

# The Effect of a Mindfulness-Based Training on Soccer Skills and Mental Focus in Male Students Aged 10 to 14

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## Abstract

**Background:** Mindfulness-based training (MBT) can improve cognitive function, emotional regulation, and motor performance in sports settings. Given the importance of both technical skills and attentional abilities in soccer performance, this study aimed to investigate the impact of MBT on shooting, passing, and mindfulness in male novice players aged 10–14.

**Methods:** This quasi-experimental study employed a pre-test–post-test design with a control group and was conducted from June to August 2024 at the indoor sports complex of Miandoab County, West Azerbaijan Province, Iran. Forty novice male football players aged 10 to 14 years were recruited using a convenience sampling method and randomly allocated to either the intervention or control group through simple randomization using sealed, opaque envelopes. The intervention group received mindfulness-based training (MBT) combined with football skill training, whereas the control group received football skill training alone. The intervention period lasted four weeks, during which both groups trained three times per week. Each session for the intervention group consisted of 20 minutes of football skill practice followed by 20 minutes of MBT exercises, while participants in the control group completed 20 minutes of football skill practice only. Shooting skill, passing skill, and mindfulness, assessed using the Mindfulness Inventory for Sport (MIS), were measured at baseline and after the intervention. Data were analyzed using analysis of covariance (ANCOVA) in SPSS version 26.

**Results:** The intervention group showed significant improvements in mindfulness (Pre:  $58.50 \pm 15.22$ , Post:  $65.75 \pm 12.47$ ,  $P < 0.001$ ), football shooting accuracy (Pre:  $47.95 \pm 9.10$ , Post:  $58.85 \pm 13.51$ ,  $P = 0.012$ ), and passing accuracy (Pre:  $7.00 \pm 1.55$ , Post:  $9.65 \pm 3.01$ ,  $P = 0.028$ ) compared with the control group, which showed no significant changes. Between-group analysis controlling for baseline scores confirmed these differences (mindfulness  $P = 0.001$ , shooting  $P = 0.001$ , passing  $P = 0.001$ ) with moderate to large effect sizes (partial  $\eta^2 = 0.30$ – $0.87$ ), highlighting the practical significance of mindfulness training on mental and technical performance in novice male players.

**Conclusions:** Mindfulness-based training combined with football skill drills significantly enhances shooting and passing performance, as well as mindfulness levels, in novice male football players aged 10 to 14. Given the critical developmental stage and the school-based context of youth sports, integrating MBT practices into school football training programs can effectively improve both technical skills and mental focus. Coaches and educators are encouraged to implement mindfulness interventions as a practical, accessible approach to support the holistic development of young athletes within school environments.

**Keywords:** Athletes; Exercise; Mindfulness; Motor Skills; Psychomotor Performance; Soccer

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## 1. Introduction

Mindfulness-based training (MBT) has gained increasing attention in sport psychology due to its potential to improve focus, reduce stress, and enhance decision-making under pressure (1). In this context, MBT refers to sustained, present-moment, non-judgmental attention to internal and external experiences. It encourages the acceptance of thoughts and emotions, thereby supporting concentration, emotional regulation, and athletic performance (2, 3).

MBT techniques such as meditation, mindful

breathing, and body scanning help athletes stay grounded, minimize distractions, and maintain calm during competition. Research indicated that MBT reduces cortisol levels, improves emotional regulation, and strengthens cognitive and motor functions essential for success in dynamic sports environments (4). As a psychological skills training method, MBT has been applied across various sports with positive outcomes, particularly in precision-based disciplines like shooting and dart throwing (5, 6).

Motor skill is defined as the learned ability to perform movements with precision and efficiency,

involving coordination and control of body movements (7). These skills are fundamental to physical competence and encompass both gross motor skills, which engage large muscle groups and involve full-body movements, as well as fine motor skills, which require the precise control of smaller muscle actions (8). Research indicated that MBT can enhance motor skill acquisition by improving cognitive control, increasing the enjoyment of physical activity, and promoting adaptive learning strategies (9). Neuroimaging studies further demonstrate that MBT increases activation in brain regions associated with attention and motor control, such as the prefrontal cortex and insula, underscoring its potential as a trainable intervention to improve motor performance (10, 11).

