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RESEARCH ARTICLE

THE EFFECT OF SUBOCCIPITAL MUSCLE INHIBITION TECHNIQUE FOR IMPROVING HAMSTRING LENGTH IN PATIENTS WITH HAMSTRING TIGHTNESS

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ABSTRACT

Aim of the study: The aim of the study is to find out the effect of suboccipital muscle inhibition technique for improving hamstring length in patients with hamstring tightness. **Method of Study:** 30 male subjects were selected randomly with the age limit of 20 to 40 years with hamstring tightness, received the treatment (suboccipital muscle inhibition) for 5 minutes. Outcome measures are assessed before and immediately after the treatment by using popliteal angle test and forward flexion distance test. **Result:** Data analyzed and result indicates that there was a significant improvement in hamstring length in patients treated with suboccipital muscle inhibition technique. **Conclusion:** From the study it was concluded that the suboccipital muscle inhibition technique significantly improves the length of the hamstring in patients with hamstring tightness.

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INTRODUCTION

Hamstring is one of the commonest muscles that often get tight. Hamstring tightness increases apparently from childhood up to age 40 and its incidence is higher in males than females. Inadequate hamstring flexibility will alter the lumbar pelvic rhythm can cause low back pain may increase the chance of lower extremity injuries, hamstring strains, patellofemoral pain and also affect the Posture and gait. Various treatment techniques are available to meet hamstring tightness such as muscle energy technique, positional release technique, myofascial release and different stretching techniques. The important of suboccipital muscle inhibition technique for cases of upper cervical spine treatment is well accepted but its relationship with other structures has not yet been identified.

Erika Quintana Aparico, et al; studied the effectiveness of suboccipital muscle inhibition technique for treating hamstring tightness. The study suggested that the possible hypothesis that hamstring muscle act as postural control of suboccipital muscles. The suboccipital muscle inhibition technique relaxes the tension in the muscles located between the axis and occiput which regulates the upper cervical vertebrae. Suboccipital muscles are: rectus capitis posterior major, rectus capitis posterior minor, oblique capitis inferior and oblique capitis superior. The Main function of these muscles is to regulate body posture and rotation of the head. Hamstring flexibility increases due to relaxation of the myofascia as the tone of suboccipital muscles falls,they are connected by one neural system, which passes through the duramater known as superficial back line.

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SUPERFICIAL BACK LINE

The superficial back line is a continuing line of fascia and muscle from head to heel it includes plantar tissues, triceps surae, hamstring, sacrotuberous ligament, erector spinae, suboccipitals and the epicranial fascia. Suboccipital muscles are considered to be the control center of superficial Back line because these muscles have link to the duramater [covering of the spinal cord]. In suboccipital muscle inhibition technique, patient comfortably in supine lying and can be easily administered by the therapist inducing relaxation of the fascia by applying pressure softly to the suboccipital area. The popliteal angle test and forward flexion distance test were used to evaluate the flexibility of the hamstring. The values are measure before and immediately after the intervention. The aim of the present study is to find out the efficacy of suboccipital muscle inhibition technique in improving flexibility of tight hamstring muscles.

STATEMENT OF THE STUDY: A study to access the effectiveness of suboccipital muscle inhibition technique for improving hamstring length in patients with hamstring tightness

AIM OF THE STUDY: Aim of the study is to find out the effect of suboccipital muscle inhibition technique for improving hamstring length in patients with hamstring tightness.

NEED OF THE STUDY: Hamstring muscle flexibility is important for the effective for hip and knee joint, if there is hamstring tightness, it hinders the normal function of hip and knee joint.It is one of the commonest causes of Low backache leading to pain and dysfunction. Nowadays hamstring tightness treated by static and dynamic stretching is commonly used intervention among the Physiotherapists. But in some instances the pain may aggravate during these stretching techniques. But in suboccipital muscle inhibition technique,there won't be increase in pain, because it indirectly treats the area. So there arises a need to study the effect of suboccipital muscle inhibition technique in improving hamstring flexibility.

HYPOTHESIS

Null hypothesis: There is no significant increase in hamstring length in patients treated with hamstring tightness by suboccipital muscle inhibition technique.

Alternate hypothesis: There is a significant increase in hamstring length in patients treated with hamstring tightness by suboccipital muscle inhibition technique.

