

Static, Ballistic and PNF stretching exercise effects on flexibility among Arba Minch football players

Abraham Derbachew ¹

¹ Lecturer, Department of Sport Science, Arba Minch University; Ethiopia
Corresponding Author: Abraham Derbachew

Abstract: Single stretching exercise for several seconds/minutes increase the range of motion. The aim of study is to examine 40 male football project players to determine if static, ballistic and PNF stretching exercise would have better improvement in flexibility performance or not. To achieve the intended objective randomized experimental design is implemented. 40 football players who have been volunteered and fulfilled the inclusion criteria are recruited and randomly grouped in to Control and Experimental group. The first Group CG, were control group and did not perform any designed treatment, the rest EG were experimental group followed six weeks intervention program, they are engaged in static, ballistic and PNF stretching exercise 3 days per week. To see actual changes in groups, sit and reach test used as a standard measuring tool, to this end paired t-test was used to compare mean value. The analysis conducted by SPSS -V 25 and in commenting on the analysis results, significance was rated at $p < .05$ level. As the result shows in the study CG have not seen significant improvement on flexibility, the mean Pre/Post differences and ($p < .05$) were .006 ($p < .98$). Whereas Experimental group EG produced significant improvement in flexibility performance; the mean Pre/Post differences and ($p < .05$) were .81 ($p < .03$) When compared with groups, the Group which received stretching training protocol obtained the greater improvement in flexibility. In line to the result the investigator noticed static, ballistic and PNF stretching exercises are effective for promoting flexibility performance among male football players.

Keywords: Flexibility, static, ballistic and PNF stretching exercise

Date of Submission: 25-02-2019

Date of acceptance: 11-03-2019

I. INTRODUCTION

Single stretching exercise for several seconds/minutes increase the range of motion (RoM) [19, 11]. Stretching is widely used by football players, trainers, coaches, physicians and therapists as a means to maintain, or restore muscle flexibility [7] cited by [26]. Stretching also used as part of physical fitness programs, because it has thought to be positively influence on physical performance and also injury prevention. Numerous studies [2,4,5,6,26] Have been conducted to investigate the effectiveness of stretching. The goal of stretching can vary, including such diversify aims as enhancing sports performance, preventing injury, recovering from following injury, and preventing muscle soreness [10,11]. The three most common stretching methods are static, ballistic, and proprioceptive neuromuscular facilitation (pnf) stretching [8,22,24,36].

Ballistic stretching, so-called low-load static stretching, and proprioceptive neuromuscular facilitation techniques [PNF] are all techniques that have been used to accomplish the goal of stretching [34,13,7,41,36]. Ballistic stretching refers to a technique that uses a repetitive bouncing motion that lengthens the muscle quickly and immediately returns it close to the starting point and it may be beneficial for clients who want to return to competitive sports [38]. These authors [38] further suggested that ballistic stretching should be performed in a controlled manner, thereby decreasing the possibility of injury to the tendon.

Static stretching involves stretching a muscle (or a muscle group) to the furthest point and keeping this position for a definite period of time [37]. Static stretching which is the most common method [43] is composed of gradually lengthening a joint to an elongated position just before the pain starts. The static stretching protocol requires that the stretch be performed in a slow, gradual manner and held at end-range just before the point that causes discomfort to the patient. [7] stated that static stretching is preferred over ballistic stretching because it is energy efficient, thus requiring less energy to perform than the ballistic stretch, and because the probability of injury may be lower than with ballistic stretching.

Proprioceptive neuromuscular facilitation [PNF] includes another stretching technique that used to aid the neuromuscular responses through proprioceptive stimulation [39]. These techniques utilize different combinations of alternating contraction and relaxation of the agonist and antagonist muscle groups to increase

joint range of motion [7,25,38,45]. In these techniques, the agonist, or prime mover which the muscle to be elongated is passively moved to end-range and isometrically contracted, which is followed by an eccentric contraction of the antagonist muscle [13,38]. However PNF techniques may difficult for the subject to understand and typically require another person to perform. Lower-load, static stretching exercises are used in most settings because of their simplicity and the decreased potential for injury [38].

It is generally assumed that a warm up, by increasing tissue temperature, will increase tissue distensibility and reduce the chance of injury, [17,19, 30] Williford et al [46] investigated the effects of jogging prior to stretching compared with stretching alone on shoulder, trunk, hamstring, and ankle flexibility. They concluded that both methods were effective at increasing ROM and flexibility. These warm-ups involve many modalities and can include stretching, heat, changes in tissue temperature by exercise, and even mental conditioning [17,19,30]. Moreover, Increasing hamstring flexibility may decreases lower extremity overuse injuries [10].

