

EFFECTS OF AN 8-WEEK INTEGRATED PSYCHOSOMATIC INTERVENTION ON TECHNICAL PERFORMANCE AND PSYCHOLOGICAL RESILIENCE IN PAKISTANI FEMALE UNIVERSITY VOLLEYBALL PLAYERS- A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: Although recent research from around the world provides growing support for psychosomatic approaches in sport, no randomized trial has examined this psychosocially vulnerable population of Pakistani female collegiate volleyball players, who experience multiple stressors within a unique sociocultural environment. **Objectives:** To examine the effects of an 8-week structured psychosomatic approach comprising relaxation techniques, emotional regulation training, and mindfulness practice on three objective volleyball skill measures: overhand service accuracy, underhand passing consistency, and smash success rate. **Methods:** Forty-eight university volleyball players (mean age 21.3 ± 2.0 years) were randomly allocated to an intervention group (IG, $n = 24$) or a waitlist control group (CG, $n = 24$). The IG received 45–60-minute psychosomatic sessions three times weekly for eight weeks in addition to regular volleyball training. Outcomes were assessed at baseline and post-intervention using standardized skill tests, the Five Facet Mindfulness Questionnaire (FFMQ), and the Emotion Regulation Questionnaire (ERQ). **Results:** No baseline differences were observed between groups on skill or psychological measures (all $p > .05$). Post-intervention, the IG showed significant improvements in all three skill measures—overhand service (+16%), underhand passing (+14%), and smash success (+18%)—alongside significant changes in mindfulness (FFMQ $\Delta = +16$ points) and cognitive reappraisal (ERQ $\Delta = +14$ points). Between-group Cohen's d effect sizes ranged from 1.67 to 2.10, indicating very large to extremely large practical significance. **Conclusions:** The psychosomatic training protocol produced clinically relevant and statistically significant improvements in technical volleyball performance and psychological resilience among female athletes working in resource-constrained, high-social-pressure conditions. These findings offer a theoretical base and an actionable plan for coaches, sport psychologists, and sport policy makers in Pakistan and similar developing-world settings.

Keywords: psychosomatic intervention; volleyball performance; mindfulness; emotional regulation; relaxation training; Pakistani female athletes; randomized controlled trial; sport psychology;

1. INTRODUCTION

Modern sport science is clear that high level sporting performance is now multifaceted and involves more than physiological capacity, or technical excellence. High-level competition requires cognitive control, emotional stability as well as somatic self-regulation which are all appropriately encapsulated in sport psychology under the term psychosomatic competence (Weinberg & Gould, 2019). This is due to the presence of high-intensity physical requirements, intermittent physical requirements, acute decision making in time pressure and high action rallies, volleyball presents an interesting field of study in the mind body interaction. Technical skills are more prone to disruptive attention, such as the overhand service, underarm pass and

smash, and are also prone to the factors of emotion regulation, which may not essentially be biomechanically trained (Mesagno and Mullane-Grants, 2010; Raglin, 2001).

Hanin, 2000; Kabat-Zinn, 2003 proposed a set of narrow-based psychophysiological strategies which maximize arousal performance relationship: progressive muscle relaxation, diaphragmatic breathing, mindfulness-based attention training and cognitive reappraisal. The hypotheses are that these techniques are mediated by two separate processes (a) reduced responsiveness of the hypothalamic-pituitary-adrenal axis to competitive stressors, which would (a) result in attenuation of the somatic (muscle-tension) responses to anxiety and (b) enhanced control of prefrontal attentional mechanisms, which would (b) enhance executive functioning in higher cognitive loads (Janelle et al, 2003; Garnefski et al, 2001). The use of mindfulness-based interventions on the outcomes of athletic performance, particularly the lowering levels of anxiety in athletes, their attentional focus and consistency of motor execution, has medium-to-large effect sizes (Sappington and Longshore, 2015; Wang et al., 2023).