OPERATIONAL DEFINITION

Hamstring Tightness: Tight hamstring refers to a muscle that is having difficulty in relaxing due to excessive tension which limits functioning and possibly causes pain.

Suboccipital Muscle Inhibition: Suboccipital muscle inhibition technique is a method of relaxing the tension in the four muscles located between the occiput and axis,which regulates the upper cervical vertebraethese muscles are known to be associated with regulating body posture as well as rotation of the head.

Popliteal Angle Test: The test measures the angle of knee flexion with a goniometer after active knee extension with the hip stabilized at 90° flexion. The angle of knee flexion represents the hamstring tightness. If the angle is less than 125° the hamstring were considered to be tight.

Forward Flexion Distance Test: The subject is in standing position now ask the subject to perform maximum and progressive anterior flexion of the trunk, maintaining the knees straight and lengthening the arms with the palm parallel and then fingers extended the measuring tape is used to determine the distance from the distal part of the fingers to floor.

REVIEW OF LITERATURE

Thomas Myers et al (2011): havestates that in their study Body reading the meridians.

The SBL is a continuity of fascial fabric from the bottom of the foot to the top of the head. Along the way, many muscles participate in holding this fascia either shortening it or preventing the SBL's fascial guy-wires from getting longer. The plantar fascia, hamstrings, lumbosacral fascia, and the erector muscles are much stronger and fascially denser than suboccipital muscles which are the functional center of the SBL. They are keys to the proper primary and secondary wave balance of the SBL. D.E. Feldman et al (2010): have conducted a study on the effects of the suboccipital muscle inhibition technique in patients with short hamstring syndrome by means of tests designed to evaluate the elasticity of the hamstring muscles and pressure algometry of myofascial trigger points. Pre and post intervention evaluation was used for the assessment of hamstring elasticity, and pressure algometry was also used (myofascial trigger points). According to outcome measures the suboccipital muscle inhibition technique modified the elasticity of the hamstring muscles. The suboccipital muscle inhibition technique modifies the pressure algometry of the biceps femoris muscle but does not modify that of the semitendinosus muscle or semimembranosus.

Mc Partland J M. et al (1997): have conducted a study on howupperneck muscle influence hamstring length. The researcher used PNF stretching to examine the effect of upper neck muscles on hip joint range of motion. The explanation for this extraordinary finding has probably more to do with the neurological importance of the sub-occipital muscles. These small muscles have the highest density of muscles spindles in the whole body and have a major sensory function for antigravity organization. Stretching the hamstring caused 9% increase in hip extension range of motion with the passive 'straight leg raise' (SLR) maneuver. Stretching of small sub-occipital muscle resulted in almost twice as much 13% increase of hamstring length as measured with the same SLR test. Thomas Myers (2002): have stated in their study shedding light on the Sub-occipital Muscles. The Superficial back line is a ribbon of fascial and muscular continuity that begins with the plantar fascia and short toe flexors beneath the arches of the foot, wrapping around the heel to the soleus and gastrocnemii of the lower leg. The gastrocnemius interlocks with the hamstrings, which are in turn continuous with the sacrotuberous ligament, which feeds into the sacral fascia. The sacral fascia is the fascial anchor for the back muscles that traverse the spine, and it is the very top muscles of this group. The SBL, however, continues on the top of the skull with the epicranial fascia, including both the occipitalis and frontalis muscles.

Brodeur RR. et al (1999): have stated in their study Rectus Capitis Posterior Minor: A small but important Suboccipital Muscle they saidthatthe suboccipital muscles are four small muscles attaching at either the C1 (atlas) or C2 (axis) vertebrae from the spinous or transverse processes. These suboccipital muscles, oblique capitis inferior, go on to attach to the base of the occiput. The suboccipital muscles play an important role in movement of the head, posture, and function of the entire body.

Gary Fryer et al (2003): have conducted a study on the effect of a cervical isometric contract- relax technique on hamstring extensibility and examine the duration of any treatment effect. Both groups in this study underwent pre and post hamstring

extensibility measurements using passive knee extension with the thigh maintained at 90° of hip flexion. The experimental group received an upper cervical isometric contract-relax treatment. A digital camera recorded the knee extension angles and the images were computer analyzed to determine hamstring extensibility. The cervical isometric contract-relax treatment produced significant effect to the extensibility of the hamstring.

