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Comparison of the Effectiveness of Sports Vision Training and Conventional Methods on Functional Ability and State-Competitive Anxiety of Young Volleyball Players in a Supervised Environment

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A B S T R A C T

Purpose: The present study aimed to compare the effects of three training methods—sports vision, combined, and specialized/traditional—on functional ability and components of state-competitive anxiety in young Iraqi volleyball players under supervised conditions.

Methods and Materials: This research employed a semi-experimental and applied design conducted in the field using a pre-test–post-test plan. A total of 42 participants were recruited and randomly assigned to three groups (n = 14 each): sports vision, combined, and specialized/traditional. Data analysis was performed using analysis of covariance and Bonferroni post-hoc tests through SPSS version 23 at a significance level of less than .05.

Findings: The findings revealed significant differences among the three training groups in both functional and psychological variables. Regarding performance indicators, although no significant differences were observed among the groups in vertical jump, the combined training group demonstrated significantly better performance than the specialized/traditional group in displacement time under supervisory pressure and evaluation conditions (p = .003). In the psychological domain, the results indicated significant differences between groups. Both the sports vision and combined training groups, compared to the specialized/traditional group, showed a significant reduction in cognitive anxiety (p = .000) and somatic anxiety (p = .000), as well as a significant increase in self-confidence (p = .000).

Conclusion: These findings confirm the superiority of modern training methods (combined and sports vision training) in improving psychological indicators that influence athletic performance.

Keywords: *sports vision training, combined training, competitive anxiety, self-confidence, functional ability, volleyball*

1. Introduction

In the present era, volleyball, as one of the most popular and competitive team sports, requires advanced cognitive and motor skills. The performance of athletes in this discipline is influenced by various factors, including visual skills, execution accuracy, and psychological states such as competitive anxiety. Recent studies have shown that the visual system plays a key role in processing environmental information and making rapid decisions under competitive conditions. Among the novel approaches considered by coaches, sports vision training has been introduced as a method aimed at enhancing visual functioning and, consequently, improving sports performance. Sports vision is an interdisciplinary specialty designed to optimize the functioning of the visual system to gain advantages in trained sports. Effective visual processing and rapid reaction speed are distinguishing elements of superior performance, and these abilities can be improved in any athlete, regardless of performance level, through sports vision training (Badami et al., 2016; Wilson & Falkel, 2004).

Some evidence suggests that training the ocular muscles influences visual skills (Badami et al., 2016) and that increased visual proficiency enhances decision-making accuracy and overall performance (Ghasemi et al., 2011; Zamani Fard et al., 2024). However, other research has reported contradictory findings, indicating that sports vision training does not always lead to improvements in visual skills (Broadbent et al., 2015; Wood et al., 2017).

On the other hand, competitive anxiety, particularly under conditions of supervision and evaluation, can negatively affect the performance of young athletes. When athletes compete, they are exposed to considerable stressors, among which social evaluative threat is frequently reported (Middleton et al., 2019; Ulrich et al., 2017). The presence of others influences the ability to perform across different tasks. Actions requiring fine motor control are often diminished under pressure. While it is tempting to focus exclusively on circumstances where performance deteriorates substantially, it is equally important to acknowledge that not all performance is impaired by pressure. For some individuals, competitive environments serve as facilitators and may even enhance performance (Middleton et al., 2019).

Plausible mechanisms underlying stress elevation under observation are straightforward. When one's sense of social belonging is threatened, motivation to redirect attention to social cues increases, likely as an adaptive strategy to succeed in subsequent interactions (Wilson et al., 2018). The relationship between social evaluative threat and task execution may depend on individual factors such as skill level and anxiety proneness (Kramer et al., 2018). State anxiety can act as a vulnerability factor, amplifying the impact of social evaluative threats (Robinson et al., 2020).

Therefore, examining the impact of different training methods on these variables is of particular importance. Volleyball, as a dynamic team sport that demands rapid decision-making, precise visual information processing, and emotional regulation in high-pressure conditions, provides an ideal context for studying the effects of vision training and competitive anxiety on athletic performance (Savelsbergh et al., 2010; Zamani Fard et al., 2024). Recent studies have indicated that sports vision skills are decisive for athletes' performance, as they enhance decision-making accuracy and skill execution (Reyment et al., 2021; Wilson et al., 2018). Conversely, competitive anxiety, especially under supervisory and evaluative circumstances, can hinder athletes' performance (Cuthbertson et al., 2019; Nielsen et al., 2019).

