Effects of psycho training on motor reaction time and ball-trapping performance in elite Iraqi Premier League soccer players

Efectos del psycho training sobre el tiempo de reacción motora y el rendimiento en el control del balón en futbolistas de élite de la Liga Premier Iraquí

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Abstract

Background. Modern football performance requires high perceptual–cognitive processing, rapid decision-making, and neuromuscular efficiency. Recent sport science research highlights the importance of integrating cognitive and motor training approaches. Psycho training represents an applied training method that combines perceptual–cognitive stimuli, reactive decision-making tasks, and sport-specific motor actions to improve football performance.
Methods. A randomized controlled experimental design with pre- and post-test measurements was used. Twenty-two elite male Iraqi Premier League football players were randomly assigned to an experimental group (n = 11) and a control group (n = 11). The experimental group completed an eight-week psycho training program integrated into regular team training (three sessions per week), including reactive agility drills and dual-task ball-control exercises, while the control group continued regular training only. Motor reaction time was assessed using the Nelson Reaction Time Test, and ball-trapping performance (foot, thigh, and chest trapping) was evaluated using standardized technical performance tests. Data were analyzed using paired and independent samples t-tests with effect size calculations.
Results. The experimental group demonstrated significant improvements in motor reaction time and ball-trapping performance, with moderate-to-large effect sizes, whereas the control group showed no significant changes. Post-test comparisons revealed significantly superior performance in the experimental group.
Conclusions. Psycho training appears to be an effective training approach for improving neuromotor responsiveness and technical ball-control performance in elite football players.

Keywords

Psycho training; sensorimotor integration; reactive agility; dual-task training; football performance.

Resumen

Antecedentes. El rendimiento en el fútbol moderno requiere un alto nivel de procesamiento perceptivo–cognitivo, toma rápida de decisiones y eficiencia neuromuscular. Investigaciones recientes en ciencias del deporte destacan la importancia de integrar enfoques de entrenamiento cognitivo y motor. El psycho training representa un método de entrenamiento aplicado que combina estímulos perceptivo–cognitivos, tareas reactivas de toma de decisiones y acciones motoras específicas del deporte para mejorar el rendimiento en el fútbol.
Métodos. Se utilizó un diseño experimental controlado aleatorizado con mediciones pretest y postest. Veintidós futbolistas masculinos de élite de la Liga Premier Iraquí fueron asignados aleatoriamente a un grupo experimental (n = 11) y un grupo control (n = 11). El grupo experimental realizó un programa de psycho training de ocho semanas integrado en el entrenamiento regular (tres sesiones por semana), con ejercicios de agilidad reactiva y tareas duales de control del balón, mientras que el grupo control continuó con el entrenamiento habitual. El tiempo de reacción motora se evaluó mediante el Nelson Reaction Time Test, y el control del balón (pie, muslo y pecho) mediante pruebas técnicas estandarizadas. Los datos se analizaron con pruebas t para muestras relacionadas e independientes y el cálculo del tamaño del efecto.
Resultados. El grupo experimental mostró mejoras significativas en el tiempo de reacción motora y en el rendimiento del control del balón, con tamaños del efecto moderados a grandes, mientras que el grupo control no presentó cambios significativos. Las comparaciones postest revelaron un rendimiento significativamente superior en el grupo experimental.
Conclusiones. El psycho training parece ser un método de entrenamiento eficaz para mejorar la capacidad de respuesta neuromotora y el control técnico del balón en futbolistas de élite.

Palabras clave

Entrenamiento psico; integración sensoriomotora; agilidad reactiva; entrenamiento de doble tarea; rendimiento en fútbol.

Introduction

Football has become a fast, extremely interactive and cognitively demanding modern game played at high velocities, needing rapid decision-making processes coupled with physical performance capabilities and complex perceptual–motor interplay. In terms of fast the speed of play it needs tactical formulations with less time–space as a resource, which demands players show at high neuromuscular efficiency and sensorimotor reactivity. Accordingly, performance at elite level football is not just a function of fitness and technical execution but also how efficiently players deal with stimuli in their immediate interpersonal environment (the game) in competition timeframes. (Schumacher et al., 2020).

