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# Comparison of the Effects of a Training Period with Sports Vision, Specialized, and Combined Approaches on Certain Skill Components and Mood in Young Iraqi Volleyball Players under Psychological Pressure

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A B S T R A C T

**Objective:** The purpose of this study was to compare the effects of a training period with sports vision, specialized, and combined approaches on skill components and mood in young Iraqi volleyball players under psychological pressure.
**Materials and Methods:** This semi-experimental study was conducted in the field using a pre-test/post-test design. A total of 42 participants who met the inclusion criteria were purposefully selected and randomly assigned to three groups (14 participants each): sports vision training, traditional training, and combined training. To assess the accuracy of volleyball serving and spiking, a test adapted from Garione et al. (2023) was employed. Mood was measured using the 32-item Brunel Mood Scale (BRUMS). Trait anxiety was assessed using the Illinois SCAT questionnaire (Martens, 1997), and state anxiety was measured using the Competitive State Anxiety Inventory-2 (CSAI-2) (Martens et al., 1990). To induce psychological pressure during the post-test, a combined monitoring and comparison method was used (Esmaeili et al., 2019). Data analysis was performed using covariance analysis and Bonferroni post hoc tests.
**Findings:** The results showed that under psychological pressure, the traditional/specialized group had the lowest serving accuracy, while no statistically significant differences were observed between the sports vision and combined groups ($p \geq 0.05$). The combined training group exhibited the highest spiking accuracy under psychological pressure, with statistically significant differences among all three groups ($p \leq 0.05$). Regarding positive mood components, no statistically significant differences were found between the sports vision and combined training groups ($p \geq 0.05$), but statistically significant differences were observed between the sports vision and traditional groups as

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well as between the combined and traditional groups ($p \leq 0.05$). In negative mood components, statistically significant differences were only observed between the combined and traditional groups ($p \leq 0.05$).

**Conclusion:** The direct and indirect effects of sports vision training can assist coaches and athletes in diversifying training programs and may be utilized as a method and tool in real competition scenarios, which are often accompanied by psychological pressure. Additionally, the low cost and feasibility of implementing sports vision programs in various settings can be advantageous for coaches and athletes.

**Keywords:** *Sports vision, psychological pressure, accuracy, mood, volleyball.*

## 1. Introduction

Competitive sports demand quick decision-making, varying degrees of motor coordination, and the maintenance of motor control under psychological pressure. The phenomenon of "choking under pressure" refers to suboptimal performance in stressful conditions (1). This phenomenon is particularly common when athletes are required to perform under pressure. Moreover, even in non-stressful situations, other factors can suddenly negatively impact individual performance (2). Psychological pressure in competitions typically affects neuromuscular coordination and can disrupt optimal athlete performance (2). Activities like serving and spiking in volleyball are often performed under psychological pressure, especially when no opportunity for recovery exists. Under such circumstances, choking can affect athletes' emotions and mood, disrupting their ability to select important environmental information and ultimately deteriorating performance outcomes. In this context, the role of sensory systems, especially the visual system due to its dominance over other senses and visual skills, is of particular importance.

Mood states in sports psychology are recognized as significant factors in athletic performance and are used to more accurately predict athletes' outcomes. The content and type of mood influence individuals' cognition, behavior, success, and failure in various situations. Based on a two-dimensional classification, mood is categorized into positive and negative states, with tension, depression, anger, fatigue, and confusion as negative moods and vigor, happiness, and calmness as positive moods (3). In stressful situations, mood states can influence emotions, decreasing positive components and increasing negative ones. These changes are particularly evident in sports skills requiring precision and motor control, such as serving and spiking in volleyball. In these skills, psychological pressure can affect mood responses, leading to disappointing results even when athletes have different expectations. However, the relationship between training type and mood states remains unclear, and conflicting results exist in current research (4).

Every sport contains elements that directly affect the final outcome. Athletes often face significant challenges in psychologically stressful situations, particularly in critical moments. Athletic and team success depends on performance under these conditions. During such times, athletes must focus carefully on their environment, select the most relevant stimuli, and disregard irrelevant ones. Researchers aim to enhance athletes' efficiency in these situations through specialized training programs, enabling optimal performance. Athletes' emotions and mood states are quickly influenced by environmental, internal, and cognitive factors, with this impact being more pronounced in skills requiring precision. Young athletes, in particular, may be more susceptible to emotional fluctuations and environmental factors. In this regard, vision plays a crucial role in providing environmental information (4).

An invaluable advantage for athletes in competitions is efficient visual skills (5, 6). These skills and their components account for approximately 80% of the methods athletes use to acquire information about their sports environment. Additionally, about 70% of all sensory receptors in the body are located in the eyes (7). It is no surprise that athletes and coaches seek new methods and programs to enhance performance, with vision often playing a central role in this pursuit (8). One innovative training approach that has garnered attention from coaches is sports vision training. Sports vision is an interdisciplinary specialty aimed at improving visual system performance to achieve advantages in trained sports. Developing visual skills can assist athletes in enhancing both athletic and motor performance at any age (9). Athletes with faster visual reaction times can perceive environmental events almost in slow motion, enabling split-second reactions and decisions that positively impact performance (10, 11). As a novel specialty, sports vision has garnered significant attention, particularly among athletes seeking innovative methods to improve visual skills and achieve better competitive performance (11).

