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Chair Stretch Technique for Hamstring Flexibility in Office Workers

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Abstract

Hamstring flexibility has been a matter of concern for all age groups in society. Tight hamstrings are associated with back pain and many other clinical conditions. The reason is that tight hamstrings restricts the hip flexion during forward bending as a result compensatory movements are produced due to which spinal joints have to compensate & produce movement. Apart from low back pain, ergonomically long hours of sitting at work place, is also one of the common causes of tight hamstrings in general population. *Methodology:* 40 office workers were included in the study. Range of motion at hip joint by SLR test was measured just prior & immediately after the hamstring stretching in chair stretch position. 18-25 years male and female individuals working with minimum 6 hours of sitting job were assigned in to group A; chair stretch and group B; warm up. *Results:* Group A & Group B showed no significant difference (t=0.884, p=0.05) at the starting of experiment however after stretching was given in group A and control group B was given warm up, a significant difference (t=5.56, p=0.05*) was found between the two groups, as chair stretch group showed more significant improvement in range of motion. *Conclusion:* The study observed that chair stretch was found to be effective in office workers in increasing hamstring flexibility.

Keywords: Chair Stretch; Hamstring Muscle; Flexibility.

Introduction

Flexibility term has been defined in many ways depending on discipline or nature of research however the word has been derived from the Latin *flectereor flexibilis* means ability to bend. In physical education, sports medicine & allied health sciences the simplest meaning of flexibility is Range of Motion available in a joint or group of joints [1]. McGill in 1998 has recommended that sufficient knee & hip flexibility is imperative to spare spine excessive motion during tasks of daily activity [2]. Commonly used clinical tool to measure human body flexibility is sit and reach test which evaluates hamstrings and spinal muscles flexibility at hip, knee and spine.

The Hamstring muscle group consists of the Biceps Femoris, semimembranosus and the Semitendinosus, and posterior part of adductor magnus forming the bulk of the posterior thigh muscles. One of their major characteristics is that they cross two major joints, the hip and the knee. The hamstring muscles are the major flexors of the knee and also aid hip extension.

Tight hamstrings are associated with back pain. The reason is that tight hamstrings restricts the hip flexion during forward bending as a result compensatory movements are produced due to which spinal joints have to compensate & produce movement. This forces the lower back to bend beyond its strong middle range [3].

Apart from these causes, even sitting in the same place for longer hours, such as in office, is also one of the common causes of tight hamstrings in general people. While sitting, the hamstrings do not function and hence are inactive and stay at a shortened length. Persistent long hours of sitting work can increase the risk of hamstring tightness. Also people with sedentary lifestyle may suffer from this condition as it decreases the activity of muscles, while daily activities requires both hip flexion with knee extension such as dressing, therefore predisposing to risk of lower back pain [4]. Due to the location of

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the hamstring muscles, originating from the ischial tuberosities, poor hamstring flexibility may restrict anterior pelvic rotation. This in turn could limit Forward bending range unless compensated for by an increase in lumbar flexion. Large amounts of lumbar flexion on a repeated basis could be a factor in the development of Low Back Pain (LBP). A relationship between hamstring flexibility and limited hip motion has been demonstrated in LBP patients [5]. It was therefore proposed to investigate if such a relationship is also seen in asymptomatic individuals. This may provide reasoning for theories regarding the direction of the causal relationship between hamstring flexibility and hip motion as it excludes pathological factors, such as sciatic nerve tension [6]. Esola et al [5]. in 1996 found the latter part of the forward bending motion occurs mainly at the hips, with a 2:1 ratio of lumbar spine to hip motion between 0°-30°, building to a 1:2 ratio between 60°-90°. Therefore the present study may be more representative of the full pelvic rotation seen during forward bending. This means it is likely that hamstring is most influential when approaching the end of pelvic rotation range. This concurs with the flexion-relaxation phenomenon, whereby at the end of forward bending range hamstring muscle activity is seen to suddenly decrease and the final degrees of motion are passive[7]. The results presented suggest hamstring flexibility influences forward bending in healthy individuals.

