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Original Article

Effects of Static and Dynamic Stretching on Sprinting Ability of Volleyball Players

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ABSTRACT

Background: The main aim of an athlete is to improve performance that depends on various parameters including warm-up practices and workout routines. Warm-up before training is vital to prepare the athlete for an upcoming event, prevent injury and optimal performance. Commonly stretching is performed in warm-up sessions considered to be important for joint flexibility. **Objective:** To investigate the effects of dynamic and static stretching on sprinting ability of volleyball players. **Methods:** This randomized controlled trial is conducted at Pakistan Sports Board and Coaching Centre, Lahore. All volleyball players practicing three or more times a week, age group 15 to 30 years and having one year of experience were included in the study whereas athletes with any musculoskeletal injuries, systemic illness, abnormal biomechanics or recent surgery were excluded. Participants were randomly allocated into two groups; Group A performed dynamic stretching and Group B did static stretching exercises thrice weekly. Participants of both groups followed their regular warm-up regime and nutrition plans and the exercise protocol of the group was allocated for the time duration of six weeks. All participants undergo pre and post-treatment tests via the running anaerobic sprint test and counter-movement jump tests. Data were analyzed using version 26.0, and frequency and percentages were calculated. The between-group and within-group differences were estimated. The p-value ≤ 0.005 was considered significant. **Results:** Anaerobic capacity for the pre and post-intervention were calculated separately for both groups (p-value<0.005). JH calculation for the pre and post-values for groups A and B have the p-value calculated as p<0.005. The group analysis for AC and JH showed a p-value of p>0.05. **Conclusion:** It is concluded that both stretching regimes that are static stretching and dynamic stretching can be used in warm-up practices for improving sprinting anaerobic capacity and explosive strength of the players but there were no significant differences between the groups.

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INTRODUCTION

Volleyball is categorized by brief irregular bursts of high-intensity and short-duration stimuli that are dispersed randomly by short recovery periods. This sport requires repeated efforts of strength, power, and agility to play, thus, inducing high physical training for good performance.[1-3] High-interval training is planned by combining both physiological and psychological load intensities in compliance with the competitive requirements.[4] For volleyball anatomical sites for a higher incidence of injuries that were reported include the ankle, knee, and shoulder.

Whereas during the in-season time of play sprains, tendinopathies, and strains are the routine injuries occurring during blocking and attacking activities.[5] Thus, accounting for the injury rate as 6.73 per 1000 athlete exposures.[6] Student-athletes are at a higher risk of illness due to increased levels of stress or sudden changes in training loads.[7] For this, an activity called warm-up is done which elevates the body temperature and blood flow to the working muscles improves performance and prevents injury[8] by accelerating the activity of oxidative enzymes, the recruitment of motor units and the kinetics of oxygen uptake.[9]

These specified warmups aiming to execute game movements help to improve the performance of the athlete[10] and also may benefit via its small to moderated effects on the prevention of musculoskeletal injuries.[11] Stretching aims to improve flexibility by increasing the range of motion at the joint. The larger the range of motion (ROM) indicates the lesser or the reduced stiffness over the musculo-tendinous unit whereas the voluntary contractions linked with stretching improves the muscular performance.[12]

Flexibility is one of the chief basic elements of fitness contributing to sports activities leading to optimal performance of the player.[13] Muscle classifications that are not successfully stretched can negatively affect athletic performance.[14] This can be static stretching (SS) in which you hold a position for a specific period; and dynamic stretches (DS) which are controlled movements designed to stretch a group of muscles. Adequate duration of stretching has some evidence of affecting performance by improved output forces generated at longer muscle lengths.[15] Sprinting performance depends mainly upon development and maturation in association with the physical fitness of young players.[16]

General warm-up including warming up inspiratory muscles can improve sprint performance as these have positive effects on acceleration and maximum speed performances.[17] If one of the purposes of stretching is to develop flexibility, it is worth investigating if the increase in flexibility improves athletic performance. The effects of dynamic stretching and static stretching on enhancing the range of motion are supported by research. However, there is limited research on the outcomes of static and dynamic stretching on sprinting explosive strength and anaerobic capacity.

METHODS

This randomized controlled trial is conducted at Pakistan Sports Board and Coaching Centre, Lahore. All volleyball players practicing three or more times a week; of age group 15-30 years; having one year of experience were included in the study whereas athletes with any musculoskeletal injuries, systemic illness, abnormal biomechanics or recent surgery were excluded from the study. Participants were designated by a non-probability convenience sampling technique.

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Each participant is allocated a number on enrolment in the study.

Participants were randomly allocated into two groups by a random number sequence generated by a computer software program called "research randomizer". After recruiting participants into groups, all participants were checked for their current level of fitness using RAST- test and countermovement jump test to get baseline values. Participants that were allocated to Group A performed dynamic stretching exercises whereas the participants assigned to Group B performed static stretching protocols, focusing on lower extremity muscles of the posterior tibialis, front and posterior leg, iliopsoas, and topside.