Mindfulness interventions have been shown to enhance motor proficiency, working memory, and emotional regulation in children and adolescents, thereby supporting motor learning and psychological resilience during critical developmental stages (12, 13). MBT has demonstrated positive effects across various sports, especially in precision sports like shooting and dart throwing (5, 6). Among youth, MBT improves motor proficiency, working memory, and emotional regulation, facilitating better motor learning and psychological resilience (12-14). Recent studies focusing on young novice soccer players have highlighted the role of MBT in enhancing mental focus, attention control, and reducing competitive anxiety, which in turn boosts confidence and performance during critical moments such as penalty shootouts (15, 16).

The age range of 10 to 14 years represents a crucial developmental window for acquiring foundational soccer skills due to significant physical, cognitive, and neurological maturation (17). Structured training during this period is essential to prevent inefficient skill development and long-term deficits that could limit future athletic potential (18, 19). Without targeted and structured training, important skills like passing, ball control, and decision-making may develop inefficiently, restricting athletic progression (19). Although the benefits of MBT are well documented in elite athletes (20), research is limited on its effects on skill development and mental focus in young novice soccer players (21). Despite several studies on MBT in elite athletes (11, 22), few focus on novice soccer players aged 10 to 14 within real training environments, limiting the understanding

of MBT as a tool for skill acquisition and mental focus in this critical group (23, 24).

Therefore, an important gap remains in understanding whether the benefits of MBT can be translated into improvements in both technical skill acquisition and mental focus among young novice soccer players during a critical stage of athletic development. Addressing this gap may help determine the practical value of incorporating MBT into youth soccer training programs. Therefore, the present study aimed to investigate the effects of Mindfulness-Based Training (MBT) on soccer skills, specifically passing and shooting, and on mindfulness levels in male novice players aged 10–14 in a real training environment. This study also aimed to provide clear evidence supporting the integration of MBT into youth soccer training programs to enhance both physical performance and psychological skills.

## 2. Methods

### 2.1. Design

This was a quasi-experimental study with pre-test–post-test design and a control group conducted from June to August 2024 at indoor sports complex of Miandoab County, West Azerbaijan province, Iran.

### 2.2. Selection and Description of Participants

Forty male novice soccer players, aged 10 to 14 years, were selected using a convenience sampling technique from those registered in summer programs at Miandoab Gym, West Azerbaijan province, Iran. Recruitment took place in coordination with local sports clubs and recreational centers. The inclusion criteria were: (1) male novice football players who (a) had not participated in regular or organized football activities in the past year, (b) were not registered with the Iranian Football Federation, and (c) did not hold a junior football license; (2) aged between 10 and 14 years; (3) willingness and ability to comply with the study protocol; (4) normal or corrected-to-normal vision, as assessed using the Snellen chart; (5) no diagnosed neurological, musculoskeletal, visual, or hearing disorders that could affect participation in soccer training or performance on the study outcomes; and (6) no previous experience with MBT practice.

Basic demographic information, including age, height, weight, and BMI, was recorded during the initial screening session. The exclusion criteria were: unwillingness to continue, displaying uncontrolled behaviors, or being absent for more than two training sessions.