Li et al. [8] 1999 found a three week program of daily hamstring stretching lead to an increase in hamstring flexibility. Improved hip motion during forward bending was also seen following the program, which further supports the influential nature of the hamstrings on this movement. A stretching program focusing on the hamstrings may decrease the forces through the hips and lumbar spine.

Hence the above literature indicate towards the role of hamstrings length and the need of its stretching in general population. Effect of prolong stretching has been well documented whereas short term & immediate effect of hamstring stretching has lesser studies in their support. Few studies have been performed investigating the effect of Static stretches less than 30 seconds i.e a short static stretching bout on maximal power output of hamstring muscle. According to Kay and Blazevich's 2011 systematic review, stretching bouts under 30 seconds result in no significant disadvantageous effects on power [9]. In research studies the term "static stretching" has been linked to durations of a single stretch cycle ranging from as few as 5 seconds to 5 minutes per repetition when either a manual stretch or self stretching procedure is employed. If a mechanical stretch provides the static stretch, the time frame can range from almost an hour to several days or weeks [10].

Also commonest static stretching method applied clinically was found to be 90-90 knee extension in supine position (passive) or forward bending in long sitting position (active). Both the positions are difficult to approach in office settings due to their type & place of work however the chair stretching method for hamstring flexibility may be easier to apply. There are two basic ways static stretching can be performed: active or passive.

Active stretching occurs when the individual uses his/her own muscles to hold the stretching position. Active stretching is more beneficial in the development of active flexibility. In passive stretching, an external force holds the static stretching position for the individual. This external force can be an object or a person. Passive stretching eliminates the need for the opposing muscle to contract while stretching. In active static stretching reciprocal inhibition is applied so the opposing muscle groups are contracted whereas in passive static stretching both the antagonist and agonist muscles may be relaxed through the stretch [11].

For example, the quadriceps can be actively stretched by the contraction of the hamstrings to flex the knee. Flexion refers to the movement allowed by some joints of the skeleton that decreases the angle between 2 adjoining bones while extension indicates the motion that increases the angle [11]. The quadriceps are passively stretched by flexing the knee using a chair or object or pulling one's ankle toward their buttocks. This allows both agonist and antagonist muscle to relax while stretching. Passive stretching is preferred when the elasticity of the muscles and connective tissues restrict flexibility and is commonly performed in rehabilitation settings. Since the muscles are in a relaxed state, there is an increased risk of muscle soreness if stretching is performed too aggressively. Active stretching may be more beneficial in improving ROM.

Therefore in view of above findings and recommendations it was hypothesized that active stretch in the form of 'Chair stretch' could be effective in enhancing hamstring flexibility in office workers having long duration sitting work.

Methodology

40 subjects fulfilling inclusion and exclusion

criteria were included in the study from delhi region. A written informed consent was obtained from the patient prior to the study for both the groups, ROM at hip joint by SLR test was measured just prior & immediately after the interventions using full circle goniometer. Selection criteria included normal 18-25 years male and female individuals working with minimum 6 hours of sitting job (full or part time) with hip flexion and ankle dorsiflexion measured within normal range using goniometer. Subjects were evenly assigned to one of the two groups by using a random numbers table. Group A; experimental group had 20 subject which were given static Chair stretch [12] only. The subject was in sitting position at the edge of a treatment table, with the leg to be stretched on the table and the opposite foot on the floor. Then the subject was asked to lean the trunk forward toward the thigh, keeping the back extended so there is motion only at the hip joint. The static stretch was maintained for 30 seconds. This sequence was repeated 3 times with 10-second rest intervals between each stretch (Figure 4).