Pratik vakhariya, Shruti panchal, Bhumi patel (2016): The Objective of this study this study is to find out the effects of various therapeutic techniques such as suboccipital muscle inhibition technique, Neurodynamic sliding and static stretching technique in subjects with short hamstring syndrome. Study conducted as pre\test and posttest experimental study with a simple random sampling for duration of 5days/week *2weeks.Outcome measures of the study includes passive SLR (<80) and Active knee extension (<125), sit and reach test. According to the outcome measures of all three techniques Suboccipital Muscle Inhibition, Neurodynamic sliding and static stretching are very effective in improving hamstring flexibility in subjects with short hamstring syndrome.

Sonal Balani, chitra Kataria (2015): has conducted a study on comparing the effectiveness of suboccipital muscle energy technique alone, passive hamstring stretching alone and combination of both the techniques for improving hamstring flexibility in collegiate subjects. 60 healthy subjects were randomly assigned into 3 groups(20 in each group).Treatment in all three groups was given for 5 consecutive days regularly.Effect was recorded immediately after post treatment by active knee extension test(AKET). All these three techniques show a significant improvement in hamstring flexibility, but the combination of both the techniques was much effective in comparison of two techniques alone.

Rasika panse et al (2018): have conducted a study on combined effect of suboccipital muscle inhibition and neural flossing technique on flexibility of hamstrings. Pre and post intervention using modified sit & reach test and active knee extension test and pain using NPRS 100 volunteers according to inclusion & exclusion criteria were selected by simple random sampling. Intervention was given thrice a week for period of 2 weeks. Data was documented on 1^{st},3^{rd} and 7^{th} day of each week. Pre and post intervention hamstring flexibility was assessed. This study concludes that hamstring tightness & stretch pain reduced significantly when combination of suboccipital muscle inhibition and neural flossing technique was given in young adults.

Aparico EQ et al [2009]: The purpose of this study is to identify the effects of suboccipital muscle inhibition technique in patients with short hamstring syndrome by means of tests designed to evaluate the elasticity of the hamstring muscles and pressure algometry of myofascial trigger points. 70 healthy subjects were selected in a simple random sampling pre and post intervention measures evaluation was used for hamstring elasticity and pressure algometry was also used (myofascial triggerpoints). According to the finger floor distance test, the straight leg raise test, the popliteal angle test, the suboccipital muscle inhibition technique modified the elasticity of the hamstring elasticity and pressure algometry was also used (myofascial trigger points). According to the finger Floor distance test, the straight leg raise test, the popliteal angle test, the suboccipital muscle inhibition technique modified the elasticity of the hamstring muscles.

Jan wilke et al (2015): Has conducted a study to provide evidence for the existence of six myofascial meridians proposed by Myers(1997) based on the anatomical dissection studies. Peer-reviewed human anatomical dissection studies reporting morphologically continuous between the muscular constituents of the examined meridians were included. The investigators rated methodological quality of included studies by means of a validated assessment tool [QUACS] study reviewed suggest strong evidence for the existence of three myofascial chains: The superficial back line and the superficial front line , moderate evidence for available for spiral and lateral lines and no existence of evidence for front functional line. The present systematic review suggests that most skeletal muscles of human body are directly linked by connective tissue.

Ishanka weerasekara et al (2010): the objective of this study is to find the prevalence of the hamstring tightness among some categories of the sports and to find whether there is relationship of hamstring tightness with the body height. Femoral length , duration of warm up and cool down .171 made students were included as study population with the age group of 20 to 28 years .prevalence of hamstring tightness was measured on both legs by popliteal Angle Test. According to this survey, the students who are playing contact sports have more hamstring tightness than the others.

Sung-Hak Cho ,et al (2015) : has conducted a study to compare the immediate effects of application of suboccipital muscle inhibition and self-myofascial release techniques in the sub-occipital region on the subjects with short hamstring syndrome.50 participants were included in the study, the subjects were allocated to 25 in each groups. The forward flexion distance test, straight leg raise test and popliteal angle test were used to evaluate the hamstring flexibility. According to the results suboccipital muscle inhibition is more effective than the self-myofascial release on suboccipital region in patients with hamstring tightness.

