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Enhancing Skill Performing Competency among Handball Players: Comparative Effects of Mental Imagery, Self-Talk, and Their Combination

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Abstract

Objectives. The objective of this study was to examine the comparative and combined effects of mental imagery and self-talk training on handball players' jump-shoot skill performing competency. The study aimed to determine whether integrating both psychological techniques leads to greater improvement in motor performance than using either strategy alone or traditional practice.

Materials and Methods. Forty male handball players were randomly assigned to four groups (n = 10 each): Mental Imagery and Self-Talk, Mental Imagery, Self-Talk, and Control. The experimental groups received a six-week psychological skills training intervention, while the control group participated only in regular handball practice. The Handball Jump-Shoot Skill Performing Competency test was administered before and after the intervention. Data were analyzed using Analysis of Covariance (ANCOVA) to control for pre-test differences, followed by Bonferroni post-hoc tests for pairwise comparisons.

Results. The ANCOVA revealed a significant group effect on post-test scores, $F_{(3, 35)} = 18.18$, $p < .001$, with an adjusted $R^2 = .665$. The Mental Imagery and Self-Talk group demonstrated the highest improvement (pre-mean = 13.90; post-mean = 17.70), followed by the Mental Imagery and Self-Talk groups, while the Control group showed minimal gain. Post-hoc analysis confirmed that the combined intervention produced significantly better results than all other groups ($p < .05$).

Conclusions. The findings suggest that the combined application of mental imagery and self-talk was the most effective psychological intervention for enhancing handball jump-shoot skill performance, emphasizing the synergistic value of integrating cognitive and motivational training strategies in sport performance improvement.

Keywords: mental imagery, self-talk, psychological skills training, handball performance, jump-shoot competency.

Introduction

Psychological skills play a vital role in enhancing athletic performance, particularly when athletes compete under pressure where physical preparation alone may not suffice. In recent years, mental training techniques such as mental imagery and self-talk have gained recognition as powerful tools to optimize skill execution, regulate emotion, and improve focus during performance (Rupprecht, Tran, & Groepel, 2024). Mental imagery involves the cognitive rehearsal of movements without physical execution, stimulating neural patterns similar to those activated during actual performance (Guillot & Collet, 2020). In contrast, self-talk refers to the verbal or internal dialogue athletes use to direct attention, enhance confidence, and control anxiety (Hatzigeorgiadis, Zourbanos, Galanis, & Theodorakis, 2011). Both techniques have demonstrated performance benefits in a wide range of sports, including basketball, tennis, and swimming (Tod et al., 2011; Slimani et al., 2016). In performance psychology, visualization technique has been a standardized training method contributes to improving athletic performance in a wide range of sports (Sharma et.al., 2024).

Despite strong evidence supporting both interventions, the main controversy in current literature concerns whether combining mental imagery and self-talk produces superior effects compared to using either technique alone. Some studies suggest that integrating both methods may create synergistic benefits, enhancing motivation, focus, and motor coordination more effectively than either intervention independently (Slimani et al., 2016). Others argue that since each technique already targets similar cognitive mechanisms—such as attentional control and self-efficacy—their combination may not yield additional improvements (Hatzigeorgiadis et al., 2020). This debate remains unresolved, particularly in handball, where rapid decision-making and precise execution are critical to performance outcomes.

Handball jump-shooting represents one of the most essential and complex offensive skills, requiring accurate timing, motor coordination, and confidence under defensive pressure. Research indicates that mental imagery can significantly improve throwing accuracy and goal-scoring ability in handball (Muluken & Konka, 2019), while self-talk interventions have enhanced motor performance, motivation, and error correction (Zourbanos et al., 2013; Theodorakis et al., 2012). Yet, the comparative and combined effects of these two interventions on jump-shoot skill competency remain inadequately studied. Recent findings in similar sports, such as badminton and basketball, suggest that combining self-talk and imagery training can yield higher improvements in skill learning and execution (Hidayat et al., 2023). However, limited evidence exists for handball players, creating a research gap that this study aims to address.

