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# IMMEDIATE EFFECT OF NORDIC HAMSTRING CURL AND DYNAMIC STRETCHING ON SLR90º-90º AND Y-BALANCE TEST–A COMPARATIVE STUDY

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## ABSTRACT

**Background:** A key physiological element of physical fitness is the elasticity of muscles. Occupational inefficiencies might be resulted from a lack of flexibility. The Y-Balance Test is a dynamic balance measurement that has been made more popular. Therefore, the immediate effects of dynamic stretching with Nordic hamstring curls are compared by this study.
90-90 SLR: Also referred to as the Active Knee Extension Test (AKET), the dimension of the hamstrings and the potential for hamstring tightness are measured by the 90-90 Straight Leg Raise Test.
Y Balance Test: Innovative tests that call for motion perception, power, and elasticity are represented by the Star Excursion Balance Test (SEBT) and the Y balance test. For athletics as well as physically demanding individuals, dynamic balance is measured by it, which presents a considerable difficulty.
**Methodology:** The subjects completing the parameters for choosing will be chosen from the ages of 18-25, Following that, everyone was placed into two groups at random. (Nordic hamstring curl and dynamic stretching). A consort form was taken from all subjects before giving the intervention analysis of dynamic flexibility by Y-balance test. The intervention was given for hamstring muscles in the form of Nordic hamstring curls and dynamic stretching. Then post-evaluation, hamstring tightness by SLR 90-90 and Y-balance test will be done.
**Conclusion:** The statistical analysis suggests that both the technique Nordic hamstring curl and Dynamic Stretching show significant improvement in flexibility and dynamic balance.
**Keywords:** Nordic Hamstring Curl, Y- balance test, SLR 90-90

## INTRODUCTION

Being suppleness is considered a very crucial physiological element of physical health required for our daily activity or for athletic events[1]. If a reduction in flexibility occurs, then slowness at working may be given rise to and an element of danger can be presented for various conditions like tension on the skeletal muscles during sports, lower back pain, knee pain, etc [2].

How smoothly movement can be performed is determined by a person's suppleness, which is a quality that improves safety and the best possible physical activity[3]. Restrictions in elasticity can be led to by many factors, such as gender, articular type, connective tissue, and skeletal muscle contraction capacity[3]. According to reports, hamstring tightness is linked to a posterior rotation of the pelvis during standing. [3].

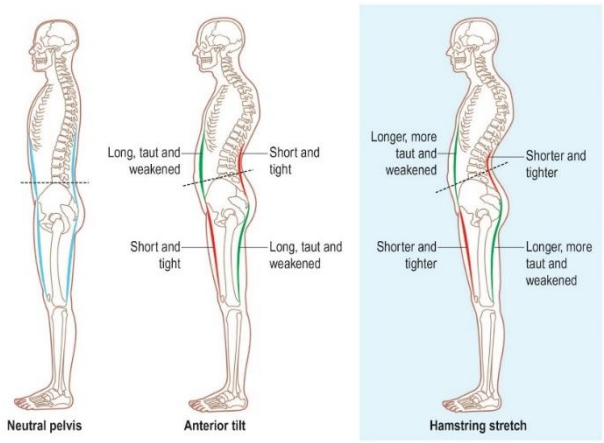


Fig 2 Hamstring tightness and pelvic tilt

The spine in the lumbar region is flattened by a posterior rotation of the pelvis, which may raise the risk of low back discomfort [3]. During first contact and mid-stance, knee flexion is significantly increased when tightness of the gastrocnemius muscles is present. Continuity and flexibility improvement are guaranteed by stretching workouts.

Various stretching methods have been created, documented, and used by coaches, athletic trainers, and physical therapists to increase range of motion and for warm-ups [4]. Prolonged sitting is considered one of the contributing factors to the development of tightness [5]. Flexibility problems are frequently suffered from by both regular individuals and athletes, particularly when it comes to the hamstring muscle group. Plantar fasciitis is also more likely to be experienced by persons with a tight gastrocnemius (along with greater compensatory pronation). The best method for easing muscle tension is aimed to be determined by the research. [5].

Dynamic stretching (DS)— DS is the term for the controlled, typically slow, rhythmic, or repetitive movement of the limb within active range of motion. As an alternative to static stretch, DS has been suggested by recent research because range of motion (ROM) is increased and muscle strength and performance are enhanced. This is because muscle temperature is raised by DS and "Post-Activation Potentiation" (PAP) is produced, which lowers the viscous resistance of muscles. Athletic ability, including muscle strength, jumping, and sprinting, can be enhanced by DS. [6].