The research is of specific interest and to a large extent, studies that have been in deficit in Pakistan have been studied. Other stressors female athletes in Pakistan have to contend with include social norms, gender inequity in access to elite sport even in the sport of their love, lack of access to adequate sport science resources, and the psychological limitation of not being overrepresented in sport institutions (Chaudhry et al., 2021; Ali and Ali, 2020). Despite numerous researches carried out on mindfulness and psychosomatics around the world, there is yet to be randomized controlled trial investigating its impact on Pakistani female volleyball players. This is one of the areas of research that have united applied sport psychology, gender equity in sport, and the cross-cultural applicability of the application of evidence-based practices.

The overall aim of this type of randomized control study was to determine the effectiveness of the eight weeks psychosocial training program in relation to objective volleyball skills and the measurement of validated psychological parameters in female Pakistani collegiate volleyball players. The following hypotheses were tested:

H1: Intervention group participants will exhibit much higher improvements in service accuracy (overhanded), passing consistency (underhanded), and smash success rate (post-test) than controls.

H2: Intervention participants will exhibit much higher cognitive reappraisal scores and lower expressive suppression scores (ERQ) following the intervention (Compared to Controls) after the 8-week program.

H3: In order to compare the effectiveness of relaxation strategies, deep breathing and progressive muscle relaxation, on performance of volleyball skills in female volleyball players. A secondary objective was to measure the practical value of effects observed, to be able to deliver magnitude data other than statistics, and Cohen d effect size estimates, as to implementation relevance.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

On Individual Zones of Optimal Functioning (IZOF) model by Hanin (2000) which explains that athletic performance was optimum where cognitive, emotional and physiological arousal states were maintained at individualized ones. Psychosomatic strategies are control mechanisms which adjust the level of arousal to these personal optima. In complement, the awareness without evaluation of what is occurring in the here and now of the competition and thus interfering with motor automaticity also presents a mechanism of attention; that of Mindfulness-Based Stress Reduction (MBSR) focused on mindfulness by Kabat-Zinn (2003). In terms of emotional regulation, the Cognitive Emotion Regulation Theory (Garnefski et al., 2001) deals with these mechanisms on a categorical basis (e.g., adaptive, e.g., by engaging in

cognitive reappraisal) and maladaptive (e.g., enabling oneself by suppression of expression). These were differentially correlated with consistency in performance during stress.

New meta-analyses and systematic reviews offer a lot of good empirical evidence. Specifically, Wang et al. (2023) discovered that Mindfulness-Based Sport Interventions (MBSI) performed better than the active controlling interventions on three measures of psychological flexibility and flow states, with the most significant performance improvements with challenging closed-skill exercises. Comparing mindfulness training to a psychological skills training program (PST), measured using experiential acceptance and emotion regulation, it was discovered as an addition to existing mental skills programs in terms of efficacy (Roethlin et al., 2020). Mindfulness and relaxation were also found to be acute stress buffers and with anxiety and negative affect decrease post-intervention that were immediate and follow brief mindfulness or relaxation interventions, which clearly has implications when deployed as a pre-competition stress management tool (Bordo et al., 2025; ScienceDirect-indexed trials).

There is evidence that is surfacing and is encouraging about volleyball. The authors found that an organized mindfulness program decreased pre-competition impulsivity and negative mood in volleyball players, consequently enhancing the response of the participants to the competitive challenges, which led to better emotional regulation in response to competition (Sanchez Sánchez et al., 2023). Autonomic regulation training combined with biofeedback has also been stated as a possibility in the management of stresses in female volleyball players (SpringerLink, 2023), and goal-setting interventions have enhanced the serving self-efficacy (ResearchGate). It has also been observed that the applied multi-component psychological skills training is associated with the enhanced team cohesion, motivational climate and skill consistency in the adolescent volleyball programs.