An analysis of recent research and publications shows increasing interest in psychological training programs in sports. For example, meta-analyses reveal that mental imagery interventions yield moderate-to-large effects on performance (Cumming & Williams, 2012; Guillot & Collet, 2020), while self-talk interventions have also been shown to significantly enhance focus and reduce anxiety (Hatzigeorgiadis et al., 2011). Despite these advances, only a few studies have systematically compared the effects of these techniques in a controlled experimental framework or tested their combined influence on handball-specific motor skills (Slimani et al., 2016; Hidayat et al., 2023). This lack of comparative evidence limits the practical understanding of how coaches should prioritize or integrate psychological training into handball practice routines.

Hypothesis: Based on this theoretical and empirical background, the hypothesis of the present study states that the combined Mental Imagery and Self-Talk training will produce greater improvements in Handball Jump Shoot Skill Performing Competency than either Mental Imagery or Self-Talk alone, and that both individual interventions will outperform the Control group.

Purpose of the Study: Therefore, the purpose of the study is to critically examine and compare the effects of Mental Imagery, Self-Talk, and Combined Mental Imagery with Self-Talk interventions on Handball Jump Shoot Skill Performing Competency among secondary school athletes. This study seeks to determine whether the combined approach produces a statistically significant improvement over the single-method interventions, thereby contributing to the optimization of psychological training strategies in handball and potentially across similar team sports.

Materials and Methods

Study Participants

Forty (N = 40) male handball players were selected as participants for this study from Lakshmibai National Institute of Physical Education (LNIPE), India. The participants' age ranged from 18 to 27 years. All players had prior competitive handball experience and were free from injury or illness during the experimental period. The participants were randomly divided into four groups of ten members each to ensure equal representation and control of individual differences. The four groups included: Mental Imagery, Self-Talk, Combined Mental Imagery and Self-Talk, and Control Group. Each participant provided voluntary consent to participate in the study, and ethical approval was obtained from the concerned institutional authority.

Study Organization

The research followed a true experimental pre-test post-test randomized group design. This design was selected to assess the effect of different psychological training interventions—Mental Imagery, Self-Talk, and their combination—on the improvement of handball players' jump shoot skill performing competency.

The study was organized in three phases:

1. Pre-Test Phase:

All participants underwent a baseline assessment of Handball Jump Shoot Skill Performing Competency using the standardized Zinn Team Handball Skills Battery Test. This pre-test established the initial skill levels of the players before any intervention.

2. Intervention Phase:

The experimental groups participated in distinct psychological skill training programs for eight weeks, conducted three times per week. Each session lasted 20 to 50 minutes, increasing gradually in duration as the participants adapted to the training.

The Mental Imagery group practiced guided visualization of jump shooting techniques, incorporating sensory and situational elements. The Self-Talk group used structured instructional and motivational phrases to enhance focus and emotional regulation during performance. The Combined Mental Imagery and Self-Talk group integrated both techniques in a synchronized manner, involving relaxation, visualization, and verbal cueing. The Control group continued with their regular handball training without any additional psychological interventions.

The training progression followed a planned pedagogical sequence to ensure gradual development of cognitive and emotional control, beginning with basic relaxation and imagery practice, and advancing to performance under simulated pressure conditions.

3. Post-Test Phase:

After completing the eight-week intervention, all participants were reassessed using the same Handball Jump Shoot Skill Performing Competency test to measure performance improvement.

This structured and progressive organization allowed a systematic evaluation of the effects of psychological skill training on handball performance.

Administration of the Test

Zinn team handball skills battery test from which handball jump shoot skill performing competency:

The Handball Shooting Ability Test is designed to measure the shooting proficiency of players in team handball. The test requires a marked level floor or ground with a smooth surface, a stopwatch, a standard handball, rope or string, measuring tape, marking tape, and scorecards or recording sheets along with a pencil for recording the results. The front surface area of the team handball goal is divided using rope or string into eight distinct sections, each assigned a specific number of points that correspond to the difficulty of successfully shooting the ball into that particular area.