Sport science has shifted focus to the interplay between cognition and motor execution when training task-specific movement patterns. Multiple modern theoretical lenses such as perceptual–cognitive training and ecological dynamics, alongside integrative models for sensorimotor control suggest the benefits of multi-faceted training approaches that engage processes integral to neural processing speed, decision-making accuracy, and movement economy (Gildersleeve, 2021; Piva et al., 2025). In this context, psycho training programs can be defined as an integrative training methodology that uses perceptual–cognitive stimuli together with rapid decision-making demands and specific motor actions in sports-oriented high-intensity drills organized to provide sportsmen with similar competitive situations. The training of this nature intends to improve sensorimotor response, cognitive processing and motor execution coupling within performance environments (Friebe et al., 2024). Psychological and mental training methods have had positive effects on psychological and cognitive performance variables in competitive athletes (Hassan & Abdulkareem, 2025).

Motor response time is an essential factor determining performance in football. It is indicative of the central nervous system competency to translate sensory input into organized motor output. Quicker reaction times facilitate easier anticipation of opponent actions, better body position, and the ability to perform technical actions with minimal wasted time. Small changes of reaction times can have a big impact on match outcomes in high-level football competition can make an important difference, especially during ball transitions (immediate reactions) or defensive pressing situations and first-touch ball control under pressure (Theofilou et al., 2022).

In contexts of football performance, perceptual–cognitive processing and motor reaction time have a direct relationship with the execution of technical skills. Upon receiving a pass, players have to quickly perceive the trajectory of the ball, interpret environmental information including opponent position, and initiate an appropriate motor response in an extremely short amount of time. And by mastering sensorimotor processing quicker, players can perform technical actions like trapping the ball more efficiently and more accurately. This could be due to perceptual–cognitive processing and motor reaction time improving competitive ball-control performance directly (Zhu et al., 2024; Schumacher et al., 2024).

Neurophysiologically, the time required for your muscles to respond is a complex function of several related processes including: sensory receptor activation, time spent by neural signals and receptors in transit back up to the brain, efficiency of cortical processing, and even rate that your muscle fibers fire after deploying your CNS commands. The training interventions that would focus directly on these components thus might lead to neural adaptations similar to an improved synaptic transmission efficiency, optimized synchronization of motor unit recruitment and faster sensorimotor coupling. Together, they enable enhanced sport-specific performance (Maudrich et al., 2022).

In technical terms of football skills, ball control is a fundamental aspect for the good performance. Motor skill development and tuning rely upon organized opportunities for learning which focus on the use of coordination, control and flexibility in movement. Studies of manipulative motor skill acquisition support the need for specific training methods to optimize motor control and technical execution efficiency (Razali et al., 2025). Good ball control allows a player to receive the pass and move into space directed away from the defender and orienting the player to the opponents' goal; it protects the ball while the player turns in response to pressure from opponents, then makes attacking options available. When failing to trap the ball well, more time is required for decision-making, followed by higher defensive pressure or loss of ball possession. Trapping must be performed under more challenging conditions in the elite level (e.g., ball speed, opponent pressure, non-shareable environmental

constraints), which means that it is highly dependent from perceptual motor coordination and reaction time (Bekris et al., 2023).

Previous studies have shown that integrated training approaches including both physical and cognitive challenges can improve sport specific performance measures. For example, youth football players have demonstrated notable enhancements in aspects of physical performance (e.g., sprinting speed) and cognitive function through engagement in dual-task training programs (Ramírez Lucas et al., 2025). Nevertheless, notwithstanding the increased relevance of neurocognitive training methods in sport science and practice, to date there has been a lack of scientific investigation in relation to the influence of psycho training–based exercises on motor reaction time and ball-trapping performance among elite football players—especially within Middle Eastern and Iraqi competitive environments. In view of the specific tactical, physical and environmental challenges of professional football leagues, context-specific scientific evidence is still required to tailor training methods.

Therefore, the present study aimed to develop psycho training exercises specifically designed for elite football players and to examine their effects on motor reaction time and selected ball-trapping skills, given the tight relationship between perceptual–cognitive processing, motor reaction time and technical execution of ball-control in performance.