As Mazumdar [23], suggested that Even though the six components of physical fitness affect the performance of a player to give good performance without being injured she/he must possess stretching exercise. Astrid J, Jiri Dvořák [3] Stated that Thigh strain is the common football injury, which linked with poor flexibility. In 2014 FIFA World Cup; a total of 104 injuries were reported; which is equivalent to an average of 1.68 injuries/match from this 15/17 (88.2%) of thigh strains occurred without contact due to poor muscle flexibility.

The present study examined 40 male football project players from Arba Minch town to determine if static, ballistic and PNF stretching exercise would increase flexibility within 6 weeks. Therefore, the present study was undertaking with an innate objective of investigating the effect of 6 weeks static, ballistic and PNF stretching exercise on flexibility among Arba Minch male football project players. In addition to this to address the question:

II. MATERIALS AND METHODS

Study area and participant

The study was carried out in Arba Minch town, Found in Southern Nations, Nationalities, and Peoples Region, Ethiopia. Geographically it is located at 6°01'59" N, latitude and 37°32'59" E, longitudes and it is situated at elevation 1269 meters above sea level.

For this study, source of population was Arba Minch male football project players. 40 healthy, under 17 years of age, volunteered to participate and free from injury and drug abuse after signing an informed consent statement, to be eligible for this study, all 40 players were met the pre-requisites, inclusion criteria and completed the study. The subjects had a mean age of 16.46 years (SD=1.48, range=15–17) were selected as study sample by employing comprehensive sampling technique. To this end, samples were randomly assigned in to two equal groups.

Flexibility was measured with a sit-and-reach test [5, 18, 27]. Subjects removed their shoes and sat in the straight leg position with their feet flat against the sit-and-reach testing box. Subjects placed one hand on the other, with the middle fingers aligned and elbows extended. Subjects reached forward with their hands on top of the sit-and reach box, as far as possible, without bending their knees. The feet were considered as zero, and each subject's score was recorded as the distance from the tip of the middle finger to the feet. Both positive and negative scores were thus measurable. Because we were interested only in the change in flexibility, the data are reported as the difference in flexibility pre- to posttest. The best of 3 trials was used.

Study Design

The randomized experimental design was implemented, to this end; the effect of exercise was evaluated by pre and post Sit and Reach Test [44]. In order to instruct each subject on how to correctly perform stretching exercises.

As indicated in Table 1 Prior to the collection of data, all Subjects completed a demographic and general health screening survey, and flexibility were measured with sit and reach test using the standard protocol described by [44] about its validity. Table 1 presents the descriptive statistics of demographics and characteristics of the groups.

Table 1; Demographic data of the subjects

Group	n	Age (y) (Mean ± SD)	Weight (kg) (Mean ± SD)	Height(cm) (Mean ± SD)	BMI (Mean ± SD)
CG	20	16.27 ±1.65	57.30 ± 2.54	155.66 ±5.37	24±2.43
EG	20	16.37 ±1.21	54.13 ± 3.64	157.59 ±3.92	22±1.99

CG= Control Group, EG= Experimental Group, SD=Standard Deviation, MD= Mean Difference

The first Group 1, CG (n=20), were control group and did not perform the stretching protocol, the rest group EG was experimental group followed six weeks intervention program, they were engaged in static, ballistic and PNF stretching exercise 3 days per week.

Experimental Treatments

Experimental group subjects performed suggested stretching exercises protocol in a controlled environment, with the researchers observing and administering the sessions. The subjects in Experimental group performed the stretching exercises protocol.

Stretching Exercise Protocol

After clear orientation has been giving to the participant the experimental groups were engage designed training given from 4:00 PM to 4:30, the subjects were instructed to stretch 3 times per week every other day at approximately the same time of day for 6 weeks. The duration of the whole exercises session was 30 minutes with a 10 second rest period between stretches. Apart from this warm up session consists activity like incremental, synchronized movement of hands and legs, arm circles different types of stretching exercise, Buttock kicks, stepping, buttock kicks, walking, high knees and with steeping the knees in four direction, main session consists Dynamic, Static, Ballistic and PNF stretching and lastly cooling down. The stretching dose was standardized across groups, in terms of its mode, duration, and frequency.

Data Management and Analysis

Before further statistical analysis, the normal distribution was checked. Paired t-test was used to compare mean value of pre and post training result, whereas the difference between groups was tested dependent t-test. The analysis was conducted by SPSS -V 25 and in commenting on the analysis results significance was rated through $p < .05$ level.

