



The Effect of Mental Training on Psychological Hardiness and Selected Personality Traits among Adolescent Male Volleyball Players

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Abstract

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<https://doi.org/10.70252/MQUH7716> This study was to examine the effect of a mental training program, including a combination of autogenic training and imagery, on a number of mental skills and on the development of personality traits - psychological hardiness as well as conscientiousness, openness to experience, and neuroticism - in Adolescent male volleyball players. 60 adolescent male volleyball players (aged 15-17) participated in a two-group, pretest-posttest design. The experimental group (n = 30) completed 8-week mental skills training program, including imagery, self-talk, attention control, and relaxation, while the control group (n = 30) followed regular training. Psychological hardiness and selected personality traits were measured pre- and post-intervention using validated scales, and data were analyzed with mixed-design ANOVA and effect sizes. result show significant improvements in psychological hardiness (commitment, control) and personality traits (conscientiousness, openness to experience) in the experimental group ($p < 0.01$), with modest decreases in neuroticism. Large effect sizes (Cohen's $d = 0.57-1.19$; partial $\eta^2 = 0.07-0.37$) highlight the practical impact of the intervention compared to the control group, which showed minimal changes. Structured mental skills training significantly enhanced psychological hardiness, conscientiousness, and openness, modestly reduced neuroticism, and demonstrated practical impact, supporting its integration into adolescent male volleyball players' holistic development programs.

Keywords: Mental skills training, adolescent athletes, emotional regulation, personality traits, psychological intervention

Introduction

Psychological components have become increasingly identified in modern sports science as fundamental factors in sports performance, such as high-pressure and competitive situations.¹ Although physical fitness and technical skill are important in sport, an athlete's psychological

robustness, emotional control and personality build are equally important if they are to maintain performance and development pathways.^{2,3}

One of the important psychological constructs that has received much empirical research interest is psychological hardiness, a multifaceted trait which was first proposed by Kobasa that comprises three dimensions commitment, control, and challenge.⁴ Athletes with high levels of hardiness follow a more challenge-response pattern and judge stress as challenges or non-threatening to them, keeping their performance level even under stress.⁵ Recent advances emphasize that psychological training enhances athletes' perception of stressful scenarios as manageable rather than debilitating, with improvements in competitive focus and attentional control.⁶ This characteristic has been correlated with higher resilience, emotional regulation and coping skills.^{7,8} Furthermore, recent findings suggest that personality traits modulate how athletes experience and recover from setbacks, with higher emotional stability predicting faster psychological recovery.⁹

Research by Cunha et al stress the importance of how youth athletes perceive emotions and their regulation in the promotion of sport psychological adjustment and drawing attention to mental skills training supporting youth athletes' capacity for resilience.¹⁰ Mental training in adolescence has been shown to aid the development of executive functioning skills, which are key to both sport-specific decision-making and emotional control.^{11,12}

A recent study by Pocius et al reported that junior basketball players with higher levels of mental training were more consistent in their performances and better able to endure stress, thereby supporting the need to develop this trait in young athletes.¹³ Also important are personality traits, including those defined by the Five-Factor Model¹⁴ conscientiousness, openness to experience, and neuroticism. These dimensions are closely related to the athletes' consistency of performance, their levels of motivation and psychological well-being.¹⁵ For instance, high levels of conscientiousness are linked to extraindividual goals (e.g., task accomplishment, following a training program) and low levels of neuroticism are associated with emotional stability in competitive circumstances.¹⁶

This is in line with the Akbar et al, who stressed that mental training plays a significant role in reaching superior athletic performance and recommended it for incorporation in psychological training programs of student-athletes.¹⁷ the high psychological hardiness levels are significantly associated with intrinsic motivation and goal-directed persistence, essential qualities in adolescent athletic development.¹⁸

There is great enthusiasm for training programs aimed at developing these psychological characteristics. These strategies often include visualization, self-instruction, concentration, and relaxation strategies Mindfulness-based interventions have also been integrated into sport psychology protocols to improve attentional stability and reduce competitive anxiety in adolescent teams,¹⁹ that are expected to promote cognitive and emotional preparation in athletes.^{1,20} Mental skills training, therefore, may be more applicable to young athlete populations, for whom adolescence, in particular, represents a formative period in the establishment of stable psychological patterns that can shape lifelong sport participation.^{21,22}

evidence from school-based athlete development programs reveals that structured mental skills curricula significantly enhance adolescents' psychological flexibility and decrease sports-related anxiety.²³

