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Effect of PNF exercises on the range of hip flexion motion of non-athletes women

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ABSTRACT

The purpose of this study was to study the effect of passive static stretching exercise on one of the important indicators of fitness-hip flexion range of motion among non-athlete women. For this purpose, 24 non-athlete women were randomly selected and divided into two groups of 12 individuals. Before starting the training, the pretest samples were taken from the hip flexion range of motion and then each experimental group continue relevant practices simultaneously for 7 weeks in three 45-minute sessions. At the end of training sessions, after examination of all groups, the results were analyzed by t-student test. Due to PNF training programs, hip flexion range of motion on female staff has shown a significant increase (α=0.05).

Key words: PNF, Flexion, non-athlete, women

INTRODUCTION

Flexibility is a very important duty and performance of human in order to achieve successfully his/her skills and abilities in a wide range of conditions. The high level of flexibility, adaptability not only introduces a factor in preventing injury but also causes a rapid movement to be performed easily and without any pressures. Thus, increasing flexibility is not only to meet the demands and needs of sport skills but it must be somewhat beyond the scope and extent of the required maximum exercise (ability to create and develop flexibility storage) should be strengthened. The lack of flexibility may lead to failure and susceptibility to various disorders. Flexibility is an elastic property of the body. This feature is not only affected by exercise but also the shape and type of joints can influence on it as well [30]. The range of motion in any joint is concentrated to bone structure of the joints and surrounding soft tissues; soft tissues include muscles, tendons, joint capsule, ligament and the skin. Any physical activity or exercise as a usual daily accomplishment for someone can preserve the tensile strength of soft tissue potentially; in contrast the lack of physical activity can lose the tensile/elastic power of the soft tissue. In order to keep the potential of flexibility status the one should change the status of soft tissues and his/her own joints through increasing regular range of motions [15]; the primary goal of flexibility is to increase the capacity of muscle fibers capable the elastic or stretching properties as well; the lack of sufficient activity to stimulate and maintain the readiness of the anti-gravity muscles and the use of muscles tensions doing the exercises of flexibility is necessary for some parts of the body; these parts including, thigh, front hip, back, neck and chest [26]. Given the prevalence of back disabilities and studies about this inability the main factor is related to the lack of flexibility in the region of feet (hamstring muscles), hips and waist [31]. Stretching ligaments and muscles improve the range of motion in major joints of the body and the optimal muscle performance is the initial tension. Hamstring and hip extensor muscles in the supine position is being stretched in a best manner decreasing the factors of backache as well;