Method

Study Design

The present study employed a randomized controlled pre-test–post-test experimental design to examine the effects of a psycho training program on motor reaction time and selected ball-trapping skills in elite football players. Participants were randomly assigned to either an experimental group that performed the psycho training program in addition to regular team training or a control group that continued regular training only.

The experimental design included controlled exposure to training stimuli, standardized testing procedures, and random assignment of participants to study groups in order to minimize potential bias. Participants were randomly assigned to two groups: an experimental group that performed the psycho training program in addition to regular team training and a control group that continued regular team training only.

Pre-test measures were taken before the implementation of the intervention to establish baseline levels of performance. Immediately after the completion of the intervention, post-test measures were done using same test and environmental setting. This methodological design ensured that the authors could precisely estimate performance changes as a result of the psycho training intervention.

Participants

Twenty-two male elite football players in the Iraqi Premier League were enrolled in this study voluntarily. The participants were players of Al-Hussein Sports Club, who were recruited during the competitive season (2025–2026). Selection of high-level players was purposeful as the study sought to depicture training adaptations under competitive excellence context, rather than developmental or amateur level.

Goalkeepers were excluded from the analysis due to their movements, tactical and physical demands being different from outfield players. A total of 22 participants were randomly assigned to two groups in equal numbers: an experimental group (n = 11) and a control group (n = 11).

The study protocol was approved by the Ethics Committee of the College of Physical Education and Sport Sciences, University of Baghdad (Approval No.: 3540-1-2026). All participants provided written informed consent prior to participation.

Baseline Equivalence

In order to compare baseline measures from the groups, independent samples t-tests were performed for all primary study variables including motor reaction time and ball-trapping performance; these are presented in table 1. There were no statically significant differences between the two groups at baseline

($p > 0.05$), which indicates that both groups were similar before the training imposition. This baseline comparability also enhanced the internal validity of this experimental design and warranted that post-intervention performance changes could be attributed to the psycho training program, rather than prior (subclinical) differences in performances.

Table 1. Baseline Equivalence Between Experimental and Control Groups in Study Variables

Variable	Unit	Control Group Mean ± SD	Experimental Group Mean ± SD	t-value	p-value
Motor Reaction Time	sec	1.87 ± 0.18	1.91 ± 0.19	0.52	0.61
Foot Trapping	score	11.02 ± 1.26	11.19 ± 1.30	0.32	0.75
Thigh Trapping	score	31.78 ± 1.18	31.42 ± 1.22	0.71	0.48
Chest Trapping	score	4.69 ± 0.64	4.56 ± 0.67	0.47	0.64

All the participants included had at least five years of football training and currently participated in a formal team-training program. All players were medically screened by the club's medical staff to ensure they were fit and free from injury and able to participate in high training intensities. A written informed consent was received from each participant following explanation of the study process, possible side effects, and anticipated benefits.

Sample size was estimated by an a priori power analysis with G*Power software (Version 3.1). Considering a medium effect size ($f = 0.25$), significance level of $p = 0.05$, and power at 0.80, the sample was sufficient with a minimum of 20 participants. Thus, the current sample size of 22 in this study was deemed to be adequate in terms of statistical power.

Intervention Program

This training paradigm is congruous with recent perceptual–cognitive and neurocognitive training models in football, which focus on linking cognitive processing, perception-action coupling, and sport-specific motor action within a context of dynamic environmental constraints (Coutinho et al., 2019; Vestberg et al., 2017; Zhu et al., 2024). The overall structure and progression of the training intervention are presented in Table *2*.

Table 2. Structure of the Psycho Training Program

Training Variable	Description
Training Period	8 weeks
Training Phase	Specific preparation phase
Weekly Frequency	3 sessions per week
Total Sessions	24 sessions
Session Duration	45–60 minutes
Warm-Up Duration	15 minutes (dynamic football-specific warm-up)
Main Psycho Training Duration	40–50 minutes
Training Intensity	High intensity (RPE 7–9)
Training Method	High-Intensity Interval Training (HIIT) + Cognitive–Motor Integration
Work-to-Rest Ratio	1:1 to 1:2 depending on drill complexity
Training Progression	Gradual increase in cognitive load, movement speed, and decision-making complexity
Type of Stimuli Used	Visual cues, directional signals, decision-making triggers
Main Training Objectives	Improve reaction time, perceptual processing, neuromuscular coordination, ball control under pressure

The psycho training program in the present study was formulated a joint perceptual–cognitive and neuromotor training intervention. The intervention integrated high-intensity sport-specific movement patterns, and cognitive and perceptual tasks that aimed to mimic competitive match situations (Casella et al., 2022).

