POWER YOGA AS AN EFFECTIVE RECOVERY TOOL FOR WOMEN VOLLEYBALL PLAYERS: A COMPREHENSIVE 12-WEEK EVALUATION

СИЛОВА ЙОГА ЯК ЕФЕКТИВНИЙ ІНСТРУМЕНТ ВІДНОВЛЕННЯ ВОЛЕЙБОЛІСТОК: КОМПЛЕКСНА 12-ТИЖНЕВА ОЦІНКА

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Abstracts

Background and Study Aim. Power Yoga involves a continuous flow that challenges both body and mind, aiming to enhance cardiovascular fitness, muscle strength, and overall flexibility. The role of Power Yoga in athlete recovery, especially for volleyball players, remains insufficiently studied. This research aimed to investigate the effects of a 12-week Power Yoga program on muscle soreness and flexibility among sub-elite women volleyball players.

Material and Methods. The study involved 37 female volleyball players from SRM Institutions, Tamil Nadu, India. Participants completed pre-test assessments before starting a 12-week Power Yoga program. Follow-up assessments were conducted at 4, 8, and 12 weeks. Measurements included muscle soreness using the Visual Analog Scale (VAS) and flexibility through Sit-and-Reach test assessed. The same tests were administered at each evaluation point to track changes and assess the impact of the Power Yoga intervention.

Results. The statistical analysis demonstrated a progressive and significant improvement in both recovery-related variables across the 12-week intervention period. Regarding muscle soreness, repeated measures ANOVA showed a consistent decline in VAS scores at each follow-up, indicating a reduction in perceived soreness levels over time. The analysis yielded a significant F-ratio of 8.59361 ($p = 0.000028$), confirming the efficacy of the Power Yoga program in alleviating post-exercise muscle soreness. Similarly, flexibility scores, as measured by the Sit-and-Reach test, improved markedly throughout the program. The flexibility gains were statistically significant, with an F-ratio of 11.61522 and a p-value of 0.00001, reflecting enhanced range of motion and musculoskeletal adaptability among participants. These findings collectively underscore the positive impact of Power Yoga in promoting muscle recovery and improving flexibility, both of which are critical components for optimal athletic performance and injury prevention in volleyball.

Conclusions. The 12-week Power Yoga program was effective in improving recovery among women volleyball players by reducing muscle soreness and enhancing flexibility. These results suggest that integrating Power Yoga into training routines can optimize recovery and performance in athletes.

Key words: Power Yoga, muscle soreness, flexibility, volleyball players.

Передумови та мета дослідження. Силова йога передбачає безперервний потік, який кидає виклик як тілу, так і розуму, спрямований на покращення серцево-судинної підготовки, м'язової сили та загальної гнучкості. Роль силової йоги у відновленні спортсменів, особливо волейболістів, залишається недостатньо вивченою. Метою цього дослідження було вивчити вплив 12-тижневої програми силової йоги на м'язову болючість і гнучкість у волейболісток субелітного рівня.

Матеріал і методи. У дослідженні брали участь 37 волейболісток з інститутів SRM, Таміл Наду, Індія. Перед початком 12-тижневої програми силової йоги учасниці пройшли попереднє тестування.

Подальші оцінки проводилися через 4, 8 і 12 тижнів. Вимірювання включали оцінку болю у м'язах за допомогою візуально-аналогової шкали (ВАШ) та гнучкості за допомогою тесту «Сидіти і тягнутися». Ті ж самі тести проводили в кожній точці оцінювання, щоб відстежити зміни та оцінити вплив утручань із силової йоги.

