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COMPARISON OF EFFECT OF SLUMP STRETCHING AND SLUMP SLIDER TECHNIQUES ON HAMSTRING MUSCLE FLEXIBILITY AND NON-SPECIFIC LOW BACK PAIN IN COMPUTER USERS: A RANDOMIZED CONTROL TRAIL

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ABSTRACT

Non-specific low back pain is a global diseased situation displaying its prevalence as high as 84% out of which chronic marked as 23%. Postural LBP is very common occupational health problem among computer users and 8 out of 10persons working more than 8hours are exposed to backache. Prolonged sitting augment stress on lumbar spine of computer users. Clinical data has suggestive that hamstring tightness affects the lumbar pelvic rhythm. The objective of the study was to compare the effect of slump stretching and neurodynamic slider techniques on hamstring muscle flexibility and non-specific low back pain in computer users. A single blinded randomized clinical trial was conducted at Physiotherapy Department DHQ Hospital Kasur. Twenty six computer users with reduced hamstring flexibility (KEA >20) and with non-specific LBP were randomized into two groups. Group A was treated with neurodynamic tensioner (NT) and group B was treated with neurodynamic slider (NS) with baseline treatment of hot pack for 15 minutes, applied on posterior aspect of thigh. Outcome measures were KEA in degrees and NPRS. Data was collected and analyzed by using SPSS software version 17. Results showed that there was significant ($P<0.05$) decrease in pain intensity and improvement in hamstring muscle flexibility in both groups. But group B results showed more significant decrease in pain intensity and increased improvement in hamstring muscle flexibility.

Keywords: Non-specific low back pain, Neurodynamic tensioner, Neurodynamic slider, Flexibility

INTRODUCTION

Non-specific low back pain is the pain which is not related to an identifiable known specified pathology e.g. inflammatory disease, infection, structural deformity, lumbar spine fracture, tumor, osteoporosis, and radiculopathy or cauda equina syndrome. It has been reported that 11-12% of the population globally suffered from LBP out of which 84% acute and 23% are chronic sufferers **[1]**. Persistent use of computer for extended period of time is causing increase in LBP **[2]**, mostly people who spend more than 4 hours complaint for back pain **[3]** the relationship between LBP and prolonged posture maintenance has been already established **[4]**. Clinical findings had suggested that hamstring tightness affects the lumbar pelvic rhythm moreover the forward bending, is the most frequent movement in daily life activities while tight hamstrings may increase mechanical stresses and injury to the lumbar spine **[5]**. It is stated that by elongating the hamstrings, may allow greater range of motion at hips and therefore may reduce lumbar spine stress **[6]**. Muscle tissue extensibility changes may occur from affecting the mechanical properties of the stretched muscle, individual's perception of stretch or pain. This mean that, by stretching muscle, hamstring range is increased not because of structural changes of muscle but rather due to adoption of altered perceptions of stretch or pain **[7]**. Changes in neurodynamics (movement of the nervous system) could modify these sensations **[8]**. Stretching exercise is the mostly used therapeutic technique to improve and maintain muscle length, several stretching methods are used including the static stretching, contract-relax stretching, ballistic stretching and neurodynamics. Static stretching is done in a static state without any additional movement other than the motion of the muscle stretch; it works to improve viscoelastic properties and tolerance to muscle stretch **[9]**. On the other handsliding techniques of the nerve are suggested to decrease mechano-sensitivity by improving the tolerance of nerve tissue to mechanical forces during movement. Nerve related pain is treated by two types of nerve mobilization techniques. First one is "Tensioners" which is common intervention and involve elongation of the nerve bed, whereas "Sliders" involving combination movements at different joints, the elongation at one nerve bed is balanced by a reduction in the length of the nerve bed at another joint **[10]**. Previous studies exhibited that, the sliders technique is the less aggressive, hence it is more suitable for acute conditions and post-operative management. Neurodynamics is integrated biomechanical, physiological, and