Baghandeh et al. (2022) demonstrated that sports vision training could positively influence certain aspects of athletes' visual performance, although its effect was less significant compared to methods such as transcranial direct current stimulation (tDCS) (Baghandeh et al., 2022). Similarly, Jackson et al. (2021) showed that combining sports vision training with perceptual-cognitive approaches could positively affect visual perception and decision-making accuracy (Jackson et al., 2021).

Although interest in sports vision training for enhancing athletic performance is increasing, questions remain as to whether it can be transferred to specific motor performance skills and how such transfer occurs under conditions of supervision and evaluation with respect to both functional skills and competitive anxiety. In light of the presented evidence and the lack of information regarding these components among young Iraqi volleyball players, as well as the contradictory results concerning the impact of sports vision training, the current research seeks to address the question: What is the effect of a period of sports vision training and conventional (specialized and combined) training on selected functional skills and components of competitive anxiety in young Iraqi volleyball players under supervision and evaluation conditions?

2. Methods and Materials

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2.1. *Study Design and Participants*

The present study employed a semi-experimental and applied design using a pretest–posttest plan across three training groups. The statistical population comprised all young Iraqi volleyball players with at least three years of athletic experience who competed in provincial and regional tournaments in 2023–2024. In the first step, 45 individuals were purposively selected; after initial screening, 42 met the inclusion criteria and were randomly assigned to three groups of 14: "sports vision training," "combined training," and "traditional/specialized training."

2.2. *Measures*

To assess functional abilities, validated T-tests were used to evaluate rapid change-of-direction ability, a reaction test to light and sound stimuli was administered using a digital chronometer device, and a 30-meter shuttle sprint test was used to measure explosive power and anaerobic endurance. To evaluate psychological variables, the Sport Attention and Concentration Questionnaire was used to measure competitive attentional dimensions, the Sport Motivation Questionnaire to examine motivational factors, and the Competitive State Anxiety Inventory-2 (CSAI-2) to assess state-competitive anxiety.

2.3. *Intervention*

Over eight weeks, three sessions per week, the specialized exercises included saccadic eye movements, peripheral focus, eye–hand coordination, and ambient (peripheral) vision drills adapted from Wilson and Falkel (2004) (Wilson & Falkel, 2004). The combined group, in addition to sports vision training, also engaged in mindfulness exercises and pressure-simulation scenarios (e.g., rapid decision-making under unexpected conditions). This combined intervention simultaneously targeted perceptual–motor components and emotion regulation. The traditional/specialized group continued only conventional volleyball practices (passing, serving, spiking, and small-sided games). Posttests were administered in an environment closely resembling real competition. To induce psychological pressure, in addition to the presence of coaches and video recording of athletes' performance, time constraints were imposed for skill execution, and unpredictable stimuli (e.g., sudden changes in trajectory or type of serve by the coach) were applied to recreate stress and social evaluation.

2.4. *Data Analysis*

Collected data were analyzed using analysis of covariance (ANCOVA) and Bonferroni post hoc tests. The significance level for all tests was set at 0.05.

3. Findings and Results

After confirming requisite assumptions—including the normal distribution of data ($p > .05$), homogeneity of group variances ($p > .05$), and linear relationships between covariate and dependent variables (displacement time × group: $p = .14$, $F = 2.04$; vertical jump × group: $p = .60$, $F = 0.50$; cognitive anxiety × group: $p = .08$, $F = 2.70$; somatic anxiety × group: $p = .96$, $F = 0.03$; self-confidence × group: $p = .56$, $F = 1.06$), and satisfying Box's M assumption (BOX = 19.46; $p = .68$; $F(20, 5459.71) = 0.82$), ANCOVA was used for data analysis.

Table 1

Comparison of means and standard deviations of functional components across the three groups

Test	Group	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD
Vertical jump (cm)	Sports vision	328.35	5.21	327.07	5.16
	Combined	330.57	2.31	329.42	3.10
	Traditional/Specialized	328.21	5.69	326.50	5.53
Displacement time (s)	Sports vision	7.12	0.31	7.36	0.31
	Combined	7.21	0.14	7.33	0.16
	Traditional/Specialized	7.21	0.22	7.55	0.32
Functional (standard T-score)	Sports vision	95.06	18.17	96.92	18.66
	Combined	106.10	8.10	100.78	8.55
	Traditional/Specialized	98.33	12.88	102.28	14.66
Cognitive anxiety	Sports vision	12.64	0.84	13.78	0.60
	Combined	12.14	1.16	13.57	1.15
	Traditional/Specialized	12.07	1.32	15.42	1.01
Somatic anxiety	Sports vision	11.35	1.08	12.78	1.05