During the test, each player is given five opportunities to perform a jump throw. Players are allowed to take three steps before releasing the ball, ensuring that the final step occurs outside the free-throw line (9-meter line). If the ball touches the ground before reaching the goal, no points are awarded for that attempt. All shots must be executed from behind the 9-meter line, and adherence to this rule is essential for maintaining the validity of the attempt.

Scoring is based on the difficulty level of the target zones within the goal. Players earn points for each successful throw according to the designated value of the section hit. Throws that hit the court surface before reaching the goal are awarded zero points. The final score for each player is calculated by summing the points earned across all five throws, with a maximum possible score of 20 points representing optimal shooting accuracy and consistency.

Description of Exercise

The psychological skills training program was conducted three times per week for eight weeks. Session duration progressed gradually, starting from 20–30 minutes in the initial weeks and extending to 50 minutes by the 8th week to allow adaptation and deeper practice.

Combined Mental Imagery + Self-talk (Group A): Sessions included relaxation, visualization of jump shots, and synchronized instructional/motivational cues. Training progressed from basic imagery and simple cues to complex, pressure-based scenarios.

Mental Imagery (Group B): Athletes practiced relaxation, guided and independent visualization of jump shots, integrating sensory detail and correcting errors. Progression moved from simple technical rehearsal to situational imagery under time or defensive pressure.

Self-talk (Group C): Training focused on relaxation, structured instructional and motivational phrases, and their application in simulated match conditions. Progression advanced from practicing cue words to automatic use under pressure.

Control Group (Group D): Continued regular handball training without additional intervention.

This progressive schedule ensured consistent psychological skill development, with each intervention tailored to improve focus, confidence, and accuracy in handball jump shots.

Research Design

The study adopted a true experimental pre-test post-test randomized group design. Participants were randomly assigned to four groups of ten athletes each: Group I (Mental Imagery), Group II (Self-talk), Group III (Mental Imagery and Self-talk combined), and Group IV (Control group). Pre-tests were conducted using the Zinn Team Handball Skills Battery Test from which Handball Jump Shoot Skill Performing Competency was chosen as the primary skill performing variable to assess Handballers Skill Performance. Following this, the three experimental groups underwent an eight-week psychological skills training program, with each group practicing their respective intervention. The Control group continued with their routine practice sessions without additional intervention. At the end of the eight weeks, the Handball Jump Shoot Skill Performing Competency was again administered as a post-test measure. The pre-test and post-test scores of the Handball Jump Shoot Skill Performing Competency was used for statistical analysis to determine the effectiveness of the interventions.

Statistical Analysis

The collected data were analyzed using both descriptive and inferential statistical techniques. Descriptive statistics, including mean and standard deviation, were used to summarize the performance scores of each group.

Inferential statistics were applied to determine the significance of the observed differences between pre-test and post-test scores. Analysis of Covariance (ANCOVA) was used to compare post-test means among the four groups while controlling for pre-test differences. This helped to accurately estimate the true effect of the interventions. When significant differences were detected, Bonferroni post hoc tests were performed to identify specific group-wise comparisons.

The level of statistical significance was set at $p < 0.05$, indicating a 95% confidence level. The use of ANCOVA and Bonferroni tests provided a robust approach to determining which intervention—Mental Imagery, Self-Talk, or their combination—had the most significant effect on improving handball jump shoot skill performing competency.

Result

Table 1 presents the overall Handball Jump Shoot Skill Performing Competency Scores for all four groups—Mental Imagery and Self-Talk, Mental Imagery, Self-Talk, and Control. The results indicate a noticeable improvement in the post-test mean scores across all experimental groups compared to their pre-test scores, whereas the Control group showed minimal change. The Mental Imagery and Self-Talk group demonstrated the highest improvement, with the mean score increasing from 13.90 to 17.70, accompanied by a reduction in standard deviation from 2.02 to 1.41, suggesting more consistent performance among participants. The Mental Imagery group also showed a substantial improvement, with the mean score rising

