

Original Research**Differences Effect Of Neuromuscular Taping And Post Isometric Relaxation With Neuromuscular Taping And Reciprocal Inhibition On Reducing Pain And Increasing Hamstring Flexibility In Overweight Adolescents****Jasmine Kartiko Pertiwi^{1*}, Afif Ghufroni²**^{1,2} Department of Physiotherapy, Poltekkes Kemenkes Surakarta, Indonesia**ABSTRACT**

Background: The existence of this muscle shortening is often found in students, who rarely exercise because of a lack of awareness to move. If it occurs continuously, it will result in a decrease in functional movement and muscle shortening, especially in the hamstring muscles.

Methods: At the Ministry of Health Surakarta 2020 Polytechnic, this study used student subjects aged 15 to 23 years with overweight conditions and functional impairment of the hamstrings. This research (sapphire walk test) was a study with a two-group treatment design and a pre-and post-test design. analyzed the data to find out the difference between pre-and post-test group 1 (tapping and PIR) using a paired t-test and group 2 (tapping and RI) using a pre-and post-Wilcoxon test because the data distribution was not normal on the VAS (Visual Analog Scale) values and the test t is paired because the data distribution is normal on the value of the BSSNRT (back saver sit and reach test).

Results: Administration of neuromuscular taping and post-isometric relaxation and neuromuscular taping and reciprocal inhibition both had a good effect on reducing pain ($p = 0.863$). and both had a good effect on increasing hamstring flexibility in overweight adolescents ($p = 0.786$).

Conclusion: The clinical implications that can be applied from this study are that there are different effects of neuromuscular taping and post-isometric relaxation with neuromuscular taping and reciprocal inhibition in reducing pain and increasing hamstring flexibility in overweight adolescents. This is an effective intervention option for overweight adolescents with impaired hamstring function.

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INTRODUCTION

To perform all physical tasks, one needs good strength, endurance, and flexibility, and everyone has flexibility that is not the same and even varies between parts of his

own body. Due to the high incidence of shortening of the hamstring muscle among students, which can indirectly affect the decrease in flexibility, it is necessary to take appropriate action to restore the length of the hamstring muscle, and it is also hoped that it will be able to gradually restore its flexibility and reduce pain due to the infrequent activity carried out. Students who continue to be carried out statically will also see their own flexibility greatly influenced by a decrease in activities that can lead to being overweight in adolescents.

One's environmental conditions and heredity factors also affect the emergence of obesity. Certain drugs and certain hormones that affect a person's appetite can also cause obesity or overweight (Li et al., 2020). The shortening that occurs in the hamstring muscles will cause pain in the posterior thigh area, and limitation of motion in the hip and lumbar joints, which results in impaired posture and gait patterns (Bahrudin, 2018). Changes in posture can cause complaints of lower back pain due to a decrease in the work balance of the contracting muscles, according to the results of hamstring muscle shortening.

The shortening of the hamstring muscles will increase the pressure in the patellofemoral syndrome. Furthermore, it is also mentioned that contractures in the muscles will affect stiffness in the joints and contribute to capsule and tendon disorders. Due to the high incidence of shortening of the hamstring muscle among students, which can indirectly affect the decrease in flexibility, appropriate action is needed to restore the length of the hamstring muscle and is also expected to be able to restore its flexibility gradually (Boora & Sharma, 2016).

A variety of measures have been used to improve flexibility. On this occasion, the author uses muscle energy techniques (PI and RI) and taping exercises to improve the shortening of the hamstring muscles. Muscle Energy Technique is an osteopathic technique that manipulates soft tissue with direct movement and with motion control performed by the patient himself during isotonic and isometric contractions that aim to improve musculoskeletal function and reduce pain (A. R. Ahmed, 2011). But the most important thing about the MET method is the use of isometric contractions.

