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Impact of self-stretching techniques on piriformis muscles tightness in supine vs sitting position: A comparative study

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Abstract---Background and Purpose: Piriformis muscle is the deep gluteus muscle present at the posterior side of the hip joint. Its main function is external rotation of hip joint. Tightness of piriformis muscle is common these days due to sedentary life style. Due to tightness of piriformis muscle, the mobility of external rotation in hip joint also gets altered. The aim of this research is to compare the effect of self-stretching in supine vs sitting position on piriformis muscle in random young adults. Methodology: A sample size of 40 (n=40) random young adults were taken and divided into two groups (n1=20) (n2=20) of 20 each. The first group was asked to do self-stretching in supine position and second group was asked to do self-stretching in sitting position for 30 sec/stretch 10 times/session 2 times in a day. This intervention was given for a week. The outcome measures include piriformis muscle tightness test and goniometer measurement. Result: The result showed significant improvement in tightened piriformis muscle in self-stretching in supine and sitting group. Conclusion: The self-stretching in sitting group showed more improvement on piriformis muscle tightness than self-stretching in supine position.

Keywords---piriformis muscle tightness test, goniometer, self-stretching, supine position, sitting position.

Introduction

Piriformis muscle is present in the gluteal region of the lower limb. It is one of the hip muscles that is small and flat and lies underneath and corresponding to the

end line of the rare side of the gluteus Medius(Windisch et al., 2007). Origin of the muscle is from the anterior surface of the sacrum between S2 and S4 and gluteal surface of ilium at the edge of the greater sciatic notch and insertion is at the superior border of greater trochanter of femur(Kirschner et al., 2009). Role of the piriformis muscle is external rotation of the hip. It lifts and turns the hip joint away from the midline of the body which moves the body weight starting from one foot then onto the next foot and looks after balance(Tonley et al., 2010). During weight bearing such as high eccentric load, adduction and internal turn of hip goes through unnecessarily.

Tightening of piriformis muscle is only the shortening in the length of the muscle that is common in these days due to sedentary lifestyles that include bad posture while standing or sitting, obesity. Main reason of piriformis tightness is prolong sitting. It also decreases the range of motion(Fishman et al., 2017). The piriformis muscle can cause sciatic nerve pain because of muscle tightness or a close by inconsistency because anatomically it is close to the sciatic nerve. Piriformis muscles tightness test is done for testing the tightness of the piriformis muscle. It is done in supine position and range of motion is also check as due to tightness it also gets altered. Passive stretching is done for testing. After diagnosis, stretching is recommended for treatment which is the part of physiotherapy method. Stretching is advised as it helps in maintaining the standard length of the muscle that has been shortened due to poor posture and that also helps in achieving the full range of motion and decreases the sciatic nerve compression. Stretching should be intermittent. Stretch hold and relax should be perform for the effective result. As per the study, the longer the duration of stretching, result will be more effective by releasing piriformis muscle tightness and also help in maintaining the range of motion. Active stretching should be done while treatment program(Reynolds & Schrattenholzer, 2007).

Range of motion is the normal range of the joint movement. The measurement of joint range is taken by the instrument name Goniometer(Newman & Zhou, 2021). Goniometer has 3 parts i.e., stationary arm, moving arm and a fulcrum/axis. Stationary arm stays at still to the proximal part of the joint whereas moving arm moves along the distal part of the joint. Fulcrum/axis remains at the axis point. Active range of motion is the movement that a person does it by oneself without any assist(Boyajian-O'Neill et al., 2008). The examiner instructs how to perform the following stretch or exercise and the person does it by self. This also helps to in examining the muscle strength of the joint muscles. It's a good screening technique for physical examination and for exercise as well. If a person does active stretching or movement that will also help in regaining to the possible range from the abnormal and maintain the strength of the muscle(Miller et al., 2012).