Результати. Статистичний аналіз продемонстрував прогресивне та значне покращення обох змінних, пов'язаних із відновленням, протягом 12-тижневого періоду втручання. Щодо болю у м'язах повторні вимірювання ANOVA показали послідовне зниження балів за ВАШ за кожного спостереження, що вказує на зменшення рівня сприйняття болю з часом. Аналіз показав значне F-відношення 8,59361 (p = 0,000028), що підтверджує ефективність програми Power Yoga у зменшенні болю у м'язах після фізичних навантажень. Аналогічно, показники гнучкості, виміряні за допомогою тесту «Сидіти і тягнутися», помітно покращилися впродовж програми. Зростання гнучкості було статистично значущим із F-відношенням 11,61522 та p-значенням 0,00001, що відображає покращення діапазону рухів та адаптивності опорно-рухового апарату в учасників. Ці результати в сукупності підкреслюють позитивний вплив силової йоги на відновлення м'язів та покращення гнучкості, що є критично важливими компонентами для досягнення оптимальних спортивних результатів та запобігання травмам у волейболі.

Висновки. 12-тижнева програма із силової йоги була ефективною для покращення відновлення волейболісток, зменшуючи біль у м'язах та покращуючи гнучкість. Ці результати свідчать про те, що інтеграція силової йоги в тренувальний процес може оптимізувати відновлення та продуктивність спортсменів.

Ключові слова: силова йога, біль у м'язах, гнучкість, волейболістки.

Introduction. In the world of volleyball, recovery plays a pivotal role in maintaining high performance levels and preventing injuries. Volleyball, characterized by intense bursts of activity including jumps, quick lateral movements, and powerful strikes, places significant physical demands on players. Effective recovery strategies are crucial for allowing athletes to recuperate from these physical stresses, ensuring they remain in optimal condition throughout the season [14]. The nature of volleyball requires players to exert considerable energy and strength during training and competitions. This high level of exertion can lead to muscle fatigue, soreness, and an increased risk of injuries if not properly managed [18; 26]. Recovery is not merely about resting but involves a comprehensive approach that includes adequate rest, proper nutrition, hydration, and various recovery techniques like massage and stretching. Each of these components plays a role in helping athletes recover their energy levels, repair muscle tissues, and prepare for future training sessions and matches. Effective recovery methods are essential for athletes to mitigate the effects of intense physical activity and enhance their overall performance. In addition to traditional recovery techniques, there is growing interest in exploring alternative approaches that can complement existing methods. One such approach is Power Yoga, a dynamic form of yoga that integrates physical exercise with mindfulness and breathing techniques [2; 25].

Power Yoga, a vigorous form of yoga emphasizing strength, flexibility, and endurance through dynamic movements and postures, offers substantial benefits for athletes by complementing their physical and mental training. Unlike traditional yoga, which often focuses on slower, static poses, Power Yoga involves a continuous flow that challenges both body and mind, aiming to enhance cardiovascular fitness, muscle strength, and overall flexibility. For athletes, the core engagement achieved through Power Yoga is crucial, as strong core muscles contribute significantly to generating power and maintaining control during high-intensity activities [9; 28]. Flexibility, a critical component of athletic performance, is improved through targeted stretches that reduce injury risks and enhance movement efficiency [10]. Power Yoga's emphasis on breath control and sustained movement builds both physical and mental endurance, allowing athletes to perform efficiently during prolonged exertion while maintaining focus and composure. Additionally, the mindfulness and relaxation techniques in Power Yoga, including deep breathing and meditation, help manage stress and anxiety, fostering a calm, focused mindset essential for peak performance [11; 21]. This

mental discipline is vital in competitive sports, where staying composed under pressure and making quick decisions can determine success [7]. Moreover, Power Yoga plays a key role in injury prevention by strengthening and stretching muscles and joints prone to repetitive stress injuries, particularly in areas like the shoulders, knees, and ankles, enhancing overall stability and resilience [8; 15]. The restorative aspects of Power Yoga, such as gentle stretching and deep relaxation, are invaluable for optimizing recovery, alleviating muscle soreness, improving circulation, and promoting relaxation, leading to quicker recovery times and better overall athletic performance [20; 27]. The integration of Power Yoga into an athlete's routine not only boosts physical attributes but also fosters a deeper connection between the mind and body, resulting in a more holistic and effective approach to training and competition. This synergy between Power Yoga and athletic training makes it an ideal practice for athletes seeking to enhance their performance across multiple dimensions [5, 9; 17].

