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Research Study *Medical research*

Effectiveness of static stretching and active muscle relaxation techniques on calf muscle tightness in normal subjects

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ABSTRACT

Study objectives
To compare the effectiveness of static stretching and active muscle relaxation techniques on calf muscle tightness in normal subjects.

Methods
12 normal college going females with age group between 18to24 were randomly allocated in 2 groups. Group 1(n=6) were given static stretching technique and Group 2(n=6) were given active muscle relaxation technique. Ankle dorsiflexion range of motion was used to measure the calf muscle tightness which was done before and after the treatment. Treatment was given in 3 sessions per week and the calf muscle tightness was again measured after the termination of treatment session.

Results
The result of this study was analyzed in terms of gain in range of motion in both group-A and B subjects. In both groups values of ankle dorsiflexion range (degree) shows that the mean range of motion during post test is higher than pre test after the application of static stretching and muscle energy techniques. When comparing the two groups there is no significant difference in means ($p \geq 0.05$).

Conclusion
The result of this study concludes that both muscle energy technique and static stretching are equally effective as there is no significant difference between the improvements in range of motion between the two groups.

Keywords: calf muscle, muscle energy technique, static stretching, Muscle relaxation technique

INTRODUCTION

Our society has become ever more sedentary, with automation replacing many tasks that once caused us to move through, and thereby maintain our range of motion (ROM), the need for maintaining or improving our flexibility has become ever more pertinent.

Achieving and maintaining an appropriate level of flexibility is especially important for people whose occupation requires long periods of time in a stationary position like standing or being seated in front of a computer such work reduces the frequency and amplitude of motion of normal activities of daily living like walking, reaching, bending that might help individuals maintain their flexibility and joint range of motion (ROM).

Maintaining same posture for prolonged periods of time places excessive stress on the musculoskeletal tissues. If a muscle is immobilized for a prolonged period of time, the muscle is not used during functional activities, and consequently the physical stresses placed on the muscles are substantially diminished. This results in muscle atrophy and weakness. This atrophy occurs more quickly and more extensively in tonic (slow-twitch) postural muscle fibers than in phasic (fast-twitch) fibers.

Calf muscle is one of the common postural muscles which is more to shortness. Many people suffer from calf muscle tightness. The people who engage in sports activities that use the leg muscles may be prone to tension in these areas, as might people who wear high heels [which force the ankle into plantar flexion]. Those who remain seated for long periods of time may also experience shortening of the tissues in this compartment because gastrocnemius and fascia associated with this part of lower extremity are held in shortened position.

Shortness of the calf muscles results in limited dorsiflexion range of motion (ROM) which is thought to contribute to excessive pronation at subtalar joint and is associated with midfoot and forefoot pain.

Stiff or shortened muscles are often activated in movements in which they otherwise would not take part. This overuse in turn leads to injury and/or to excess inhibition of their antagonists. In general, the shorter the muscle, the more it may inhibit its antagonist.

Shortened muscles may cause pain from the periosteum, tendons or muscle belly, including referred pain to other structures or segments. A stiff, shortened muscle can be subjected to greater stress when contracted suddenly and forcefully, thus damaging itself or its associated tendon. This can be prevented by stretching the relevant muscle or muscle group.

Proper flexibility program reduces the risk of injuries and restores the normal functions of the shortened muscles. Clinicians may prescribe stretching programs for many reasons, decreasing risk of injuries, rehabilitating after injury, improving posture, reducing aches and promoting relaxation.

There are different stretching techniques and protocols for improvement in calf muscle flexibility and extensibility.

Static stretching is a commonly used method of stretching in which soft tissues are elongated just past the point of tissue resistance and then held in lengthened position with a sustained stretch force over a period of time.

AIM OF THE STUDY

The aim of the study is to evaluate the effectiveness of static stretching versus active muscle relaxation technique on calf flexibility in normal subjects.

