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Original Article

THE EFFECT OF MINDFULNESS TRAINING ON FLOW AND SPIKE PERFORMANCE IN VOLLEYBALL WITH NON-DOMINANT HAND

O EFEITO DO TREINAMENTO DE *MINDFULNESS* NO FLUXO E DESEMPENHO DA CORTADA NO VÔLEI COM A MÃO NÃO DOMINANTE

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RESUMO
O objetivo deste estudo foi investigar o efeito do treinamento de *mindfulness* no desempenho de *flow* e *spike* com a mão não dominante em 42 jogadores de voleibol semi-habilidosos (idade média 17,38, desvio padrão 1,40) da cidade de Qom, que foram divididos aleatoriamente em quatro grupos de 11. O primeiro e o segundo grupos praticaram *mindfulness* e treinamento de spike de voleibol. O terceiro e o quarto grupos praticaram treinamento da cortada de voleibol sem treinamento de *mindfulness*. As intervenções duraram 8 semanas com 2 sessões por semana. Testes pré-intervenção e pós-intervenção, incluindo o teste de Spike AAHPERD e o questionário de fluxo, foram conduzidos. Os resultados do teste ANOVA indicaram: a interação entre gênero, intervenção e grupo não foi significativa em ambas as variáveis (P>0,05). Isso indica que o gênero não afeta a receptividade ao treinamento das variáveis de fluxo e cortada no voleibol. No entanto, a interação entre intervenção e grupo foi significativa (p<0,05), com o grupo de intervenção mostrando maior progresso em comparação ao grupo controle. Esses resultados sugerem que a incorporação de exercícios psicológicos, como *mindfulness*, ao treinamento físico é eficaz para melhorar o desempenho em *flow*, pois pode aumentar o prazer do treino e é importante para a vida esportiva dos atletas. No entanto, o gênero não tem impacto na receptividade ao treino neste contexto.
Palavras-chave: Flow, Mindfulness, Cortada, Mão dominante, Treinamento

ABSTRACT
The aim of this study was to investigate the effect of mindfulness training on flow and spike performance with the non-dominant hand in 42 semi-skilled volleyball player (mean age 17.38, standard deviation 1.40) from Qom city, who were randomly divided into four groups of 11. The first and second groups practiced mindfulness and volleyball spike training. The third and fourth groups practiced volleyball spike training without mindfulness training. The interventions lasted for 8 weeks with 2 sessions per week. Pre-intervention and post-intervention tests, including AAHPERD Spike test and flow questionnaire, were conducted. Results of ANOVA test indicated: the interaction between gender, intervention, and group was not significant in both variables (P>0.05). This indicates gender does not affect the training receptivity of flow and volleyball spike variables. However, the interaction between intervention and group was significant(p<0.05) with the intervention group showing greater progress compared to the control group. These results suggest that incorporating psychological exercises such as mindfulness alongside physical training effective in enhancing flow performance as it can improve the enjoyment of training and is important for athletes' sports life. However, gender does not have an impact on training receptivity in this context.
Keywords: Flow, Mindfulness, Spike, Dominant hand, Training

Introduction

Achieving optimal athletic performance requires not only a high level of physical ability but also positive psychological factors that enable an individual to perform at their best. A crucial element in reaching peak performance, whether in team sports or physical education classes, is an athlete's capacity to form a positive connection with the task at hand. This connection involves not only deriving enjoyment from the activity but also delivering superior performance through full flow in the process. In positive psychology, this experience of complete engagement and enjoyment is referred to as flow[1,2].

Flow is a mental state characterized by deep cognitive involvement, heightened motivation, and an overall sense of fulfilment and enjoyment[3]. During flow, individuals are intensely focused on the present moment, often becoming oblivious to the passage of time and

external distractions[4]. In the context of sports, athletes and coaches frequently report experiencing peak performance and skill enhancement during flow states. Those who achieve flow during performance tend to experience a surge of positive emotions afterward, contributing to their motivation and sustained improvement. When athletes fully immerse themselves in their performance, they not only derive satisfaction and enjoyment but also attain higher levels of achievement. With complete concentration, they are able to more effectively pursue their goals[5]. Thus, flow is an essential factor in sports and motor skill development. Enhancing and fostering flow can enable athletes to reach their full potential. Improving athletic performance through stress reduction and enhanced focus has proven to be highly effective, and mindfulness has been identified as a beneficial tool in this regard, particularly in enhancing motor control, balance, and physical fitness[6,7].

