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Original Research Article

Immediate effect of sciatic neurodynamic slider and tensioner technique on hamstring flexibility and postural balance in healthy adults: a randomized control trial

Dharmita Yogeshwar*, Tapaswini Sahoo

Alva's College of Physiotherapy, Moodbidri Dakshina Kannada, Karnataka, India

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***Correspondence:**
Dr. Dharmita Yogeshwar,
E-mail: yogidharmita@gmail.com

ABSTRACT

Background: Inadequate hamstring muscle flexibility leads to impaired balance in healthy individuals. So, the present study is conducted to evaluate the immediate effect of neurodynamic slider and tensioner technique on hamstring muscle flexibility and balance in healthy individuals.
Method: Total 42 healthy individuals both male and female age between 18-26 with AKE <70 degree participated in the study. 42 individuals were randomly assigned in two groups. Group A received neurodynamic slider technique followed by group B received tensioner technique. AKE angle was immediately examined before and after the intervention to evaluate hamstring flexibility.
Results: Results is concluded that both slider and tensioner technique are equally effective to improve hamstring muscle flexibility ($p<0.05$) and balance in healthy individuals within the group but. As the findings of between the group shows that both the techniques are equally effective not superior on one another ($p>0.05$).
Conclusions: This study concludes that both the neural slider and tensioner techniques were equally effective in immediately increasing the hamstring flexibility and dynamic postural balance in healthy individuals.

Keywords: Hamstring muscle, Flexibility, Balance, Neurodynamic, Muscle tightness

INTRODUCTION

Muscle flexibility is defined as a muscle's ability to increase its length by completing a range of movement of one join .[1] Flexibility is important factor which enables smooth movement.[2] Limited flexibility impairs normal dynamic balance and function, which thereby results in musculoskeletal impairment, pain and decreased physical performance mainly due to overus.[3] When an individual is unable to extend the knee fully with hip 90 degree flexed associated with discomfort or pain over the posterior compartment of thigh indicates tightness in the hamstring muscle. [4] As Sciatic nerve innervate hamstring muscle so while doing any functional activities like walking, running, jumping sciatic nerve undergoes continuous pressure which has an impact on the neural structure elasticity and it affects the hamstring flexibility and hence is more prone for tightness.[5] Decreased hamstring flexibility could be due to altered neurodynamic affecting the sciatic, tibial, and common fibular nerves.[6] Any mechanical or physiological alterations in the nerve can result in increased mechanosensitivity which is the sensitivity of a nerve to movement that results in pain during movement or any sustained postures.[7] In standing position hamstring work with the hip extensor muscle and maintain standing balance in sagittal plane.[8] Balance is ability of individual to maintain center of gravity with base of support [9] and Gluteus maximus and erector spine maintain the trunk extension by stabilizing the pelvis.[10] When hamstring gets

shortened it causes posterior pelvic tilt and leads to flat back and postural changes along with decrease in AKE range and ankle dorsiflexion along with increase in thoracic kyphosis and it also disturbs gluteus, abdominal and trunk muscle balance and causes standing posture instability.[8,10,11] Neurodynamic technique or neural mobilization is multidimensional manual technique which helps to improve neural and non-neural tissue function.[12,13] It release tension in the nerve [14,15] by moving one or several joints to stretch the nerve bed through both the ends and decreases the neural mechanosensitivity and thus helps in increasing hamstring flexibility and helps to restore dynamic balance.[11,16]

Neurodynamic Slider (NS) is a type of neural mobilization where one end of the neural tissue is elongated and another end is slackened. [17] Neurodynamic Tensioner (NT) is another type of neural mobilization where joint movements are performed simultaneously in which the tension is applied on both sides of the neural structures in order to lengthen the nerve bed.[18] There is bidirectional relationship present between hamstring flexibility, neural tissue mobility and dynamic balance in healthy individuals. Moreover, limited flexibility leads to impaired balance in healthy subjects. So, this study is designed to evaluate and compare the immediate effect of sciatic nerve slider and tensioner technique on hamstring flexibility and dynamic postural balance on healthy individuals.

METHODS

Study setting and design

A Randomized control trial was conducted during September 2022 to December 2022 among healthy individuals after the ethical approval of institutional ethical committee. Data was collected from Alva's college of physiotherapy, moodbidri, Karnataka, India.

Participants requirements

Healthy young adults age between 18-26 years both male and female participated in the study with active knee extension angle less than 70° which indicates hamstring muscle tightness. Participants with musculoskeletal, neurological disorders affecting the lower limb or any previous spine and lower extremity surgery and subjects with knee extension angle more than 70° were excluded from this study.

