



Effect of Stretching Exercises Plus Caflam on Flexibility of Female Athletes

**Sajjad Ali Gill^{1*}, Samavia Noor¹, Abida Naseer², Saeed Javed²,
Sumeria Rajab³, Fehmida Ayoob³, Rana Adil⁴, Hira Shahid¹, Shahbaz Ahmad⁴
and Qurban Ali⁵**

¹*Department of Sports Sciences and Physical Education, The University of the Punjab, Lahore Pakistan.*

²*Department of Physical Education and Sports Sciences, Govt College University Faisalabad, Pakistan.*

³*Department of Physical Education and Sports Sciences, The Islamia University of the Bahawalpur, Pakistan.*

⁴*Institute of Agricultrural Sciences, University of the Punjab, Lahore, Pakistan.*

⁵*Institute of Molecular Biology and Biotechnology, The University of Lahore, Lahore, Pakistan.*

Authors' contributions

This work was carried out in collaboration among all authors. Author SAG designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors SN, AN, SJ, SR, FA, RA, HS and SA managed the analyses of the study. Authors SA and QA managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i1531281

Editor(s):

(1) Dr. Chouitah Ourida, University of Mascara, Algeria.

Reviewers:

(1) Otávio Augusto Soares Machado, FEFISO, Brazil.

(2) Mohanad f. hamood, university of Baghdad, Iraq.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/66647>

Original Research Article

Received 12 January 2021

Accepted 17 March 2021

Published 22 March 2021

ABSTRACT

The present study investigated how stretching exercises (Static, Dynamic and Proprioceptive neuromuscular facilitation (PNF)) along with Caflam (diclofenac potassium) affect the flexibility of female athletes at Punjab University Level. It is a controlled experiment with (n=40) female athletes, aged 18-24 years, divided into two groups intervention (N=30) and control group (N=10) randomly.

*Corresponding author: E-mail: sajjad.sspe@pu.edu.pk, drsajjadaligill@gmail.com;

Stretching exercises were conducted through 6 weeks divided into two sessions that consisted of both static and dynamic exercises in each session. Flexibility was measured with sit and reach test in pre and post evaluation sessions. The study purpose was to identify the effect of stretching exercises on flexibility of female athletes (N=40) by using different stretching exercises techniques (static and dynamic stretching exercises) on female athletes. Paired sample t-test used and found that it showed highly significant results using "Statistical Package for Social Sciences" (SPSS) V.22 utilized. The effect size was also calculated through Cohans'D which was 1.41. The subjects were followed for 4 months to check the recurrence rate of the control & intervention groups and found that 19% having injuries of lower extremity (control group) and 11% having after post-exercise evaluation (intervention group).

Keywords: Static and dynamic exercises; range of motion (ROM).

1. INTRODUCTION

Stretching exercises helped to prepare the body for physical activity and athletic events by improving joint range of motion, thus promoting improved performance and reducing the incidence of injury [1,2,3,4]. Consequently, athletes and coaches regularly include stretching exercises in both training programs and in pre-event warm-up activities [5]. However, Stretching is the frequently technique used in sport as a prepares the specific muscles during the activity, as well as replenish the muscles through exercise (Anderson, 2010). Upon undertaking a regular stretching program, frequent changes begin to occur within the body and specifically within the muscles itself as other tissues that begin to adapt the stretching process include fascia, tendons, skin and scar tissue (www.stretchcoach.com). Stretching is commonly undertaken in practice and matches as before and after performing in game or it can also be done as part of training session as well which is suppose as a relaxation of muscles, that prepared for a specific training session and helped in reduction of risk in sports injury. With stretching, subsequent gains in muscle lengths will lead to improved performance and decrease in the likelihood of injury. There are several different ways to stretch, easy to complex, simple to hard and single to multi joint not only provide flexibility to the muscles tendons and ligament but also provide strength to the muscles as well. Each type of stretching has its own pros and cons and the key to attaining the most appropriate stretching technique by which our performance purpose and goal is achieved (www.sportscoach.com). For example, static stretching (SS), dynamic stretching (DS), ballistic stretching (BS) and proprioceptive neuromuscular stretching (PNF) etc. This study was primarily based on two main stretching exercises namely static stretching SS and

dynamic stretching DS that helped athletes to gain flexibility that lead to improved performance. The injury record of few decades about static stretching become an important part of warm-up (Young and Behm, 2002). An Ancient technique of starting activity (Warm-up) was comprised of an aerobic module whose basic function is to elevate body temperature 1–2°C [6,7]. The elevated temperature enhanced muscle and body amenability, electroneurography nerve which exploits amplification techniques [8].