Skills such as coordination, concentration, balance, and precision are considered key elements in any sporting event, with some researchers believing these skills can be improved through sports vision training, as the visual system responds well to visual training loads (5, 6). Volleyball, for example, is a sport that significantly benefits from sports vision training. Due to its high technical and tactical demands, volleyball involves fast and powerful movements, imposing considerable physical and psychological pressure on players during training and competition (12). Researchers in sports science focus on enabling athletes to perform with maximum power, speed, efficiency, and confidence under various conditions, especially high-stress situations. Correct action selection, attention to appropriate stimuli and cues, and effective motor system activation are crucial factors in this regard. Most sports, including volleyball, require high physical and psychological skills to handle stressful conditions effectively (13). Further research in this field can expand our understanding of the impact of sports vision training.

Evidence suggests that, like other body systems, the visual system can be strengthened and improved through specific visual training, just as athletes utilize specialized training methods to enhance overall performance (14). Today, sports vision training is employed to elevate athletes' performance levels and outpace competitors (10, 11). Sports vision, as an interdisciplinary specialty, is used to enhance visual system performance for benefits in various sports. Optimal visual processing and high reaction speed are two key elements distinguishing excellent athletic performance, which can be developed in any athlete, regardless of skill level, through sports vision training (11). Athletes with faster visual reaction times can perceive environmental events almost in slow motion, enabling split-second reactions and decisions, thereby improving performance (10).

Sports vision training refers to a set of techniques aimed at enhancing visual performance and improving motor function. These exercises can improve visual skills, including static visual acuity (15), dynamic visual acuity (16), contrast sensitivity (17), saccadic eye movements (18), depth perception (8), reaction time (19), visual search speed (Kumar, 2011), divided attention (20, 21), and eye-hand coordination (22). Some evidence indicates that eye muscle training can impact visual skills (23-26), improving visual skills, decision-making accuracy (20, 27), and performance. However, conflicting findings also exist. For example, Abernethy and Wood (2001) reported that the benefits of sports vision training combined with physical training are not superior to physical training alone. Furthermore, many studies on the combined effects of sports vision training on athletic skills are limited and often suffer from methodological weaknesses. Some studies lack control groups (28), while others fail to examine the combined effects of visual and athletic skills as separate variables (29, 30). Given these factors, there is still no consensus on the effectiveness of sports vision training for visual and athletic performance (28).

Although there is growing interest in sports vision training for athletic performance, questions remain regarding whether it can transfer to specific athletic and motor skills and how such transfer occurs under psychological pressure for specific sports skills and mood. Considering the lack of information on the studied components among young Iraqi volleyball players and the contradictory results regarding the effects of sports vision training, the researcher seeks to address whether there is a difference in the effects of a training period with sports vision, specialized, and combined approaches on certain skill and mood components of young Iraqi volleyball players under psychological pressure. Thus, the purpose of this study is to compare the effects of a training period with sports vision, specialized, and combined approaches on certain skill, performance, and mood components of young Iraqi volleyball players under psychological pressure. The potential findings of this study could be valuable in advancing knowledge and information in this field for the target population. Additionally, the results could provide valuable insights for coaches, athletes, and volleyball sports officials in Iraq.

## 2. Methods and Materials

### 2.1 Study Design and Participants

This study is a semi-experimental research design for data collection and is applied in terms of its purpose and outcomes. It was conducted in the field using a pre-test/post-test design. The study population consisted of young volleyball players with at least three years of experience in volleyball. Based on purposive sampling, 60 young Iraqi volleyball players who met the inclusion criteria (normal vision, a minimum of three years of volleyball experience, no eye surgery or lens use, no use of glasses, male gender, right-handedness, and no use of sedatives) were selected. Due to the non-cooperation of 10 participants at the beginning and withdrawal of eight participants during the study (after the introductory session and pre-test), the final sample consisted of 42 participants (mean age = 18.61 ± 0.98 years, height = 1.91 ± 0.03 m, weight = 89.09 ± 3.74 kg, trait anxiety = 16.71 ± 1.08). They were randomly assigned to three groups (14 participants each): sports vision, combined, and traditional/specialized training groups.

### 2.2 Instruments

#### 2.2.1 Snellen Vision Test

The Snellen Vision Test was used to assess the visual acuity of volleyball players before participant selection. Participants were eligible only if they had normal visual acuity and achieved a perfect score.