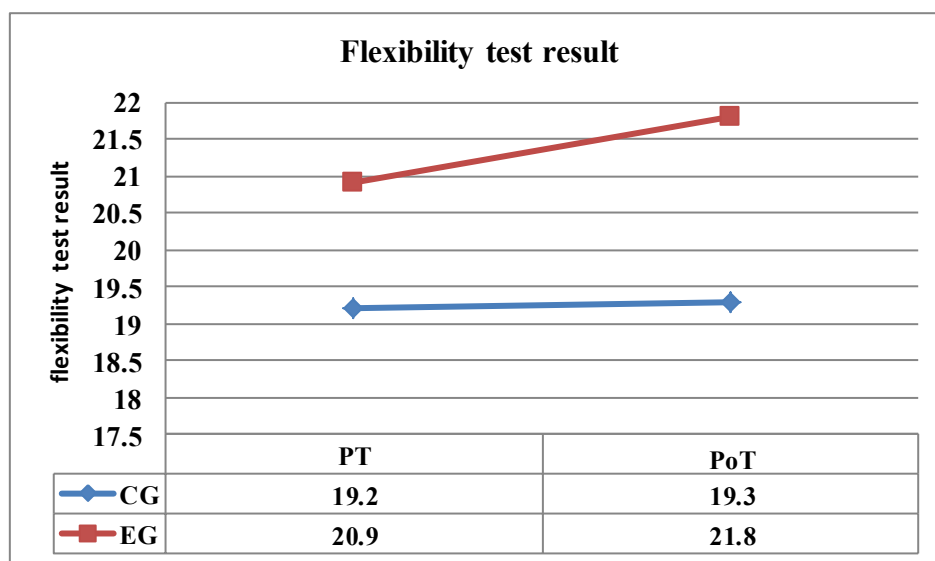
III. RESULTS

Table 2 illustrates the descriptive statistics and T-test result of sit and reach test.

Table 2; Descriptive statistics and T-test result of sit and reach test in Cm

Group	n	PT (Mean ± SD)	PoT (Mean ± SD)	MD	Sig (p< .05)
1 (CG)	20	19.2±2.4	19.3±2.5	.006	.98
2 (EG)	20	20.9±4.0	21.8±4.1	.810	.03

Mean ± SD in the same columns in each parameter are significantly different * $p < .05$. CG= Control Group, EG= Experimental Group, PT=Pre-test, PoT=Post-test, SD=Standard Deviation, MD= Mean Difference



Group 1 (CG) = Control Group, EG= Experimental Group, PT=Pre-test, PoT=Post-test,

The first Group (CG) were control group and did not perform the stretching exercise, Among subjects tested, the significance differences were not found in the measurements over time from pre to post-test in this group, As the result shows in the study CG have not seen significant improvement on flexibility, the mean Pre/Post differences and ($p < .05$) were .006 ($p < .98$). However significant increment was noted in experimental groups (EG) between pre and post-measurements, the mean Pre/Post differences were .81 ($p < .03$) this is due to the effect of stretching exercise protocol they were engaged in. The result illustrated that current stretching exercise protocol had have positive significant result and the investigator noticed that suggested stretching exercise protocol be positive effect on developing and promoting the flexibility performance of football players.

IV. DISCUSSION

[1] conducted study on effects of 6 weeks ballistic stretching training on the properties of human muscle and tendon structures Mean RoM increased significantly from $33.8 \pm 6.3^\circ$ to $37.8 \pm 7.2^\circ$ only in the intervention group. Following a single ballistic stretching intervention, some authors [14] reported decreasing PRT and muscle-tendon stiffness, while others [12] determined unchanged muscle-tendon stiffness.

When the literature is reviewed, there are a great number of studies in line with the results of this study [18, 32, 27]. [8] examined the effects of three different durations (15 sec, 3, sec and 60 sec) of stretching exercises for 5 days a week during 6 weeks on the range of motion of hamstring muscle group, and found out that the highest range of motion was achieved with 60 seconds of static stretching exercises. [8] advocated that the best result for range of motion could be achieved when 60 seconds or longer static stretching was performed. In his study, [28] stated that 15 and 30 seconds of static stretching and warm-up exercises increased flexibility in acute phase. In addition, [28] also found out that when measurements after 15 and 30 seconds of stretching exercises were examined, flexibility values were found to be higher after 30 seconds of stretching exercises. [29] study found a significant difference between the flexibility values after 20 seconds of stretching exercises and no stretching exercises and concluded that 20 seconds of stretching exercises affected flexibility values positively.

V. CONCLUSION

At the conclusion of the study, Among subjects tested, the significance differences were not found in Control Group (CG) over time from pre to post-test, however significant improvement was noted in Experimental Groups (EG) obtained the larger overall mean difference over a 6-week period, which resulted static, ballistic and PNF stretching exercise.

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Abraham Derbachew. "Static, Ballistic and PNF stretching exercise effects on flexibility among Arba Minch football players." *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*. vol. 24 no. 03, 2019, pp 87-92.