Mindfulness is generally described as a specific type of non-judgmental awareness, where individuals maintain moment-to-moment attention to both internal and external stimuli without attempting to alter, suppress, or disregard them[7,8]. Mindfulness is both a mental state and a practice. A mindful individual focuses on the process, step by step, without becoming overly concerned with the outcome, remaining entirely focused on the task at hand[7]. Mindfulness-based approaches have been shown to influence athletic performance across various disciplines and increase individuals' adherence to exercise[7,9]. Empirical studies have confirmed the positive impact of mindfulness on sports performance and athletic enhancement[10]. Various psychosocial factors can either facilitate, inhibit, or disrupt flow, and numerous studies have investigated potential facilitators and disruptors of flow. Among these, interventions such as mental imagery and hypnosis have been employed to enhance flow experiences[7]. Given the established positive role of mindfulness in sports performance, it is reasonable to assume that mindfulness could also play a key role in enhancing flow[11]. Empirical research has shown that mindfulness interventions positively impact cognitive and psychological factors, which in turn can enhance flow[12].

Studies by Rashedi et al [13], and Warren [14] for example, found that mindfulness practices like yoga led to improvements in psychological factors such as positive emotions. Furthermore, a review by Meiklejohn et al. [15] concluded that mindfulness training offers a wide range of cognitive, social, and psychological benefits across various age groups. A review of the literature on flow and mindfulness also suggests that mindfulness can influence flow[16]. Chen et al [9] demonstrated that mindfulness skills can effectively increase the state of flow in individuals performing tasks. Similarly, Nicolas et al [17] study found a positive correlation between mindfulness and flow in athletes. Bernier et al[18] also highlighted the benefits of mindfulness training, which led to increased flow experiences in individuals. Kee and Wang [19] found that mindfulness training increased flow levels and improved concentration during training. Other studies by Ahern et al[12], Pineau[20], and Zhang et al[21] and Lochbaum et al[11] further support the positive effects of mindfulness on flow in athletes.

The growing body of evidence highlights the positive effects of mindfulness on athletic performance and flow, indicating its potential as a valuable training tool. However, there are still some research gaps that need to be addressed. One important question is how gender influences the effectiveness of mindfulness training. Research indicates that men and women may react differently to training interventions, which raises the issue of whether gender plays a role in how mindfulness affects athletic performance, such as volleyball spiking, and psychological factors like flow. While gender discrepancies in flow have been observed in recreational activities, it is unclear if similar differences exist in sports and training settings[12].

Another important question concerns the role of non-dominant limbs in athletic performance. Recent studies have investigated the effects of training with both dominant and non-dominant limbs. For instance, Holland and Hoff [22] found that soccer players who trained with their non-dominant foot showed significant improvements in tasks such as dribbling,

shooting, and goal-directed kicks when tested with both feet after the training period. Training with the non-dominant foot resulted in enhanced performance on both sides of the body[23].

In volleyball, athletes are required to perform complex skills not only with their dominant hand but also with their non-dominant hand. For instance, a volleyball player must be able to spike the ball using both hands, especially in situations where the ball is coming at a difficult angle or the athlete is forced to use their non-dominant hand. This ability to spike with the non-dominant hand can be a critical advantage in match situations where an athlete's dominant hand is unavailable, or the play requires a quick adjustment. The capacity to utilize both hands effectively enhances a player's overall performance, particularly in crucial moments of the game. Moreover, training both hands can help prevent injury, as athletes will rely less on repetitive movements from only one hand. Despite the clear benefits of training the non-dominant hand for spiking in volleyball, research in this area remains limited. This study aims to fill this gap by exploring the impact of mindfulness training on psychological immersion (flow) and non-dominant spiking performance in volleyball players. By doing so, it aims to provide coaches with evidence-based insights into how mindfulness training can enhance both psychological and physical aspects of volleyball performance, with a focus on gender-specific training approaches.

The primary aim of this study is to examine the impact of mindfulness training on the level of flow and non-dominant hand spike performance in volleyball players. It is hypothesized that mindfulness training will significantly enhance flow during volleyball performance and improve non-dominant hand spike performance. Additionally, the study explores the potential influence of gender on the effectiveness of mindfulness training, hypothesizing that gender may play a role in the outcomes of the training.