Furthermore, the still and motionless stretching was isometric stretching [6,7], its motion involved the range of motion which hold up to 10-15 sec [6]. In other words, we can say that the motionless movement which resulted in enhanced the ROM around [9]. The change in ROM which attributed to increase in the extension and decrease in soreness which affected limb musculotendinous unit (MTU) and have been classified as adaptable temporary changes, the enhancement have been mostly ascribed to lessen MTU stiffness [10] as well as amplified in patience to stretch [11].

Furthermore, to enhance in Range of motion, the predictable advantage of stretching were the decrease the risk [1] and protection against injury [4], whose resultant in ensuing muscle fibers relief [12] and upgraded activity level [6,7]. The ultimate functionality was due to the elevated stretching ability or improved ROM around muscle and joint during sports activity [7].

Second, the stretching which control the motion movement Dynamic refers as "stretching which involves skillful movement through the ROM for a certain joint" moreover, facilitate the control, run and explosive jump which resulted no adverse effect on performance [13,14,15,16]. In the perspective of dynamic stretching, the proponent indicated that rapid durations of dynamic

stretching did not affect performance, and vice versa [15,16,17]. Flexibility emphasis on the range of motion (ROM) at joint which plays a vital role as health-related fitness component and up-keep of a healthy lifestyle especially for sports performance [18,19]. Flexibility represents the ability to move a joint or a series of joints through a full, unrestricted, pain-free range of motion [20]. Whole body muscles required range of motion to work at its maximum instant [21].

The muscle and their fascia (sheath) should be the main focus while developing flexibility. An individual's performance depends upon number of components namely health related fitness components (Cardiovascular endurance, Muscular strength, Muscular endurance, Flexibility, Body composition) and skill related fitness components (speed, power, agility, coordination, balance, reaction time). Among these components, flexibility is one of the vital part for performance enhancement as it is important to see by the way of only one spoke in the performance wheel. Different fitness components are required according to sports, it is mandatory to perform exercise on regular basis as it contains all ingredients of physical and mental fitness. special requirements when it comes to flexibility. The most common fitness component is flexibility which refers to exploit the range of motion of your joints and muscles. An improvement in the flexibility led to improve your other fitness components (health and skill related components) which can be upgraded with stretching on regular basis and also become the part of our warm-up and cooldown as well in the conditioning periodization. It has been theorized by athletes, coaches, professionals, athletic trainers and physiotherapists that increasing flexibility is an important aspect of physical fitness, leading to upgrade of athletic performance as well as reducing the incidence of injury. One of the most important components of fitness is flexibility as it rated high for the performance of an athlete. The stiff and sore muscles did not perform strength exercises and ROM efficiently, it can be performed as flexible as u are and thus athlete becomes fatigued and weak. If athletes led to reduce speed, movement, decreased strength and power due to fatigue and stiffness which athletes gets more prone to injuries. Regular physical training helps maintain range of motion, strength of muscles and prevent injuries. Therefore, it is important to stretch all major muscle groups regularly before and after workouts or during training session if you're an athlete.

1.1 Hypothesis

The study hypothesized that flexibility of female athletes improved through stretching exercises and manage that impact of flexibility on female athlete's performance.

2. METHODOLOGY

The study consisted of 40 female athletes of Punjab University (New Campus). All the subjects enrolled in research were between the ages of 18 to 24 years and the research carried out on the basis of experimental method with purposive sampling technique procedure. The data was collected mostly from Department of sports sciences and physical education. Pre-experimental research design based on control group and intervention groups separately. Pre and post-exercise evaluation conducted for this study to get the baseline results. Pre-exercise values had been taken without warm up through sit and reach test protocols and flexibility measurement had been taken. After pre-exercise evaluation subjects executed warm-up sessions. The stretching exercises included in the warm-up and separately sessions for 6 weeks. The stretching sessions comprised of both static and dynamic stretching exercises and their frequency was three to five times per week along with caflam (as prescribed by the physicians). After completion of 6 weeks stretching exercises program, the subjects passed through again post-exercise evaluation battery process to get the final evaluation values.

Sit and reach test is a valid and reliable test to measure flexibility. A wooden box 30.5 cm x 30.5 cm x 30.5 cm (12 inches) with a fixed 53.34 centimetre (21 inches) ruler on top along with the extended top board of 22.86 cm (9 inches) towards the feet was used in the study. The flexibility was measured both in inches and centimetres. The test was conducted at University of the Punjab, Department of sport sciences and physical education, Lahore. The athletes performed exercises and test on the grass. The attire included T-shirt, mesh trousers and shoes were off during sit and reach test.