### 2.3. Sample Size Determination

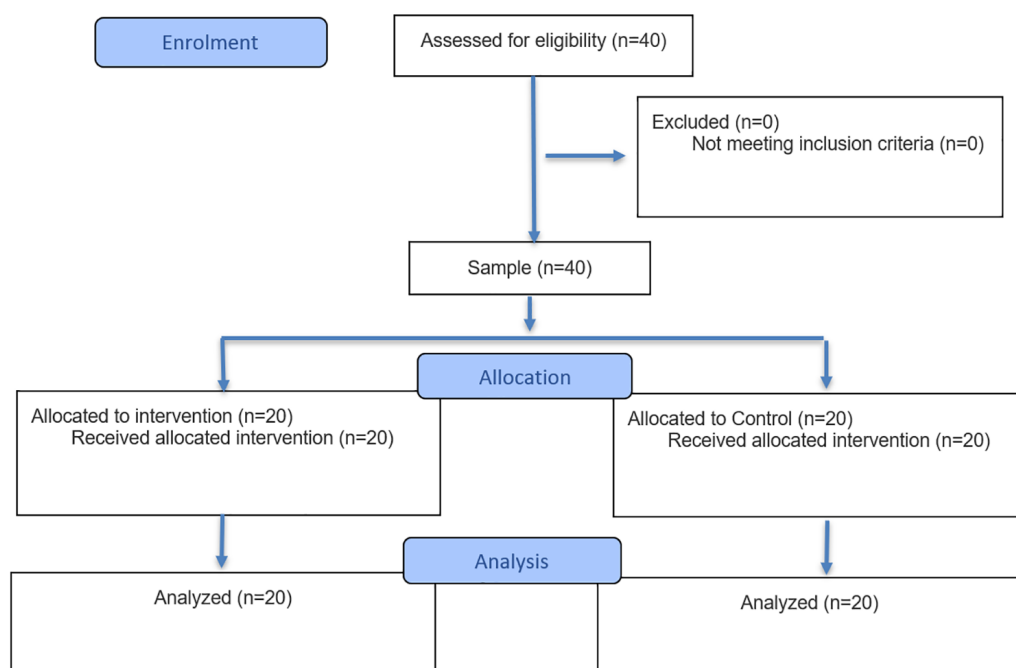
The required sample size was calculated based on primary football performance outcomes, particularly passing accuracy, as reported in a similar randomized controlled trial by Norouzi and colleagues (21). In their study of novice adolescent football players, the intervention group achieved a higher post-test mean score for football passing performance ( $8.91 \pm 1.22$ ) compared with the control group ( $7.52 \pm 1.73$ ). Using these values, the effect size (Cohen's  $d \approx 0.84$ ) was calculated, and the minimum sample size per group was estimated using G\*Power (version 3.1.9.7) with  $\alpha = 0.05$  and power = 0.95, resulting in 18 participants per group. To account for potential dropouts, 20 participants were recruited per group, for a total of 40 individuals. Participation was entirely voluntary, and all participants and their parents were informed about the study aims and procedures. Parents or legal guardians provided written informed consent prior to participation. The participants' information was anonymized using ID codes, and all sensitive data were securely stored, with access restricted to the research team.

### 2.4. Randomization

Using a computer-generated random number sequence, the study participants were allocated in a 1:1 ratio to either the mindfulness-based training (MBT) group or the control group. To maintain allocation concealment, sealed, opaque, and consecutively numbered envelopes were prepared beforehand and opened in order by an independent researcher who was not involved in participant recruitment or outcome assessment; no stratification factors were applied. The outcome assessor remained blinded to group allocation, ensuring a single-blind design. The flow diagram of the study is summarized in Figure 1.

### 2.5. Data Collection and Measurements

*Mindfulness Inventory for Sport (MIS):* Mindfulness was assessed using the Mindfulness Inventory for Sport (MIS) developed by Thienot and colleagues, consisting of 51 items across three subscales: awareness, nonjudgment, and refocusing (25). It uses a 2-point Likert scale ranging from 1 (not at all) to 2 (completely). Subscale scores range from 17 to 34, and the total score ranges from 51 to 102. In Iranian female athletes, MIS has demonstrated good psychometric properties. Ajilchi and colleagues confirmed the three-factor structure of MIS, supporting construct validity and reported strong reliability (26). Overall, MIS shows robust face and content validity through expert



**Figure 1:** The figure shows the CONSORT flow diagram of the research.

review, high internal consistency (Cronbach's  $\alpha = 0.82\text{--}0.91$ ), and adequate test-retest reliability ( $r = 0.78\text{--}0.86$ ) in athlete populations (25-27). Face and content validity were established through expert review by sport psychologists and coaches, ensuring the items are relevant, clear, and representative of the constructs of mindfulness.