In conclusion, this study seeks to provide insights into the role of mindfulness in enhancing both flow and non-dominant limb performance in volleyball. By exploring these dimensions, the study aims to contribute to a more holistic understanding of how mental training can complement physical skill development in athletes and offer practical recommendations for coaches to tailor training methods accordingly.

Methods

Research design

This study utilized a semi-experimental design, incorporating both pre-test and post-test assessments, along with a control group. The design aimed to investigate the effects of mindfulness training on two main outcomes: the level of flow and the performance of non-dominant hand spiking in volleyball players. Participants were assessed on these outcomes before and after the intervention, and the control group was compared to the experimental group to evaluate the impact of mindfulness training on volleyball performance and psychological immersion.

Population and Statistical Sample

The statistical population of this study consisted of 42 semi-skilled volleyball players from the city of Qom. Semi-skilled players were defined as individuals with at least two years of volleyball training but not involved in the Premier League or at a professional level. The sample included 21 female players with a mean age of 17.50 years and a standard deviation of 1.47, and 21 male players with a mean age of 17.27 years and a standard deviation of 1.35. Further descriptive details regarding the subjects are presented in Table 1.

Table 1: Descriptive information of subjects

variables	*SD± Mean (male)*	*SD± Mean (female)*	*SD± Mean (total)*
age	1.35 ± 17.27	47.1± 17.5	1.40 ± 17.38
height	4.037 ± 181.6	1.923 ± 162.8	10.347 ± 172.20
weight	8.700 ± 69.20	5.656 ± 53.00	10.989 ± 61.10

Source: *The authors.*

The inclusion criteria for this study were as follows: 1) right-handed players, 2) a history of at least 2 years of volleyball activity, and 3) an age range between 16 and 22 years. The exclusion criteria included: 1) left-handed individuals, and 2) individuals without consent. Prior to beginning the study, the Faculty of Physical Education at Kharazmi University in Tehran approved the research proposal, and an ethics code was obtained from the Research Institute of Physical Education. Written consent was obtained from the parents of participants under 18 years old, as well as directly from participants aged 18 or older.

For subject selection, information about sports halls in the city of Qom was initially gathered. Six sports halls offering volleyball training were identified based on the study's objectives. One hall was excluded because it only offered training for male participants, while another was excluded due to significant age differences among participants. From the remaining four halls, one was selected based on the cooperation of the coaches, the desired age group of participants, and the availability of the hall for the study.

The study's objectives were announced at the chosen hall, and 66 individuals expressed interest in participating. However, only 24 participants met the study's criteria and were selected. For more details on the subject selection process, refer to Chart 1.

Chart1: How to select participants

In the first stage, 66 volunteers were selected

✓ Examining people in terms of eligibility or non-eligibility criteria for entering the study

1. Eligible Participants:
Right-handed individuals
Participants with more than 2 years of experience
Age range: 16 to 22 years old

2. Ineligible Individuals:
Individuals without consent
Individuals with less than 2 years of training experience
Left-handed individuals

✓ 22 people were excluded From the study due to not meeting the entry requirements

Of the 22 individuals:
1. 5 were excluded due to having a training history of more than 7 years.
2. 6 individuals under the age of 18 were excluded due to not having parental consent.
3. 2 were excluded due to injuries sustained during training sessions.
4. 3 left-handed individuals were excluded.
5. 3 individuals over the age of 22 were excluded.

Source: The authors.