Table 1. Overall Handball Jump Shoot Skill Performing Competency Score

Groups	N	Pre-Mean	Post Mean	Pre SD	Post SD
Mental Imagery and Self-Talk	10	13.9	17.7	2.02485	1.41814
Mental Imagery	10	12.0	15.0	2.05480	2.05480
Self-Talk	10	10.9	12.9	2.33095	2.46982
Control Group	10	8.9	9.2	1.91195	2.65832

from 12.00 to 15.00, while the Self-Talk group recorded an increase from 10.90 to 12.90. In contrast, the Control group exhibited a marginal increase in mean score from 8.90 to 9.20, indicating that regular handball practice without psychological intervention had minimal influence on performance enhancement. Overall, the data suggest that psychological skills training interventions, particularly the combined use of Mental Imagery and Self-Talk, were more effective in enhancing handball players' jump shoot skill performing competency than either technique alone or no intervention at all.

Table 2. Inferential Statistical Analysis Using ANCOVA for Overall Handball Jump Shoot Skill Performing Competency Score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	392.012[a]	4	98.003	20.370	.000
Intercept	297.430	1	297.430	61.822	.000
Handball Accuracy Pre	6.212	1	6.212	1.291	.264
Groups	262.440	3	87.480	18.183	.000
Error	168.388	35	4.811		
Total	8068.000	40			
Corrected Total	560.400	39			

a. R Squared = .700 (Adjusted R Squared = .665)

Table 2 presents the inferential statistical analysis using ANCOVA for the Overall Handball Jump Shoot Skill Performing Competency Scores among the four groups—Mental Imagery and Self-Talk, Mental Imagery, Self-Talk, and Control. The analysis aimed to determine the effectiveness of the psychological training interventions while controlling for the influence of pre-test scores. The results indicate that the model was statistically significant ($F = 20.370$, $p < .001$), suggesting that the interventions had a meaningful impact on post-test performance scores. The R Squared value of .700 (Adjusted $R^2 = .665$) reveals that approximately 70% of the variance in post-test performance can be explained by the independent variables included in the model, indicating a strong effect of the training interventions. The covariate, Handball Accuracy Pre-test, was found to be non-significant ($F = 1.291$, $p = .264$), showing that the pre-test scores did not significantly influence the post-test results. However, a significant main effect of Groups was observed ($F = 18.183$, $p < .001$), confirming that the differences among the four training conditions were statistically significant. Overall, the ANCOVA results demonstrate that the psychological training programs—particularly the combined Mental Imagery and Self-Talk intervention—produced a significant improvement in handball players' jump shoot skill performing competency compared to the other groups and the control condition.

Table 3. Pairwise Comparison done for critical analysis for the Post hoc test using Bonferroni for Handball Jump Shoot Skill Performing Competency Score

(I) Groups	(J) Groups	Mean Difference (I-J)	Sig.[b]
Mental Imagery and Self-Talk	Mental Imagery	3.078*	.032
	Self-Talk	5.397*	.000
	Control Group	9.496*	.000
Mental Imagery	Mental Imagery and Self-Talk	-3.078*	.032
	Self-Talk	2.319	.158
	Control Group	6.417*	.000
Self-Talk	Mental Imagery and Self-Talk	-5.397*	.000
	Mental Imagery	-2.319	.158
	Control Group	4.098*	.002
Control Group	Mental Imagery and Self-Talk	-9.496*	.000
	Mental Imagery	6.417*	.000
	Self-Talk	-4.098*	.002