High-intensity interval training has been extensively applied to enhance physiological and performance adaptations in athletes of various sports modalities(Easa et al., 2022). Comparable physiological and body composition changes after high-intensity combat sports training have also been observed in young adults (Laha & Phanpheng, 2025).

The intervention was implemented over an eight-week training period during the specific preparation phase of the competitive season. Psycho training sessions were conducted three times per week and were incorporated into the main part of the team training session to ensure ecological validity and maintain sport-specific training context, as shown in table 3.

Table 3. Weekly Training Content Distribution

Week	Training Focus	Cognitive Load	Movement Speed	Exercise Complexity
1–2	Basic reaction drills + simple ball control	Low	Moderate	Low
3–4	Reactive agility + ball trapping under visual stimulus	Moderate	Moderate–High	Moderate
5–6	Dual-task training (reaction + ball control + decision making)	High	High	High
7–8	Match-simulation reactive drills under time pressure	Very High	Very High	Very High

Training session duration was 60 min, with a gradual progression in intensity throughout the training. The warm up phase was consisted of a dynamic warm up part with a duration of ~15 min to prepare the neuromuscular and cardiovascular system. This was succeeded by the main psycho training session, which lasted 40–50 min and consisted of high-intensity exercises requiring both cognitive processing and motor execution. Technical integration exercises were also conducted, to aid in the transfer of training adaptations into football specific skills.

An example of the internal structure of a single psycho training session is presented in Table 4 to illustrate the distribution of training load, cognitive demand, and movement intensity within each training unit.

Table 4. Example of a Single Psycho Training Session Structure

Session Component	Duration	Training Content	Training Objective	Intensity
Dynamic Warm-Up	15 min	Dynamic mobility, activation drills, light ball work	Neuromuscular activation, injury prevention, movement preparation	Low–Moderate
Reactive Agility Drills	10 min	Multi-directional sprint and change of direction in response to visual stimulus	Improve reaction speed and sensorimotor integration	High
Dual-Task Ball Control	15 min	Ball trapping combined with directional or visual decision-making tasks	Improve cognitive–motor coordination and decision speed	High
Reactive Passing and Trapping	10 min	Passing and trapping under unpredictable stimulus signals	Improve ball control under pressure and perceptual anticipation	High
Technical Integration Drill	10 min	Small-sided reactive play situations	Transfer training adaptations to match-specific performance	Moderate–High

Training was progressed via increments in movement complexity, reaction time (RT) requirements, decision-making and cognitive load. Training intensity was monitored according to the Rating of Perceived Exertion (RPE) scale and was kept between 7 and 9, corresponding to high intensity training zones known to induce performance adaptation in elite athletes.

Psycho Training Protocol

The psycho training tasks were developed according to recent principles of motor learning and neurocognitive training. Training tasks involved a combination of rapid movement-based actions in synchrony with visual or directional cues.

The training was based on a combination of multidirectional agility drills and visual stimulus reaction tasks. Subjects had to react to visual cues and accordingly change the direction of movement, which improved sensorimotor integration and neural speed processing. Furthermore, dual-task ball control drills were utilized in which players would have to trap or control the ball (single leg stance) while performing secondary cognitive tasks including responding to auditory directional cues or identifying visual targets

Follow reactive passing and trapping training were also introduced wherein players were required to react to labels that cued unpredictable information before performing any action of ball control. The drills were specifically created to simulate match play situations that require quick reactions from players under the pressure of time and space.

The overall objective of the psycho training protocol was to stimulate neural adaptation processes, including faster sensory processing, improved neuromuscular coordination, and enhanced perceptual anticipation ability.