NEED OF STUDY

Many people suffer from calf muscle tightness. People those whose occupation requires long periods of time in a stationary position like standing or being seated in front of a computer such work reduces the frequency and amplitude of motion of normal activities of daily living. While sitting in front of a desk, the knees are flexed at 90^{o} and ankles are plantarflexed. Adapting this posture for longer periods of time, resulting in adaptive shortening of the calves. This can be prevented by stretching the muscle.

So, there arises a need to evaluate this study, in finding out which method of stretching is better in improving the calf muscle flexibility.

METHODOLOGY

TYPE:
Comparative.
STUDY SETTING:
Sports Physiotherapy outpatient Department,
Chettinad academy of research and education,
chennai
STUDY POPULATION:
Normal college going females with calf muscle tightness.
SAMPLING METHOD:

Random.

SAMPLE SIZE:

12 subjects.

STUDY DURATION:

One week.

SAMPLING CRITERIA:

Inclusion criteria

- Age: 18-24 years.
- Gender: Females only.
- Subjects should not have any effect from previous ankle joint injury that would limit active range of motion.
- Subject should have ability to stand in a static position for two minutes at a time.

Exclusion criteria

- History of ankle joint injury.
- Metabolic disease.
- Any type of congenital deformity like fixed flexion deformity
- Prolonged tightness causing spondylolisthesis.

MATERIALS USED

- Low couch
- Goniometer- to measure ankle joint ROM
- Stop clock- for time allotment.

TREATMENT PROTOCOL

Static stretching:

- Hold time- 30 seconds
- Repetitions- 3to4times.

Muscle energy technique:

- Hold time- 7to10 seconds.
- Repetitions – 3to4times.
- Intensity - 20% of maximal muscle strength

DATA ANALYSIS

Data collection

STATIC STRETCHING (GROUP A)

S.NO	GASTROCNEMIUS				SOLEUS			
	PRE		POST		PRE		POST	
	R	L	R	L	R	L	R	L
1.	8^o	10^o	10^o	12^o	20^o	20^o	22^o	22^o
2.	11^o	12^o	16^o	18^o	20^o	14^o	26^o	20^o
3.	7^o	7^o	10^o	10^o	15^o	20^o	20^o	25^o
4.	9^o	10^o	10^o	11^o	20^o	19^o	21^o	20^o
5.	10^o	10^o	17^o	17^o	18^o	25^o	25^o	30^o
6.	8^o	7^o	10^o	12^o	17^o	19^o	26^o	28^o

MET (GROUP B)

S.NO	GASTROCNEMIUS				SOLEUS			
	PRE		POST		PRE		POST	
	R	L	R	L	R	L	R	L
1.	12^o	11^o	18^o	15^o	12^o	13^o	18^o	17^o
2.	6^o	5^o	13^o	11^o	10^o	10^o	20^o	20^o
3.	10^o	5^o	13^o	11^o	10^o	8^o	25^o	22^o
4.	5^o	10^o	8^o	13^o	20^o	20^o	23^o	23^o
5.	8^o	7^o	10^o	9^o	15^o	15^o	20^o	17^o
6.	15^o	17^o	20^o	22^o	30^o	17^o	33^o	25^o

COMPARION WITHIN GROUPS

Static (group A)

MUSCLE GROUP		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	GASTROCNEMIUS (pre-R)	8.8333	6	1.47196	.60093
	GASTROCNEMIUS (post-R)	12.1667	6	3.37145	1.37639
Pair 2	GASTROCNEMIUS (pre-L)	9.3333	6	1.96638	.80277
	GASTROCNEMIUS (post-L)	13.3333	6	3.32666	1.35810
Pair 3	SOLEUS (pre-R)	18.3333	6	2.06559	.84327
	SOLEUS (post-R)	23.3333	6	2.65832	1.08525
Pair 4	SOLEUS (pre-L)	19.5000	6	3.50714	1.43178
	SOLEUS (post-L)	24.1667	6	4.21505	1.72079