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	Combined	11.64	0.84	13.14	1.16
	Traditional/Specialized	11.00	1.46	15.14	0.66
Self-confidence	Sports vision	26.14	1.40	24.78	1.42
	Combined	26.28	0.91	24.71	1.06
	Traditional/Specialized	26.64	1.00	23.28	0.99
State-competitive anxiety	Sports vision	50.14	2.56	51.35	2.40
	Combined	50.07	1.59	51.42	1.34
	Traditional/Specialized	49.71	2.30	53.85	1.65

Very small changes in vertical jump performance were observed between pretest and posttest across all three groups. All groups showed slight changes (increased times) in displacement performance, indicating a small reduction in movement speed. The "Traditional/Specialized" group exhibited the greatest increase in time (largest speed reduction). In all groups, anxiety (both cognitive and somatic) increased and self-confidence decreased. The Traditional/Specialized group experienced the largest increases in anxiety (both cognitive and somatic) and the largest decrease in self-confidence; it also recorded the highest posttest "state-competitive anxiety." Whereas the "Sports Vision" and "Combined" groups showed small increases in state-competitive anxiety, the "Traditional/Specialized" group exhibited a marked increase (from 49.71 to 53.85).

Table 2

Results of the analysis comparing the effect of two types of training on the studied variables

Source	Variable	Sum of Squares	df	Mean Square	F	Sig.	Eta²	Power
Pretest	Vertical jump	820.705	1	820.705	816.609	.000	.960	1.00
	Displacement time	2.045	1	2.045	83.822	.000	.711	1.00
	Cognitive anxiety	26.804	1	26.804	87.145	.000	.719	1.00
	Somatic anxiety	24.564	1	24.564	65.050	.000	.657	1.00
	Self-confidence	38.276	1	38.276	134.452	.000	.798	1.00
Group	Vertical jump	4.915	2	2.458	2.445	.102	.126	.45
	Displacement time	.318	2	.159	6.521	.004	.277	.88
	Cognitive anxiety	29.109	2	14.554	47.318	.000	.736	1.00
	Somatic anxiety	48.958	2	24.479	64.825	.000	.792	1.00
	Self-confidence	28.725	2	14.363	50.452	.000	.748	1.00
Error	Vertical jump	34.171	34	1.005				
	Displacement time	.830	34	.024				
	Cognitive anxiety	10.458	34	.308				
	Somatic anxiety	12.839	34	.378				
	Self-confidence	9.679	34	.285				

The results of the statistical analysis show that the type of training program had a significant effect on psychological variables and also on speed performance (displacement time). However, it had no significant effect on maximal strength (vertical jump).

Table 3

Results of Bonferroni post hoc test for pairwise comparison of studied variables and determination of differences between groups

Variable	Group 1	Group 2	Mean Difference	Std. Error	Sig.
Vertical jump	Sports vision	Combined	-.250	.399	1.000
	Sports vision	Traditional/Specialized	.626	.408	.403
	Combined	Traditional/Specialized	.875	.406	.114
Displacement time	Sports vision	Combined	.136	.062	.109
	Sports vision	Traditional/Specialized	-.090	.064	.494
	Combined	Traditional/Specialized	-.226	.063	.003
Cognitive anxiety	Sports vision	Combined	-.170	.221	1.000
	Sports vision	Traditional/Specialized	-1.987	.226	.000

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	Combined	Traditional/Specialized	-1.818	.224	.000
Somatic anxiety	Sports vision	Combined	-.170	.221	1.000
	Sports vision	Traditional/Specialized	-1.987	.226	.000
	Combined	Traditional/Specialized	-1.818	.224	.000
Self-confidence	Sports vision	Combined	.320	.213	.425
	Sports vision	Traditional/Specialized	2.035	.217	.000
	Combined	Traditional/Specialized	1.715	.216	.000

Based on the above results, a statistically significant difference was observed in displacement time between the combined and traditional groups; in cognitive anxiety, somatic anxiety, and self-confidence between the sports vision and traditional groups; and also between the combined and traditional groups. It appears that sports vision and combined training methods are superior to the traditional/specialized method—not necessarily in improving physical performance, but because of their very clear positive effect on reducing anxiety and maintaining self-confidence. The combined method may also provide a small advantage in improving displacement time.