Testing Procedures

Motor Reaction Time Assessment

The Nelson Reaction Time Test was used to measure motor reaction time, a common test of simple reaction time in sports performance-based research. In this test, subjects react to a visual stimulus with a sudden movement, which could be running in the direction of an line/rope (i.e., as fast as possible toward this) or another stimulus. Each subject performed six trials, three aimed at each side. Before the testing period, a series of familiarization sessions were conducted to verify an identical understanding of testing procedures for all players as well as to avoid possible learning effects. The shortest response time among the trials was considered for statistical analysis. All testing sessions were standardized with respect to the time of day, environmental conditions, and equipment arrangement in order to prevent variability and ensure reliability between the measurements. The Nelson Reaction Time Test has been validated for reaction time assessment among athletic populations (Mohammadpour et al., 2012).

Ball-Trapping Skill Assessment

Ball trapping ability was assessed using established technical performance measures in three specific ball-trapping tasks, chest trap, thigh trap and foot trap - all fundamental aspects of ball control in high-level football. High-definition video cameras were used to record every player performance for further post-performance analysis. The recordings were rated by three separate expert raters consisting of experienced coaches and performance analysts.

Quality of performance was measured using a standardized scoring system ranging from 0 to 10 points for each trial, which evaluated the preparatory phase (2 points), the execution phase (5 points), and the final control phase (3 points). Each player performed three trials for each trapping test, and the final performance score represented the sum of the three trials, resulting in a maximum possible score of 30 points for each ball-trapping skill. To establish scoring consistency, inter-rater reliability analysis revealed excellent agreement between evaluators (ICC = 0.89–0.93), indicating high reliability of the scoring procedure.

The protocol was guided by accepted protocols and best practice in football skill assessment procedure which underpins the significance of standardized testing environment and reliability of measurement procedures(Ali, 2011).

Statistical Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS version 26). Descriptive statistics, including means and standard deviations, were calculated for all variables. Data normality was assessed using the Shapiro–Wilk test. Inferential statistical analyses included paired-samples t-tests to examine within-group changes between pre-test and post-test measurements and independent-samples t-tests to evaluate differences between the experimental and control groups. Although a two-way group × time analysis could also be applied, paired and independent t-tests were selected due to the relatively small sample size and the straightforward two-group experimental design. Effect size was calculated using Cohen's d, computed as the difference between means divided by the pooled standard deviation, to determine the magnitude of training effects. Effect size values were interpreted according to established thresholds: small (0.20), moderate (0.50), and large (0.80). The level of statistical significance was set at $p \leq 0.05$.

Results

The results are presented according to the statistical procedures used to examine within-group and between-group differences in motor reaction time and ball-trapping performance variables. Ball-trapping scores represent the sum of three trials (maximum score = 30 points). Descriptive and inferential statistical analyses were performed to determine the effects of the psycho training program on the experimental group compared with the control group following the intervention period.

Table 5 shows the experimental group differences regarding psycho training intervention within groups. The findings show significant changes for all the study variables following the completion of training. Motor reaction time decreased, whereas foot trapping scores increased. In contrast, thigh and chest trapping scores decreased. In the trapping tests, lower scores indicate better performance, reflecting faster ball stabilization and more efficient ball reception. Moderate to large effect sizes, suggesting

practically meaningful gains in both neuromotor responsiveness and technical ball-control performance were observed.

Table 5. Pre- and Post-Test Results for the Experimental Group

Variable	Unit	Pre-Test Mean ± SD	Post-Test Mean ± SD	t-value	p-value	Effect Size (d)
Motor Reaction Time	sec	1.91 ± 0.19	1.18 ± 0.16	5.42	0.001	0.88
Foot Trapping	score	11.19 ± 1.30	12.63 ± 0.92	4.21	0.002	0.74
Thigh Trapping	score	31.42 ± 1.22	30.21 ± 0.84	3.87	0.003	0.69
Chest Trapping	score	4.56 ± 0.67	3.49 ± 0.61	4.96	0.001	0.81

Table 6 shows the results that each of the control group managed to reach after the conventional training period. There are statistically no significant differences that lead to an increase or a decrease in any of the measures. Only minimal nonsignificant changes were detected, which indicate limited practical significance of the routine training program on motor reaction performance and ball-trapping skills within the study duration.