The purpose of the study. The role of Power Yoga in athlete recovery, especially for volleyball players, remains insufficiently studied. This study aims to investigate the effects of a 12-week Power Yoga program on recovery in women volleyball players.

Material and Methods. Participants. The study included a total of 37 women volleyball players experiencing mild to high muscle soreness identified through a pre-study survey from SRM Institutions in Tamil Nadu, India. These participants were selected through purposive sampling, targeting individuals actively involved in competitive volleyball with a minimum of two years of sports age. All participants were sub-elite volleyball players, demonstrating consistent performance at the university or intercollegiate level. Their ages ranged between 18 and 25 years. To ensure their voluntary participation in the 12-week Power Yoga program, written informed consent was obtained from each player before the study commenced. Those with chronic injuries, medical contraindications, or concurrent training programs were excluded to maintain study integrity.

Research Design. The study adopted a quasi-experimental design, with pre– and post-intervention assessments used to determine the effects of the 12-week Power Yoga program. Participants were purposefully selected, and random assignment was not applied. This design allowed the researchers to evaluate the program's impact in a practical setting while addressing the specific physiological recovery needs of sub-elite women volleyball players.

Procedure. The research was structured to examine the effects of a 12-week Power Yoga intervention on recovery among the participants. The program began with baseline measurements of muscle soreness and flexibility. Subsequent assessments were conducted at 4 weeks, 8 weeks, and 12 weeks to monitor progress. Participants engaged in Power Yoga sessions three times a week, each lasting 60 minutes, which focused on improving strength, flexibility, and relaxation through a series of dynamic poses and breathing exercises (Table 1).

Measurements. To evaluate the impact of the Power Yoga program, several recovery-related variables were measured. Muscle soreness was assessed using the Visual Analog Scale (VAS), where participants rated their soreness from 0 to 10 [6]. Flexibility was measured with the Sit-and-Reach Test, recording the distance reached in centimeters [13].

Statistical Analysis. Data analysis included descriptive statistics to summarize the mean and standard deviation of each recovery variable at different time points. A one-way ANOVA was performed to identify significant differences in recovery outcomes across the four assessment periods (Pre-Test, 4-Week, 8-Week, and 12-Week). All analyses were conducted with a significance threshold set at $p < .05$ to determine the effectiveness of the Power Yoga program in enhancing recovery.

Results of the Study. The results present longitudinal data on recovery variables at each assessment point start, 4 weeks, 8 weeks, and 12 weeks. The analysis highlights changes in muscle soreness and flexibility identifying significant trends and improvements over the 12-week Power Yoga program.

The analysis of the data reveals significant changes in all measured recovery variables over the 12-week Power Yoga program. For muscle soreness, the ANOVA results indicate a significant reduction in soreness levels from the pre-test to the 12-week assessment, with a notable F-ratio of 8.59361 and a p-value of 0.000028. This suggests that the Power Yoga program effectively reduced muscle soreness over time. In terms of flexibility, the significant F-ratio of 11.61522 and p-value of 0.00001 highlight substantial improvements in participants' flexibility as measured by the Sit-and-Reach Test. The flexibility scores increased consistently from the pre-test to the 12-week assessment, reflecting the positive impact of the Power Yoga interventions on participants' range of motion. The mean scores for the variables at various time points are displayed on the line graph (Fig. 1).