Measuring Tools

Flow Questionnaire: The 12-item questionnaire developed aims to assess the experience of flow. At the start of the questionnaire, three quotes were provided to describe the main characteristics of the flow experience. Respondents were asked to indicate with a yes/no response if they had experienced something similar to what was described in the quotes. If they answered positively, they were then prompted to briefly describe that experience in two sentences. Following this, they responded to 12 questions using a Likert scale to describe various aspects of the flow experience. For instance, "I enjoy it even if I don't have to do it." Some questions with negative content were reverse-coded, such as "I feel anxious" or "I feel bored and listless". This questionnaire, designed by Jackson and Marsh[24], is based on Csikszentmihalyi's theory and other qualitative research. The scale consists of 36 questions and 9 dimensions, with each dimension containing 4 questions. The dimensions include the balance between challenge and skill, merging of action and awareness, clear goals, unambiguous feedback, focus on the task at hand, sense of control, lack of self-consciousness, passage of time, and autotelic experience. Responses are scored on a 5-point Likert scale (strongly disagree = 1 and strongly agree = 5). The internal consistency of this scale was estimated by Marsh and Jackson to range from 0.80 to 0.86. This questionnaire underwent validity and reliability testing in Iran, and its reliability coefficient was found to be 0.87. The Cronbach's alpha coefficient for the entire flow scale was 0.86. The Cronbach's alpha coefficients for the dimensions were as follows: balance between challenge and skill 0.86, merging of action and awareness 0.85, clear goals 0.85, unambiguous feedback 0.83, focus on the task at hand 0.80, sense of control 0.84, lack of self-consciousness 0.86, passage of time 0.87, and autotelic experience 0.86[24].

Kentucky Questionnaire of Mindfulness Skills: This 39-item questionnaire is designed to measure four components of mindfulness: observing, non-judgmental description, acting with awareness (focus), and accepting without judgment. The questionnaire is rated on a 5-point Likert scale, ranging from "very rarely" to "mostly." Psychometric analysis conducted by Bayer on participants showed that the questionnaire has high internal consistency (0.73), and the Cronbach's alpha coefficients for the subscales of observing, describing, focusing, and accepting were 0.91, 0.84, 0.83, and 0.87, respectively. Test-retest reliability was 0.65, 0.81, 0.86, and 0.83, respectively. Additionally, a significant correlation was found between this scale and other scales. The studies examined the psychometric properties of this questionnaire in Iran. Their findings showed that the Cronbach's alpha for this questionnaire was 0.82, and factor analysis revealed four factors: focusing, describing, acceptance (attention), and observing, which explained 26.42% of the total variance of the test. The convergent validity of the subscales ranged from 0.47 to 0.78[25].

AAHPERD Spike Test: To conduct the AAHPERD Spike Test, the volleyball court was marked as shown in Figure 1. The subject stood at point X, and the tester tossed the ball from point T, 20 times for the subject. The subject spiked once with the non-dominant hand to the hatched area on the right and once to the hatched area on the left. Each ball that landed within the hatched area was awarded 1 point. If the pass was incorrect, that attempt was not counted and was repeated. This test has been used in previous studies and is considered valid for assessing volleyball spiking[26].

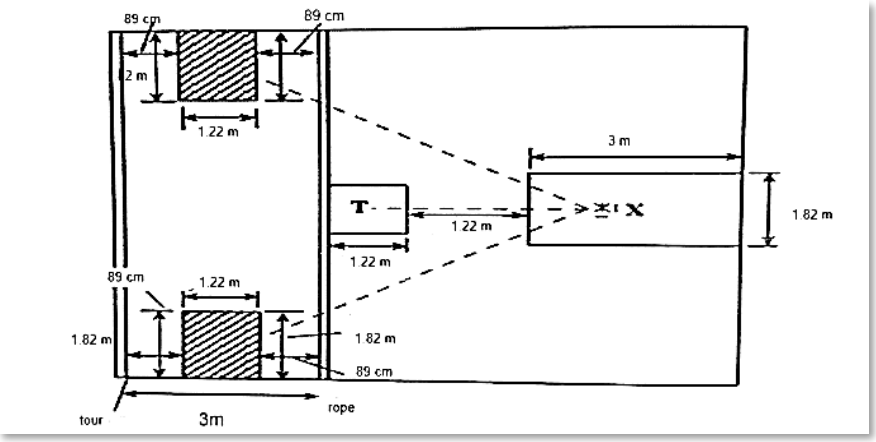


Figure 1: the volleyball spike test
Source: The authors.

Implementation Method

The research lasted for 2 months and 15 days. After selecting the participants, they were randomly assigned to four groups: two experimental groups (Female: 11 participants, Male: 11 participants) and two control groups (Female: 11 participants, Male: 11 participants). The random assignment was conducted by one of the researchers. Subsequently, a separate individual administered the pre-test. This pre-test, which included the Flow questionnaire and the AAHPERD spike test using the non-dominant hand, was conducted with all participants one week before starting the mindfulness protocol and implementing the independent variable.