Table 6. Pre- and Post-Test Results for the Control Group

Variable	Unit	Pre-Test Mean ± SD	Post-Test Mean ± SD	t-value	p-value	Effect Size (d)
Motor Reaction Time	sec	1.87 ± 0.18	1.71 ± 0.20	2.12	0.058	0.32
Foot Trapping	score	11.02 ± 1.26	11.41 ± 1.10	1.74	0.110	0.28
Thigh Trapping	score	31.78 ± 1.18	31.02 ± 1.05	2.01	0.067	0.31
Chest Trapping	score	4.69 ± 0.64	4.32 ± 0.70	1.89	0.081	0.29

Post-test comparison between the experimental and control group are shown in Table 7. Findings show that the experimental group significantly outperformed the control group in all of these study domains. Effect sizes were moderate to large, which demonstrates that the psycho training program was more effective than traditional football training in enhancing motor reaction performance and ball-trapping skill execution for elite football players.

Table 7. Post-Test Comparison Between Experimental and Control Groups

Variable	Unit	Control Mean ± SD	Experimental Mean ± SD	t-value	p-value	Effect Size (d)
Motor Reaction Time	sec	1.71 ± 0.20	1.18 ± 0.16	6.01	0.001	0.95
Foot Trapping	score	11.41 ± 1.10	12.63 ± 0.92	3.94	0.002	0.72
Thigh Trapping	score	31.02 ± 1.05	30.21 ± 0.84	3.12	0.006	0.63
Chest Trapping	score	4.32 ± 0.70	3.49 ± 0.61	3.87	0.003	0.70

Discussion

The present study examined the effects of an integrated psycho training program on motor reaction time and selected ball-trapping skills in elite football players. The findings demonstrated significant improvements in motor reaction time and ball-control performance in the experimental group compared with the control group. These results suggest that integrating perceptual–cognitive stimuli with sport-specific motor actions may enhance neuromotor responsiveness and technical skill execution in elite football contexts.

Previous research has highlighted the importance of neurophysiological mechanisms in regulating performance in elite football players, particularly those related to neural processing efficiency and sensorimotor coordination (Zouer Habeb et al., 2025).

From a neurophysiological point of view, integrated cognitive–motor training has been found to improve the neural processing efficiency and transfer speed between sensory input systems and motor output reaction. Training conditions that require the combination of physical execution with higher-order cognitive decision making elicit activity in cortical and subcortical neural networks subserving motor planning and movement execution. Repeated exposure to cognitively demanding motor tasks would increase neuroplasticity in the brain and signal clarity through increased synaptic transmission and motor unit synchronization thereby improve the efficiency of responding (Spampinato & Celnik,

2021). These neural changes are particularly pertinent in high performance sports settings, where athletes are required to quickly respond to the dynamic environment.

The observed motor reaction performance enhancements can also be viewed in terms of perception–action binding. Motor learning alterations could also be attributed to neural transfer between extremities and motor's coordination efficacy. Interlimb transfer and motor asymmetry have also been shown to predict improvements in serial reaction time performance, representing neuro-adaptive processes that underpin motor learning and sensorimotor integration (Fernandes et al., 2025). In the light of motor control theories, successful performance during competition significantly depends on the ability of athletes to adequately process environmental information and transform it into effective motor actions. Training to incorporate the demands of perceptual decision-making has been shown to improve anticipation and response efficacy in team sport athletes (Roca et al., 2012). In elite football, but more broadly in football, the importance of players having to process quickly visual information and produce an efficient motor response is clear to achieve good performance at high-speed match play.

The improvements in ball-trapping performance observed in the present study may be explained by enhanced sensorimotor integration and movement coordination resulting from the combined perceptual–cognitive and motor demands of the psycho training exercises. Ball control ability, which is crucial in the game of football, is characterized by timing accuracy, perception of space and dynamic integration between visual perception and motor implementation. Past research has shown that feedback training focusing on both perceptual and motor demands enhances technical skill performance reliability and accuracy, particularly under pressure (Abdulghani et al., 2025; Clemente et al., 2023). It also suggests that motor skill learning is not just a result of practicing the movement over and over again, but it involves the combination and coupling of perceptual and cognitive elements during the process of skill development. Biomechanical effectiveness has also been identified as an essential factor in achieving successful technical skills execution in several sport categories (Abdulkareem & Sattar Jabbar, 2025).