#### 2.2.2 Trait Anxiety Questionnaire

To measure trait anxiety, the Illinois SCAT questionnaire (Martens, 1997) was used. This questionnaire consists of 15 items based on a Likert scale, including five filler items. Items 6 and 11 are scored inversely. The scores determine the individual's trait anxiety, ranging from 10 (low trait anxiety) to 30 (high trait anxiety). Scores above 20 indicate high anxiety, scores between 15 and 20 indicate moderate anxiety, and scores below 14 indicate low anxiety. The internal structure, reliability, and validity of this questionnaire were assessed separately for children and adults using responses from 2,500 athletes. Test-retest reliability was calculated, with a correlation coefficient ranging from 0.73 to 0.88 and an average of 0.81. The Kuder-Richardson formula (KR20) showed internal consistency coefficients between 0.95 and 0.97 for children and adults, indicating high validity (Martens, 1997). The researcher also calculated internal consistency using Cronbach's alpha, yielding α = 0.79 for the Illinois SCAT questionnaire (2).

#### 2.2.3 Volleyball Serve Accuracy Test

This protocol involved each participant attempting ten serves. Scores for each tennis-style serve were recorded, as shown in the diagram. If the ball hit a line, the higher score was recorded. A ball hitting the net or landing out of bounds scored zero. The participant's score was the total from all ten serves (31).

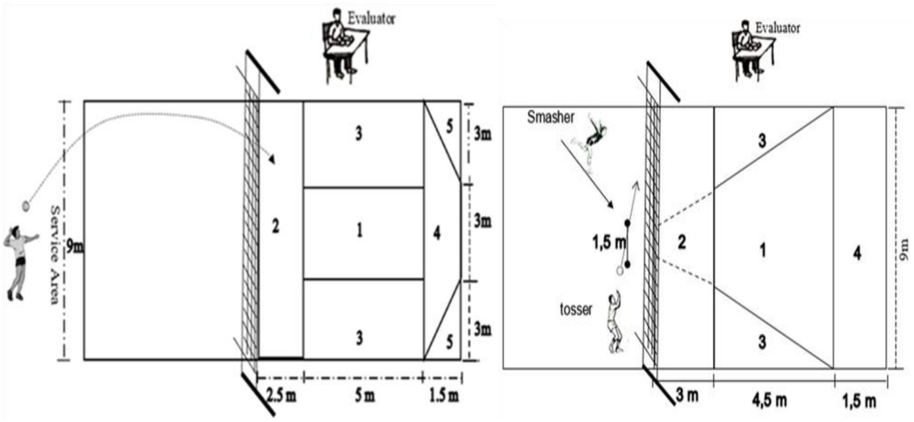


**Figure 1.** Diagram of Volleyball Serve and Spike Accuracy Test Protocol (31)

#### 2.2.4 Volleyball Spike Accuracy Test

For this test, a ball hitting the net or landing out of bounds scored zero. Balls hitting marked lines on the court received higher scores. Each participant executed ten spikes, with scores recorded for each attempt. Spikes were performed from a designated 1.5-meter area at the center of the court. The participant's score was the total from all ten spikes (31).

#### 2.2.5 Mood States Questionnaire:

Athletes' mood states were assessed using the 32-item Brunel Mood Scale (BRUMS) developed by Lin et al. (2007). This scale is an extended version of the 24-item BRUMS, with two additional subscales consisting of eight items. It evaluates eight psychological states: tension, depression, anger, vigor, fatigue, confusion, calmness, and happiness. Each subscale contains four items. Vigor, calmness, and happiness (12 items total) represent positive mood states, while tension, depression, anger, fatigue, and confusion (20 items total) represent negative mood states. Each item is scored on a scale of 0 to 5, with "not at all" scoring 0 and "extremely" scoring 5. The response options include "not at all," "a little," "moderately," "quite a lot," and "extremely." (32). Since the development of the 24-item BRUMS, its validity and reliability have been evaluated in various studies (33-35). In Iran, Farokhi et al. (2012) examined the factorial validity and reliability of the Persian version of the 32-item BRUMS among 432 male and female athletes across ten team and individual sports. The results showed acceptable fit indices (RMSEA = 0.80, CFI = 0.94, TLI = 0.93), internal consistency (tension = 0.74, vigor = 0.80, confusion = 0.72, fatigue = 0.76, happiness = 0.77, calmness = 0.78, depression = 0.70, anger = 0.72, overall = 0.78), and temporal reliability (tension = 0.90, vigor = 0.87, confusion = 0.84, fatigue = 0.86, happiness = 0.87, calmness = 0.86, depression = 0.88, anger = 0.86, overall = 0.88) (36).

### *2.3 Execution Method*

After announcing the study and selecting participants, 42 individuals with trait anxiety scores between 15 and 20 were purposefully selected for the research process. These individuals were randomly assigned to three groups (14 participants per group): sports vision, combined, and traditional/specialized training groups. During the pre-test, all participants completed tests for serve accuracy, spike accuracy, and mood scores using the Brunel Mood Scale (BRUMS). The two experimental groups, sports vision and combined, participated in training for nine weeks, while the traditional/specialized group did not receive any intervention and continued their regular training programs. During the post-test, after inducing psychological pressure, the research variables were re-measured for all three groups.