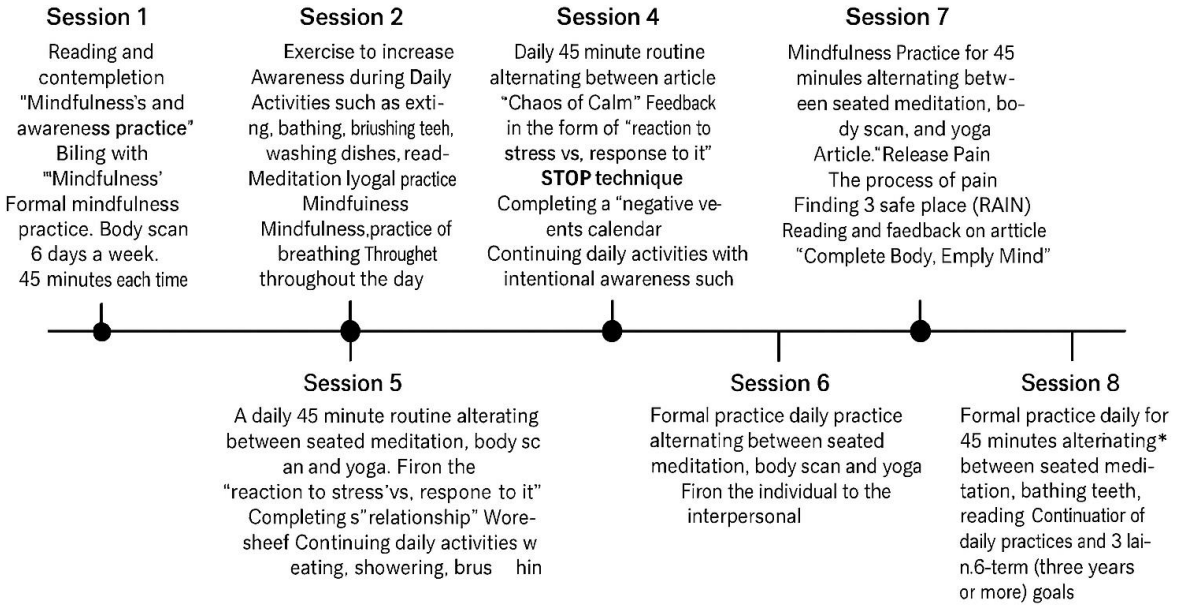
The pre-test and post-test procedures were identical and included two main steps: First, participants completed the Flow questionnaire, followed by the AAHPERD spike test. The rater, who was blinded to the group assignments, assessed all participants on the same day and simultaneously. The data were then collected and provided to the researchers for analysis. Both the experimental and control groups underwent spike volleyball training over 8 sessions, each with regular intervals. While both groups participated in the volleyball training, only the experimental group also underwent mindfulness training, which was not included in the control group's regimen.

Intervention of Volleyball Spike

Initially, an orientation session was conducted for both male and female coaches to demonstrate the spiking exercises and explain the procedural details. Following this, participants performed 50 volleyball spikes with their non-dominant hand during each training session. These sessions took place twice a week, under conditions that closely resembled those of the main testing sessions.

After the volleyball spike training, both female and male participants in the experimental group participated in mindfulness exercises. These exercises, which included body scanning, meditation, and other related activities, were conducted once a week for 8 weeks, with each session lasting 2 hours. The mindfulness training was led by a clinical psychologist with expertise in mindfulness exercises. After each training session, participants in the experimental group were required to complete weekly exercises based on the mindfulness protocol and document their activities in personal notebooks. This training method was designed in alignment with the methods used in previous studies.

Chart 2: How to practice mindfulness



Source: The authors.

Statistical analysis

After entering the data into SPSS-24 software, the Shapiro-Wilk test was used to assess the normality of the data. Descriptive statistics of the participants were examined using the mean and standard deviation. For inferential statistics, the assumptions of the analysis of covariance (ANOVA) were checked and confirmed before using the test. Tukey's post hoc test was employed to examine the differences between groups in the post-test. All statistical information was evaluated at a significance level of 0.05.

Ethical Considerations

This research was conducted under the supervision of Kharazmi University and the Department of Sports and Youth of Qom Province. Participants were informed of the research objectives and assured that their information would remain confidential. Informed consent was obtained from participants prior to the start of the study.