Fig 3 Dynamic Stretch

Nordic Hamstring Curls: The acceptance of Nordic hamstring curl training (NHCT) has been seen in recent years, a form of exercise that is characterized by the use of eccentric contractions to strengthen the hamstring muscles and is performed on level ground without the need for specialized equipment. More maximum eccentric muscular strength is required for hamstring muscle activation during NHCT, which incorporates knee and hip joint movements, than for conventional hamstring exercises. The reason this workout is so popular is that body weight is used as resistance and no specific equipment is required. According to a review of the literature, higher jump height, eccentric muscular strength, and muscle activation are demonstrated by NHCT studies. In addition to improving muscular function and lowering the risk of injury, it has been demonstrated by numerous studies that NHCT is a crucial exercise for strengthening the hamstring muscles. [7].

Fig 4 Nordic hamstring Curls

The Y Balance Test: An increasingly popular and sophisticated variation of the classic excursion is the

Y-Test, which only requires excursions in three directions: anterior, posterolateral, and posteromedial. Good reproducibility is exhibited by the Y-Test despite little specialist training being required and it being portable, convenient to administer, and reasonably priced [8]. The stiffness of the hamstring muscles is measured using the 90-90 SLR. A tight hamstring is defined as having an angle less than 125 [9].

## METHODOLOGY

An experimental study was conducted in the Physiotherapy OPD at Marwadi University with a purposive sample of 30 young adult subjects aged between 18–25 years. Individuals were included if they had full passive range of motion (ROM) of knee flexion and hamstring extension and were either male or female [10]. Subjects were excluded if they had a history of lower limb injury, pain, fracture, or surgery involving the back, pelvis, hip, knee, or ankle in the past year; were involved in recreational or flexibility-based sports activities; had inflammatory conditions affecting movement; or had spinal deformities [10]. After obtaining informed consent, participants were randomly assigned into two intervention groups: Group A: Dynamic Stretching and Group B: Nordic Hamstring Curl. Pre-intervention dynamic balance was assessed using the Y-Balance Test [11] and the SLR 90-90 test [12]. The Y-Balance Test required participants to maintain a single-leg stance with hands on the pelvis while reaching in three directions with the opposite leg, with the best of three trials recorded. Hamstring tightness was assessed in subjects using the 90-90 SLR test. The popliteal angle of a person is assessed. A hamstring is deemed tight if the popliteal angle is less than 125 degrees, which is the ideal value. Data was gathered using a standardized procedure; participants were maintained in a supine line position with their hips and knees at 90 degrees to assess hamstring tightness, and the popliteal angle was measured using a universal goniometer. Group A: Dynamic stretching involved standing with feet hip-width apart, swinging the leg forward with the foot flexed, reaching toward the foot with the opposite hand, and alternating legs for 15 repetitions each, coordinated with breathing [4]. Group B: The Nordic Hamstring Curl group performed exercises by kneeling with their heels secured under a fixed object or held by a partner, leaning forward while keeping the hips and spine aligned, and using the hamstrings eccentrically to control descent, catching themselves as needed [13]. Post-intervention evaluation was carried out using the Y-Balance Test and the SLR 90-90 test to assess hamstring flexibility.

## RESULT

Statistical analysis was conducted using SPSS version 23. In statistical analysis of group, A (Table 1) & B (Table 2), the p-value is less than 0.05, which suggests that both techniques are effective for hamstring tightness, but in between group analysis (Table 3), the p-value is more than 0.05, which suggests that there is not a specific one technique that is more effective for hamstring muscle tightness.

| | GROUP A | | | |
|---|---|---|---|---|
| | | PRE<br>Mean ± SD | POST<br>Mean ± SD | P Value |
| Rt. Side | SLR 90º-90º | 38.80 ± 9.60 | 33.13±8.78 | .001 |
| | Y –Balance Test | 352.6±31.0 | 378.8 ± 31.3 | .001 |
| Lt. side | SLR 90º-90º | 38.80 ± 9.60 | 33.13±8.78 | .001 |
| | Y –Balance Test | 348.9±34.2 | 375.3 ± 42.0 | .001 |

Table 1- Group A: Dynamic Stretching P-value

| | | GROUP B | | |
|---|---|---|---|---|
| | | PRE<br>Mean ± SD | POST<br>Mean ± SD | P Value |
| Rt. Side | SLR 90º-90º | 36 ± 8.2 | 29 ± 6.03 | .005 |
| | Y –Balance Test | 328.1±45.0 | 353.5 ± 44.7 | .001 |
| Lt. side | SLR 90º-90º | 34.2±5.1 | 23.67±5.815 | .001 |
| | Y –Balance Test | 327.6±49.4 | 358.6 ± 55.6 | .001 |