Following participant selection and assessment of trait anxiety, anthropometric characteristics, including height, weight, and body mass index (BMI), were recorded. The participants were then randomly assigned to the three groups, with 14 individuals in each group, totaling 42 participants. In the pre-test phase, a repetition effort test was conducted for all participants, and their scores were recorded. For data analysis, the standard T score for vertical jump and the standard T score for maximum effort test displacement time were used as a single standardized score. Additionally, the AMSAT-3 psychological skills questionnaire was distributed to participants, who were asked to choose the best option reflecting their current state. After collecting the AMSAT-3 questionnaires, the three training groups (sports vision, traditional/specialized, and combined) performed their specific programs in 27 sessions lasting 90 minutes each.

Each training session included 10 minutes of warm-up, 30 minutes of sports vision exercises or intervention, 20–30 minutes of volleyball skill-specific physical training, and 10 minutes of cool-down and stretching exercises. The sessions were designed in a circular format, with participants moving through five stations, spending six minutes at each. The stations focused on developing visual skills, such as peripheral vision, saccadic eye movements, and convergence. The difficulty levels of the exercises were adjusted across three levels based on wall distance, standing position, and the use of tools like foam to gradually increase motor and cognitive challenges.

In the combined training program, participants performed the same sports vision exercises but with movements specifically designed using a volleyball and aligned with the sport’s techniques. For example, at the first station, sports vision training was combined with overhead ball control, progressing to standing on one leg and using foam to increase difficulty. At the second station, lateral movement exercises included ball displacement. Other stations incorporated volleyball-specific movements, such as ball control, passing, and spiking, focusing on visual skills and motor coordination, with varying difficulty levels.

The traditional/specialized group’s training program consisted of repetitive, simple volleyball skill techniques practiced in a sport-specific environment without sports vision exercises. This traditional intervention combined technical skills training with coaching-based exercises designed to facilitate learning, specifically including small-sided games (e.g., 3 vs. 3 or 5 vs. 5) and repetitive drills reflecting specific game situations with teammates and opponents (Formenti et al., 2019).

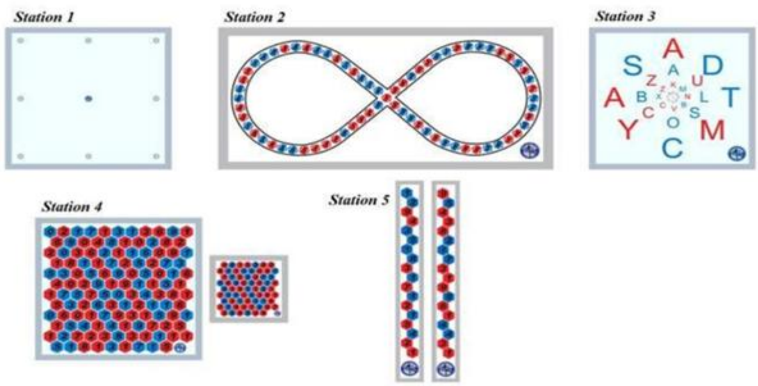


**Figure 2.** Visual representation of the screens used in sports vision and combined training groups (adapted from Formenti et al., 2019).

To induce psychological pressure during the post-test, a combined monitoring and comparison method was used (Esmaili, Safavi Hammami, Mohadi, & 2020). For the post-test session, psychological pressure conditions were prepared. Four video cameras were installed at the four sides of the volleyball court, two meters away from the longitudinal and transverse lines, and participants were informed that their skill execution would be recorded (performance pressure). Additionally, four prominent coaches from the volleyball federation, who were involved in identifying players for the national volleyball team and served as coaching staff for volleyball clubs in Iraq, were invited. Participants were told that their performance would be evaluated by these individuals (evaluation pressure).

After setting up the cameras and evaluators and providing necessary explanations, participants were informed that those selected would receive a financial reward of 300,000 Iraqi dinars (financial incentive). Participants were then asked to complete the Competitive State Anxiety Inventory (CSAI-2) and the Brunel Mood Scale (BRUMS). Once the participant was ready, serve accuracy and spike accuracy tests were conducted, and their scores were recorded. Participants were advised to refrain from engaging in intense physical activity two days before the post-test.

### *2.4 Data Analysis*

For data analysis, multivariate analysis of covariance (MANCOVA) and Bonferroni post hoc tests were conducted using SPSS version 23 at a significance level of less than 0.05.

## 3. Results

Table 1 compares the mean and standard deviation values for serve accuracy, spike accuracy, competitive state anxiety, positive mood, and negative mood across the three training groups (sports vision, combined, and traditional/specialized) during the pre-test and post-test phases. The data show that serve and spike accuracy scores decreased across all groups from pre-test to post-test under psychological pressure, with the traditional/specialized group experiencing the greatest decline. Positive mood scores also decreased across all groups, with the sports vision and combined groups maintaining higher adjusted means compared to the traditional/specialized group. Conversely, negative mood scores increased for all groups, with the traditional/specialized group showing the largest increase in negative mood components compared to the other two groups.