Data collection and analysis

Randomization of subjects was done using simple random sampling. Further they were screened clinically considering the inclusion and exclusion criteria and the selected healthy subjects were requested to participate in the study. 42 healthy individuals were selected and were divided into two groups. Each group consisted of 21 healthy subjects. Group A received Neural slider technique and Group B received Neural tensioner technique. The nature of the study and intervention was explained to the subjects and those who were willing to participate were included. Before proceeding to intervention, a written consent was taken from subjects.

Intervention

Group A received Neural slider technique in which subject was in high sitting with hands placed behind the back. The cervical spine was extended actively by the subject at the time when the primary investigator extended the intervention side knee with ankle maintained in maximum dorsiflexion. Group B received Neural Tensioner technique in which subject was in high sitting with hands placed behind the back. The cervical spine was actively flexed by the subject with simultaneous extension of the intervention side knee with ankle maintained in maximum dorsiflexion passively by the primary investigator. The frequency of intervention for both groups were 3 sets with 3 repetition each. The stretch was maintained for 30seconds followed by 10sec relaxation after each stretch.

Statistical analysis

The data analysis was done using SPSS 20 for windows. Descriptive statistics were calculated for each group. The paired t test was used to test the significance within group for AKE and Y balance test for both the groups. Unpaired t test was used to test the significance of AKE and Y balance test between the groups.

Sample size estimation

Sample size is 42 by using G*power 3 program with a power of 80%, effect size of 0.8, error probability of 0.05.

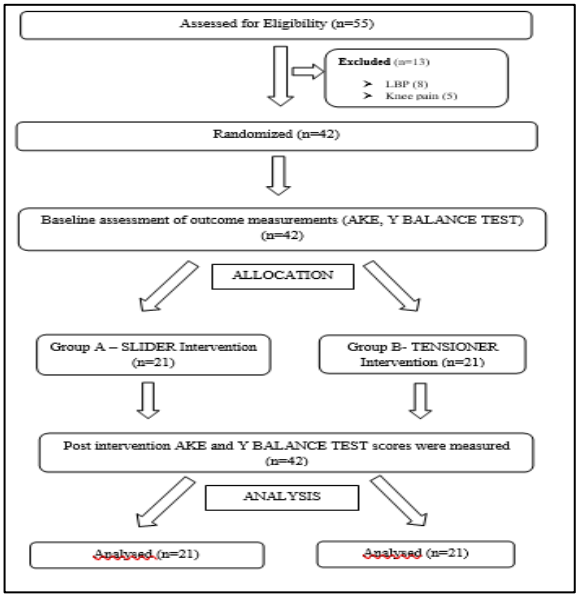

Figure 1: Sample size distribution.

RESULTS

This study investigated the effect of neurodynamic sciatic nerve slider and tensioner technique on hamstring flexibility and postural balance in healthy individuals. Total (n=55) subjects participated in the study out of them N=42 subjects were included in the study on the basis of inclusion and exclusion criteria. The mean value of gender and age of slider group is 1.71±0.463, 20.76±2.548. Mean value of tensioner group of gender and age is 1.67±0.418, 23.05±2.376 (Table 1).

Table 1: Demographic data.

Characteristics	Slider group (Mean±SD)	Tensioner group (Mean±SD)	P value
Gender	1.71 ±0.463	1.67±0.418	0.02
Age	20.76 ±2.548	23.05±2.376	0.105
Side	1.38±0.498	1.29±0.463	0.776

Table 2: Paired t test within the group.

Outcome	Test	Mean±SD		P value	
		Slider	Tensioner	Slider	Tensioner
AKE	**Pre**	46.71±7.058	44.00±7.403	0.000	0.000
	Post	56.71±5.560	51.71±7.030		
Y balance A	**Pre**	75.00±8.660	73.67±13.847	0.000	0.004
	Post	79.10±8.944	76.48±14.531		
Y balance R	**Pre**	72.71±11.394	72.90±14.342	0.004	0.003
	Post	77.24±11.866	77.10±17.222		
Y balance L	**Pre**	69.71±11.607	71.38±14.351	0.012	0.041
	Post	74.62±11.404	75.00±16.233		

Table 3: Standard error and CI.

Outcome	T value		Std. Error		95% CI			
	Slider	Tensioner	Slider	Tensioner	Slider		Tensioner	
					lower	Upper	Lower	Upper
AKE	-11.872	-7.450	0.842	1.035	-11.757	-8.243	-9.874	-5.554
Y balance A	-4.526	-3.233	0.905	0.869	-5.983	-2.208	-4.622	-9.997
Y balance R	-3.255	-2.289	1.390	1.830	-7.423	-1.625	-8.009	-.372
Y balance L	-1.221	-2.188	1.766	1.654	-8.588	-1.221	-7.069	-.169

Table 4: Independent t test/between the group.