Moreover, the effectiveness of the psycho training intervention may also be explained through principles of dual-task training, which require athletes to process cognitive stimuli while simultaneously executing motor actions. Dual-task training improves cognitive as well as motor performance through promoting attentional capacity and neuro-resource allocation efficiency during complex movement tasks (Herold et al., 2018). Within elite sport an athlete is seldom asked to produce an action in isolation, rather they are required to execute skills while making decisions that involve environmental demands. Thus, training methods that mimic these complex requirements may result in greater transfer of learning.

Additionally, experimentation with high-intensity training plus cognitive load exposure could have added to the resulting changes seen in performance. High-intensity training has been associated with influences on neuromuscular function, including motor unit recruitment and movement velocity of execution. Complemented with perceptual–cognitive stimuli, such training may expedite the adaptation of skills by tapping into physical and neural performance systems(Yoshiko et al., 2023). A model such as this fits well with modern sport performance frameworks in which the integration between physical, cognitive, and perceptual domains of performance is emphasized. Interventions that are focused on neuromuscular control and movement stability have been effective in enhancing sport-specific performance and movement accuracy among athletes (Hassan & Abdulkareem, 2026).

The results of the present study emphasize the importance of incorporating perceptual–cognitive components into football training programs. Motor reaction time and ball-trapping performance correlations suggest that training environments integrating reactive stimuli with task execution may more closely replicate match conditions allowing for greater transfer learning to occur during competitive performance.

Limitations

The current study has several limitations that should be considered when interpreting the findings. First, the sample size was relatively small and limited to elite players from a single professional football club, which may restrict the generalizability of the results to other competitive levels, age groups, or playing environments. Second, the duration of the intervention was relatively short (eight weeks), and

therefore the long-term effects of psycho training on performance variables remain unclear. Third, the study relied primarily on performance-based outcome measures, and the absence of direct neurophysiological measurements such as EMG or EEG limited the ability to investigate the underlying neural mechanisms associated with the observed improvements. Finally, positional differences among outfield players were not considered, which may influence training adaptations and performance responses.

Conclusions

These current findings indicate that incorporating psycho training into soccer practice settings could be beneficial for improving motor response time and technical performance when controlling the ball, among top-level football players. This method of high-intensity sport-specific training focused on the extension of perceptual–cognitive decision-making during the task which has been shown to result in a greater neuromotor response and improved performance in a dynamic competition setting.

These results provide evidence in support of contemporary models of sport performance that emphasize the interaction of cognitive, perceptual, and motor components occurring within training environments. Thus, the psycho training method used in this study may be a valuable model to use to improve functional sport performance outside of conventional technical and physical approaches.

On the practical side, training drills based on reaction and cognitive demands can be beneficial for football players to develop their ability to predict unpredictable match situations and can therefore support improved performance efficiency in competition.

Recommendations

Based on the results of this investigation, it is suggested that football coaches and performance practitioners should integrate psycho training protocols involving perceptual–cognitive stimuli coupled with sport-specific motor responses into routine training sessions as a part of specific preparation phase for the competitive season. Integration of reactive agility drills, dual-task exercises, and decision-making tasks may help to improve the motor reaction time and ball-control performance under match-like scenarios.

The training programs should also strive to replicate perceptual and decision-making requirements of competition as this may promote better transfer from the training environments to game performance. The neurological enhancement through the use of cognitive tasks should be integrated with physical high-intensity movements in order to maximize neuromuscular and perceptual adaptations in football elite players.

It is proposed that future work looks at the long-term benefits of psycho training across varying age groups as well as competitive levels and playing positions. Moreover, future studies could also include neurophysiological measurement tools like EMG or EEG to examine the neural mechanisms that mediate effects on performance from combined cognitive–motor training.

Conflict of interest

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

Disclosure statement

This study was not supported by, or yielded any financial gain to, any of the authors.

Informed Consent

All parties participating in this project were required to provide informed consent.

Ethical Approval

The study was approved in compliance with the ethical standards of internationally accepted principles for research involving human participants. The ethical standards of the Declaration of Helsinki were followed in the present study. An approval of the committee of ethics at the College of Physical Education & Sports Science University of Baghdad (Approval No.: 3540-1-2026) for work with human subjects had already been obtained before the data collection was started. Subjects were advised of the option to discontinue participation at any time without penalty

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