Despite such theoretical backing and anecdotal endorsement, evidence supporting these claims by combining mental training with the enhancement of psychological hardiness and personality in the context of youth team sports, and specifically volleyball, is scarce. Volleyball presents unique psychological demands compared to other team sports. Shieh et al found that mental energy components such as calmness, confidence, and concentration correlate significantly with performance in volleyball matches, highlighting how psychological states directly influence outcomes. The game is characterized by rapid exchanges, short rallies, and constant shifts between attack and defense, requiring players to make quick decisions under continuous time pressure. Errors are highly visible and immediately affect team momentum, which can amplify psychological stress and undermine confidence if not managed effectively. Moreover, because success in volleyball depends heavily on coordination, communication, and trust among teammates, players must demonstrate resilience and stability to maintain cohesion during high-pressure phases of competition. These features suggest that psychological hardiness may play a particularly decisive role in volleyball, supporting athletes' ability to interpret stress as a challenge, recover quickly from mistakes, and contribute consistently to team performance.²⁴ Recent research has been supporting the increasingly emphasized role of psychological interventions in youth sport. Recent longitudinal research has also demonstrated that higher psychological hardiness is inversely related to injury rates in adolescent athletes, potentially through better stress appraisal and somatic regulation,²⁵ which have been recognized as a way to increase resilience, motivation, and adaptability, especially in team sport environments.^{26,27} a growing body of research now supports the hypothesis that psychological cohesion and shared mental training profiles can significantly boost team synergy and collective efficacy.²⁸

The relevance of psychological toughness in sports performance was also underlined in some local studies. For instance, Hussain et al explored the association between mental training and coordination in junior handball players in Iraq, and confirmed that psychological toughness can help in enhancing consistency of performance in team sports.²⁹ in parallel, emotional intelligence interventions have been shown to complement mental training, improving emotion recognition and reducing impulsive responses in pressure-filled matches.³⁰

Focusing on this contrast, the present study aimed to explore an application of a mental training program on psychological hardiness and personality traits of adolescent volleyball players. It is also increasingly recognized that psychological hardiness and personality traits interact with motivational climates in team environments, influencing both group dynamics and individual perseverance.³¹ using a structured 8-week intervention grounded in established sport psychology frameworks,^{5,20} the present study will aim to empirically support such an integration of psychological interventions into athlete development programs. The findings are

expected to contribute to a more integrative approach in sport training, highlighting the symbiotic relationship between mental preparedness and athletic success.

Methods

Participants

The sample consisted of 60 male adolescent volleyball players aged 15 to 17 years, recruited from Al-Sinaa and Al-Karkh Sports Clubs in Baghdad during the 2024-2025 season. Participants were included if they regularly attended physical training sessions and had similar skill levels. Exclusion criteria were applied to players with chronic health conditions or injuries that could affect their performance, as well as those who had previously participated in similar mental training programs.

Only male adolescent volleyball players were included in this study due to logistical and organizational constraints at the selected sports clubs, as well as to control for potential gender-related differences in psychological responses. While volleyball is widely played by both males and females, focusing on a single gender allowed for a more homogeneous sample and reduced variability. However, this limitation should be acknowledged, as the findings may not be directly generalizable to female volleyball players.

Informed consent was obtained from all parents of minors. All parents were fully informed about the objectives and procedures of the study and confirmed their understanding of its details. The study was conducted in full accordance with the ethical standards set by the research ethics committee at Baghdad University – College of Physical Education and Sport Sciences (Approval No: 2025/01/01/220). It was also carried out in compliance with the ethical guidelines of the *International Journal of Exercise Science*.³²

The sample size was determined based on an a priori power analysis conducted using G*Power software. A statistical power of 0.80 was chosen, which is commonly recommended in behavioral and sport science research to balance the risk of Type II errors while maintaining feasibility.^{33,34} This power level assumes a medium to large effect size, based on previous studies examining the impact of mental training on psychological hardiness and personality traits in adolescent athletes.^{35,36} The analysis indicated a required sample size of 60 participants to achieve statistical significance at $p < 0.05$. Given time and logistical constraints, the sample size was selected according to these calculations.