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Table 3 presents the results of the pairwise comparison conducted through a Post Hoc test using the Bonferroni adjustment for the Handball Jump Shoot Skill Performing Competency Scores. The analysis was performed to identify specific differences among the four groups—Mental Imagery and Self-Talk, Mental Imagery, Self-Talk, and Control—following the significant ANCOVA results. The findings indicate that the Mental Imagery and Self-Talk group demonstrated significantly higher post-test scores compared to all other groups. Specifically, significant differences were observed when compared with the Mental Imagery group (Mean Difference = 3.078, $p = .032$), Self-Talk group (Mean Difference = 5.397, $p < .001$), and Control group (Mean Difference = 9.496, $p < .001$). These results suggest that the combined intervention of Mental Imagery and Self-Talk was the most effective psychological training approach for enhancing handball skill performance. Additionally, the Mental Imagery group also showed a significant improvement over the Control group (Mean Difference = 6.417, $p < .001$), though the difference between Mental Imagery and Self-Talk groups was not statistically significant ($p = .158$). Similarly, the Self-Talk group outperformed the Control group (Mean Difference = 4.098, $p = .002$). Overall, the Bonferroni post hoc results reveal a clear hierarchical pattern in intervention effectiveness: Mental Imagery and Self-Talk > Mental Imagery > Self-Talk > Control. This demonstrates that integrating both psychological strategies leads to superior performance gains in Handball Jump Shoot Skill Performing Competency compared to using either strategy alone.

Discussion

Overview of the Main Hypothesis

The main hypothesis of this study proposed that the combined practice of Mental Imagery and Self-Talk would

significantly enhance Handball Jump Shoot Skill Performing Competency compared to the use of either technique individually or the absence of psychological intervention. The results from ANCOVA and post hoc analysis clearly supported this hypothesis, revealing that athletes who engaged in both Mental Imagery and Self-Talk training exhibited the highest post-test mean scores. This suggests a synergistic interaction between cognitive visualization and verbal cueing, where the integration of both methods amplifies focus, accuracy, and self-regulation. The findings are consistent with contemporary research emphasizing the efficacy of psychological skill integration in sports training (Hidayat et al., 2023; Theodorakis et al., 2001).

Discussion of Conclusions (Comparison with Previous Studies)

The results of this study align with prior findings that combined psychological interventions lead to greater improvements in sport-specific skills than single-method approaches. The Mental Imagery and Self-Talk group demonstrated the highest mean improvement, suggesting a synergistic effect between visualization and verbal regulation techniques. This finding is consistent with Holmes and Collins (2001), who noted that imagery coupled with cognitive cues enhances motor learning and performance consistency. Similarly, Hardy et al. (2001) emphasized that self-talk improves focus and self-regulation during performance execution. In contrast, while the Mental Imagery and Self-Talk groups individually improved compared to the control group, their combined use appeared to integrate both the cognitive and motivational components necessary for optimal performance outcomes (Tod, Hardy, & Oliver, 2011). Comparable trends have been observed in basketball and football training, where integrating imagery and verbal strategies produced superior skill retention (Hatzigeorgiadis et al., 2009; Munroe-Chandler, Hall, & Fishburne, 2008).

Justifications and Importance of the Results

The findings underscore the growing recognition that psychological interventions are not merely supplementary but essential components of athletic training programs. In Handball, where rapid decision-making and precise motor coordination are vital, the ability to mentally rehearse actions before physical execution can significantly enhance performance accuracy (Moran, Guillot, & MacIntyre, 2012). The present study confirms that structured psychological training cultivates self-efficacy and reduces performance anxiety—factors directly influencing skill acquisition (Behncke, 2004; Birrer & Morgan, 2010). Furthermore, these results hold pedagogical importance for sports educators, demonstrating that incorporating psychological conditioning alongside technical drills can lead to comprehensive athlete development (Vealey & Greenleaf, 2010).

Practical Application of the Results

From a practical standpoint, the application of combined Mental Imagery and Self-Talk techniques offers coaches and trainers an accessible, low-cost, and scientifically supported tool to improve performance outcomes. Implementing guided imagery sessions before practice and employing constructive self-talk scripts during skill rehearsal can strengthen focus and motor execution in young athletes (Gould et al., 2014). These methods can be easily adapted into existing training curricula without extensive infrastructural resources, making them feasible for school-level sports programs. The integration of psychological training also helps in developing resilience, coping mechanisms, and motivation—key attributes for sustaining high-level performance in competitive Handball environments (Thelwell & Greenlees, 2003; Hatzigeorgiadis et al., 2011).