*Soccer Shooting Test:* Shooting accuracy was assessed using the soccer shooting test of Mor and Christian (28), which evaluates precision but not speed or power. Four circular targets (1.21 m diameter) were placed in each corner of a soccer goal. The participants took shots from a distance of 14.63 m (16 yards), with 10 points awarded for a shot that hit a target and 4 points for shots that passed through the target area. Each participant had one practice shot per target, followed by four test shots, rotating through the four target corners. Points were awarded based on accuracy (2 points for direct hits, 1 point for adjacent hits). The test has demonstrated strong psychometric properties, including high test-retest reliability ( $r = 0.96$ ) and substantial construct validity ( $r = 0.78$ ), indicating its effectiveness in assessing shooting performance among soccer players (28).

*Soccer Passing Test:* Passing skill was assessed using the soccer passing test of Mor and Christian (28). The participants passed the ball from three different positions on the field, each 13.71 m from a target area defined by two cones (45.72 cm high). Positions included center, right, and left. Four passes were made from each position (12 in total). The final passing skill score was the average score across all attempts. This test is validated for adolescents, with reported test-retest reliability of 0.96 (28).

## 2.6. Procedure

The participants were randomly assigned to the mindfulness-based training (MBT) or control group. All pre- and post-tests were performed under identical standardized conditions, including consistent time (4-6 PM), lighting, temperature, and equipment.

Before the intervention, a certified coach provided a group briefing on basic passing and shooting techniques. To minimize cross-group contamination, each group was trained on separate

days under the direct supervision of the research team, and all sessions were delivered using standardized instructional protocols.

The experimental group completed 12 sessions, each with 20 minutes of soccer skill practice and 20 minutes of MBT practices. MBT, adapted from Zhu and co-workers, focused on mindful breathing and body scan exercises led by a certified instructor with over two years of experience (29). The control group performed equivalent physical training without MBT components. Although the intervention sessions were slightly longer, prior research supports the benefit of combining MBT with physical training to improve both skill and psychological outcomes (30, 31).

## 2.7. Data Analysis

All statistical analyses were performed using SPSS version 26.0. Before performing the ANCOVA, the relevant assumptions were verified. Data normality was assessed using the Shapiro-Wilk test, homogeneity of variances was examined with Levene's test, and homogeneity of regression slopes across groups was confirmed. Between-group differences were analyzed using ANCOVA, controlling for pre-test scores, while within-group changes were evaluated with paired t-tests. Statistical significance was set at  $P < 0.05$ .

## 3. Results

All participants were male, with 20 in the intervention group and 20 in the control group. The mean age was  $13.13 \pm 1.03$  years in the intervention group and  $12.55 \pm 1.35$  years in the control group. There were no statistically significant differences between the groups in terms of height ( $1.64 \pm 1.60$  m vs.  $1.60 \pm 1.64$  m;  $P = 0.59$ ), weight ( $60.55 \pm 5.88$  kg vs.  $57.85 \pm 8.30$  kg;  $P = 0.87$ ), or baseline mindfulness scores ( $58.50 \pm 15.22$  vs.  $51 \pm 14.59$ ;  $P = 0.71$ ). These results indicated that the groups were comparable at baseline, allowing any subsequent differences to be attributed to the intervention (Table 1).

Table 2 presents mean and standard deviation values, within-group statistical comparisons, and between-group differences (controlling for baseline scores) in mindfulness scores, football shooting, and passing skills for both the intervention and control groups before and after the intervention.