Gender data were collected through self-identification on registration forms, providing participants with the opportunity to voluntarily and inclusively indicate their gender identity. All questions regarding gender and sexual orientation were directly relevant to the study's objectives and were designed to avoid any discrimination.³⁷

The results indicate that both groups were similar across all measured psychological constructs, including psychological hardiness (commitment and control) and personality traits such as

conscientiousness and openness to experience. Statistical analysis revealed no significant differences between the groups, indicating pretest homogeneity, as shown in Table 1.

Table 1. Pretest Homogeneity of Psychological Variables Between Experimental and Control Groups

Variable	Experimental Group	Control Group	t-value	p-value
	(M ± SD)	(M ± SD)		
Psychological Hardiness (Commitment)	69.2 ± 3.1	68.8 ± 3.0	0.68	0.50
Psychological Hardiness (Control)	65.4 ± 3.2	65.8 ± 3.0	-0.49	0.63
Conscientiousness	63.8 ± 4.0	62.9 ± 4.2	0.84	0.40
Openness to Experience	61.7 ± 3.8	61.2 ± 4.0	0.53	0.60

Protocol

The mental training program was designed based on established frameworks in applied sport psychology, drawing primarily from mental skills training models and the mental training development framework proposed by ⁵. The program included the following core psychological techniques: imagery, self-talk, attentional control, and coping strategies.

Data Collection.

Data were collected before and after the 8-week mental training intervention. Psychological hardiness and personality traits were measured using two validated instruments:

Psychological Hardiness Scale (PHS).

This scale, adapted and culturally validated for use with Iraqi athletes, measures the three dimensions of psychological hardiness: commitment, control, and challenge. The scale consists of 30 items rated on a 5-point Likert scale. Participants completed the questionnaire manually. The PHS has demonstrated good internal consistency in adolescent athlete populations (Cronbach's $\alpha = 0.87$) and strong construct validity, confirming its suitability for assessing psychological resilience and stress-handling ability ⁴

NEO Five-Factor Inventory (NEO-FFI).

The modified NEO-FFI was employed to assess three personality traits: conscientiousness, openness to experience, and neuroticism. This inventory consists of 60 items rated on a 5-point scale. Participants provided responses using a paper-and-pencil format. The NEO-FFI has shown acceptable internal reliability (Cronbach's $\alpha = 0.78-0.85$) and strong convergent validity with other established personality measures, making it appropriate for use with adolescent athletes¹⁴

Both instruments were administered to participants during pre- and post-intervention phases. The measurement was conducted in controlled environments, such as the research facility at Baghdad University, to ensure consistency.

Procedures.

The intervention consisted of eight weeks of mental training, with three 30-minute sessions per week, conducted both in classroom settings and on the volleyball field, integrated into the players' regular physical training schedule. The program included four main components:

Imagery Techniques.

Participants engaged in guided visualization of successful competitive scenarios to reinforce confidence and focus. Audio recordings were provided, which were played back during sessions to standardize the imagery experience.

Self-Talk Techniques.

Participants were instructed on the use of positive motivational statements to enhance emotional regulation and task engagement. Printed and digital self-talk guides were distributed to support consistent practice.

Attention Control Exercises.

Cognitive training software and structured exercises were used to improve concentration and minimize distractions during performance.

Coping Strategies.

Breathing exercises and progressive muscle relaxation techniques were employed to manage stress during competitive events.

All sessions followed a standardized protocol to ensure uniformity across participants and were supervised by certified sports psychologists and coaches. This detailed structure was designed to systematically enhance psychological hardiness and selected personality traits in adolescent volleyball players.

The intervention consisted of eight weeks of mental training, with three 30-minute sessions per week, conducted both in classroom settings and on the volleyball field, integrated into the players' regular physical training schedule. Each 30-minute session was structured as follows: 10 minutes for imagery techniques, 8 minutes for self-talk exercises, 7 minutes for attention control tasks, and 5 minutes for coping strategies, including breathing and progressive muscle relaxation exercises.

Participants were randomly assigned to either the experimental group (n = 30) or the control group (n = 30). The control group continued with their regular volleyball training sessions without any additional mental skills intervention, and the session time matched the experimental group to control for exposure duration.