Outcome	Test	Mean±SD		P value	
		Slider	Tensioner	Slider	Tensioner
AKE	**Post**	56.71±5.560	51.71±7.029	0.014	0.015
Y Balance A	**Post**	79.09±8.943	76.47±14.53	0.486	0.486
Y Balance R	**Post**	77.23±11.865	77.09±17.22	0.975	0.975
Y Balance L	**Post**	74.61±11.403	75.00±16.232	0.930	0.930

Paired t test/within the group

Results shows that Slider and tensioner technique both are equally effective to improve the hamstring muscle flexibility and balance in healthy individuals as the p value for both groups is <0.05, which shows significant improvement in balance and hamstring flexibility with increase in AKE angle after the intervention. The mean and standard deviation values was higher for both groups, as shown in (Table 2) followed by t value and standard error values with 95% CI is given in (Table 3) Paired t test within the group.

Independent t test/between the group

A significant interaction was found between both the groups and there was less difference found between the p value of slider and tensioner group as the p value is >0.05, which shows that both slider and tensioner technique both are equally effective to improve the hamstring flexibility and balance as the p value for Y balance test and AKE is more than 0.05 as shown in (Table 3), and the standard error and confidence interval values is mentioned in table 4 Independent T test/between the group. Results is concluded that both slider and

tensioner technique are equally effective to improve hamstring muscle flexibility (p<0.05) and balance in healthy individuals within the group but. As the findings of between the group shows that both the techniques are equally effective not superior on one another (p>0.05).

Table 5: Standard error and CI.

Outcome	T value	Std. Error	95% CI	
			lower	Upper
AKE	2.556	1.955	1.047	8.952
Y balance A	0.703	3.723	-4.906	10.144
Y balance R	0.031	4.563	-9.080	9.366
Y balance L	-0.088	4.329	-9.130	8.368

DISCUSSION

This study aimed to compare the immediate effect of sciatic nerve slider and tensioner technique on hamstring flexibility and dynamic postural balance on healthy individuals. The result revealed that both sciatic nerve slider and tensioner technique have a positive and similar effect on healthy individuals. Both the groups showed increase in the AKE and Y balance immediately after the application but did not have a significant advantage over each other in terms of increasing the hamstring flexibility and dynamic postural balance.

On application of the neural slider and tensioner technique the tension mainly occurs in the nervous system which in turn increases the pressure within the nerve due to the decrease in cross-sectional area, the axonal transport system lengthens the sciatic nerve after shortening due to the influence of the surrounding related structure. The extensibility of the neural structures contributes to the musculoskeletal flexibility and muscle performance is also enhanced because of the increase in the number of muscle fibers segments and cross-sectional area of the muscle fibers.

The result of the present study support those of the previous study by Sharma et al who in their study concluded that neural slider and tensioners techniques along with static stretching were equally effective in increasing hamstring flexibility, as the p value of slider and tensioner technique is 0.00 which shows significant improvement in AKE angle in present study.[7] Nunes et al compared the effects of nerve slider and tensioner technique applied to femoral, sciatic and tibial nerves to static stretch on vertical jump and dynamic balance assessed using star excursion balance test and reported no difference between interventions for any of the measures.[12-18] Findings are similar in present study, in both the groups improvement in Y-balance test is seen but it is more significant in anterior (p=0.00, 0.04) and right side (p=0.004, 0.003) in comparison to left side (p=0.012.0.041) of Y-balance test (Table 2).

According to Cabellero et al neurodynamic sliding technique has a positive effect in increasing the hamstring flexibility in healthy male soccer players.[19] Similarly, Ferreira et al concluded that both sliding and tensioning neural mobilization techniques were equally improved static postural control and lower limb performance in young athletes.[20] As the findings is similar to current study. However, Ahmed et al revealed that neurodynamic slider technique has a greater short-term effect in improving hamstring flexibility more than the static stretching.[5] Similarly in present study there was no significant difference was found with in the group in increasing the hamstring flexibility (p<0.001) and dynamic postural balance (p<0.05) but there was significant difference was seen between the groups (p>0.05) suggesting that both are equally effective neither technique being superior to other.

Present study only examined the immediate effects of a single episode instead of evaluating long term and short-term effects among both the groups. However, follow up was also not given to all the participants and the author was not able to identified that how long the flexibility and postural balance was maintained in the muscle. All the findings shows that neurodynamic technique are effective to improve flexibility and balance in healthy individuals.

CONCLUSION

This study concludes that both the neural slider and tensioner techniques were equally effective in immediately increasing the hamstring flexibility and dynamic postural balance in healthy individuals.

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