**Table 1:** Demographic characteristics of the participants

Variable	Intervention Group (n = 20)	Control Group (n = 20)	P value
Age (years)	13.13 ± 1.03	12.55 ± 1.35	0.73
Height (meters)	1.64 ± 1.60	1.60 ± 1.64	0.59
Weight (kg)	60.55 ± 5.88	57.85 ± 8.30	0.87
Mindfulness score	58.50 ± 15.22	51 ± 14.59	0.71

**Table 2:** Pre- and Post-Test Comparisons of Mindfulness and Football Skills

Variable	Group	Pre-test Mean ± SD	Post-test Mean ± SD	Within-Group t	Within-Group P value	Between-Group P value (ANCOVA)
Mindfulness Score	Control (n = 20)	51 ± 14.59	51.65 ± 14.05	-0.497	0.625	—
	Intervention (n = 20)	58.50 ± 15.22	65.75 ± 12.47	-10.912	<0.001	0.001
Football Shooting	Control (n = 20)	41.00 ± 8.62	40.80 ± 8.82	0.89	0.38	—
	Intervention (n = 20)	47.95 ± 9.10	58.85 ± 13.51	-6.17	<0.001	0.001
Football Passing	Control (n = 20)	7.70 ± 2.55	7.80 ± 2.46	-0.56	0.57	—
	Intervention (n = 20)	7.00 ± 1.55	9.65 ± 3.01	-4.52	<0.001	0.001

SD: Standard Deviation; P < 0.01 indicates a statistically significant difference.

In the control group, no statistically significant within-group differences were observed for mindfulness, football shooting, or passing skills. Despite slight changes in mean scores, paired t-tests indicated that these changes were not statistically significant (P = 0.625 for mindfulness, P = 0.38 for shooting, and P = 0.57 for passing). In contrast, the intervention group exhibited statistically significant improvements across all three variables. The mean mindfulness score increased from 58.50 ± 15.22 (pre-test) to 65.75 ± 12.47 (post-test), (t = -10.912, P < 0.001). Similarly, football shooting scores improved from 47.95 ± 9.10 to 58.85 ± 13.51 (t = -6.17, P < 0.001), and passing scores increased from 7.00 ± 1.55 to 9.65 ± 3.01 (t = -4.52, P < 0.001). These findings supported the effectiveness of the mindfulness-based intervention in enhancing both mental and technical performance among novice male football players.

The results of the analysis of covariance (ANCOVA) indicated that, after controlling for pre-test scores, there was a statistically significant difference in post-test scores between the intervention (mindfulness-based) and control groups for all three variables including football shooting, football passing, and mindfulness score.

Specifically, the mindfulness-based intervention had a significant effect on shooting performance (F (1, 37) = 28.757, P = 0.001, partial  $\eta^2$  = 0.43), as well as on passing performance (F(1, 37) = 15.879, P = 0.001, partial  $\eta^2$  = 0.30).

Furthermore, the intervention produced

a highly significant improvement in overall mindfulness levels, as measured by the MIS total score (F (1, 37) = 246.246, P = 0.001, partial  $\eta^2$  = 0.869). This indicates a very large effect size, with the intervention accounting for approximately 87% of the variance in post-test mindfulness scores.

These results suggested that, after controlling for baseline performance, participants in the intervention group experienced significantly greater improvements in both technical football skills and mindfulness levels compared with those in the control group.

In terms of the effect size, the intervention accounted for 43% of the variance in shooting performance, 30% of the variance in passing performance, and 86.9% of the variance in mindfulness scores, indicating a moderate to large effect on technical skills and a very large effect on sport-related mindfulness in novice male players.

#### 4. Discussion

The present study aimed to examine the effect of a mindfulness-based training (MBT) on the development of technical football skills, specifically shooting and passing, in novice male players aged 10 to 14 years. This age range is a critical period for the development of motor, cognitive, and neurological abilities, representing a sensitive window for acquiring foundational football skills.

Our findings showed that integrating MBI with physical training significantly improved shooting

and passing skills in the experimental group. In contrast, the control group, which received only physical training, did not demonstrate significant improvements. Additionally, mindfulness scores increased significantly in the intervention group, underscoring the effectiveness of MBI in enhancing mental focus and attentional control. This enhancement in mindfulness likely contributed to the observed improvements in technical football skills by promoting greater concentration and reducing performance anxiety during skill execution.