Every stretching protocol lasted for about 10 seconds of two sets i.e., repeated twice (2 x 10 seconds), with a 10-second gap between activities that employed both limbs at the same time and no rest between exercises that uses one limb at one time.[18] Both the groups performed exercises 3 times a week in addition to their warmup and training regimes. During this study duration of 6 weeks, participants were commanded to keep their regular physical routine activities and nutritional behaviors unchanged. After 6 weeks, all participants were re-assessed for the RAST- test and countermovement jump test to evaluate the effects of the stretching protocols assigned. (Ethics committee reference number REC/RCR&AHS/21/0428 dated 2021-12-29; trial ID IRCT20210811052138N2).

Data were analyzed using the 26.0 version and frequency and percentages were calculated. The between-group and within-group differences were estimated. The p-value ≤0.005 was considered significant.

RESULTS

The results of this study showed that the mean and standard deviation of anaerobic capacity for the pre and post-intervention was calculated to be 1392.04±267.51 and 6.94±5.17 respectively for the DS group. The AC for group B was calculated for pre and post-treatment as their mean and standard deviation were 1406.62±291.13 and 7.11±4.74 respectively. The p-vale for both groups is $p<0.05$ while the JH calculation for the pre and post-values for group A was 84.61±36.46 and 1715.64±449.17 respectively. The pre and post-calculations for Group B JH performance

Table I: Descriptive Statistics of Participants

Study Groups		n	Mean ± SD
Group A Dynamic Stretching	Age	20	17.45 ± 2.42
	Height	20	5.48 ± 0.39
	Weight	20	53.5 ± 6.24
Group B Static Stretching	Age	20	17.45 ± 2.42
	Height	20	5.48 ± 0.39
	Weight	20	53.50 ± 6.24

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Table II: Between-group Analysis

	p-value	
	Pre-treatment	Post-treatment
Jump Height	0.67	0.15
Anaerobic Capacity	0.87	0.91

Table III: Within-group Analysis

	p-value	
	Dynamic Stretching	Static Stretching
Jump Height	0.01	0.000
Anaerobic Capacity	0.000	0.000

were 80.21±28.71 and 1539.95±298.16 respectively. The p-value calculated for the JH of both groups is $p<0.05$. Between the group analysis for AC and JH was calculated for group A as 1392.04±267.51 and 6.94±5.17 respectively. The group analysis for AC and JH for group B was calculated as 1406.66±291.13 and 7.11±4.74 respectively. The p-value for both variables was $p>0.05$. The primary findings of the present study were that the 6-week DS and SS interventions display similar improvements in sprinting explosive strength and anaerobic ability.

The anaerobic sprinting ability show significant improvements within the group whereas between-group analysis showed no intervention option is better than the other. The explosive strength measured in the form of jump heights in countermovement jump (CMJ) analysis shows that whatever the intervention protocol is applied there were significant improvements in the jump heights of the participants. Between-group analysis for the jump height shows no intervention gives better-improved results than the other group.

DISCUSSION

A recent study was conducted to evaluate the significance of SS and DS on the 20m sprinting capability of amateur players. All participants performed SS, DS and sport-specific warm-up on different occasions. The results of the study showed a decline in sprinting performance after SS. The DS or sport-specific warm-up improves the sprinting capability.[10] The present study displays similar effects of SS and DS on sprinting AC and explosive strength capabilities. In agreement with the hypothesis, another similar research on female handball players concluded that dynamic stretching concerning static and no stretching groups results in a small increment in average power and so DS improves sprint-related performance.[19] The present study concludes that both the regimes

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i.e., SS and DS improve sprinting performance and JH. A previous study was done on college-level male

gymnasts to check the effect of following a stretching protocol on vertical jump performance. 11 participants were checked for SJ, CMJ and depth jump. The study concluded that DS exercises similar to the gymnasts' movements are effective in JH improvements.[20] The current study has 40 participants that showed no significance the difference in SS and DS protocol.

A recent study was done on male habitual volleyball players to investigate the effects of SS and DS on sprint and jump performances. The results of this study show both techniques have favorable effects on acceleration capabilities.[18] The present study also shows similar results by displaying significant improvements in sprinting and jumping performance. Whereas, SS and DS show equally significant results.

Clinicians are recommended to use stretching whether static or dynamic for improving sprinting and jumping performance; Athletes can use both techniques of stretching in their training plans for improving their anaerobic capacity and jump heights.

CONCLUSION

It is concluded that both stretching regimes that is static stretching and dynamic stretching can be used in warm-up practices for improving sprinting anaerobic capacity and explosive strength of the players. Effects of stretching for fatigue index and anaerobic capacity with peak power differences needs to be further evaluated for marathon runners and swimmers. This study employs a specific set of stretching exercises, whether static or dynamic. The findings of the study shall be included with caution in any stretching exercise programs comprising several features i.e., exercise frequency, intensity, and duration.

DECLARATIONS

Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.
Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.
Competing interests: None
Funding: No funding source is involved.
Authors' contributions: All authors read and approved the final manuscript.
CONSORT Guidelines: All methods were performed following the relevant guidelines and regulations.

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