Results

The Kolmogorov-Smirnov test results indicated that the data were normally distributed at all levels ($p > 0.05$). The mean and standard deviation of flow and spectrum scores for both male and female participants in the pre- and post-tests for both the experimental and control groups are presented in (Table 2). As shown, the mean flow score for males was 40.78 before mindfulness training and 27.90 after mindfulness training. In the female group, the mean flow score was 30.85 before mindfulness training and 64.90 after mindfulness training. Additionally, the mean spectrum score for males was 70.4 before mindfulness training and 27.8 after

mindfulness training. In the female group, the mean spectrum score was 20.3 before mindfulness training and 55.4 after mindfulness training.

Table 2. Mean and Standard Deviation of flow Scores in Semi-Skilled Male and Female Volleyball Players in the Experimental and Control Groups (Before and After Mindfulness Training)

Group	Variables	Sex	number	Pre-Test		Post- Test	
				Mean	*SD*	*Mean*	*SD*
experimental	Flow	male	11	78.40	16.358	90.27	9.414
		female	11	85.30	8.538	90.64	15.279
	Spike	male	11	4.70	1.49	8.27	2.453
		female	11	3.20	1.47	4.55	1.21
control	Flow	male	10	78.20	16.378	78.40	16.358
		female	10	85.12	8.723	85.30	8.538
	Spike	male	10	4.59	1.654	4.70	1.494
		female	10	3.12	1.632	3.20	1.476

Source: The authors.

The results of the 2x2x2 ANOVA Table 3 indicated that there was no significant interaction between gender, intervention, and group for both variables (P>0.05). This suggests that gender does not have an effect on the trainability of flow and spike variables in volleyball. However, there was a significant interaction between intervention and group ($p<0.05$). Tukey's post hoc test for interaction between intervention and group showed a significant difference between the two groups in the trainability of flow (Cohen's $d=0.64$, $p=0.017$) and spike (Cohen's $d=1.43$, $p<0.001$) variables in the post-test.

Table 3 provides descriptive statistics for both variables in both the pre-test and post-test after combining the scores of males and females. Focusing on this table, it is evident that the intervention group demonstrated greater improvement compared to the control group.

Table 3. Overview of the Outcomes of the Analyses of Variance for all Dependent Variables

		Test	Test*Sex	Test x Group	Test x Group x Sex	Pre-test		Post-test	
						test	*control*	*test*	*control*
Flow	F	12.92	1.29	24.01	0.002	78.41±10.83	83.7±16.7	90.45± 12.3	6.41±2.68
	P	<0.001	0.26	<0.001	0.96				
	ηp^2	0.25	0.033	0.38	0.001				
Spike	F	66.9	0.72	35.03	1.88	2.77±2.22	2.9±2.12	81.85±13.18	3.95±1.68
	p	<0.001	0.4	<0.001	0.17				
	ηp^2	0.63	0.19	0.34	0.47				

Source: The authors.

Discussion

The primary aim of this study was to examine the effects of mindfulness training on the level of flow and the performance of an overhand spike with the non-dominant hand in semi-skilled volleyball players, as well as to explore the influence of gender on these variables. The results indicate significant improvements in both flow and spike performance following mindfulness training, with no notable differences based on gender. The 2x2x2 ANOVA analysis revealed no significant interaction between gender, intervention, and group for both flow and spike outcomes, suggesting that mindfulness training has a comparable effect on both male and female participants. However, a significant interaction between the intervention and

group ($p<0.05$) highlighted that the experimental group showed more considerable improvements than the control group in both flow and spike performance. These improvements, observed across both male and female participants, support the notion that mindfulness training can enhance performance regardless of gender, reinforcing previous findings that mindfulness is a versatile tool for improving both psychological and motor performance in sports.

Research by Chen et al[9] on Taiwanese baseball players, for example, found that a 4-week mindfulness-based intervention significantly improved flow state, cognitive anxiety, and mental health outcomes such as sleep disturbance. This study highlighted the association between mindfulness ability and flow state ($P<0.001$), aligning with the current study by showing that mindfulness training enhances psychological engagement (flow) and performance. Similarly, Nicolas et al[17] found a moderate positive correlation between mindfulness and flow in competitive athletes, supporting the theory that mindfulness enhances athletes' ability to enter flow states. Additionally, Aherne et al[12] demonstrated that mindfulness training improved flow dimensions, such as "Clear Goals" and "Sense of Control," in university athletes, which also mirrors the current study's findings in volleyball players. Furthermore, Zhang et al[21] found that mindfulness training enhanced skill acquisition in novice athletes, demonstrating the effectiveness of mindfulness in improving motor control and performance, especially for precision tasks, similar to the volleyball skills examined here.