4. Discussion and Conclusion

The findings of the study revealed that, after controlling for vertical jump scores in the pre-test, there were no significant differences among the participating groups in vertical jump ability. However, results showed a significant difference in displacement time scores of young Iraqi volleyball players under psychological pressure. Based on the Bonferroni test and pairwise comparisons, a statistically significant difference in favor of the combined training group was found compared to the specialized/traditional group. The present finding of no significant differences in vertical jump ability among the training groups aligns with previous studies. For example, Reyment et al. (2021) reported that a perceptual–motor training program, although leading to significant improvements in decision-making and passing, had no significant effect on vertical jump performance (Reyment et al., 2021). Similarly, Hülsdünker et al. (2019) demonstrated that neurofeedback training improved visual processing speed but did not significantly affect pure power tests such as vertical jump (Hülsdünker et al., 2019). This consistency suggests that improvements in purely physiological indices such as maximal strength are primarily influenced by neuromuscular factors and respond better to strength-specific training interventions than to perceptual–visual training.

In contrast, the superiority of the combined training group in displacement time under pressure may appear inconsistent with studies emphasizing the effectiveness of specialized traditional training. For instance, Gabbett and Benton (2008) showed that a high-volume, high-intensity specialized training program can significantly improve physiological factors such as speed and agility (Gabbett & Benton, 2008). This apparent inconsistency may be explained by the nature of the task and measurement conditions. Traditional training tends to focus on improving "pre-determined agility," whereas the task used in the present study, measured under psychological pressure, involved more "reactive agility," which is strongly influenced by perceptual and rapid decision-making components. A logical explanation for the superiority of the combined group in displacement time under pressure lies in the integrated and comprehensive nature of this training type. This finding is consistent with Savelsbergh et al. (2010) and Broadbent et al. (2015), who showed that perception-based and combined (physical–cognitive) training allows athletes to process information more quickly and produce more optimal motor responses under complex and stressful conditions (Broadbent et al., 2015; Savelsbergh et al., 2010). Such training facilitates the transfer of learning to real competitive situations. Therefore, the superiority of the combined group may stem from the simultaneous engagement of perceptual, cognitive, and motor mechanisms during training, which more effectively prepares athletes for skill execution under competition-like pressure.

The results also showed significant differences in cognitive anxiety, somatic anxiety, and self-confidence between the sports vision and traditional groups ($p = .000$) and between the combined and traditional groups ($p = .000$). Sports vision and combined training methods appeared superior not necessarily in terms of improving physical performance, but due to their very clear positive impact on reducing anxiety and maintaining self-confidence. The present finding of significant reductions in cognitive anxiety in the sports vision and combined groups, compared to the traditional group, aligns with a growing body of research emphasizing the role of attention- and awareness-based interventions in emotional regulation. Wood et al. (2017) found that perceptual–visual training helps athletes focus attention on task-relevant cues and ignore distracting stimuli

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(such as negative thoughts or fear of failure), which are primary sources of cognitive anxiety (Wood et al., 2017). These exercises enhance athletes' secondary appraisal processes, leading them to evaluate their internal and external resources (e.g., trained skills) as more sufficient for coping with the demands of stressful situations. This reappraisal directly reduces worry and negative thoughts, the core components of cognitive anxiety.

Nielsen et al. (2019) investigated the effect of mindfulness-based interventions on performance under psychological pressure. They found that these interventions enabled athletes to nonjudgmentally monitor their internal states (such as anxious thoughts) and instead exhibit more controlled, automatic responses (Nielsen et al., 2019). This ability to observe without reaction prevents the escalation of negative thought cycles and, in turn, reduces cognitive anxiety. Such mechanisms explain why training groups that incorporated components of awareness and attention performed more successfully in managing stress. Although the present study showed reductions in cognitive anxiety, some research has highlighted the limitations of psychological interventions in extreme high-pressure environments. Wilson et al. (2018), for example, found that under conditions of severe and unpredictable stress, even trained individuals experienced impaired cognitive performance and increased anxiety (Wilson et al., 2018). They argued that although attentional training is beneficial, it may not be sufficient to counteract the effects of highly intense, chronic stress. This discrepancy can be explained by differences in task nature and pressure levels. The supervisory and evaluative pressures in the present study were realistic but likely moderate enough for attention- and awareness-based interventions to be effective, whereas Wilson's study focused on extreme conditions (e.g., military combat). Thus, the overall conclusion is that the effectiveness of such training in reducing cognitive anxiety may depend on the intensity of psychological pressure. For common competitive stress in sport, these interventions appear highly effective.