**Table 1.** Comparison of Means and Standard Deviations of Examined Components Across the Three Groups

| Test | Group | Pre-Test Mean | SD | Post-Test Mean | SD |
|---|---|---|---|---|---|
| Serve Accuracy | Sports Vision | 39.21 | 3.51 | 37.28 | 3.87 |
| | Combined | 38.92 | 2.66 | 37.57 | 3.34 |
| | Traditional/Specialized | 38.71 | 3.51 | 36.50 | 3.39 |
| Spike Accuracy | Sports Vision | 33.85 | 2.53 | 31.85 | 2.62 |
| | Combined | 34.21 | 1.96 | 33.28 | 1.85 |
| | Traditional/Specialized | 33.71 | 1.72 | 30.92 | 1.38 |
| Competitive State 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 |
| Negative Mood | Sports Vision | 12.21 | 2.45 | 18.92 | 1.54 |
| | Combined | 13.14 | 2.03 | 19.00 | 1.24 |
| | Traditional/Specialized | 13.07 | 1.97 | 20.28 | 1.20 |
| Positive Mood | Sports Vision | 7.28 | 1.48 | 4.92 | 1.38 |
| | Combined | 7.50 | 1.82 | 5.07 | 1.73 |
| | Traditional/Specialized | 7.50 | 2.10 | 3.14 | 1.16 |

Table 2 presents the ANCOVA results for the effects of training type on the variables under psychological pressure. Significant differences were found among the groups for serve accuracy ($F = 4.40$, $p = 0.02$), spike accuracy ($F = 33.72$, $p = 0.000$), positive mood ($F = 23.12$, $p = 0.000$), and negative mood ($F = 5.20$, $p = 0.01$). The intervention had a large effect size on spike accuracy ($\eta^2 = 0.65$) and positive mood ($\eta^2 = 0.56$). These findings indicate that the training type significantly influenced participants' performance and mood under psychological pressure, with the combined training group showing superior results in most variables.

After confirming the necessary assumptions, including normal data distribution ($p \geq 0.05$), homogeneity of variances ($p \geq 0.05$), examination of the linear relationship between covariates and dependent variables (serve accuracy*group p = 0.17, F(2) = 1.80; spike accuracy*group p = 0.058, F(2) = 3.09; positive mood*group p = 0.08, F(2) = 2.70; negative mood*group p = 0.96, F(2) = 0.03), and the Box's test assumption (BOX = 19.46; p = 0.68, F(20, 5459.71) = 0.82), data were analyzed using analysis of covariance (ANCOVA).

**Table 2.** ANCOVA Results Comparing the Effects of Training Type on the Examined Variables Under Psychological Pressure

| Source | Variable | Sum of Squares | df | Mean Square | F | Sig. | Eta Squared | Power |
|---|---|---|---|---|---|---|---|---|
| Pre-Test | Serve Accuracy | 426.49 | 1 | 426.49 | 726.57 | 0.000 | 0.95 | 1.00 |
| | Spike Accuracy | 3.35 | 1 | 3.35 | 8.96 | 0.005 | 0.20 | 0.82 |
| | Positive Mood | 0.29 | 1 | 0.29 | 0.38 | 0.54 | 0.01 | 0.09 |
| | Negative Mood | 0.44 | 1 | 0.44 | 0.34 | 0.56 | 0.01 | 0.08 |
| Group | Serve Accuracy | 5.16 | 2 | 2.58 | 4.40 | 0.02 | 0.20 | 0.72 |
| | Spike Accuracy | 25.22 | 2 | 12.61 | 33.72 | 0.000 | 0.65 | 1.00 |
| | Positive Mood | 35.32 | 2 | 17.66 | 23.12 | 0.000 | 0.56 | 1.00 |
| | Negative Mood | 13.51 | 2 | 6.75 | 5.20 | 0.01 | 0.22 | 0.76 |
| Error | Serve Accuracy | 20.54 | 35 | 0.58 | | | | |
| | Spike Accuracy | 13.09 | 35 | 0.37 | | | | |
| | Positive Mood | 26.72 | 35 | 0.76 | | | | |
| | Negative Mood | 45.47 | 35 | 1.29 | | | | |

Table 3 reports the Bonferroni post hoc test results for pairwise comparisons of the training groups. For serve accuracy, significant differences were observed between the combined and traditional/specialized groups ($p = 0.01$) but not between the sports vision and combined groups ($p = 0.28$). Spike accuracy comparisons revealed significant differences favoring the combined group over both the sports vision ($p = 0.000$) and traditional/specialized groups ($p = 0.000$). For positive mood, significant differences were found between the combined and traditional/specialized groups ($p = 0.000$), while no significant difference was observed between the sports vision and combined groups ($p = 1.00$). Negative mood scores were significantly lower in the combined group compared to the traditional/specialized group ($p = 0.01$), further emphasizing the effectiveness of combined training in mitigating negative mood components under stress.