#### *Age-Related Development and Role of MBT*

The age range of 10 to 14 years is characterized by rapid development in agility, balance, coordination, decision-making, and cognitive responses (32, 33). During this critical period, MBT practices can play a crucial role in enhancing focus, reducing stress, and improving cognitive functioning, which in turn benefits motor learning and the execution of technical skills (34). Furthermore, given the individual differences in physical and cognitive development, combining MBT with tailored physical training can help maximize the athletic potential of young players (19). These findings highlighted the value of incorporating MBT programs into youth sports programs to support skill acquisition and overall performance enhancement.

#### *Increases in Mindfulness and Psychological-Neurological Mechanisms*

The results showed a significant increase in mindfulness scores among the study participants in the intervention group, with a large effect size (partial  $\eta^2 = 0.52$ ). This finding is consistent with prior research demonstrating that structured MBT programs can enhance mindfulness traits in athletes (6). The observed improvements may be due to several mechanisms, including better emotion regulation and increased psychological resilience, which are particularly important during adolescence (35). From a cognitive and neurodevelopmental perspective, MBT practices helps young athletes develop a nonjudgmental awareness of their internal experiences, thereby strengthening attentional control and reducing experiential avoidance (36). Over time, these processes not only improve immediate performance but also support sustained mental

well-being and adaptive coping strategies essential for long-term athletic and personal growth (37).

#### *Effects of MBT on Technical Football Performance*

The study results demonstrated a significant impact of MBT on technical football performance. The effect sizes were moderate to large, with partial  $\eta^2 = 0.43$  for shooting and 0.30 for passing. These results align with a systematic review by Lochbaum and co-workers, which reported a moderate average effect size ( $d = 0.51$ ) for sport psychology interventions, including mindfulness, on athletic performance (38). The observed effect sizes support the integration of MBT as a valuable complement to technical training for youth athletes, particularly beginners.

Our findings are consistent with those of Mashhoot and colleagues, who reported significant improvements in shooting, passing, and dribbling among beginner football players following MBT in Iraq (39). Similarly, Arslan and Ermiş found that combining motor training with MBT enhances training effectiveness, supporting our results (40). However, our findings partially contrast with Köksal and colleagues, who focused on motor coordination training without MBT and did not observe a direct effect of MBT on technical skills (41). These differences may stem from variations in the nature and duration of the interventions.

#### *4.1. Limitations*

While our study offered valuable insights, several limitations should be noted. First, the sample size was relatively small and limited to one geographic area, which may affect the generalizability of the results. Second, the study focused only on male participants; future research should explore potential gender differences. Third, while technical performance was assessed, psychological variables such as attentional control, anxiety, or motivation, which could mediate the effect of MBT were not measured. Additionally, although shooting and passing performance were evaluated using the Soccer Shooting and Passing Tests of Mor and Christian, formal evidence regarding their face, content, or construct validity is limited. This represents a methodological limitation and should be considered when interpreting the results.

## 5. Conclusions

This study provided empirical evidence supporting the effectiveness of a short-term mindfulness-based training (MBT) in improving football passing and shooting skills among beginner adolescent players. The findings suggested that MBT can enhance motor performance even in early stages of skill acquisition, highlighting its potential as a complementary approach to technical coaching. By cultivating present-moment awareness and reducing performance-related distractions, MBT may facilitate more effective learning and execution of sport-specific skills.

Given the increasing demands for mental skills training in youth sports, incorporating MBI into regular football training programs could foster both psychological and motor development. Coaches and educators are encouraged to consider MBT as a low-cost, accessible, and evidence-based strategy to support the holistic development of young athletes. Future research should include follow-up assessments, explore combining MBT with other interventions, and use neurocognitive tools to better understand its mechanisms.

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## Authors' Contributions

Mohammad Yousefi: Contribution to the conception and design of the study; data collection and analysis; drafting the work and reviewing it critically for important intellectual content. Razieh Khanmohammadi: Contribution to the conception and design of the study; drafting the work and reviewing it critically for important intellectual content. All authors have reviewed and approved the final manuscript and take responsibility for all aspects of the work, including questions regarding the accuracy or integrity of any part.

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## Ethical Approval

The Ethics Committee of Urmia University, Urmia, Iran approved the present research with the code of IR.URMIA.REC.1403.030. Also, written informed consent was obtained from the participants.

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