In the research design flow chart (Fig. 2), it is shown that subjects were divided into two groups i.e. the control group (n=10) and the experimental group (n=30). Then the pre-test for both the groups (n=40) was conducted through sit and reach box to check their flexibility

Flow Chart

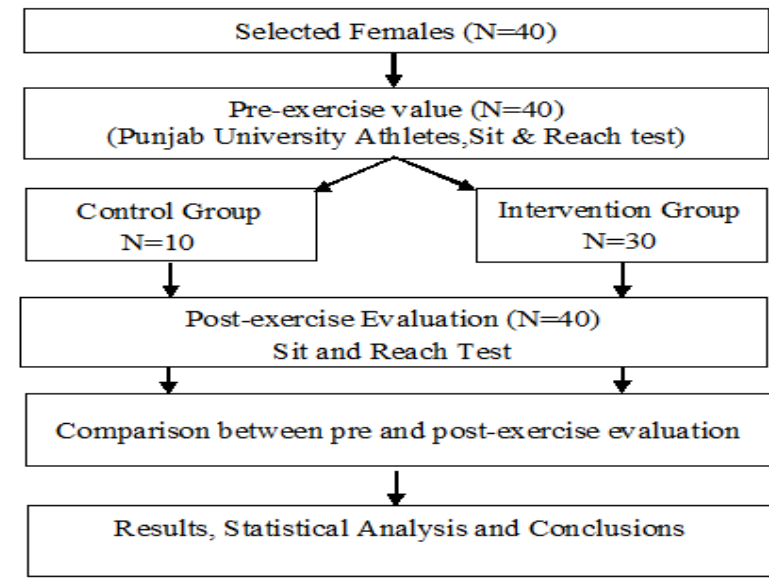


Fig. 1. Research design flow chart of the activity

initially and to know how training sessions and exercises can improve their flexibility. The training session was conducted on female athletes (n=30) and was executed for 6 weeks divided into 2 exercise sessions. Then the post-exercise evaluation was conducted from (n=40) subjects including experimental and control group to know the difference in their results. Then analysis was done to compare how stretching exercises influence on flexibility improvement (experimental group) vs. (control group), who did not participate in any training session. At last the study was concluded that stretching exercises has positive effect on flexibility improvement and performance whereas flexibility measurements remained the same with no progress in subjects who did not perform any stretching exercises throughout.

2.1 Research Question

- ✓ Is stretching exercises effected the flexibility of the female (athletes & non-athletes) and also help down in cut down the injuries rate.

2.2 Objectives

- ✓ To check the female athlete flexibility affected through stretching exercises

- ✓ Flexibility cut down the recurrence rate of injuries in both female and male athletes

2.3 Data Analysis

The testing instruments that were used in the study are Sit and Reach Test for flexibility measurement, height scale and weighing machine. The Sit-and-Reach Test (SRT) was first described by Wells and Dillon in the 1952 is commonly measure flexibility of the shoulder muscles, lower back, hips, and hamstring. Sit and reach test is a valid and reliable test to measure flexibility. A wooden box 30.5 cm x 30.5 cm x 30.5 cm (12 inches) with a fixed 53.34 centimetre (21 inches) ruler on top along with the extended top board of 22.86 cm (9 inches) towards the feet was used in the study. The flexibility was measured both in inches and centimetres. The test was conducted at University of the Punjab, Department of sport sciences and physical education, Lahore. The athletes performed exercises and test on the grass. The attire included T-shirt, mesh trousers and shoes were off during sit and reach test.

The experimental research descriptive techniques like frequency, mean, median, standard deviation and inferential techniques with paired sample t-test was applied and analyzed through statistical software SPSS)

V.22. The effect size was also calculated for the comparison. Paired sample t-test was utilized and it result was founded significant $p < 0.001$. The study also calculated Cohans'D which determined the effort size of the female was 1.41 respectively.

The figure showed the performance of the female athletes after 6 weeks training program and result founded it highly significant as it improved through static and dynamic exercise.

The pre and post exercise values (Female) showed difference of 2.8 along with improvement (%) 6.6 respectively. The result also showed significant improvement ($p < 0.001$) through paired sample t-test.