Table 2- Group B: Nordic Hamstring Curl P-value

| | | BETWEEN GROUP ANALYSIS | | |
|---|---|---|---|---|
| | | GROUP-A<br>Mean ± SD | GROUP-B<br>Mean ± SD | P Value |
| Rt. Side | SLR 90º-90º | 6.00±2.138 | 5.13±1.99 | .594 |
| | Y –Balance Test | 12.58±4.24 | 7.19±2.77 | .934 |
| Lt. side | SLR 90º-90º | 6.00±2.138 | 5.13±1.99 | .261 |
| | Y –Balance Test | 12.58±4.24 | 7.19±2.77 | 1.000 |

Table 3- P-value for between group analysis

## DISCUSSION

Our study, 'Immediate Effect of Nordic Hamstring Curl and Dynamic Stretching on SLR90°-90° and Y-Balance Test—A Comparative Study,' found that both techniques were individually effective for the hamstring tightness, but when comparing both techniques, there was not any higher effective technique found.

One of the articles, Effects of stretching exercise training and ergonomic modifications on musculoskeletal discomforts of office workers: a randomized controlled trial, is suggested by this study to provide preliminary evidence for the use of ergonomic modification and exercise to improve discomfort for office workers with MSDs. Based on the results of this study, a significant difference was not found among treatment groups after 4 months of intervention, but a significant improvement was shown by all the groups in comparison with the control group (no-treatment) and in comparison, with their baseline scores. It should be noted that a significant improvement was not observed in the ergonomic [14].

Research article the benefit of stretching for hamstring injury recovery: a study of 80 athletes indicates that it is indicated by our findings that stretching is extremely important in treating muscle strain injuries because the efficiency of the rest rehabilitation regimen is improved by it [15].

How dynamic stretching (DS) affected the hamstrings' flexibility in healthy people both immediately and over time was investigated by a recent study. Ten sets of DS, with 15 repetitions per set, were done by the participants, focusing on the hamstrings. The findings were convincing: knee range of motion (ROM) was improved by DS and passive stiffness in the hamstrings was dramatically decreased. At the beginning of discomfort, a brief increase in the pain threshold (PT) was also noted.

These modifications are considered significant since decreased hamstring flexibility and restricted knee range of motion are acknowledged as recognized risk factors for hamstring injuries sustained during athletics (Goldman & Jones, 2011; Woods et al., 2004). It is implied by this data that by improving joint mobility and muscular flexibility, warm-up exercises may be crucial in preventing injuries when DS is added [16].

According to a systematic review and meta-analysis, the incidence of hamstring injuries is lowered by the Nordic hamstring exercise. It is claimed by one article that the risk of hamstring injuries can be cut in half by incorporating the Nordic hamstring exercise into injury prevention programs. Despite the fact that a great deal of variation exists among various sports and among athletes in terms of age and gender, the Nordic hamstring exercise is still considered very effective overall, and it is urged that doctors incorporate it into their preventative programs [17].

The mechanism by which dynamic stretching improves flexibility could be the effects of the dynamic stretching component for increasing ROM post-intervention can One possible effect of an elevated muscle temperature resulting from dynamic stretching is a decrease in muscle viscosity [18].

Passive stiffness has been shown to be reduced by dynamic stretching, and it has also been suggested that tissue extensibility may be improved by raising the temperature through the reduction of the viscous resistance of muscles [18].

After dynamic stretching, a decrease in passive stiffness has been shown. It has also been suggested that muscle viscous resistance may be reduced and tissue extensibility may be improved by raising the temperature [19].

It was found by the study "Effectiveness of Nordic Hamstring Exercise in Improving Hamstring Muscle Flexibility, Strength, and Endurance among Young Adults" that following five weeks of training, hamstring muscle flexibility, strength, and endurance were significantly improved by Nordic Hamstring Exercise as determined by the 30-second sit-to-stand test, modified sphygmomanometer test, and sit-and-reach test, respectively. Therefore, it can be said that young adults' hamstring strength, flexibility, and endurance are increased by Nordic hamstring exercises. It is possible to conclude that an effective training program can be included in a regular exercise regimen, as easy muscle fatigue can be prevented by Nordic hamstring exercises through the improvement of physical fitness parameters like muscle flexibility, strength, and endurance. The efficiency of daily living activities will be increased by this. No special equipment is required for the Nordic hamstring workout, it is simple to perform, and a lot of energy is not required [20].

## CONCLUSION

Our study, 'Immediate Effect of Nordic Hamstring Curl and Dynamic Stretching on SLR90°-90° and Y-

Balance Test – A Comparative Study,' revealed that both interventions demonstrated a comparable and significant impact on improving performance in the Y-Balance Test and SLR90°-90° measurements."

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