetic Abilities Affecting Football**

| No. | Cognitive abilities | Measurement Unit | Test | M. | St.d | (T) Test | Sig. |
|---|---|---|---|---|---|---|---|
| 1 | dominant foot Sensation | cm. | Pre | 7.706 | 0.510 | 9.544 | 0.0009 |
| | | | Post | 5.556 | 0.594 | | |
| 2 | Time Perception (10 seconds) Balance Perception (60 seconds) | Sec. | Pre | 7.512 | 0.384 | 23.366 | 0.0003 |
| | | | Post | 4.543 | 0.307 | | |
| 3 | dominant foot Sensation Time Perception (10 seconds) | Sec. | Pre | 23.737 | 0.618 | 36.213 | 0.0005 |
| | | | Post | 14.825 | 0.967 | | |

Similarly, Table 3 shows a significant improvement in the dribbling skill of the experimental group. The mean dribbling time decreased from 19.387 seconds in the pre-test to 14.618 seconds in the post-test, with a T value of 35.323 and a significance level of 0.0007, demonstrating that the training positively influenced skill acquisition.

**Table 3. The Differences Between Pre- and Post-Tests of the Experimental Group in Learning the Dribbling Skill in Football**

| No. | Skill | Measurement Unit | Test | M. | St.d | (T) Test | Sig. |
|---|---|---|---|---|---|---|---|
| 1 | Dribbling | Sec. | Pre | 19.387 | 0.366 | 35.323 | 0.0007 |
| | | | Post | 14.618 | 0.413 | | |

**Musamus Journal of Physical Education and Sport (MJPES)**
http://ejournal.unmus.ac.id/index.php/physical
Volume 7, No. 2, April 2024, Pg. 165-176
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For the control group, although significant improvements were also observed, the magnitude of change was comparatively lower. As shown in Table 4, the control group recorded reductions in the post-test means for all cognitive kinesthetic abilities, with T values of 3.079, 5.073, and 21.983 respectively. Table 5 shows a decrease in the mean dribbling time from 19.525 to 17.681 seconds, with a T value of 19.003 and a significance level of 0.0006, suggesting modest progress without the intervention of specialized training.

**Table 4. The Differences Between Pre- and Post-Tests of the Control Group in the Development of Several Cognitive Kinesthetic Abilities Affecting Football**

| No. | Cognitive abilities | Measurement Unit | Test | M. | St.d | (T) Test | Sig. |
|---|---|---|---|---|---|---|---|
| 1 | Dominant foot Sensation Time Perception (10 seconds) | cm. | Pre | 7.906 | 0.490 | 3.079 | 0.008 |
| | | | Post | 7.425 | 0.358 | | |
| 2 | Balance Perception (60 seconds) dominant foot Sensation | Sec. | Pre | 7.531 | 0.332 | 5.073 | 0.0001 |
| | | | Post | 6.718 | 0.526 | | |
| 3 | Time Perception (10 seconds) | Sec. | Pre | 23.987 | 0.617 | 21.983 | 0.0007 |
| | | | Post | 19.831 | 0.564 | | |

**Table 5. The Differences Between Pre- and Post-Tests of the Control Group in Learning the Dribbling Skill in Football**

| No. | Skill | Measurement Unit | Test | M. | St.d | (T) Test | Sig. |
|---|---|---|---|---|---|---|---|
| 1 | Dribbling | Sec. | Pre | 19.525 | 0.349 | 19.003 | 0.0006 |
| | | | Post | 17.681 | 0.197 | | |

To further assess the effectiveness of the intervention, a comparison of post-test results between the two groups was conducted. Table 6 highlights significant differences favoring the experimental group in all cognitive kinesthetic abilities. The differences in dominant foot sensation, balance perception, and time perception yielded T values of 10.767, 14.259, and 17.885, respectively, with all p-values indicating statistical significance. Table 7 supports these findings in the context of the dribbling skill, where the experimental group significantly outperformed the control group ($T = 26.737$, $p = 0.006$).

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http://ejournal.unmus.ac.id/index.php/physical
Volume 7, No. 2, April 2024, Pg. 165-176
DOI: 10.35724/mjpes.v7i2.7022

**Table 6. The Comparison in the Post-Test Between the Two Research Groups in the Development of Several Cognitive Kinesthetic Abilities Affecting Football**

| No. | Cognitive abilities | Measurement Unit | Group | M. | St.d | (T) Test | Sig. |
|---|---|---|---|---|---|---|---|
| 1 | Dominant foot Sensation Time Perception (10 seconds) | cm. | Control<br>Experimental | 7.425<br>5.556 | 0.358<br>0.594 | 10.767 | 0.0002 |
| 2 | Balance Perception (60 seconds) dominant foot Sensation | Sec. | Control<br>Experimental | 6.718<br>4.543 | 0.526<br>0.307 | 14.259 | 0.03 |
| 3 | Time Perception (10 seconds) | Sec. | Control<br>Experimental | 19.831<br>14.825 | 0.564<br>0.967 | 17.885 | 0.01 |

**Table 7. The Comparison in the Post-Test between the Two Research Groups in Learning the Dribbling Skill in Football**

| No. | Skill | Measurement Unit | Group | M. | St.d | (T) Test | Sig. |
|---|---|---|---|---|---|---|---|
| 1 | Dribbling | Sec. | Control<br>Experimental | 17.681<br>14.618 | 0.197<br>0.413 | 26.737 | 0.006 |

These results confirm that the use of specialized exercises had a more substantial effect on the development of cognitive kinesthetic abilities and dribbling performance compared to conventional training methods used in the control group.