3. DISCUSSION

The study emphasis on the static, dynamic and proprioceptive exercises which enhanced flexibility for female athletes. This study was limited to all female athletes at University of the Punjab along with no major injury, Lahore. Main

research questions were formulated in relation to purpose of present investigation, which is to identify the upshot of stretching exercises on flexibility of female athletes. The adaptation of stretching resulted in the deduction of risk of injury it was also supported by Unick et al. [22]; Fletcher and Anness, [14]; Manoel et al. [23]; Holt and Lambourne, [24]; Torres et al. [25]; Hough et al. [17]; Pearce et al. [16]; Hanabusa et al. [21].

The present investigated study concluded that through stretching strength is also improved it was also reported by High et al. [26]; Behm, [6]; Young, [7]; Hanabusa et al. [21]. Under the shadow of this study it is highly recommended that the training sessions must include stretching for better performance. The recurrence rate was measured and found that control group had 19% after followed the rehab athletes for 4 months of lower extremity injuries and intervention group had 11% after completed the 4 months followed up plan.

Table 1. Showing Pre and Post-exercise values evaluated through paired sample t-test along with difference, percentage t-value and p-value as well

Subjects	Pre-exercise	Post-exercise	Diff (%)	T-value	P-value	Cohens D
Female	42.4 ± 7.4	45.2 ± 6.9	2.8 (6.6)	-7.6	*** 0.001	1.41

*** $p < 0.001$ highly significant

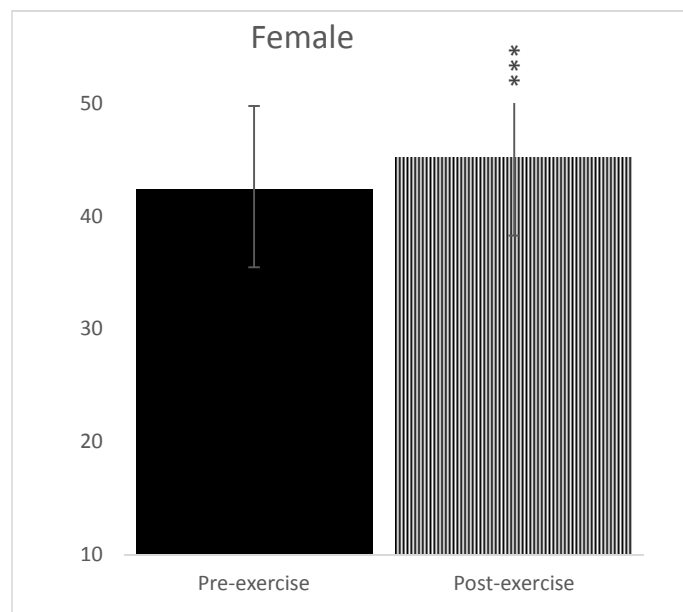


Fig. 2. Showing the Pre and post-exercise evaluation values of female athletes

4. CONCLUSION

The aim of the present study was elaborating the “effect of stretching exercises on flexibility of female athletes”. After careful handling and supervision of subjects and analysis of pre-test and post-test measurements of flexibility of the female athletes, researcher concluded that the flexibility of female athletes improved by the mean of pre-test 42.38 cm to post-test 45.19 cm after exercises sessions and thus performance definitely was increased. Results reveal that stretching exercises has a positive effect on flexibility of female athletes. Results also reveal that stretching exercises such as static, dynamic and proprioceptive exercises have positive effect on flexibility on players’ performance. At the end researcher concluded that female athletes should perform stretching exercises on regular bases to enhance their flexibility and performance.

CONSENT

It’s not applicable.