Passive movement is done by the examiner by giving assistance to the moving part of the body and subjects use no energy of itself(Oliveira et al., 2018). Passive ROM is slightly more than active ROM as each joint has a limited quantity of accessible movement that is not under voluntary control. So, passive stretching is done while testing of piriformis muscle tightness(Carvalho et al., n.d.). Stretching in supine and sitting position have different effects on other muscles of the body(Nelson et al., 2005). In supine position, the muscles of upper body (muscles

of thorax, abdomen, neck and core region) remain in relax state as back gets fully supported over the plinth where gravitation force is zero, parallel to gravity(Awan & Babur, 2011). Only muscles of upper limb, lower limbs and pelvic region works that to parallel to the gravitational force. No resistive force is available, whereas in sitting position all muscles of the body is in functional state because of no support and body works against the gravity(Suh et al., 2017).

Methodology

The participants elected to participate in the review were present on an endorsed date. All members were guaranteed about the confidential nature of the study. All members first filled up the consent form and handed over to the researcher. Height and weight of the participants were measured and then the following measures were introduced: Piriformis tightness test is performed to all the subjects to select the patient with the piriformis tightness for further process. Consent form is then provided to get all the information with respect to the reason and proposed outcome of the study, and permits the member to express their consent to participate in the study anonymously. The subjects were informed about the confidential nature regarding the study. Once consent form was obtained from the participants, their demographics which included name, age, gender and occupation were taken. Goniometer measurement is taken of all the participants to check the angle of how much their piriformis is having its range. A total of 40 subjects were considered which will later be assigned into 2 groups (20 each) i.e., Group 1 (Stretching in Supine position); Group 2 (Stretching in Sitting position) Group A will be performing stretching in supine position and Group B will be performing stretching in sitting position. Both will be performed for 2 times in a day for a week. 30 sec of hold to stretch then 5 sec relax 10 times/ session. After a week, Goniometer measurement was taken again to check the improvement in the angle of range of motion.

Data Analysis

Data analysis was done under the Social Science Packaging Software SPSS 21.0 version. Paired t-test within the group was utilized to analyse the pre and post readings. The graphical representation is done using MS EXCEL 2016.

Result

The result is very clear and shows that there is indeed a difference in self-stretching exercise of piriformis muscle of both the groups after the intervention is completed as shown in the following tables:

- Table 1: shows the descriptive statistics of age in both groups 1 and 2.
- Table 2: shows the frequency of genders of both the groups 1 and 2.
- Table 3: comparison on pre and post exercise of group 1 by paired t-test.
- Table 4: comparison on pre and post exercise of group 2 by paired t-test.
- Table 5: correlation between group 1 and group 2

Both groups showed improvement as both groups showed p value less than 0.005. However, group 2 is more significant than group 1 as its p value is lesser than group 1.

Table 1
Age Statistics

Group Statistics					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Age	1	20	25.30	2.557	.572
	2	20	24.85	2.007	.449

Table 2
Gender ratio

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MALE	27	67.5	67.5	67.5
	FEMALE	13	32.5	32.5	100.0
	Total	40	100.0	100.0	

Table 3
Group 1 pre and post comparison (paired t-test)

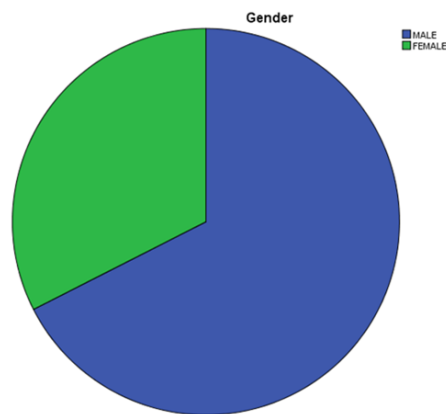
	MEAN±SD	T-TEST	P-VALUE
PRE	30.3500±2.71981	4.073	0.001
POST			

Table 4
Group 2 pre and post comparison (paired t-test)