**Discussion**

The results presented in Tables 2 and 3 indicate significant differences between the pre-test and post-test scores of the control group in the development of several kinesthetic cognitive abilities and in learning the football dribbling skill, favoring the post-test outcomes. The researcher attributes this improvement to the effectiveness of the applied instructional curriculum, which incorporated demonstrations and repetitive practice of motor skills. This repetition enhanced the functional efficiency of the kinesthetic cognitive system, thereby improving learners' motor experiences. According to Koltai et al. (2016), consistent performance and repetition of skill exercises facilitate motor understanding, increasing learners' concentration and awareness of their surroundings. Bozkurt (2018) also emphasized that focused repetition supports skill acquisition by enhancing perceptual awareness, which is

**Musamus Journal of Physical Education and Sport (MJPES)**
http://ejournal.unmus.ac.id/index.php/physical
Volume 7, No. 2, April 2024, Pg. 165-176
DOI: 10.35724/mjpes.v7i2.7022

critical in motor learning. Čoh et al. (2004) noted that repeated practice enables integration both within and across different motor skills, leading to more efficient performance.

Tables 4 and 5 similarly demonstrate significant differences in pre- and post-test scores for the experimental group, again favoring the post-test. These results are attributed to the effectiveness of the specialized exercise-based curriculum, which concentrated on enhancing kinesthetic cognition. As Yudy Hendrayana (2015) stated, kinesthetic cognitive functions are fundamentally altered when subjected to targeted educational interventions. The exercises conducted during instructional sessions were designed to transfer cognitive-motor benefits to the learners, thereby enhancing skill execution (Harahap et al., 2018). Perception, as Harahap explains, stems from sensory input transferred through neural pathways, and skill exercises develop physical and motor capacities as learners respond continuously to stimuli—particularly relevant in competitive sports (Cope et al., 2017).

In addition, the use of varied styles in skill exercises, with an emphasis on stimulating sensory perception, contributed significantly to enabling learners to perform the dribbling skill with observable progress. Robin et al. (2020) emphasize that enriched educational environments increase learner experiences, mastery of skills, and performance quality.

Tables 6 and 7 clearly show significant differences between the post-test results of the experimental and control groups in favor of the experimental group. This outcome reinforces the effectiveness of the kinesthetically focused instructional exercises. DOĞGÜN (2023) affirms that physical and skill-based exercises naturally promote the development of kinesthetic cognitive abilities. Koçak (2019) supports this by stating that most scientific sources agree that kinesthetic cognition can be enhanced with targeted, appropriate exercises. Furthermore, Hendrayana (2017) points out that varied methods—such as diversity in exercise types and motor task demands—are critical in developing kinesthetic perception.

Repetitive practice that stimulates internal sensory receptors enables individuals to better perceive body positioning during movement. This perception evolves gradually through experience, with repetition enhancing the learner's ability to judge movements, distances, and spatial relationships (Ryngier, 2021). Mandoob Makki Ati et al. (2024) also emphasize that the visual-kinesthetic pathway allows learners to anticipate and understand the movement trajectory, which promotes cognitive development, motor efficiency, and reduced execution time.

The researcher concludes that the improvements in kinesthetic cognitive abilities and dribbling skills observed in the experimental group stem from the structured nature of the exercises—especially those emphasizing sensory perception—combined with optimal

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http://ejournal.unmus.ac.id/index.php/physical
Volume 7, No. 2, April 2024, Pg. 165-176
DOI: 10.35724/mjpes.v7i2.7022

repetition and rest intervals. As Huang and Liu (2020) assert, effective motor learning requires well-organized practice schedules, proper distribution of rest, and consistent exercise design to reduce errors and improve skill performance.

Finally, the improvement in kinesthetic cognitive variables is attributed to repeated stimulation of sensory receptors, which fosters the formation of new neural connections and enhances neuromuscular responses. Balanced and consistent sensory targeting during performance promotes the development of these abilities. Rawat et al. (2019) argue that kinesthetic perception is a critical psychological, motor, and cognitive function that allows learners to accurately interpret spatial, temporal, and physical relationships in sport.

The superior gains observed in the experimental group support the conclusion that targeted kinesthetic cognitive training significantly enhances both perception and motor skill acquisition. Dhouibi et al. (2021) reinforce that regular stimulation of cognitive abilities accelerates the motor learning process, improves performance efficiency, and prepares learners to adapt to varying environments. This fosters the development of highly skilled and cognitively adept athletes.

## Conclusions

The findings of this study demonstrate that the educational programs implemented for both research groups had a positive influence on the development of certain cognitive and kinesthetic abilities relevant to football. Moreover, these programs contributed significantly to the improvement of football dribbling skills. Notably, the experimental group—whose training incorporated specialized skill exercises focused on enhancing motor sensation—outperformed the control group that followed a conventional skill exercise program. The superior development of cognitive abilities within the experimental group was clearly reflected in their enhanced learning outcomes, particularly in mastering the dribbling skill.

Based on the results, it is recommended to integrate cognitive development strategies alongside the teaching of fundamental football skills to optimize learning effectiveness. Special attention should be given to fostering cognitive abilities in younger age groups involved in football training. Additionally, the development of cognitive capacities should be prioritized when teaching basic skills in other team sports. Finally, further studies are encouraged to explore methods of enhancing cognitive abilities across various age groups and sporting disciplines.

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