Dr.Nilam Dave, et al (2017): Has conducted a study on the individual and combined effect of suboccipital muscle inhibition technique and doming of diaphragm technique for hamstring tightness. 45 subjects with hamstring tightness were selected and randomly divided into three groups: Group A (suboccipital muscle inhibition technique), Group B (Doming of Diaphragm technique) and Group C (both techniques), by lottery method. Each patient was assessed before and after the treatment by sit and reach test, Popliteal Angle Test and straight leg raise. At the end of the study Group C [combination of the both techniques] showed better result than Group A and Group B.

Carlos Cruz –montecinos,et al(2016): Has \conducted a study to provide an evidence for fascial connectivity between cervical region and lower limbs. Fifteen participants were selected used on inclusion and exclusion criteria. Ultrasound transducer was placed on belly of medial gastrocnemius. Then ask the subject of flex the cervical spine. Offline pressure sensors were used to synchronize the 2D kinematic data from cervical flexion and deep fascia displacement of medial

gastrocnemius. In conclusion, by using automated tracking method the present analyses evidence statistically significant displacement of deep fascia. These results suggest myofascial connectivity between the cervical spine and lower limbs.

Drew Taylor, et al (2003): Had conducted a study on effect of cervical spine isometric contract-Relax technique on hamstring extensibility. 40 asymptomatic participants were randomly assigned equally to either an experimental or control group .Both groups underwent pre and post hamstring extensibility measurements using passive knee extension test. The experimental groups received an upper cervical isometric contract relax treatment. The results were no significant effect of the extensibility of hamstring by the cervical isometric contract relaxes treatment.

Pramod K.Jagtap,et al (2015): Had conducted a study on effect of suboccipital muscle inhibition technique on hamstring tightness patients.50 subjects between 18 to 25 years were enrolled in the study. All the subjects receiving the suboccipital muscle inhibition technique for 2 minutes pre and post outcome measurement were done by using the active knee extension test and forward flexion distance test. Resultsconcluded that the suboccipital muscle inhibition technique is effective in improving the hamstring flexibility.

Basma Hasaneen, et al (2016): Had conducted a study on the effect of suboccipital muscle inhibition technique on pain intensity, range of motion and functional disability in patients with chronic mechanical low back pain, 30 Female patients were included in the study with age of 23 – 30 years and assigned in two groups. Group A received exercise training and suboccipital muscle inhibition. Group B received only exercise training both groups were assessed using the visual analog scale for pain, scholar's test for ROM of lumbar flexion and extension patients were assessed before and after treatment. The results of this study show that there are significant improvements in pain, ROM in the lumbar region by the patients treated with suboccipital muscle inhibition and exercise training.

Carregaro RL, et al(2006) : The objective of the study is to compare the results between forward flexion distance test and straight leg raise test for measuring the flexibility of posterior thigh muscles. 35 healthy male were selected randomly. The reliability of the photogrammetric analysis procedures on the angles measured by two examiners was tested. According to the conclusion study both the test are valuable for measuring the flexibility of posterior thigh muscles.

Richard L. Gajdosik et al (1994): Had conducted a study on influence of hamstring length on the standing position and flexion range of motion of the pelvic angle, Lumbar angle and thoracic angle.30 subjects with age of 19 to 38 were participated in the study. Measurements were taken by toe touch angles and standing pelvic angle. According to the conclusion, the position of pelvis and spine will alter the length of the hamstring muscle.

Mohamad Shariff A Hamid, et al (2013): Had done a study to find the Interrator and Intrarator reliability of the Active Knee extension Test among healthy adults for measuring hamstring flexibility. 14 participants were participated in this study. The percentage of agreement within 10^0 for Active Knee extension was 93 % for dominant knee and 79 % for non-dominant knee. The findings suggest that active knee extension test showed excellent Interrator and Intrarator reliability of assessing hamstring flexibility.

Ten Berge SR, et al (8 July 2010): Had conducted a study to find out the reliability of popliteal angle to measure the hamstring flexibility. 15 subjects with age of 20 to 29 years &15 children's with age of 2- 17 years were participating in the study. Passive knee extension is angle is measured to all the subjects. As the results of this study shows the popliteal angle is highly significant to measure the length of the hamstrings.

Min-hee Kim, et al (2009): Has done a study on reliability of measured popliteal angle by traditional and stabilized Active-Knee extension test 20 healthy adults were participated in the study. The Popliteal angle was measured with a digital inclinometer during each test. The results show the traditional and stabilized active knee extension test to be highly reliable with test-retest reliability.