Table 1

12-Week Power Yoga Training Schedule

Week	Exercise	Repetitions	Sets	Duration	Rest	Remarks
1-4	Sun Salutations	5	3	10 mins	2 min	Focus on breathing and flow
	Tree Pose	30 sec	3	2 mins	3 min	Balance and core engagement
	Forward Bend	1 min	2	2 mins	2 min	Stretch hamstrings and lower back
	Downward Dog	1 min	3	3 mins	3 min	Stretch and strengthen the posterior chain
	Cobra Pose	30 sec	2	2 mins	2 min	Open chest and stretch the abdominals
	Child's Pose	1 min	2	2 mins	2 min	Relax and stretch lower back
	Plank Pose	30 sec	2	1 min	2 min	Strengthen core and shoulders
	Bridge Pose	30 sec	2	1 min	2 min	Strengthen glutes and lower back
5-8	Sun Salutations	7	3	13 mins	2 min	Increase intensity and flow
	Tree Pose	45 sec	3	3 mins	3 min	Challenge balance and flexibility
	Forward Bend	1.5 min	2	3 mins	2 min	Deepen stretch and relaxation
	Downward Dog	1.5 min	3	5 mins	3 min	Strengthen and stretch deeper
	Cobra Pose	45 sec	2	2 mins	2 min	Enhance chest openness and flexibility
	Child's Pose	1.5 min	2	3 mins	2 min	Deep relaxation and stretch
	Plank Pose	45 sec	2	2 min	2 min	Increase core and shoulder strength
	Bridge Pose	45 sec	2	2 min	2 min	Strengthen glutes and lower back
9-12	Sun Salutations	10	3	15 mins	2 min	Maintain smooth and continuous flow
	Tree Pose	1 min	3	3 mins	3 min	Advanced balance and core strength
	Forward Bend	2 min	2	4 mins	2 min	Maximum stretch and relaxation
	Downward Dog	2 min	3	6 mins	3 min	Deep stretch and strength
	Cobra Pose	1 min	2	3 mins	2 min	Full chest expansion and core flexibility
	Child's Pose	2 min	2	4 mins	2 min	Full relaxation and lower back stretch
	Plank Pose	1 min	2	2 min	2 min	Enhance core and shoulder strength
	Bridge Pose	1 min	2	2 min	2 min	Strengthen glutes and lower back

Table 2

ANOVA Results for Recovery Variables

Variable	Assessment Point	∑X	Mean	∑X²	Std. Dev.	SS Between-Treatments	df	MS Between-Treatments	F-Ratio	p-Value
Muscle Soreness	Pre-Test	255.5	6.9054	1771.45	0.4447	5.0865	3	1.6955	8.59361	0.000028
	4-Week	249.7	6.7486	1692.01	0.4369					
	8-Week	244.3	6.6027	1620.25	0.4475					
	12-Week	236.9	6.4027	1524.01	0.4475					
Flexibility	Pre-Test	588.8	15.9135	9376.88	0.4411	6.8716	3	2.2905	11.61522	0.00001
	4-Week	596.1	16.1108	9610.61	0.4396					
	8-Week	602.9	16.2946	9831.23	0.4478					
	12-Week	610.3	16.4946	10073.87	0.4478					

Discussion. This study aimed to evaluate the impact of a 12-week Power Yoga program on recovery metrics muscle soreness and flexibility in women volleyball players. The results of this study offer valuable insights into how a 12-week Power Yoga program can positively impact recovery metrics for women volleyball players [3; 18]. The analysis focused on muscle soreness and flexibility. Each of these variables was assessed at four key points: the start of the program, 4 weeks, 8 weeks, and 12 weeks, providing a comprehensive view of the program's effects over time. A conceptual framework linking muscle soreness and flexibility was established based on existing literature. Studies indicate that increased flexibility can reduce the risk of muscle tightness and post-exercise discomfort [29].

The gradual decrease in soreness over time suggests that Power Yoga not only helps in managing immediate post-exercise discomfort but also contributes to longer-term recovery. This is particularly relevant for volleyball players who frequently experience muscle strain and soreness due to the high-intensity nature of their sport [11; 22] . Flexibility improvements were also notable and confirm the effectiveness of Power Yoga in enhancing flexibility. This progressive enhancement in flexibility likely benefits volleyball players by improving their range of motion, which can enhance performance and reduce the risk of injuries. Increased flexibility can aid in the execution of complex movements and better overall agility on the court [7; 24].