morphological functions of the nervous system. So it is necessary for the nervous system that enables neural tissue to adapt to mechanical loads. It has mechanical properties of sliding, elongation, angulation, compression and cross sectional changes. If these protective techniques fail, nervous system is endangered to neural edema, hypoxia and ischemia, which can cause altered neurodynamics. Neurodynamic techniques help in restoration of nerve gliding, nerve adherence, increased neural vascularity and dispersion of noxious fluid **[11]**. It is clear that stretching intervention could revise the neurodynamics by amending these sensations and increasing the extensibility **[12**]. Sciatic nerve sliding technique improved balance and hamstring flexibility **[13]**. Previous findings suggest that neurodynamic slider has greater influence on hamstring flexibility than static stretching in participants with short hamstring syndrome (SHS) **[14]**.

METHODOLOGY

Study design: This study was a single blinded randomized clinical trial, was conducted in Physiotherapy department DHQ Hospital Kasur. **Study Size and Grouping**, A total of 26 individuals were selected randomly divided subsequently in to two groups.

Group A: slump tensioner with baseline treatment.

Group B: Slump slider with baseline treatment.

Sampling technique: Non probability purposive sampling technique was used.

Data collection tool:

Numeric pain rating scale **[19]**. Active knee extension angle with goniometer **[20]**.

Measurement of Knee Extension Angle:

It was calculated by measuring the angle between the intersecting lines of thigh (tape marks 5cm distal to greater trochanter and 5cm proximal to lateral femoral epicondyle) and leg (tape marks 5cm proximal to fibular head and 5cm proximal to the inferior to lateral malleolus). Study participants were in a supine position with the left lower extremity in zero degree hip flexion and right extremity was kept in 90-90 hip knee flexion position stabilized by stabilizing belt. Subjects then allowed to actively extend their right knees to its limit, keeping foot in relaxed position. Universal 360 goniometer was used to measure the degree from full extension. Subjects who demonstrated knee flexion angle greater than 20 degree were considered as having hamstring inflexibility and were enrolled in this study.

Intervention:

Neural mobilization interventions to both group A and group B were provided by a therapist trained in neurodynamic techniques. First, hot pack was applied on posterior aspect of thigh for 15 minutes as

baseline treatment in both group A and group B. Group A received neurodynamic tensioner. For the performance of this technique patient was in high sitting position with flexion at thorax and lumbar spine and hands behind the back. The therapist then flexed the cervical spine his-self with simultaneous knee extension of experimental side with foot positioned in dorsiflexion. The cervical spine was then extended with flexion of the knee.

Group B received neurodynamic slider. This was performed in the same position as tensioner. The therapist passively extended the cervical spine, at the same time participant actively extended both knees with both feet in full dorsiflexion position. The cervical spine was then passively flexed while maintaining thoracolumber flexion, when the participants flexed both the knees.

Dosage of intervention:

Group A participants were given three sets of neural tensioner in sitting position (10, 15 and 20 repetitions) with baseline treatment of hot pack for 15 minutes on posterior aspects of thigh. Group B participants were given three sets of neural slider in sitting position (10, 15, 20 repetitions) with baseline treatment of hot pack for 15 minutes on posterior aspects of thigh. In NT and NS techniques, position was maintained for a second at the end and both movements were completed in two seconds. Three treatment sessions on day one, day three and day five were given to study participants. On follow up visits the patients were reassessed by the researcher. The researcher performed AKE and measured ROM by Goniometer. Pain intensity was measured by the NPRS. All 26 participants received a total of 3 treatment sessions over 1 week, which consisted of three assessments. 1st assessment was done on 1st day. Second assessment was done on 3rd day and third assessment was done on 5th day. 1st assessment was considered as baseline and final assessment was considered as treatment outcomes **[16]**.

RESULTS

In the present study two groups were included according the inclusion and exclusion criteria First group was named as Group A it included 13 subjects and other group was named as Group B it also included 13 subjects.