DESIGN AND METHODOLOGY

STUDY DESIGN- Quasi Experimental Study
SAMPLING TECHNIQUE- Simple Random Sampling
SAMPLE SIZE- 30 patients
STUDY SETTING- Physiotherapy Outpatient Department, Adhiparasakthi College of Physiotherapy, Melmaruvathur, Kanchipuram District

AGE GROUP	-	20-40 years
SEX	-	Males only
DURATION	-	4 weeks

SAMPLING CRITERIA

Inclusion Criteria

- Male subjects in the age group of 20-40 years.
- Subjects without any previous history of hamstring injury since past 1 year.
- Popliteal angle test should be positive for hamstring tightness.

Exclusion Criteria

- Acute strain in the hamstring muscle within 6 weeks.
- Any cervical pathology.
- Any deformity in the spine, hip, knee and ankle.
- Fracture of spine and lower extremity.
- Neurological and Neuromuscular Pathology.
- All the things except from the inclusion criteria.

VARIABLES OF THE STUDY

INDEPENDENT VARIABLE	-	Suboccipital Muscle Inhibition
DEPENDENT VARIABLE	-	Hamstring Length/Flexibility
ASSESSMENT TOOL	-	Goniometry Tape Measurement
MATERIALS USED	-	Treatment couch Goniometer Inch tape

Table showing comparison of pretest and posttest values of popliteal angle test and forward flexion distance test

Paired Samples Statistics						
Samples		Mean	N	Std. Deviation	Std. Error Mean	"t" value
Pair 1	Popliteal Angle -Pre test	48.8667	30	3.10432	.56677	20.234**
	Popliteal Angle - Post test	35.2333	30	4.68809	.85592	
Pair 2	Forward Flexion Distance Test -Pre test	19.7333	30	5.68078	1.03716	18.924**
	Forward Flexion Distance Test - Post test	7.9000	30	4.59648	.83920	

**p<0.001

METHODOLOGY

Present study intends to assess the effectiveness of suboccipital muscle inhibition technique to improve hamstring length in patient with hamstring tightness. All the subjects will be asked to sign the written consent form stating that voluntary acceptance to participate in this study. The subjects with hamstring tightness will be selected according to inclusion and exclusion criteria. The study includes 30 male subjects aged between 20-40 years. Then all the subjects those who complete criteria which are included for the study with hamstring tightness received the treatment (suboccipital muscle inhibition technique) for 5 minutes. Outcome measures were assessed before and immediately after treatment, by using Popliteal Angle Test and Forward Flexion distance test.

TREATMENT PROCEDURE

TREATMENT TECHNIQUE

SUBOCCIPITAL MUSCLE INHIBITION TECHNIQUE

The patient is in supine position with eyes closed the therapist stand behind the subjects head and place the palms of his hands beneath the subjects head, resting the pad of fingers on the projection of posterior arch of atlas, pressure was exerted upward and towards the therapist, the pressure was maintained for 5 minutes until the tissue relaxation had been achieved.

ASSESSMENT TOOL DESCRIPTION

POPLITEAL ANGLE TEST

The test measures the angle of knee flexion with a goniometer after active knee extension with the hip stabilized at 90° flexion. The angle of knee flexion represents the hamstring tightness. If the angle is less than 125° the hamstring were considered to be tight.

FORWARD FLEXION DISTANCE TEST: The subject is in standing position now ask the subject to perform maximum and progressive anterior flexion of the trunk, maintaining the knees straight and lengthening the arms with the palm parallel and then fingers extended the measuring tape is used to determine the distance from the distal part of the fingers to floor.

DATA COLLECTION AND ANALYSIS

DATA ANALYSIS

STATISTICAL TOOLS: The following statistical tools were used to compare pre/posttest values.