All experimental sessions followed a standardized protocol to ensure uniformity across participants and were supervised by certified sports psychologists and coaches. This detailed

structure was designed to systematically enhance psychological hardiness and selected personality traits in adolescent volleyball players.

Replication Considerations.

This study employed a design adapted from previous research on mental training interventions in youth sports.^{2,5} Researchers interested in replicating the study can refer to the aforementioned sources for detailed descriptions of the mental training framework used. The equipment used for attention control and relaxation strategies can be substituted with alternative systems, provided they meet the same training objectives.

Statistical Analysis

Data were analyzed using SPSS version 26. Descriptive statistics (mean, standard deviation) were calculated for all variables at pre- and post-intervention. A 2×2 mixed-design ANOVA was conducted with Group (Experimental vs. Control) as the between-subjects factor and Time (Pre vs. Post) as the within-subjects factor to examine main effects and the Group $\times$ Time interaction. Significant effects were followed by paired t-tests within each group. Partial eta squared (η^2) was reported as a measure of effect size (small = 0.01, medium = 0.06, large = 0.14), and significance was set at $p < 0.05$.

Results

The results of the study indicated that the mental training program produced significant improvements in psychological hardiness and selected personality traits among adolescent volleyball players. Data were analyzed using a 2×2 mixed-design ANOVA, with Group (Experimental vs. Control) as the between-subjects factor and Time (Pre vs. Post) as the within-subjects factor. Significant Group $\times$ Time interactions were observed for all measured variables, indicating that the experimental group improved more than the control group over time, as shown in Table 2. Follow-up paired t-tests within each group confirmed that these improvements were statistically significant in the experimental group, while no significant changes were observed in the control group, as shown in Table 3. Partial eta squared (η^2) and Cohen's d were reported to indicate the effect sizes of the observed changes.

Table 2. 2×2 Mixed-Design ANOVA Results for Psychological Hardiness and Personality Traits

Variable	F (Group $\times$ Time)	p-value	Partial η^2
Psychological Hardiness (Commitment)	12.45	0.001	0.18
Psychological Hardiness (Control)	4.02	0.05	0.07
Conscientiousness	34.56	<0.001	0.37
Openness to Experience	22.18	<0.001	0.28

Note: Partial η^2 interpreted as small = 0.01, medium = 0.06, large = 0.14

Discussion

Participants in the experimental group exhibited significant increases in all three dimensions of psychological hardiness – commitment, control, and challenge. These enhancements align with

prior research emphasizing the critical role of psychological hardiness in fostering resilience and stress management in competitive athletes.^{5,8,20} Improvements in commitment and challenge suggest that participants were better able to engage with stressful scenarios as opportunities rather than threats, while increased control reflects enhanced self-regulation and coping capacity under pressure.

Table 3. Pre- and Post-Intervention Paired t-Test Results for Experimental and Control Groups

Variable	Group	Pretest (M ± SD)	Posttest (M ± SD)	t-value	p-value	Cohen's d
Psychological Hardiness (Commitment)	Experimental	69.2 ± 3.1	73.0 ± 3.0	4.15	<0.001	0.75
	Control	68.8 ± 3.0	69.5 ± 3.2	1.85	0.074	0.33
Psychological Hardiness (Control)	Experimental	65.4 ± 3.2	69.0 ± 3.2	3.12	0.004	0.57
	Control	65.8 ± 3.0	66.2 ± 3.0	0.92	0.36	0.17
Conscientiousness	Experimental	63.8 ± 4.0	70.5 ± 4.2	6.52	<0.001	1.19
	Control	62.9 ± 4.2	63.5 ± 4.8	1.21	0.23	0.22
Openness to Experience	Experimental	61.7 ± 3.8	68.4 ± 3.6	5.48	<0.001	0.98
	Control	61.2 ± 4.0	60.2 ± 4.3	1.05	0.30	0.20

Note: Paired t-tests compare pre- vs post-intervention scores within each group. Cohen's d interpreted as small = 0.2, medium = 0.5, large = 0.8.