The significant reduction in somatic anxiety in the sports vision and combined groups is consistent with research emphasizing mind–body connections and physiological regulation. Cuthbertson et al. (2019) demonstrated that cognitive-bodily reappraisal training could reduce somatic anxiety in competitive athletes (Cuthbertson et al., 2019). In this approach, athletes are taught to reinterpret physiological arousal symptoms (e.g., increased heart rate, sweating) not as disabling signs of anxiety but as indicators of bodily readiness and energy for performance. This reappraisal leaves the physiological response intact but changes its subjective meaning, reducing distress associated with these symptoms. The combined and vision-based training groups in this study likely simulated pressure conditions that provided athletes with opportunities to practice such reappraisal. Robinson et al. (2020) argued that traditional specialized training often targets only physiological responses, whereas combined training, which includes perceptual components under pressure, allows athletes to monitor and manage their physiological arousal during cognitive engagement (Robinson et al., 2020). This integration increases athletes' tolerance of arousal and prevents its interpretation as negative anxiety, which explains why the combined group reported lower somatic anxiety than the traditional group.

Although evidence is strong, some research has suggested that under certain conditions, interventions may not completely suppress innate physiological responses to intense stress. Kramer et al. (2018) showed that elite taekwondo athletes in highly pressurized championship contexts experienced significant increases in physiological stress markers (such as salivary cortisol and heart rate), regardless of their psychological training (Kramer et al., 2018). While trained athletes reported less cognitive anxiety, their physiological arousal remained elevated. This finding indicates that the somatic component of anxiety may be more resistant to interventions. The apparent discrepancy can be explained by distinguishing between physiological activation and somatic anxiety. Physiological activation (e.g., increased adrenaline) is an automatic and essential bodily preparation for performance, whereas somatic anxiety is the negative, distressing interpretation of that activation. Thus, while physiological responses may not always be eliminated, interventions such as vision and combined training effectively reduce the negative interpretation of these responses. Trained athletes may still experience high heart rates but perceive them as energy and readiness, not as anxiety. The present findings, therefore, support the importance of interventions that reshape cognitive appraisal of bodily arousal, enabling athletes to view it as a natural and beneficial part of performance rather than a threat.

The observed increase in self-confidence in the sports vision and combined groups is consistent with strong theoretical and empirical frameworks emphasizing the role of perceived resources and successful experiences under pressure in shaping confidence. Jackson et al. (2021)

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demonstrated that perceptual–motor training conducted in pressure-simulated contexts gave athletes opportunities to monitor their abilities under challenges and accumulate small successes, which in turn became powerful sources for positive self-appraisal of competence (Jackson et al., 2021). Similarly, Middleton et al. (2019) applied the challenge–threat framework, showing that athletes exposed to incremental pressure training were more likely to appraise stressful situations as challenges (where resources match demands) rather than threats (where demands exceed resources) (Middleton et al., 2019). Such challenge appraisals were directly associated with higher confidence and better performance.

By contrast, Ulrich et al. (2017) highlighted the risk that excessive pressure during training can harm athletes' self-efficacy if the pressure exceeds their current coping resources or repeated failures occur without adequate support (Ulrich et al., 2017). This underscores that the dosage and design of pressure training are critical. The present study's findings suggest that the pressure applied in the vision and combined groups was likely carefully monitored and incrementally designed to be challenging but manageable. This allowed athletes to observe their capacity to overcome difficulties, thereby strengthening confidence. In contrast, the traditional group may have experienced pressure that emphasized potential failure rather than providing manageable opportunities for success.

Overall, the study demonstrated differential impacts of the three training methods (sports vision, combined, and specialized/traditional) on both functional and psychological indicators of young volleyball players. While no significant differences emerged in vertical jump ability, the combined training group showed superior displacement performance under pressure compared to the traditional group. More importantly, the most prominent finding was the positive psychological effects of the novel methods: both sports vision and combined training significantly reduced cognitive and somatic anxiety while maintaining higher confidence under stress.

This pattern suggests that the superiority of combined and vision-based methods lies not necessarily in enhancing pure physiological capabilities, but in psychologically empowering athletes to cope with competitive pressure more effectively. Integrating perceptual, cognitive, and stress-related components into training appears to teach athletes how to reinterpret physiological responses, manage attention, and monitor competence under challenges. As a result, athletes evaluate stressful conditions as manageable challenges rather than overwhelming threats.

In conclusion, this study emphasizes the need to move toward integrative training models that simultaneously address physical, technical–tactical, and psychological dimensions of sport. Such training designs can serve as practical strategies for coaches aiming to improve athletes' psychological resilience and, ultimately, their stable performance under competitive high-pressure conditions.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the study and participated in the research with informed consent.

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