**Table 3.** Bonferroni Post Hoc Test Results for Pairwise Comparisons of Variables

| Variable | Group | Mean Difference | Standard Error | Sig. |
|---|---|---|---|---|
| Serve Accuracy | Sports Vision-Combined | -0.51 | 0.29 | 0.28 |
| | Sports Vision-Traditional | 0.28 | 0.29 | 0.01 |
| | Combined-Traditional | 0.86 | 0.29 | 0.01 |
| Spike Accuracy | Sports Vision-Combined | -1.14 | 0.23 | 0.000 |
| | Sports Vision-Traditional | 0.75 | 0.23 | 0.008 |

| | | | | |
|---|---|---|---|---|
| | Combined-Traditional | 1.89 | 0.23 | 0.000 |
| Positive Mood | Sports Vision-Combined | 0.10 | 0.33 | 1.00 |
| | Sports Vision-Traditional | 2.01 | 0.33 | 0.000 |
| | Combined-Traditional | 1.90 | 0.33 | 0.000 |
| Negative Mood | Sports Vision-Combined | -0.26 | 0.44 | 1.00 |
| | Sports Vision-Traditional | -1.05 | 0.43 | 0.06 |
| | Combined-Traditional | -1.31 | 0.43 | 0.01 |

## 4. Discussion and Conclusion

The purpose of this study was to compare the effects of a training program involving sports vision, specialized, and combined approaches on the serve and spike accuracy and mood of young Iraqi volleyball players under psychological pressure. According to the results, the multivariate analysis of covariance (MANCOVA) revealed significant statistical differences among the three training groups (sports vision, combined, and traditional/specialized) in the variables examined under psychological pressure ($p \leq 0.05$). Bonferroni post hoc test results showed that except for comparisons between the sports vision and combined groups in serve accuracy ($p = 0.28$), positive mood, and negative mood ($p = 1.00$), significant differences existed in all other cases ($p \leq 0.05$).

From the pre-test to the post-test, the results show that serve accuracy decreased in all three groups under psychological pressure. However, after controlling for serve accuracy in the pre-test using ANCOVA, the greatest decrease in serve accuracy during the post-test under psychological pressure occurred in the traditional/specialized training group (adjusted mean = 37.02 ± 0.20). In contrast, the adjusted means for the sports vision (36.74 ± 0.20) and combined (37.57 ± 0.20) groups were similarly affected, resulting in no significant difference between them. This indicates that the traditional/specialized training group was more affected by psychological pressure, perceiving it as more limiting, which led to a greater decline in serve accuracy compared to the other groups.

Ahmadi, Kashif, and Burhani (2019) reported that psychological pressure increases self-awareness, redirecting the focus of athletes to skill components to ensure desirable outcomes. However, these findings contradict the distraction theory, which suggests that psychological pressure fills cognitive processing capacity with irrelevant stimuli like anxiety and self-doubt (37). Esmaili et al. (2020) reported decreased performance in skilled individuals under psychological pressure, attributing this to their focus on skill mechanisms, leaving fewer attentional resources for skill execution, supporting the explicit monitoring theory (38).

Moin, Zahedi, and Meshkati (2014) concluded that task-relevant attention leads individuals to control their movements step-by-step, while task-irrelevant attention allows for automatic and unconscious movement control, resulting in more effective performance. They also found that highly skilled individuals experienced "choking" under psychological pressure when focusing on task-relevant cues, which likely affected serve accuracy in this study (39).

Formenti et al. (2019) emphasized the role of the training environment (traditional/specialized training) in enhancing perception and action in specific sports skills, aligning with an ecological approach (40). However, this study's findings under psychological pressure differ, suggesting that the traditional/specialized group experienced greater pressure due to the presence of evaluators, cameras, and monitoring, focusing more on their performance. Conscious control of movements likely disrupted motor automaticity, consistent with the conscious processing hypothesis, resulting in impaired performance (2).

Serve accuracy in volleyball depends on the precise contact between the hand and the ball, especially the fingers. Psychological pressure may disrupt motor commands sent to the fine muscles of the fingers, affecting the motor programs and serve accuracy. When athletes focus on irrelevant cues, they fail to attend to task-relevant cues, leading to performance decline (39). The type of attentional focus, task characteristics (e.g., volleyball serve accuracy), and psychological pressure influence performance outcomes, with "choking" occurring when athletes overemphasize external evaluations and deviate from optimal anxiety levels (41).

The results indicate a 7.99% increase in competitive state anxiety for the traditional/specialized training group from the pre-test (49.71 ± 2.30) to the post-test (53.85 ± 1.65). This suggests that evaluations and comparisons significantly impacted younger athletes, making them focus more on task execution under the influence of an internal focus. Creating psychological pressure alters movement coordination and freedom, affecting serve accuracy (29).