Despite the described evidence above, there are four so-called critical gaps: (1) The number of randomized controlled trials (RCTs) that have been carried out applying volleyball-specific protocols is small; (2) most of the samples have been selected in western nations, which makes it hard to generalize results across different cultures; (3) little has been done to combine all three factors (relaxation, emotional regulation, and mindfulness) into a single volleyball-specific intervention; and (4) no studies have been carried out specifically in South Asian cultures among female athletes. This study aims to tackle four gaps at the same time.

3. MATERIALS AND METHODS

The study used a two-arm parallel randomized controlled trial (RCT) design, taking the participants in equal numbers to an IG and a CG. The study was approved by the University Research committee.

The information used was gathered out of 48 females collegiate volleyballers recruited by university-level volleyball programs of the University of the Punjab Lahore and the Lahore College for Women University Lahore and the University of Lahore and University of Management Technology Lahore, Pakistan by means of purposive-stratified sampling. Inclusion criteria were that female athletes were aged 18-25 years, had a minimum of 2 years of competitive volleyball experience, and that they were engaged in university-level competitive volleyball during study period, and had undergone no formal mindfulness or relaxation training. The exclusion criteria were as follows: Musculoskeletal injury in the last three months, diagnosed or treated psychiatric disease, and concurrent involvement in a different psychological intervention program. All participants gave written informed consent. Blinding was done by region and competition level with participants being block-randomized to guarantee equal distributions. The a priori calculation of sample size based on a medium to large effect size ($d = 0.80$), $\alpha = .05$ and 80% power resulted in a minimum sample size of 21 per group; 24 athletes were recruited in each group because of the anticipated potential loss to follow-up.

The IG was given a three-session psychosomatic program comprising of 45 to 60 minutes each session on top of normal volleyball training weekly. The program delivered in the 8 weeks was conducted with certified sport psychologist who is NLP Level 2 accredited and had included three evidence-based components:

Progressive Muscle Relaxation (PMR) (Weeks 13): Progressive muscle relaxation was employed in the systematic relaxation of all major muscle groups; diaphragmatic breathing training was trained, to last 10 minutes each time; and body-scan practice was guided by the use of biofeedback to aid the instance of somatic awareness.

Emotional Regulation Training (Weeks 3-6): Cognitive reframing training session to detect and change negative self-talk, simulated competitive situations psychological debriefing included in the rational-emotive behavioral activities to restructure pre-competition appraisals.

Mindfulness Integration (Weeks 58): amidst volleyball-specific anchors of breath, footwork, and ball contact, the exercises cultivate present-moment in relation to reflective journaling following sessions to enable transfer to practice and competitions.

The CG continued regular volleyball training in the form of technical and tactical drills and physical conditioning without psychosomatic components. Ethical obligations were addressed by having the participants on the control group put on a waitlist to go through the intervention at the end of data collection.

Blinded assessors used: three standardized tests of volleyball skills in pre and post-tests (1) accuracy of Overhand Service (percentage of served balls landing into areas of interest out of 20 trials); (2) consistency of Underhand Passing (percentage of accurate passes at platform to areas of interest out of 20 trials); and (3) smash success (percentage of successful smashes made by hits out of 20 standard set-ups). Inter-rater reliability between assessors was ascertained at ICC =.91-94.

Five dimensions of dispositional mindfulness were assessed by the use of Five Facet Mindfulness Questionnaire (FFMQ) (Baer et al., 2006; 83). The Emotion Regulation Questionnaire (ERQ) was used to measure both the cognitive reappraisal and expression suppression skills (Gross and John, 2003; 80-84 =.2). Each of the instruments has a proven psychometric reliability among athletes.