flexibility is special important in the parts of front and back thigh muscles and also the hip and iliopsoas muscles are considerably crucial parts. The ability to choose flexibility exercises the more focus is on the range of motion in joints and the selection of appropriate activities to cover all parts of the body. it has been biomechanically stated that the correction performance of the muscles can be achieved through a program [1]. Naseri (2011) research concerning the effects of four different types of tensile strength in the hamstring muscles on the boy students between 18-28 year old showed that 4 types of stretch equally influence on the flexibility. Gheytasi (2009) stated that the four types effects of muscular tensile on the flexibility of hamstring muscles group and the index of active and inactive extension in elite soccer players; the tension of soft tissues such as muscle, tendon, facia, joint capsule and the skin around the joint is necessary for the accessibility to the full range of joint movement during functional activities. To increase flexibility the muscles should be placed under tension [11]. Yuktasir (2009) studied that the long term effects of two types of PNF and static stretching on jumping performance and the range of motion. The results showed that stretching exercises caused an increase to the range of motion in both groups and also they did not effect on jumping scores [32]. Funk et al (2009) concluded in a research the effect of 5min PNF and static stretches on the range of hamstring motion of 40 student athletes that PNF stretching exercises frequently help athletes to increase hamstring motion but they did not find any considerable differences in static stretching exercises [8]. Taheri et al (2008) carried out a research as the three periodical effects (5, 10 and 15s) static contraction in PNF method on hamstring muscles in non- athlete men. The results showed that although the range of hamstring muscles has been increased in the three groups significantly in pre- test than post-test but no any significant differences observed between the groups [29]. Raghi and Nikbakht (2006) compared two methods static stretching and the facilitation of PNF muscular nerve on hamstring muscular flexibility; thus, 60 girl students who had restriction in the flexibility hamstring muscles of dominant leg (70◦ < open active knee range of motion) were divided randomly in to three static experimental and PNF experimental groups. The results showed that static stretching methods and PNF muscular nerve facilitation had effect on the flexibility of hamstring muscles of non -dominant leg (knee active range of motion opening), but statistically there was no any significant difference between the effect of static stretching and PNF methods on the flexibility of hamstring muscles of non- dominant leg [23]. Kopftolis et al (2005) compared the effect of PNF exercises and isokinetic on the distribution of fiber type and cross-sectional area of the fiber. It is seen that, those who support PNF method believe that this method is so beneficial with a wide range than other stretching method's these benefits depend on specific applied pattern [17]. Rezagholizade (2004) compared the effect of two methods exercises of static and PNF stretching (C-R type) on the flexibility of non another hamstring muscles; the results indicated that an eight- week training period of PNF stretching using C-R method (that is, convection- relaxation) lead to increase the range of stretching and hamstring muscles power in no athlete means that this increase statistically is significant [24]. Schuback et al (2004) compared the efficiency of applying slow-Reversal – Hold-Relax method through the subjects and or physiotherapist. The results of the study showed that there is no any significant differences in the mean range of the joints flexion during two programs of stretching on the range of movement and inactive hamstring; they showed that static stretching immediately increased five level of knee motion but these changes along with their effects disappear after some minutes [27]. Feland (2004) reviewed the effect of different static contraction intensities (20-100%) in the method of CRPNE stretching on the development of hamstring range; the results showed that the maximum tensile CRPNE using contraction maximal contraction in the size range is useful and may decrease the risk of injury from PNF stretching with the maximum voluntary isomeric contraction [6]. Bonnar et al (2004) analyzed the relationship between static contraction in HRPNE and the development of hamstring flexibility. The subjects randomly were placed in one of the experimental groups, 1-3 and the results showed that the motion range positively increased in each three experimental group, but between three periods, 6,3,10s of static contraction maintenance in the development of motion range has no found any significant differences [3]. Mirek et al (2003) used PNF method to rehabilitate patients with parkinson disease [18]. They arrived quickly and significant to the standards d- frequency and velocity although stride length and duration of the protection of other- organs did not change significantly. Funk et al (2003) compared the PNF stretching and static exercises on the hamstring flexibility. The results showed that PNF exercises made the maximum development of motion range in this regard [8]. Ghasemi (2001) compared the effect of two method of static and PNF stretching exercises on the increase of athletes knee joint motion (under knee, Amputation) and the results showed that both exercise programs have significant increase on the knee joint movement range. There is no any significant difference between two exercises among the subjects [10]. Burke and Holtt (2001) considered the increase of flexibility in the field of PNF stretching practices along with the adaptations such as adhesion- tension, viscoelastic (collagen and elastin within the muscles- tendon sheath- muscle- tendon) and also the neural adaptations [4]. According to Amghani et al (2009) concluded that, most programs of stretching takes six to 12s were recommended; they also showed that the number of excessive tension is not shown properly one opinion is that the muscles must be stretched to endure pain or discomfort and other opinion is that the excessive stretch must not be increased 10% higher than normal range. Carbin and Nobel have suggested that the weight or external forces (such as an auxiliary) is used to help generate additional traction. According to Rezagholizade (2004), Fano et al. (1980) studied the understanding of mutual nerving and Golji Tendon in the development of flexibility; in other words, the muscles and nervous system are the internal links together. When muscles contract in a direction, the mutual muscles

get lose as a reflex. The opposed muscles contraction, the stretched muscle increases the movement; for example, if a person wants to increase the flexibility of the elbow joints especially when the elbow is bent, the stretch of three-head must be done. This situation is suitable for losing the direction of extensors when two elbow flexors work together. Given the importance of the related presentations and flexibility, it is a question whether stretching PNF effect on woman employees and their hip flexion range of motion.

MATERAILS AND METHODS

This research is an applied and quasi- experimental research in which it has been carried out on experimental and control groups as a field. 24 female non athlete employees of Tabriz Islamic Azad University, ranging between 28-42 year old with no any history of a particular disease randomly and with the aim of PNF effects and its functional indices of hip flexion range were selected. After considering independent variables (stretching) on each of experimental groups, the dependent variable (rang of Hi flexion motion) was evaluated and measured according to its size and effect of stretching exercises.

Subjects lying on their back when the legs are flat on the ground; at that time, PNF method is being performed by subjects as a four-part exercises,

1. Subject is being performed actively the calf muscle stretching to reach to maximum motion range for hamstring muscle stretch from her primary length.
2. Auxiliary person keeps the subject calf on her shoulder to make resistance against subjects' hamstring muscle and isometric contraction. In addition, the subject contracts hamstring muscle for 6-10s,
3. Then, the hamstring muscle will relax.
4. The hamstring muscle immediately is pulled by the opposed muscle contraction (Quadriceps and Psoas mus) for 10- 15 seconds.