Controlling for pre-test spike accuracy showed significant differences among the groups in post-test spike accuracy under psychological pressure (p = 0.000), with 58% of the variance attributed to the intervention. Bonferroni test results revealed significant differences favoring the combined training group. Sports vision exercises, involving perceptual-visual, motor-visual, and proprioceptive visual loads, enhance skills like eye movement, focus, visual alertness, and perception, improving athletes' performance in their specific sports (5). Like the musculoskeletal system, the visual system responds to increasing loads, with sports vision training enhancing visual perception, memory, and depth perception (42).

Integrating sports vision with routine sports programs enables athletes to focus on task-relevant cues and avoid distractions, improving performance in psychological pressure scenarios. Combined training particularly aids spike accuracy, requiring neural-muscular coordination and precise timing. Visual systems help athletes utilize environmental information for decision-making, crucial for volleyball techniques like spiking. Sports vision training supports cognitive and motor systems, helping athletes perform optimally under real-world and high-pressure conditions.

The intuitive connection between mood states and performance has served as a catalyst for psychologists to explore this relationship over the past 40 years. Extensive research has documented the role of mood in predicting athletic performance (32, 43-46). However, despite more than 250 published studies investigating mood responses in sports environments, empirical evidence regarding the relationship between mood and performance remains ambiguous (47). Researchers have struggled to precisely define the "optimal mood" for peak performance (48). The current state of literature suggests that methodological factors may contribute to many of these unclear findings (32). When individuals engage in tasks or events of personal significance (e.g., exams or major sports competitions), substantial evidence indicates that the mood and emotions experienced before and during athletic tasks can impact performance quality (32, 49).

The findings of this study revealed significant differences among groups in positive mood scores under psychological pressure (p = 0.000), with 56% of the variance attributable to the intervention. Mood, defined as a set of transient emotions that vary in intensity and duration and typically last longer than emotions, influences the evaluation and interpretation of psychological situations and affects past, present, and future performance. Mood content impacts cognition, behavior, success, and failure in external situations. Based on the two-dimensional classification of mood, negative moods include anxiety, depression, anger, fatigue, and confusion, while positive moods encompass vigor, happiness, and calmness (32).

Previous studies have demonstrated that emotions predict performance (44). A greater challenge lies in mitigating the intensity of unpleasant emotions to prevent poor performance. The role of mood, particularly emotions, has garnered increasing attention and been studied across various sports disciplines and competition levels (50). Research indicates that mood states can influence athletic performance (7), highlighting the importance of emotional regulation for high-level performance (51). Among the psychological aspects gaining recent attention in athletes are mood states (52). Studies suggest that more favorable mood profiles (high happiness and low fatigue, tension, depression, anger, and confusion) correlate with better sports performance (53).

The results show that positive mood scores decreased across all three groups from pre-test to post-test under psychological pressure. The adjusted means for the sports vision (5.01 ± 0.23) and combined (5.02 ± 0.23) groups were close in the post-test, indicating similar perceptions of psychological pressure in positive mood components. In contrast, the traditional/specialized group scored lower (3.09 ± 0.23), suggesting that sports vision training helped the first two groups better maintain positive mood states. Sports vision training likely enabled these groups to manage negative influences, such as evaluation and comparison, better and maintain emotional regulation. Meanwhile, the traditional/specialized group was more affected by evaluative and environmental factors (e.g., judges and cameras).

Models emphasizing intrapersonal focus, such as the Individual Zones of Optimal Functioning, hold potential for refining our understanding of mood-performance relationships (54). Several studies have explored this relationship using cross-sectional and intrapersonal designs. For instance, Lane and Chappell (2001) found that pre-performance mood scores accounted for 9% of variance in cross-sectional performance analyses among 11 basketball players competing in a global university tournament. Intrapsychic performance correlated significantly with mood for six players, explaining up to 40% of the variance, though no correlation was observed for the remaining five players. This indicates that sports vision training under psychological pressure can indirectly reduce intrapersonal focus, preventing deviations in positive mood components (calmness, happiness, and vigor) (43).

Bonferroni post hoc analysis revealed significant differences in negative mood dimensions between the combined and traditional/specialized groups ($p = 0.01$), favoring the combined group. Because mood is transient, the mechanisms through which mood profiles differentiate performers at various success levels remain unclear, as elite athletes do not exclusively exhibit positive mood states (55). Elite athletes may experience disturbed mood due to injury, missed opportunities, hard training, or stressful events (55-58). Beedie et al. (2000) reported that pre-performance mood profiles are significant predictors of subsequent performance under specific conditions, aligning with this study's findings (59).

Negative mood scores (tension, depression, anger, fatigue, and confusion) increased across all three groups from pre-test to post-test under psychological pressure. The adjusted means for the sports vision (19.12 ± 0.31, 54.95% change) and combined (19.02 ± 0.23, 44.60% change) groups showed smaller increases compared to the traditional/specialized group (20.20 ± 0.31, 55.16% change). This difference was statistically significant between the traditional/specialized and combined groups, indicating that combined training was more effective in managing negative emotions under psychological pressure.