Prospects for Further Research

The outcomes of this study open new avenues for exploring the long-term and sport-specific implications of combined psychological training methods. Future research may investigate how varying durations, intensities, or modalities of mental skills training affect performance across different age groups and genders. Moreover, integrating neurophysiological measures such as EEG or EMG responses could provide objective evidence of how cognitive interventions influence motor activation patterns. Expanding this line of inquiry will deepen the understanding of the mind–performance relationship, ultimately contributing to more effective, evidence-based training models in Handball and other skill-dominant sports.

Conclusion

The present study demonstrates that psychological skills training interventions, particularly the combination of Mental Imagery and Self-Talk, significantly enhance Handball Jump Shoot Skill Performing Competency among secondary school athletes. The findings indicate that while both Mental Imagery and Self-Talk individually improve skill performance compared to standard training, their combined application produces superior results, reflecting a synergistic effect. This supports the primary purpose of the study, which was to evaluate the comparative effectiveness of different psychological interventions in improving handball-specific skill performance. The results provide empirical evidence that integrating cognitive visualization with motivational and instructional self-talk can optimize both motor execution and mental readiness in competitive scenarios.

Furthermore, the study underscores the practical value of psychological training as an integral component of sports education and coaching. Coaches and trainers can implement structured mental imagery and self-talk protocols to enhance athletes' focus, accuracy, and confidence, without requiring additional physical training time. The results also highlight the potential for these interventions to reduce performance variability and enhance consistency across different athletes. In conclusion, the study not only confirms the effectiveness of combined mental training strategies but also offers a foundation for future research to explore long-term effects, variations across age and skill levels, and integration with other sport-specific psychological techniques to maximize overall athletic performance.

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Conflict of Interest

Authors declare no conflict of interest.

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Підвищення компетенції виконавської майстерності серед гандболістів: Порівняльний вплив ментальних образів, внутрішнього діалогу та їхнього поєднання

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 7 с., 3 табл., 23 джерела.

Мета дослідження. Метою цього дослідження було вивчення порівняльних та комбінованих впливів тренувань з використанням ментальних образів та внутрішнього діалогу на навички майстерності виконання кидків у стрибку гандболістів. Дослідження мало на меті визначити, чи призводить інтеграція обох психологічних методів до значного покращення рухової результативності, ніж використання кожної із зазначених стратегій окремо або традиційної практики.

Матеріали та методи. Сорок гандболістів чоловічої статі було розподілено за методом рандомізації на чотири групи (по 10 осіб у кожній): «Ментальні образи та внутрішній діалог», «Ментальні образи», «Внутрішній діалог» та «Контрольна». Експериментальні групи отримали шеститижневий інтервенційний курс з тренування психологічних навичок, тоді як контрольна група продовжувала займатися стандартними тренуваннями з гандболу. На перед- та постінтервенційному етапах дослідження проведено тест на визначення рівня майстерності з виконання кидків у стрибку з гандболу. Дані були проаналізовані за допомогою коваріаційного аналізу з метою контролю передтестових відмінностей, з подальшим проведенням post-hoc тестів Бонферроні для парних порівнянь.

Результати. Коваріаційний аналіз виявив значний груповий ефект на посттестові показники, $F_{(3, 35)} = 18.18$, $p < .001$, з скоригованим $R^2 = .665$. Група «Ментальні образи та внутрішній діалог» продемонструвала максимальне поліпшення (середній передтестовий показник = 13.90; середній посттестовий показник = 17.70), за якою слідували групи «Ментальні образи» та «Внутрішній діалог», тоді як контрольна група показала мінімальний приріст. Post-hoc аналіз підтвердив, що комбінована інтервенція призвела до значно кращих результатів, ніж у решти груп ($p < .05$).

Висновки. Результати дослідження свідчать, що комбіноване застосування ментальних образів та внутрішнього діалогу виявилося найефективнішою психологічною інтервенцією для підвищення навичок майстерності виконання кидків у стрибку в гандболі, підкреслюючи синергетичну цінність інтеграції когнітивних та мотиваційних стратегій тренування у покращенні спортивної результативності.

Ключові слова: ментальні образи, внутрішній діалог, тренування психологічних навичок, результативність у гандболі, майстерність виконання кидків у стрибку.

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