Paired Samples Test

MUSCLE GROUP		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	GASTROCNEMIUS (pre –R)	-3.33333	2.25093	.91894	-5.69554	-.97113	-3.627	5	.015
	GASTROCNEMIUS (post-R)								
Pair 2	GASTROCNEMIUS (pre-L)	-4.00000	2.36643	.96609	-6.48342	-1.51658	-4.140	5	.009
	GASTROCNEMIUS (pos-L)								
Pair 3	SOLEUS (pre -R)	-5.00000	3.03315	1.23828	-8.18310	-1.81690	-4.038	5	.010
	SOLEUS (post-R)								
Pair 4	SOLEUS (pre -L)	-4.66667	2.87518	1.17379	-7.68398	-1.64935	-3.976	5	.011
	SOLEU (post-L)								

MET (GROUP B)

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	GASTROCNEMIUS (pre-R)	9.3333	6	3.77712	1.54200
	GASTROCNEMIUS (post-R)	13.6667	6	4.58984	1.87380
Pair 2	GASTROCNEMIUS (pre-L)	9.1667	6	4.57894	1.86934
	GASTROCNEMIUS (post-L)	13.5000	6	4.63681	1.89297
Pair 3	SOLEUS (pre-R)	16.1667	6	7.75672	3.16667
	SOLEUS (post-R)	23.1667	6	5.41910	2.21234
Pair 4	SOLEUS (pre-L)	13.8333	6	4.44597	1.81506
	SOLEUS (post-L)	20.6667	6	3.26599	1.33333

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	GASTROCNEMIUS (pre-R) GASTRCNEMIUS (post-R)	-4.33333	1.96638	.80277	-6.39693	-2.26974	-5.398	5	.003
Pair 2	GASTROCNEMIUS (pre -L) GASTROCNEMIUS (post-L)	-4.33333	1.63299	.66667	-6.04705	-2.61961	-6.500	5	.001
Pair 3	SOLEUS (pre-R) SOLEUS (post-R)	-7.00000	4.69042	1.91485	-11.92229	-2.07771	-3.656	5	.015
Pair 4	SOLEUS (pre-L) SOLEUS (post-L)	-6.83333	4.66548	1.90467	-11.72945	-1.93722	-3.588	5	.016

Comparison between groups

MUSCLE	group		N	Mean	Std. Deviation	Std. Error Mean
GASTROCNEMIUS (post-R)	dimension1	static	6	12.1667	3.37145	1.37639
		met	6	13.6667	4.58984	1.87380
GASTROCNEMIUS	dimension1	static	6	13.3333	3.32666	1.35810

(Post-L)		met	6	13.5000	4.63681	1.89297
SOLEUS (post-R)	dimension1	static	6	23.3333	2.65832	1.08525
		met	6	23.1667	5.41910	2.21234
SOLEUS (post-L)	dimension1	static	6	24.1667	4.21505	1.72079
		met	6	20.6667	3.26599	1.33333

	t-test for Equality of Means						
MUSCLE GROUP						**95% Confidence Interval of the Difference**	
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**Lower**	**Upper**
GASTROCNEMIUS (post-R)	-.645	10	.533	-1.50000	2.32499	-6.68039	3.68039
GASTROCNEMIUS (post-L)	-.072	10	.944	-.16667	2.32976	-5.35769	5.02436
SOLEUS (post-R)	.068	10	.947	.16667	2.46419	-5.32389	5.65722
SOLEUS (post-L)	1.608	10	.139	3.50000	2.17690	-1.35043	8.35043

The above table consists of pre and post test values for the right and left gastrocnemius, soleus muscle flexibility scores in the study population. The mean, standard deviation for sample observations have been utilized.

RESULT

The result of this study was analyzed in terms of gain in range of motion in both group-A and B subjects. In both groups values of ankle dorsiflexion range (degree) shows that the mean range of motion during post test is higher than that during pre testafter the application of static stretching and muscle energy techniques. When comparing the two groups there is no significant difference in means ($p \geq 0.05$).

CONCLUSION

The result of this study indicates that both muscle energy technique and static stretching are equally effective within the groups but there is no significant difference between the improvements in range of motion between the two groups.

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