ETHICAL APPROVAL

It’s not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Safran MR, Seaber AV, Garrett WE. Warm-up and muscular injury prevention an update. *Sports Medicine*, 1989;8(4): 239-249.
2. Shellock FG, Prentice WE. Warming-up and stretching for improved physical performance and prevention of sports-related injuries. *Sports Medicine*. 1985; 2(4):267-278.
3. Bandy WD, Irion JM, Briggler M. The effect of time and frequency of static stretching on flexibility of the hamstring muscles. *Physical Therapy*. 1997;77(10): 1090-1096.
4. Smith CA. The warm-up procedure: To stretch or not to stretch. A brief review. *Journal of Orthopaedic & Sports Physical Therapy*. 1994;19(1):12-17.
5. Gleim GW, McHugh MP. Flexibility and its effects on sports injury and performance. *Sports Medicine*, 1997;24(5): 289-299.
6. Behm DG, Chaouachi A. A review of the acute effects of static and dynamic stretching on performance. *European Journal of Applied Physiology*. 2002; 111(11):2633-2651.
7. Young WB. The use of static stretching in warm-up for training and competition. *International Journal of Sports Physiology and Performance*. 2007;2(2):212-216.
8. Baxter C, Mc Naughton LR, Sparks A, Norton L, Bentley D. Impact of stretching on the performance and injury risk of long-distance runners. *Research in Sports Medicine*. 2017;25(1):78-90.
9. Power K, Behm D, Cahill FARRELL, Carroll M, Young WARREN. An acute bout of static stretching: effects on force and jumping performance. *Medicine and Science in Sports and Exercise*. 2004;36(8):1389-1396.
10. Wilson GJ, Murphy AJ, Giorgi A.. Weight and plyometric training: effects on eccentric and concentric force production. *Canadian Journal of Applied Physiology*. 1996;21(4):301-315. Available:www.stretchcoach.com
11. Magnusson P, Renström P. The european college of sports sciences position statement: The role of stretching exercises in sports. *European Journal of Sport Science*. 1996;6(2):87-91.
12. McHugh MP, Cosgrave CH. To stretch or not to stretch: the role of stretching in injury prevention and performance. *Scandinavian Journal of Medicine & Science In Sports*, 2010;20(2):169-181.
13. Little T, Williams AG. Effects of differential stretching protocols during warm-ups on high speed motor capacities in professional soccer players. *Journal of Strength and Conditioning Research*. 2006;20(1):203-207.
14. Fletcher IM, Anness R. The acute effects of combined static and dynamic stretch protocols on fifty-meter sprint performance in track-and-field athletes. *Journal of Strength and Conditioning Research*. 2007;21(3):784-787.
15. Yamaguchi T, Ishii K. An optimal protocol for dynamic stretching to improve explosive performance. *The Journal of Physical Fitness and Sports Medicine*. 2008;3(1):121-129.

16. Pearce AJ, Kidgell DJ, Zois J, Carlson JS. Effects of secondary warm up following stretching. *European Journal of Applied Physiology*. 2009;105(2):175-183.
17. Hough PA, Ross EZ, Howatson G. Effects of dynamic and static stretching on vertical jump performance and electromyographic activity. *The Journal of Strength & Conditioning Research*. 2009;23(2):507-512.
18. Evetovich TK, Nauman NJ, Conley DS, Todd JB. Effect of static stretching of the biceps brachii on torque, electromyography, and mechanomyography during concentric isokinetic muscle actions. *The Journal of Strength & Conditioning Research*. 2003;17(3):484-488.
19. Knudson D, Bennett K, Corn ROD, Leick D, Smith C. Acute effects of stretching are not evident in the kinematics of the vertical jump. *The Journal of Strength & Conditioning Research*. 2001;15(1):98-101.
20. Funk DC, Swank AM, Mikla BM, Fagan TA, Farr BK. Impact of prior exercise on hamstring flexibility: a comparison of proprioceptive neuromuscular facilitation and static stretching. *Journal of Strength and Conditioning Research*. 2003;17(3):489-492.
21. Hanabusa H, Moriyasu A, Bando H, Takasugi M, Murakami M. The key to Injury prevention would be. *Daily Stretching for Muscle Flexibility and Strength*; 2021.
22. Unick J Kieffer HS, Cheesman W, Feeney A. The acute effects of static and ballistic stretching on vertical jump performance in trained women. *Journal of Strength and Conditioning Research*. 2005;19(1):206-212.
23. Manoel ME, Harris Love MO, Danoff JV, Miller TA. Acute effects of static, dynamic, and proprioceptive neuromuscular facilitation stretching on muscle power in women. *The Journal of Strength & Conditioning Research*. 2008;22(5):1528-1534.
24. Holt BW, Lambourne K. The impact of different warm-up protocols on vertical jump performance in male collegiate athletes. *The Journal of Strength & Conditioning Research*. 2008;22(1):226-229.
25. Torres EM, Kraemer WJ, Vingren JL, Volek JS, Hatfield DL, Spiering BA, Maresh CM. Effects of stretching on upper-body muscular performance. *The Journal of Strength & Conditioning Research*. 2008;22(4):1279-1285.
26. High DM, Howley ET, Franks BD. The effects of static stretching and warm-up on prevention of delayed-onset muscle soreness. *Research Quarterly for Exercise and Sport*. 1989;60(4):357-361.

© 2021 Gill et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/66647>