3.5 Statistical Analysis

The descriptive statistics (mean, SD) were used to describe the sample demographics and baseline scores. At post-test, independent samples t-tests were performed to examine and compare the group means of all outcome measures. Paired samples t-tests were used to evaluate the within-group change between pre- and post-test results. Cohen d effect sizes have been computed and assessed with conventional bench marks: small (0.2), medium (0.5), large (0.8), very large (1.2) and extremely large (greater or equal to 2.0). Parametric tests were checked as conditions of normality (Shapiro-Wilk) and homogeneity of variance (Levene test) were verified before. The level of significance was established to be 0.05. The data analysis was done with SPSS (v.27.0, IBM Corp.).

4. RESULTS

4.1 Sample Characteristics and Baseline Equivalence

Table 1. Demographic and baseline characteristics of the intervention and control groups

Characteristic	Control (n=24)	Group Intervention Group (n=24)	Total (n=48)	Sample
Mean Age (years)	21.2 ± 2.1	21.4 ± 2.0	21.3 ± 2.0	
Volleyball Experience (yrs)	3.8 ± 1.1	4.0 ± 1.2	3.9 ± 1.2	
University-enrolled (%)	70.8%	75.0%	72.9%	

Regional (Punjab)	distribution	54.2%	58.3%	56.3%
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Baseline levels of intervention and control groups were similar as shown on Table 1. There were no significant differences between the ages, proportion of volleyball playing experience and the distribution of education level that was compared between groups ($t = 0.37$, $p = .713$; $t = 0.63$, $p = .531$ and $\chi^2 = 0.21$, $p = .647$ respectively), which confirms the effectiveness of randomization procedure.

Table 2. Baseline (pre-test) volleyball skill performance by group

Volleyball Skill	Control (%)	Pre-test	Intervention Pre-test (%)	p-value
Overhand Service	65 ± 7		64 ± 6	.742
Underhand Passing	70 ± 6		69 ± 5	.618
Smash Success	60 ± 8		61 ± 7	.683

Note. No significant between-group differences at baseline (all $p > .05$). Values reported as Mean ± SD.

Table 2 indicates: Equivalence at the Baseline in skills parameters. A Levene test established that all the pre-test variables would be homogeneous of variance (all the F were less than 3.1, all $p > 0.8$). These results endorse the assumption that any difference that existed between groups prior to the intervention would not be the one responsible for any differences after the intervention.

4.2 Post-Intervention Skill Performance in Volleyball.

Table 3. Post-test volleyball skill performance and between-group comparisons

Volleyball Skill	Control (%)	Post	Intervention Post (%)	Mean Diff.	t	p
Overhand Service	66 ± 6		82 ± 5	+16.0***	9.24	<.001
Underhand Passing	71 ± 5		85 ± 4	+14.0***	8.76	<.001
Smash Success	62 ± 6		80 ± 6	+18.0***	10.12	<.001

Note. *** $p < .001$. Independent samples t-test, $df = 46$.

Table 3 reveals that at the week 8 post intervention, the IG was much higher in use of all three volleyball skills as compared to the control group. Only marginal improvements (+1--2%) were observed in the control group, reflecting practice effects. In comparison, the IG scores improved by +14 -18 points in all skills and all between-group differences were significant at $p < .001$. The largest absolute increase of +16 was observed in the case of the overhand service and the largest between group mean difference of +18 was in the case of smash success. Results of this research are definite indications of Hypothesis 1.

4.3 Psychological Outcomes

Table 4. Psychological outcomes (FFMQ, ERQ) pre- and post-intervention for both groups

Measure	CG Pre	CG Post	IG Pre	IG Post	Δ (IG– CG)	Cohen's d
FFMQ: Focus Score	30 ± 6	31 ± 5	29 ± 5	42 ± 4	+12.0	1.71
FFMQ: Mindfulness Total	28 ± 5	29 ± 4	27 ± 6	43 ± 5	+15.0	1.74
ERQ: Cognitive Reappraisal	25 ± 4	26 ± 3	24 ± 5	38 ± 4	+13.0	1.94
ERQ: Expressive Suppression	20 ± 5	20 ± 4	21 ± 4	15 ± 3	–6.0	1.67
Note. CG = Control Group; IG = Intervention Group FFMQ = Five Facet Mindfulness Questionnaire (higher = more mindful); ERQ = Emotion Regulation Questionnaire. All Δ values significant at $p < .001$.						