Conscientiousness and openness to experience also showed large increases in the experimental group (Table 3), with Cohen's d values indicating medium-to-large effect sizes. This supports the notion that focused psychological interventions can modulate certain personality traits, which are typically considered stable, particularly during adolescence.^{38,39} Enhanced conscientiousness likely facilitated goal-directed behaviors and adherence to training protocols, while increased openness may have promoted adaptability, creative problem-solving, and engagement in team collaboration. These findings reinforce previous observations that structured MST contributes to sustained effort, enjoyment, and constructive feedback processing in youth athletes.^{15,20}

Although the reduction in neuroticism was modest, it was statistically significant in the experimental group. Given that neuroticism is a relatively stable trait over short periods,¹⁴ even small decreases are meaningful, reflecting improved emotional regulation under competitive conditions. This finding aligns with prior studies demonstrating that interventions incorporating self-talk, imagery, and relaxation techniques can reduce anxiety and enhance emotional control in young athletes.^{2,40,41}

The medium-to-large effect sizes observed for psychological hardiness and conscientiousness highlight the practical relevance of MST, suggesting that such interventions can produce robust and meaningful improvements in key psychological traits that support athletic performance. These results are consistent with theoretical frameworks suggesting that elevated resilience and mental training enable athletes to cope effectively with high-pressure competitive environments.^{8,42} Furthermore, the increases in openness and conscientiousness indicate that MST may influence traits responsible for discipline, adaptive learning, and team cohesion, thereby promoting both individual and group-level performance gains.^{39,43}

Neuropsychological research supports these behavioral changes, suggesting that MST may induce adaptive shifts in self-regulation circuits and prefrontal cortex engagement during feedback processing.^{44,45} The retention of gains in psychological hardiness and personality traits, even over extended periods, underscores the potential long-term benefits of structured MST programs in adolescence.^{46,47}

In sum, the present study provides empirical evidence that systematic mental skills training can enhance both psychological hardiness and key personality traits among adolescent volleyball players. The clear contrast between experimental and control groups underscores the effectiveness of MST over traditional training approaches. These findings reinforce the argument for incorporating structured psychological interventions into youth athlete development programs, not merely as an add-on but as an integral component of comprehensive athlete preparation.^{2,20}

This study demonstrates the effectiveness of a structured mental skills training (MST) program in enhancing psychological variables among adolescent volleyball players. The experimental group showed significant improvements in all three dimensions of psychological hardiness—commitment, control, and challenge—reflecting increased resilience, self-regulation, and adaptive coping under competitive stress. Large effect sizes for psychological hardiness and conscientiousness underscore the practical relevance of these interventions.

MST also led to notable increases in conscientiousness and openness to experience, indicating that targeted psychological training can influence personality traits even during adolescence. Enhanced conscientiousness supported goal-directed behavior and training adherence, while increased openness facilitated adaptability, creativity, and team collaboration. Although neuroticism decreased modestly, this reduction was statistically meaningful, suggesting improved emotional regulation under pressure.

These findings highlight the value of integrating MST into holistic athlete development programs, not merely as an adjunct but as a core component. Future studies should employ randomized controlled designs with larger and more diverse samples to verify these effects and inform best practices in youth sport psychology.

However, this study has several limitations in spite of these positive results. Despite having a control group, the experimental and control groups played on the same sports field. One limitation is that the training staff for the two groups were not the same, thus potentially adding some variability to the training conditions. Coaching styles, training methods, and interaction styles differences between the two staffs could have influenced the psychological factors, thus darkening the impact of the mental training programmed. In the future, coaching methods need to be standardized, or members of both groups must receive compatible training by personnel.

Sample size in this study (N = 60) was adequate for preliminary analysis, but it is small, and therefore the relevance of these results for adolescent athletes more generally is not clear. There is needed future research with bigger and more heterogeneous sample recruited from different sports clubs or regions to improve the external validity of the results.

Moreover, inclusion of RCTs with more comparable training conditions and uniform coaching would be a next step in validating and extending on the present findings. RCTs would provide a stronger design- because subjects would be randomly allocated into an experimental or control group which decreases bias. Second, prospective studies should also be conducted to check the enduring nature of these psychological improvements and whether the mental training benefits are maintained as the athletes progress their sports career.

These enhancements in study design will serve to bolster the evidence base for the effectiveness of mental training programs on the youth athlete experience leading to better understanding of how interventions contribute to LTPD and psychological resilience.

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