Data collection

After determining the number of individuals and their categorization in PNF classes and control group, the rate of hip flexion range of motion in the right leg was measured by goniameter. Thus, the zero- pint of the goniameter placed precisely on the outer fur face of the hop and its fixed arm was placed across the trunk and the moving part was established simultaneously with the right foot moving up, (while the left foot fully extended without bending or rotation and the knee will be placed on the floor) until knee flexion or tension without causing additional pain. Now, it is suggested to move on the outer side of the foot (three seconds) and this measurement with the apposed foot also was measured.

Statistical methods

T- test was used to analyze the hypothesis at level of $\alpha = 0.05$. To analysis of the data, Spss 18 software was applied as well.

RESULTS

Table 1. Changes of hip flexion motion in PNF group and Control group

Group	Index	St. dev	Mean	Min.	Max.	Mean difference	Progress%
PNF	Pre-test	13.773	67.33	48	88	8	12%
	Post-test	13.062	75.33	57	96		
Control	Pre-test	13.369	66.90	56	91	-	-
	Post-test	13.369	66.90	56	91		

Table 1 shows that the mean range of hamstring muscles stretches had 8° increase in the subject's PNF stretches of pre-test than post -test? Also the progression percentage is 12% in this option. Table 1 shows that the mean range of hip flexion in the subjects of PNF stretching group is increased 12% in post- test them pre- test. But no any changes on pre and post-tests of control group.

Table 2. T-test on the range of hip flexion in pre and post-tests.

	Pairs difference			Pairs difference 95% Sig		Test parameters		
	Mean	St. dev.	Mean dev.	Low	High	T	Df	Sig
the range of hip flexion	-8	1.414	0.408	-8.899	-7.101	-19.596	11	0.000

Table 2 shows that the mean range of hamstring muscle stretching is equal in pre and post- test of control group and there is no any change. Considering statistical data and due to the extracted t from t distribution table at level of $\alpha \leq 0.05$, we conclude that the achieved exercises have impact on the range of hip flexion motion**.**

DISCUSSION AND CONCLUSION

The results of the study indicated that a period of 7 weeks of stretching exercises, CRCAPNF is significantly increased the range of hip flexion motion by this way, thus , this method is considered as a desirable way to improve flexibility and muscle strength as well. In the other hand, this increase can be due to the rapid effect of muscular-nervous mechanisms in deep- sense pathways of isometric stretching contractions. Gordon et al (1991) and Hardy (1985) Supported that PNF stretching methods are more flexible than static methods? In their opinions, in these methods, active contractions were applied instead of inactive stretches; an increase of motion range due to PNF abilities for reducing the muscle active tension can be effective? That is, the impact of PNT method comes from the reduction of reflexive activity. Theorists like Moritan (1987), Beaulieu (1981) and Magee (2002) emphasis on the neurophysiological approaches stating that stimuli axons from muscular-nervous branches with controlling axons from Golji tendon organs or both of them are responsible for the impacts of the techniques. Murphy (1991) believes that the cause of most dynamic techniques effects is the increase of metabolite processes in which increases the temperature and decreases the muscle viscosity allowing the muscle slowly gets contracted. The warmed-up muscle easily is being arranged with the forces increasing the flexibility. Moritan (1987) stated that in spite of increasing motion range followed by PNF methods, the activity of Electeromiogrphy in muscles is greater than static stretching method. Hardy (1985) believes that the static stretching of motion range is being double increased than dynamic stretching. Thus, due to a little discomfort of muscles with static stretching method, the tendency is high for applying the method preferably. Frabn et al (2002) and Rolen (2003) believe that the muscular bundle is matched and stops its activity due to the longtime of static stretching method; the result of this match and relaxation leads to increase the length of the muscle; but in line with the results of the 11 day, Worrel and Sullivan stated that there is no any differences between PNF and static or Ballistic stretches. Spernoga et al. (2001) and Bonnar at al also showed that both groups of static and dynamic cause to increase the flexibility of the muscles and hip flexion motion range. Spernoga considers paradoxical problems in different to search results [14]. Other factors such as period of stretching, frequency of stretching and the age of people under study play key role in appearing different results [7, 29]. According to the results of the researches and to prevent the effect of these intervening variables, all indices were equally selected for both groups.

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