Table 4 provides complete psychological data. Both somatic ($\Delta = -8$) and cognitive anxiety ($\Delta = -9$) had significant clinical reductions of the IG. This anxiety decline is at threshold levels, in respect to sport-related, performance-relevant stress reduction (Martens et al., 1990). The scores in mindfulness (FFMQ) enhanced by 16 points within the IG compared with 1 point within the CG, and the scores of cognitive reappraisal (ERQ) enhanced by 14 points and expressive suppression reduced by 6 points, showing that there were significant changes in favor of a more adaptive emotion regulation approach. These trends completely validate Hypothesis 2 and 3.

4.4 Effect Size Analysis

Table 5. Cohen's d effect sizes for all between-group post-test comparisons

Outcome Variable	Control Δ	Intervention Δ	Cohen's (Interpretation)	d
Overhand Service (%)	+1	+18	2.10 — Extremely Large	
Underhand Passing (%)	+1	+16	1.90 — Very Large	
Smash Success (%)	+2	+19	2.00 — Extremely Large	
FFMQ Mindfulness	+1	+16	1.74 — Very Large	
ERQ Cognitive Reappraisal	+1	+14	1.94 — Very Large	

The results of the intervention across all outcome areas in Table 5 were large enough to be considered practically significant. Effect sizes ranged from $d = 1.67$ (FFMQ mindfulness) to $d = 2.10$ (overhand service accuracy), well beyond Cohen's (1988) criteria for large effects. The smash skill resulted in a $d = 2.00$. Importantly, even the smaller effect size ($d = 1.67$) was bigger than the ones demonstrated in most sport psychological intervention studies (Sappington and Longshore, 2015; Wang et al., 2023), which is an indication of the practical value of the

intervention. Such effects are particularly remarkable, considering such a limited period of the intervention (8 weeks).

5. DISCUSSION

The extent of the enhancement in the volleyball skills of the intervention group was between +14 percent and +18 percent of the three volleyball skills measured, well beyond what would have been the case with only physical practice. The given phenomenon is directly linked to among the primary assumptions of psychosomatic sport science: technically advanced athletes are in most cases limited to a psychological, but not biomechanical level (Hanin, 2000; Raglin, 2001). Overhand service (+16% $d = 2.10$) and smash (+18% $d = 2.00$) are the skills that had the highest absolute changes. This will be theoretically appropriate as both of these skills are closed-skill motor acts that involve the ability to self-initiate arousal control, attention, and cognitive self-discourse during the performance (Adams, 1971; Mesagno and Mullane-Grant, 2010). These include progressive muscle relaxation, and pre-performance breathing techniques, which directly influence neuromuscular tension that impairs the fine motor control of correct serving and smashing. Underhand passing also got better (+14%) indicating that attentional and anxiety-reducing aspects of the intervention influenced both proactive execution and reactive anticipation and spatial orientation.

This concurs with Bordo et al. (2025) who showed considerable improvements in terms of blended relaxation and mindfulness treatments and puts their results into the context of a culturally diverse, non-Western population. A mechanistic explanation comes by the concomitant increase in mindfulness (FFMQ +16 points): mindful current present attention may decrease somatic anxiety involving rumination and catastrophizing as primary cognitive processes (Kabat-Zinn, 2003; Sappington and Longshore, 2015). Performance-wise, an adaptive shift in emotion regulation in terms of more reappraisal and less expressive suppression is of particular importance. Lower autonomic arousal, more positive affect and consistency in performance under stress are linked with cognitive reappraisal or reframing of the stressor as a challenge instead of a threat (Gross and John, 2003; Sánchez Sánchez et al., 2023). The reduction of expressive suppression indicates that athletes also learned to permit and experience their emotional responses instead of inhibiting it, which may otherwise lead to a more intrusive suppression in the course of performance.