A Universal goniometer (Figure 1) was used to measure range of motion at hip joint in SLR before & after the hamstring stretching in group A [13]. Subject was placed in the supine position, with both knees extended and hips in 0 degrees of flexion, extension, abduction, adduction and rotation. The knee of the lower extremity being tested was held in full extension. The other lower extremity was kept flat on the examining table to stabilize the pelvis and prevent excessive amounts of posterior pelvic tilt and lumbar flexion (Figure 2). The hip was flexed by lifting the lower extremity off the table. The knee was kept in full extension by applying firm pressure to the anterior thigh. The end of the testing motion occurs when resistance is felt from tension in the posterior thigh and further flexion of the hip causes knee flexion, posterior pelvic tilt, or lumbar flexion. The fulcrum of the goniometer was placed over the lateral aspect of the hip joint, using the greater trochanter of the femur for reference. The proximal arm was aligned with the lateral midline of the pelvis and the distal arm was aligned with the lateral midline of the femur, using the lateral epicondyle for reference (Figure 3).

Group B; control group had 20 subjects and they were made to do warm up exercises including brisk walking 10 minutes and general movements of lower limb such as knee extension (with no hold in end range) for 5min in sitting position on chair. A Universal goniometer was used to measure range of motion at hip joint in SLR before & after the warm-up protocol given in group A. All readings before & after in chair stretch group or control group were recorded three times and average was calculated for record purpose for all subjects.

Results

Comparison of age of subjects between Group A (mean=21.05 SD=2.04) and Group B (mean=20.95 SD=2.06) showed no significant difference. On statistical analysis using One way ANOVA at 95% confidence interval F-value was found to be 25.53 with p-value 0.05 & standard error 5.34. Hence the value varied significantly among the two groups.

Comparison between Pre and Post Values of ROM at Hip Joint in the Group A & B

Group	Total no of patients	Pre intervention mean ± standard deviation	Post intervention mean ± standard deviation	df= 19	t-Test value	p=level of significance
A	20	54.20 ± 5.92	66.70 ± 11.68	19	4.28	0.05*
B	20	54.45 ± 5.92	55.43 ± 5.23	19	0.57	0.25^{NS}

*significant at p<0.05, NS – Not Significant, df – degree of freedom

Group B showed no significant difference (t=0.57 p=0.25) before & after the warm up was given however after stretching was given in group A significant difference (t=4.28, p<0.05) was found in hip ROM. Therefore result of the study signified that chair stretch was found to be effective in increasing hip ROM in office workers.

Comparison of ROM at Hip Joint between the Group A & B Post Intervention

Groups	Total no of patients	Post intervention mean ± standard deviation
A	20	66.70 ± 11.68
B	20	55.43 ± 5.23
t-Test value (p=level of significance)	df=38	t= 5.56 p<0.05*

*significant at p<0.05, df – degree of freedom

Group A & Group B showed no significant difference (t=0.884, p=0.5) at the starting of experiment however after stretching was given in group A and control group was given warm up significant difference (t=5.56, p<0.05) was found between the two groups in hip ROM. Chair stretch group showed significantly higher increase in hip ROM. Therefore results of the study signified that chair stretch was found to be effective in increasing hamstring flexibility in office workers.

Fig. 1: Goniometer

Fig. 2: Measurement of Hip ROM (initial position)

Fig. 3: Measurement of Hip ROM (final position)

Fig. 4: Static Stretch

Discussion

Many people suffer with tight hamstrings. Hamstring injuries are one of the most common musculotendinous injuries in the lower extremity. They occur primarily during high-speed or high intensity exercises and have a high rate of recurrence. Worrel et al [14] stated that a ''lack of hamstring flexibility was the single most important characteristic of hamstring injuries in athletes.'' Static stretching is one of the safest and most commonly performed stretching methods used to increase muscle length [15]. This type of stretch is applied slowly and gradually at a relatively constant force to avoid eliciting a stretch reflex [16]. The resultant increase in muscle length is related to visco-elastic behavior that has been demonstrated with in vitro and in vivo experiments [17]. In the present study, chair stretch group showed significant improvement in hamstring flexibility when compared to control group.

The results of this study agree with other studies that a static stretch is effective in increasing hamstring length [18]. This study also showed that with warm up exercises, no significant change was obtained in hamstring length.

Conclusion

Static stretching is effective in immediately improving hamstring flexibility with a single session of 3 repetition of 30 second in office workers.

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