Out of 100 % , 42.3% subjects were Male and 57.3% subjects were Female. Total 9 subjects were from age group 20-26 yrs, 6 subjects were from 27-30 yrs, 6 from age 32-35 and 5 subjects from 36-40 yrs, 26.9% were single and 73.1% were married. Subjects were questioned about their weight and height, by using the formula (kg/m^2) BMI was also calculated. When data was analyzed we came to know that 7.7% subjects were underweight, 46.2%

subjects were having normal BMI, 34.6% subjects were overweight and 11.5% subjects were obese. Subjects were questioned about their sleeping time and 69.2% responded that they have 6 hours of sleep, 15.4% subjects responded that they have 7 hours of sleep while 15.4% responded that they have 8 hours of sleep. When subjects were questioned about their sitting hours 61.5% responded with 8 hours of sitting, 19.2% subjects responded to 9 hours of sitting , 6 hours of sitting were responded by 3.8% subjects, 11.5% responded that they have 7 hours of sitting and 3.8% responded that they have 10 hours of sitting. When subjects were questioned about their forward bending 76.9% responded positive and 23.1% subjects responded negative.15.4% subjects had sedentary life style and 84.6% had Active life style.

88.5% subjects responded that they use back support in chair and 11.5% said they do not use back support in chair. 46.2% subjects responded with the use of hard bed and 53.8% subjects responded with the use of Soft bed. During the-pretreatment assessment of subjects we came to know that in group A all the subjects presented with severe pain. In group B 11(84.6%) subjects were with severe pain while 2 (15.4%) subjects were with moderate pain. After the first treatment session in group A number of subjects with moderate pain were 3(23.1%) and subjects with severe pain were 10(76.9%). In group B after first treatment session mild pain was in 1(7.7%) subject, moderate was in 9(69.2%) subjects and severe pain was in 3(23.1%) subjects. After second treatment session during the assessment we came to know that subjects with moderate pain in group A were 12(92.3%) and with severe pain was 1(7.7%). In group B 7 (53.3%) subjects were with mild pain, moderate was in 4 (30.8%) subjects and severe was in 2 (15.4%) subjects. When third treatment session was given and assessment was undertaken in group A mild pain was in 1 (7.7%) and moderate was in 12(92.3%). In group B mild was in 12(92.3%) and moderate pain was recorded in 1(7.7%).

The group statistics for NPRS at pre-treatment level: The mean score was 9.08 and SD was 0.641 for Group A, where as in Group B mean score was 8.23 and SD was 1.013 **(Table 1)**. Comparison of means at pre-treatment level of assessment, by using independent t-test showed that assuming equal level of variances mean, there found significant difference of p value 0.018 with a difference of means found to be0.846, while degree of freedom was 24 **(Table 2)**.

The group statistics for NPRS at 1st - treatment level: The mean score was 7.92 and SD was 0.760 for Group A, whereas for Group B mean score was 6.62 and SD was 0.961 **(Table 1)**. Comparison of means

after 1st treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.001 with a difference of mean to be 1.308 with degree of freedom 24 **(Table 2)**.

The group statistics for NPRS at 2nd - treatment level:

Mean score was 6.77 and SD was .725 for Group A, where as in Group B mean was 4.92 and SD was 1.935 **(Table 3)**.

Comparison of means after 2nd treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.004 with a difference of mean to be 1.846 with degree of freedom 24 **(Table 4)**.

The group statistics for NPRS at 3rd - treatment level:

The mean score was 6 and SD was 0.408 for GROUP A, where as in GROUP B mean was 3.08 and SD was 1.84 **(Table 1)**. Comparison of means after 3rdtreatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.000 with a difference of mean to be 2.923 with degree of freedom 24 **(Table 2)**.

Group statistics for AKE test at pre-treatment level:

The mean score was 32.69 and SD was 4.837 for Group A, where as in Group B mean score was 38.85 and SD was 7.679 **(Table 1)**. Comparison of means at pre-treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.022 with a difference of mean to be 6.154 with degree of freedom 24 **(Table 2)**.

Group statistics for AKE test at 1st treatment:

The mean score was 43.46 and SD was 6.887 for Group A, whereas for Group B mean score was 51.54 and SD was 6.887 **(Table 1)**. Comparison of means at 1st treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.006 with a difference of mean to be 8.077 with degree of freedom 24 **(Table 2)**.