An important finding in this study was the absence of gender differences in trainability. While some studies, such as Benjaminse et a l[27], suggested gender as a significant factor in trainability, particularly in injury prevention, the present study supports findings from Mohammadi Orangi et al[28], which indicated that gender does not significantly affect the impact of training interventions on performance. These findings suggest that the benefits of mindfulness training are universal, further supported by a growing body of literature.

To complement the statistical analysis, effect size calculations demonstrated large effect sizes for both flow and spike performance, reinforcing the practical significance of the results. Effect size values were substantial, indicating that the differences between the experimental and control groups were not only statistically significant but also meaningful in real-world contexts. These effect sizes suggest that mindfulness training has a profound impact on improving psychological engagement (flow) and motor performance (non-dominant hand spike). The observed improvements can directly translate into sports practice by improving athletes' focus, skill execution, and engagement during training and competition. Coaches can utilize these findings by incorporating mindfulness practices into training routines to enhance athletes' concentration, anxiety management, and technical skills. These significant effect sizes not only validate the statistical findings but also highlight the practical, tangible benefits of mindfulness training for improving both mental and physical performance in sports.

From a dynamic systems perspective, various factors influence practice and learning, including psychological factors, mental practice, and the use of mindfulness as individual constraints. Combining mindfulness with physical practice supports learning by enhancing psychological engagement, which aligns with the theoretical underpinnings of the current study. The benefits of mindfulness in semi-skilled athletes may also be attributed to its ability to break the monotony of physical training by introducing a fresh, enjoyable training environment. This novel experience fosters enthusiasm, which boosts learning and flow, further enhancing performance[29].

The current study also provides valuable insights into the absence of gender differences in response to training. Though some previous studies highlighted gender-related differences in

training outcomes, particularly in areas such as injury prevention, the present study found that both male and female participants showed similar responses to physical and mindfulness training. This could be attributed to the varied training methods used and the integration of mindfulness training, which appealed to both genders and resulted in improvements. Since flow is associated with enjoyment, happiness, and engagement, it is expected that athletes, regardless of gender, would benefit equally from mindfulness, leading to progress in both performance and immersion. However, these observations warrant further investigation in future studies to explore gender-specific responses more thoroughly.

Strengths and Limitations

One strength of this study was the integration of both physical and mental training while considering gender, which had not been extensively explored in previous research. However, the limited sample of semi-skilled players from a single city presents a key limitation, which may affect the generalizability of the findings. Since the sample was restricted to one geographic area, the results may not fully reflect the diversity of athletes across different regions, countries, or cultures. Future research should aim to expand the sample to include athletes from diverse backgrounds, sports, and geographical locations to better understand the effectiveness of mindfulness training in varying contexts.

Moreover, the inability to fully control training variables, particularly gender-based differences in training approaches, may have impacted the internal validity of the study. While the research included both male and female participants, the training was not conducted in a fully integrated manner, which could have led to differences in coaching styles, training intensity, or gender-specific factors. Future studies should ensure more standardized training protocols for both genders, perhaps through joint sessions or equal resources for both male and female participants, to reduce variability stemming from these factors and provide more accurate insights into the impact of mindfulness training.

Conclusion

In conclusion, this study highlights that while physical training alone enhances performance in semi-skilled athletes, combining it with mindfulness training has a dual impact on psychological variables such as flow and skill-related factors like learning volleyball spikes. The introduction of mindfulness training creates a novel and enjoyable learning environment that fosters greater engagement, enthusiasm, and flow, ultimately improving performance. Coaches and athletes can benefit from integrating mindfulness with physical training, as it enhances focus, skill execution, and stress management, leading to improved performance in high-pressure situations. By promoting a balanced approach that includes both mental and physical components, athletes can refine their skills while maintaining psychological resilience, which is critical for long-term performance development. Given the consistency of these findings with previous research, coaches should incorporate mindfulness exercises into their regular training routines to maximize both psychological and physical performance benefits for athletes across genders.

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