The findings suggest that integrating Power Yoga into the training and recovery routines of volleyball players could provide significant benefits. The program's ability to reduce muscle soreness and enhance flexibility underscores its potential as a valuable component of a comprehensive athletic regimen. Coaches and sports professionals might consider incorporating Power Yoga sessions regularly to help athletes recover more effectively from training sessions and competitions. Given its benefits, Power Yoga can serve as a supplementary recovery tool that complements other recovery strategies such as rest, nutrition, and traditional physical therapy [4; 10]. The study's assessment schedule pre-test, 4 weeks, 8 weeks, and 12 weeks revealed that the effects of Power Yoga become more pronounced over time. The gradual improvements across all measured variables suggest that the benefits of Power Yoga accrue progressively. This highlights the importance of sustained practice and the potential for cumulative benefits. For optimal results, a consistent and long-term commitment to Power Yoga may be necessary. Coaches should factor this into training schedules, ensuring that Power Yoga is integrated into the athletes' routines for an adequate duration to maximize its effectiveness [16; 20].

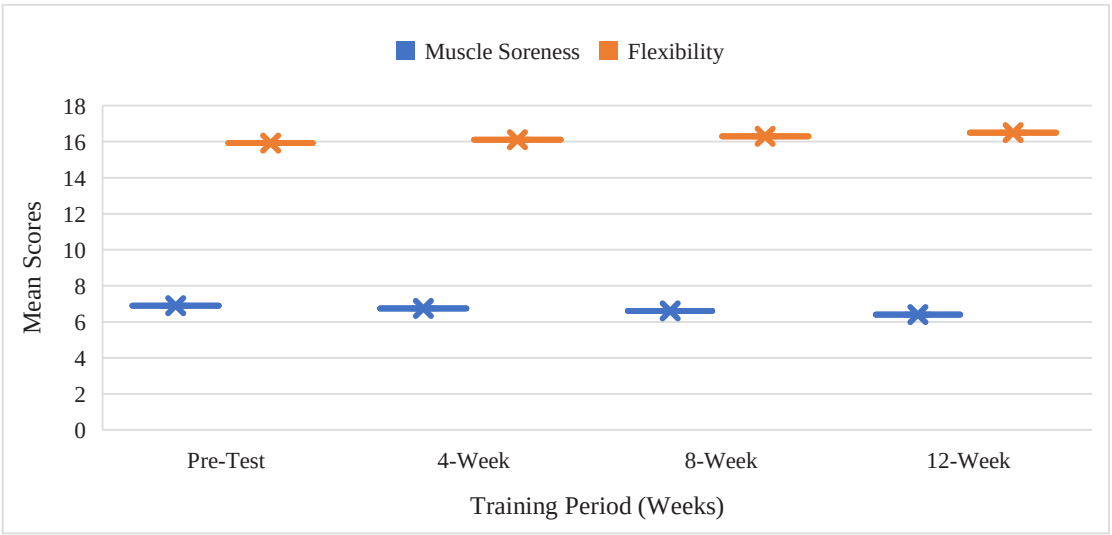

Fig. 1. Changes in mean scores from pre-test to 12-week assessment for muscle soreness and flexibility

The 12-week Power Yoga program has shown promising results in enhancing recovery metrics among women volleyball players. The reduction in muscle soreness and improvements in flexibility collectively demonstrate the program's comprehensive benefits[15, 19]. Incorporating Power Yoga into training routines offers a holistic approach to athlete recovery, addressing both physical and physiological aspects. The positive outcomes observed suggest that Power Yoga could be a valuable addition to conventional recovery practices, supporting athletes in maintaining peak performance and overall well-being [1; 12; 23].

Conclusions. This study highlights the beneficial impact of a 12-week Power Yoga program on recovery metrics among women volleyball players. Key findings reveal significant improvements in muscle soreness and flexibility. Muscle soreness decreased notably over the program duration, suggesting effective relief from post-exercise discomfort. Flexibility gains were substantial, indicating enhanced range of motion, which can improve athletic performance and reduce injury risk. These results suggest that Power Yoga can be a valuable addition to athletic training programs. Incorporating Power Yoga into regular training routines can complement traditional recovery methods, offering a holistic approach to athlete recovery.

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Conflicts of Interest. The authors confirm that they have no conflicts of interest related to this study.

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