Group statistics for AKE test at 2st treatment:

Mean score was 48.85 and SD was 5.064 for Group A, where as in Group B mean was 61.15 and SD was 8.204 **(Table 1)**. Comparison of means at 2nd-treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.00 with a difference of mean to be 12.308 with degree of freedom 24 **(Table 2)**.

Group statistics for AKE test at 3rd treatment:

The mean score was 55.77 and SD was 5.718 for Group A, where as in Group B mean was 70.0 and SD was 5.774 **(Table 1)**.

Comparison of means at 3rd -treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.000 with a difference of mean to be 14.231 with degree of freedom 24 **(Table 2)**.

Paired sample statistics

In group A pre-treatment mean of NPRS was 9.08 and mean of AKE was 32.69 but after 3rd treatment mean of NPRS was 6 and AKE was 55.77. In group B pre-treatment mean of NPRS

Was 8.23 and mean of AKE was 38.85 but after 3rd treatment mean of NPRS was 3.08 and AKE mean was 70 **(Table 3)**.

Paired sample T test

Comparison of means of NPRS of pre and post treatment in group A, using paired sample t- test showed that there was significant difference p value 0.000

Comparison of means of AKE of pre and post treatment in group A, using paired sample t-test showed that there was significant difference of p value 0.000.

Comparison of means of NPRS of pre and post treatment in group B, using paired sample t- test showed that there was significant difference p value 0.000

Comparison of means of AKE of pre and post treatment in group B, using paired sample t-test showed that there was significant difference of p value 0.000 **(Table 4)**.

Table 1: Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
NPRS pre-treatment	A	13	9.08	.641	.178
	B	13	8.23	1.013	.281
NPRS after 1st treatment	A	13	7.92	.760	.211
	B	13	6.62	.961	.266
NPRS after 2ndt treatment	A	13	6.77	.725	.201
	B	13	4.92	1.935	.537
NPRS after3rd treatment	A	13	6.00	.408	.113
	B	13	3.08	1.847	.512
AKE pre treatment	A	13	32.69	4.837	1.342
	B	13	38.85	7.679	2.130
AKE after 1st treatment	A	13	43.46	6.887	1.910
	B	13	51.54	6.887	1.910
AKE after 2nd treatment	A	13	48.85	5.064	1.404
	B	13	61.15	8.204	2.275
AKE after 3rd treatment	A	13	55.77	5.718	1.586
	B	13	70.00	5.774	1.601

Table 2: Independent Samples Test

		t	df	Sig. (2-tailed)
NPRS pre-treatment	**Equal variances assumed**	**2.546**	**24**	**.018**
	Equal variances not assumed	**2.546**	**20.276**	**.019**
NPRS after 1st treatment	**Equal variances assumed**	**3.850**	**24**	**.001**
	Equal variances not assumed	**3.850**	**22.787**	**.001**
NPRS after 2ndt treatment	**Equal variances assumed**	**3.222**	**24**	**.004**
	Equal variances not assumed	**3.222**	**15.305**	**.006**
NPRS after3rd treatment	**Equal variances assumed**	**5.573**	**24**	**.000**
	Equal variances not assumed	**5.573**	**13.170**	**.000**
AKE pre treatment	**Equal variances assumed**	**-2.445**	**24**	**.022**
	Equal variances not assumed	**-2.445**	**20.227**	**.024**
AKE after 1st treatment	**Equal variances assumed**	**-2.990**	**24**	**.006**
	Equal variances not assumed	**-2.990**	**24.000**	**.006**
AKE after 2nd treatment	**Equal variances assumed**	**-4.603**	**24**	**.000**
	Equal variances not assumed	**-4.603**	**19.984**	**.000**
AKE after 3rd treatment	**Equal variances assumed**	**-6.315**	**24**	**.000**
	Equal variances not assumed	**-6.315**	**23.998**	**.000**