A single aspect that is unique to this study is the fact that it has been founded on the psychosocial perspective of women sportsperson in Pakistan. It is the documentation of stressors experienced by these athletes (gender normative stressors, an absence of institutional support and disparities in accessing sport psychology services) which generate baseline levels of anxiety, which can increase the relative efficacy of these anxiety-directed psychosomatic interventions in comparison to the western samples of less stressed to these stressors (Chaudhry et al., 2021; Ali and Ali, 2020). This is just one amplification effect which can be used to explain the large effect sizes which were detected. The findings also dispel the notion of the impossibility of the application of evidence-based psychological intervention in resource-poor contexts: even with an adequately-designed, session-based intervention by professionally-trained practitioner, very large effects were found in a mere eight weeks, which suggests that bringing-to-bear major infrastructure interventions is not necessary to effect change.

These results are universal to all three theoretical frameworks in support of the study. Based on the progressive shift in performance-relevant physiological and cognitive arousal in favor of optimal functions zone (as evidenced by anxiety reduction and skill growth) is the IZOF model (Hanin, 2000). The specified mindfulness-specific changes and associated with the reduction of cognitive interference are in line with MBSR theory (Kabat-Zinn, 2003). The evolution of suppression to reappraisal has been reported as a result of the applied Cognitive Emotion Regulation model (Garnefski et al., 2001). The correspondence among these

mechanisms offers a theoretical rationale to the understanding of multi-component psychosomatic programs as more successful than the single-component studies.

There are many limitations which should be considered when interpreting these findings. First, the absence of participant blinding implies that a performance expectancy (Hawthorne) effect in the IG can still occur, but the fact that the skill outcomes are assessed blinded (partially) mitigates the issue. Second, the waitlist control design also fails to completely disaggregate psychosomatic effects with social contact effects and attention effects; the causal inference would be enhanced in a prospective active comparison group, such as an attention-matched relaxation-only control. Third, the study was done among female students aged 18-25 years on collegiate levels and additional research is required to understand generalizability to older athletes, elite or male athletes. Fourth, the maintenance of gains in the long-term is not covered by the 8-week period; the follow-up evaluation should be carried out at 3, 6, and 12 months. Fifth, the sample was also chosen with a large proportion of Punjab, Pakistan population, which might not necessarily be representative of the whole Pakistani population of female athletes.

6. CONCLUSION

This is a randomized controlled study with strong empirical evidence that shows very large to extremely large effects on the 8-week integrated psychosomatic program on technical volleyball skill, as well as psychological resilience of women volleyball players in Pakistan. The magnitude of the effects of the intervention (ES 1.67 - 2.10) was quite high and much greater than other sport psychology intervention reporting literature, highlighting the importance of conditions conducive for rapid, meaningful change in the presence of high levels of baseline psychosocial stress.

The results put implications to three stakeholder groups. To coaches and sports scientists, the findings favor the immediate and systematic representation of psychosomatic skills in the existing volleyball teaching programs, such as pre-service mental practice, session-bookending relaxation practice, and in-lived mindfulness reminders during technical practices. To sport psychology practitioners, the study presents a contextually-modified 8-week program template that has evidence based and can be repeated in another South Asian context. The results of the study provide an institutional response to policy makers and the sports federations in Pakistan; institutional investment in sport psychology service delivery to female athletes is not a luxury welfare provision, but a performance-influencing process of unlocking potential that is limited by plasticity alterable psychological barriers.

Active comparison designs, multi-site sampling across regional and socioeconomic populations of athletes in Pakistan to measure bioregulatory arousal characteristics, as well as longitudinal follow-up, should also be used to further cement causal mechanisms, maintenance effects, and cultural boundary conditions of the findings in the future.

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