MEAN : $\bar{X}\ \mathrm{X}\frac{\phi x}{n}$

STANDARD DEVIATION

: $S\ \mathrm{X}\sqrt{\frac{\phi f x\ \mathrm{Z}\bar{x}\text{Å}}{n\ \mathrm{Z}1}}$

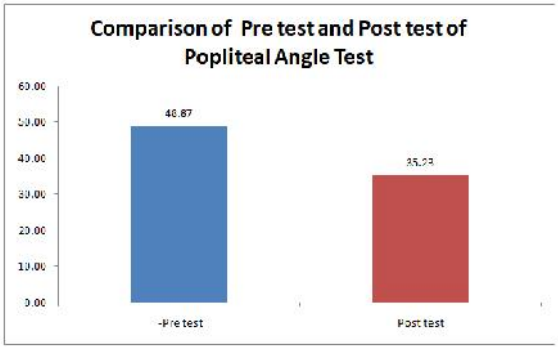
3. PAIRED "t" TEST :

$$t\ \mathrm{X}\frac{\bar{d}}{s/\sqrt{n}}$$

d = mean difference.
n = total number of subjects.
S= Standard deviation.

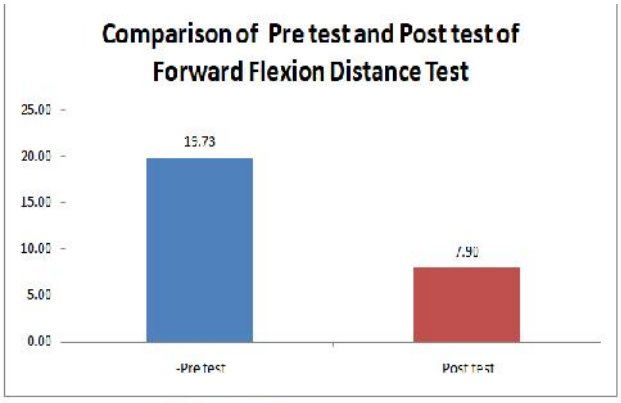
The comparative mean values, mean differences, standard deviation and paired t values between the pre versus posttest values of popliteal angle test and forward flexion distance test. Paired t-test was used to analyze the dependent variable (popliteal angle test and forward flexion distance test). The result shows that there is a significant difference between the pre and posttest values.

Graphical Representation of pre and posttest for popliteal angle test



Pretest - 48.87Posttest - 35.23

Graphical Representation of pre and posttest for forward flexion distance test



Pretest - 19.73Posttest - 7.90

RESULTS

Thirty male patients with hamstring tightness were included in the study treated with suboccipital muscle inhibition technique. Pre and Posttest values were assessed by popliteal angle test and forward flexion distance test. Paired t test was used to compare variables before and after interventions .After the intervention,the length of hamstring muscle was significantly improved. Data analyzed and the result indicates that there was a significant improvement in length of the hamstring in patients with hamstring tightness.

DISCUSSION

The research work was experimental approach,which studied the effectiveness of suboccipital muscle inhibition technique to improve the length of the hamstring in patients with hamstring tightness. For this study 30 male patients were recruited the outcome measurements was done by popliteal angle test and forward flexion distance test. On statistical analysis using "t" test, it was found that there is a significant difference in post test score, thus rejecting the null hypothesis. Hence it can be concluded that suboccipital muscle inhibition technique is effective in improving length of the hamstring muscle in patients with hamstring tightness.

LIMITATIONS OF STUDY

- Limited sample size – 30 subjects is the sample size for this study, more sample size will impact on the study result
- Only the male subjectsare participate in the study
- It does not select the subjects based on the occupational causes
- Chosen variable is limited to hamstring length only.

SUGGESTIONS FOR THE FUTURE STUDY

- Can be done with large populations
- Study can be done comparatively with other therapeutic technique
- Study can be done in athlete peoples to improve their sports performance.

CONCLUSION

From this study it is concluded that hamstring tightness is effectively treated with suboccipital muscle inhibition technique and there is a significant improvement in the length of the hamstring muscle. So according to my method of study, it is found that the suboccipital muscle inhibition technique is an effective therapeutic option in the treatment of hamstring tightness.

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APPENDIX

INFORMED CONSENT

I_____ freely voluntarily agree to participate in the study "THE EFFECT OF SUBOCCIPITAL MUSCLE INHIBITION TECHNIQUE FOR IMPROVING HAMSTRING LENGTH IN PATIENTS WITH HAMSTRING TIGHTNESS".

I have been explained about the procedure and that risk that would occur during this study.

Participant:
Date:
I have explained and defined the procedure to which the subject has consented to participate on his own language.
Researcher:
Date:

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