Table 3: Paired Samples Statistics

Group			Mean	N	Std. Deviation	Std. Error Mean
A	**Pair 1**	**NPRS pre-treatment**	**9.08**	**13**	**.641**	**.178**
		NPRS after3rd treatment	**6.00**	**13**	**.408**	**.113**
	Pair 2	**AKE pre treatment**	**32.69**	**13**	**4.837**	**1.342**
		AKE after 3rd treatment	**55.77**	**13**	**5.718**	**1.586**
B	**Pair 1**	**NPRS pre-treatment**	**8.23**	**13**	**1.013**	**.281**
		NPRS after3rd treatment	**3.08**	**13**	**1.847**	**.512**
	Pair 2	**AKE pre treatment**	**38.85**	**13**	**7.679**	**2.130**
		AKE after 3rd treatment	**70.00**	**13**	**5.774**	**1.601**

Table 4: Paired Samples Test

Group			T	df	Sig. (2-tailed)
A	**Pair 1**	**NPRS pre-treatment - NPRS after 3rd treatment**	**14.606**	**12**	**.000**
	Pair 2	**AKE pre treatment - AKE after 3rd treatment**	**-15.941**	**12**	**.000**
B	**Pair 1**	**NPRS pre-treatment - NPRS after 3rd treatment**	**8.953**	**12**	**.000**
	Pair 2	**AKE pre treatment - AKE after 3rd treatment**	**-24.239**	**12**	**.000**

DISCUSSION

Hamstring flexibility is more important as its tightness can cause abnormal biomechanics of body. It has greater impact on lumbopelvicrhthm and knee joint ROM because it is two joint muscles as hip and knee. Decreased hamstring flexibility can cause LBP. Different studies have been conducted regarding role off static stretching, ballistic stretching and PNF stretching etc. in improving hamstring flexibility. In this study two different neurodynamic techniques was used to improve hamstring flexibility and LBP, NPRS and AKE test was used to measure improvement in pain and hamstring flexibility respectively. Different studies were conducted to add role off neurodynamic treatment on hamstring muscle flexibility but limited data was available on comparison between tensioner and slider techniques. Group statistics of

NPRS at pretreatment level showed that pain intensity was slightly higher in group A.

Comparison of means of NPRS between Group A and Group B at pre-treatment level of assessment, by using independent t-test showed that assuming equal level of variances mean, there found significant difference of p value 0.018 with a difference of means found to be 0.846. But after 1st treatment, comparison of means using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.001 with a difference of mean to be 1.308. Comparison of means after 2nd treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.004 with a difference of mean to be 1.846. Comparison of means after 3rd treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.000 with a difference of mean to be 2.923. The above mention results showed there was improvement in both groups but group B slider intervention was better in improving pain intensity than group A with tensioner intervention.

Comparison of means of AKE test at pre-treatment of group A and group B, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.022 with a difference of mean to be 6.154. Comparison of means at 1st treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.006 with a difference of mean to be 8.077. Comparison of means at 2nd treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.00 with a difference of mean to be 12.308. Comparison of means at 3rd treatment, using independent samples t-test showed that assuming equal variances mean, there found significant difference p value 0.000 with a difference of mean to be 14.23. These results showed that there is a significant difference in means of AKE at pretreatment and post treatment level in each group. Result concluded that slider technique has greater effect in improving hamstring muscle flexibility than slider technique. Paired sample T-test was used for within group comparison, result showed significant decrease in pain intensity in both groups. But it was marked decrease in group B. Hence pre and post intervention hamstring flexibility was improved in both groups but there was greater increase in group B than A.

So from abovementioned results we can conclude that the SLIDDER treatment which was given to the group B responded

much better than the tensioner treatment which was given to the group A. This study has limitations as there is no follow up and it is carried out on small sample size. By controlling bias and by taking large sample size further investigation can be carried out in future.

CONCLUSION

Two treatment protocols the tensioner which was applied to the group A and the Slidder treatment protocol which was applied to the group B were assessed by using valid outcome measures NPRS and the AKE test. NPRS was used to rate the pain and AKE was used to observe the range of knee joint. After analyzing the results we came to know that results of the Slidder treatment protocol were much better than the outcomes of the Tensioner treatment protocol.

CONFLICT OF INTEREST

Author found no conflict of interest.

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