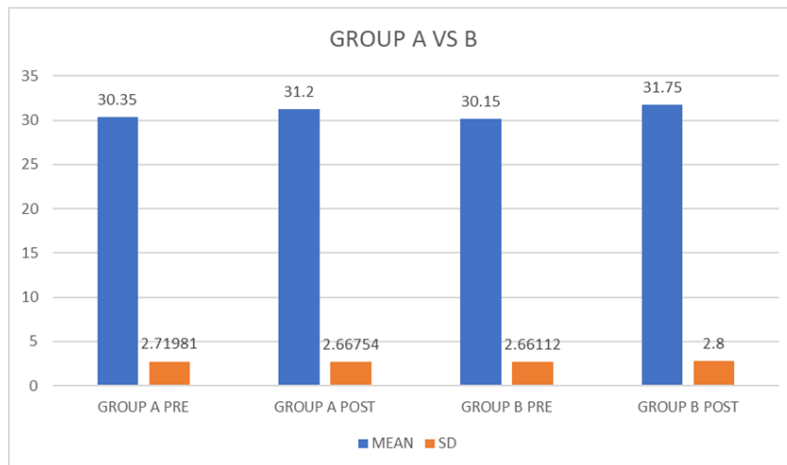
	MEAN±SD	T-TEST	P-VALUE
PRE	30.1500±2.66112	10.514	0.000
POST			

Table 5
Correlation between group 1 and 2

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	GAPOST & GAPRE	20	.940	.000
Pair 2	GBPOST & GBPRE	20	.968	.000



Graph 1. Ration between male and female graph



Graph 2: Graph showing mean of comparison of pre and post intervention scores of groups 1 and group 2

Discussion

The motive behind this study is to determine the effect of self-stretching on piriformis muscle in supine and sitting position. This study was designed to determine whether there is any difference in effect of self-stretching exercise in supine and sitting position on piriformis muscles or both shows similar effect. The subjects who volunteered for the review were separated into two groups, one group performed self-stretching in supine position and another group was asked to perform self-stretching in sitting position. Both the groups underwent for test before and after the application of interventions and both the groups showed significant improvement in the tests performed to check the flexibility of piriformis muscle but there seems to be more improvement in the piriformis muscle tightness to which self-stretching in sitting position was given.

This study shows significant increase in self-stretching in supine position on piriformis muscle in young adults. These findings were similar to the study done by Samahir Abuaraki Elbkheet et.al., 2017, in which they attributed that performing self-stretching in supine position gave more better result than mulligan mobilization. This study also shows significant increase in self-stretching in sitting position on piriformis muscle in young adults. These findings were similar to the study done by Quratulain Saeed et.al., 2017, in which they concluded that external rotation done in sitting position was more effective than adductor sequence group which is done passively in supine position by the examiner. Similar result was seen in a recent study done by Ruchika Zade et.al., 2019, in which the conclusion was made that the longer the stretching time, better the result is seen. 30sec/stretch protocol is more beneficial than 10sec/stretch protocol. In earlier studies, effectiveness of self-stretching on piriformis muscle in supine and sitting position were proved. But comparison between these two was not done earlier. In this study, the effect of self-stretching on piriformis muscle in supine and sitting position was done with the intervention of 1 week protocol and it is clearly shown that self-stretching done in sitting position is more effective than self-stretching done in supine position (Renan-Ordine et al., 2011).

Conclusion

Therefore, this study has shown that both the groups had significant improvement in their piriformis muscle tightness. But improvement in self-stretching of piriformis muscle in sitting position group was more than the self-stretching in supine position group. It is also shown in statistical analysis that group 2 is statistically more significant as compared to group 1. Thus, we reject the null hypothesis and acknowledge the alternate hypothesis as there is a significant difference between self-stretching of piriformis muscle in supine and sitting position as self-stretching in sitting position showed more improvement

Limitations of the study

- The sample size included in the study was limited.
- Intervention duration of the study was less.

Future research

- Intervention duration could have been more for more effective result.
- This study is done on random people in the age group of young adults, further studies can be done on people of any particular field.

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