Murayama and Sekiya (2007) used grounded theory to qualitatively explore the "choking under pressure" process, identifying changes in motor control perception, risk-avoidance strategies, and physical fatigue as contributors to decreased efficiency. Psychological factors, including irrational thoughts, negative emotions, and strategic shifts, along with physiological changes like sympathetic nervous system activation, further influenced performance decline (60).

Psychological pressure and stressful environments are inevitable for athletes, particularly younger ones. Managing these conditions remains a significant concern for coaches. Incorporating sports vision training into routine volleyball programs can provide both physiological and psychological benefits, helping young volleyball players better adapt to stress.

Yoon et al. (2021) investigated relationships between mood states, perfectionism, and choking under pressure among 209 male university baseball players in high-stress situations. They found that mood states did not significantly influence choking or performance under normal conditions (61).

These findings can be explained through the biopsychosocial model. Understanding individuals' responses to stress is key to optimizing performance in sports contexts. While some models explain success and failure in terms of psychology or physiology, the biopsychosocial model integrates these perspectives (62). The biopsychosocial model of challenge and threat states is based on Lazarus and Folkman's (1984) transactional stress theory and Dienstbier's (1989) physiological toughness theory. This model assumes that challenge and threat states occur only in motivated performance situations—scenarios linked to a pursued goal, requiring evaluation, and potentially stressful (62). Athletes striving for peak performance in competitions represent such scenarios (62). Stress and maladaptive responses to psychological pressure arise from individual evaluations (e.g., comparison and judgment). When faced with situations threatening survival or well-being, the brain prioritizes resources to address perceived threats at the expense of current tasks or goals (3). It is plausible that sports vision training interventions helped the sports vision and combined groups unconsciously prioritize goals, a benefit the traditional/specialized group lacked.

A challenge state is experienced when individuals perceive sufficient resources to meet situational demands. Conversely, a threat state arises when individuals perceive their resources as insufficient to meet situational demands (63). This perception appears more pronounced in the traditional/specialized group. The transactional stress theory highlights the positive implications of challenge appraisals and the negative implications of threat appraisals (64). Positive moods may indicate that a stressful situation is slightly challenging, while unpleasant moods may signify a potentially threatening situation (65). Challenge states can evoke a spectrum of emotions, while threat states are typically associated with negative emotions (negative mood). Moreover, emotions can be beneficial in a challenge state but not in a threat state. This suggests that the sports vision and combined groups likely appraised the conditions as challenging, while the traditional/specialized group perceived them as threatening.

Challenge and threat states influence effort, attention, decision-making, and physical performance—all fundamental aspects of successful athletic performance (66). Previous studies have examined individual differences in athletes' perceptions and responses to sport-related stress. A path analysis by Nicholls et al. (2016) described athletes' pre-competition appraisals of stress. Viewing problems as a surmountable challenge was associated with positive emotions, task-focused coping strategies, and higher satisfaction with performance. Conversely, viewing problems as a personal threat was linked to negative emotions, distraction-based coping, reduced engagement, and lower satisfaction with performance. High-personal-relevance sports competitions can be perceived as both challenges and threats (67).

Britton et al. (2019) found that young athletes with stronger emotional responses to stress were more likely to perceive upcoming competitions as more stressful and view themselves as having less control and fewer coping resources. In the same study, young athletes with higher perceived stress reactivity evaluated competitions as both threats and challenges. Their perceived reactivity to stress significantly influenced how they appraised competitive events (68).

This study's findings indicate that young Iraqi volleyball players are influenced by psychological pressure stemming from evaluation and the importance of competitive outcomes, potentially leading to performance declines. The sports vision and combined groups performed better in managing psychological pressure and serve accuracy, with the combined group showing superior spike results. This underscores the benefits of integrating regular training with sports vision exercises. The research demonstrates that sports vision training not only enhances athletic performance but also aids in maintaining positive moods and mitigating the effects of negative moods under stressful conditions. Overall, implementing such training programs can help coaches and athletes diversify training strategies and reduce the detrimental impacts of stress.

## Authors' Contributions

This article is derived from the first author's doctoral thesis. H.S.H.A. conceptualized the study, designed the methodology, and led the implementation of the training programs for the participants. He also supervised the data collection process and contributed to the analysis of results. H.Z. assisted in the development of the training protocols, particularly in the application of the sports vision training approach, and played a key role in the interpretation of findings. A.M.Y.E. supported the recruitment of participants, facilitated the administration of psychological assessments, and was responsible for ensuring the accuracy of the mood and anxiety assessments. Z.M. contributed to the statistical analysis, particularly in performing covariance analysis and post hoc tests, and also helped in the writing and revision of the manuscript. All authors collaborated in drafting, revising, and finalizing the manuscript. They collectively approved the final version and take responsibility for the integrity and accuracy of the research.

## 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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## Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. The study protocol was approved by the Ethics Committee of Islamic Azad University – Science and Research Branch (IR.IAU.SRB.REC.1403.192).

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