Holey, (2006) MET refers to post-isometric relaxation (PIR) and reciprocal inhibition (RI). Post-isometric relaxation (PIR) refers to a decrease in the isometric contraction of the hamstring muscles by a few seconds followed by relaxation. MET uses isometric contractions using antagonists or agonists (either by stretching or not), isotonic contractions (also called concentric or eccentric contractions), and a combination of isotonic and isometric contractions (as needed). When the agonist muscle contracts before stretching the muscle, it has the effect of reducing the reflex component of the contraction, which causes relaxation.

This will increase the length of the muscle and the range of motion of the joint, which causes post-isometric relaxation. One of the MET mechanisms is the reciprocal inhibition mechanism, which states that when the muscle contracts isometrically, the antagonist muscle will be inhibited, and a relaxation process will occur afterward. Isometric contractions that involve two neurological components using MET are in a first way by post-isometric relaxation (PIR) relaxation following agonist contractions, as a result of the Golgi organ tendons, and in a second way by inhibiting reciprocal inhibition (RI), which affects the antagonist, as a result of the muscles spindle (Sathe et al., 2020).

The Golgi tendon organ (GTO) is located in the tendon of the hamstring muscle as an agonist. Nerve afferent impulses from the Golgi tendon organs to the dorsal root of

the spinal cord encounter motor neuron inhibition. This stops the discharge of efferent motor neuron impulses by preventing further contraction and decreasing muscle tone, which in turn results in relaxed and elongated hamstring muscles during relaxation.

Reciprocal inhibition, which has a working principle, refers to the inhibition of the antagonist muscle, namely the isometric contraction of the quadriceps muscle. This occurs due to the stretching of the proprioceptive receptors in the muscle spindles to maintain a constant muscle length. In this way, the proprioceptive receptors in the muscle spindles will stimulate afferent nerve fibers and meet with the stimulation of motor neurons in the agonist's muscle, and at the same time inhibit the motor neurons of the antagonist's muscle to prevent further contraction, which in turn results in relaxed and elongated agonist muscles (H. Ahmed et al., 2015).

Neuro Muscular Taping (NMT) is a specific application of elastic adhesive tape to the skin surface by eccentric stimulation technique resulting in decompression and dilation of the covered area which is used for therapeutic purposes, NMT has an arthrokinematic effect, acts reflexively on muscles and mechanical conditioning of the fascia. and receptors, thereby altering muscle performance, effectively influencing posture, and correcting joints (Marcolin et al., 2017). Kinesio tape It is claimed to be beneficial in enhancing muscle function, improving strength, inhibiting muscular activity, improving flexibility, decreasing pain, and providing proprioceptive input. Very few studies were found to analyze its effect on a healthy hamstring, and no studies except for one individual case study were found that analyzed the effect of Kinesio tape on hamstring muscles with a history of injury. (Fenech, 2015). The purpose of this study was to determine the effect of stretching exercises with NMT on hamstring flexibility in young women with overweight impairments in functional movement and muscle shortening.

MATERIALS AND METHOD

This research is a treatment of two groups with pre- and post-test designs (quasi-experimental). Group 1 gives neuromuscular taping and post-isometric relaxation, and Group 2 gets neuromuscular taping and the reciprocal inhibition method five times with frequency every day for a week. With the inclusion criteria, subjects were adolescent, overweight students with a minimum BMI value of 23 Kg/m², and there was a decrease in flexibility in the hamstring muscles.

With a back saver sit and reach test value of at least 1–10 cm, there is a pain in the hamstring muscles with a VAS of at least 4, the subject is cooperative and willing to be a research subject, and the exclusion criteria are that the subject did not follow the exercise 3 times according to a predetermined schedule and that there was irritation of the skin after the installation of NMT. The implementation using MET, previously the NMT, will be attached to the hamstring of the research subject with a decompression technique on the medial and lateral hamstrings. With the tip of the upper base being on the posterior sciatic tuberosity and ending in the popliteal press with a Y-shaped cut (Fenech, 2015).

MET application with post-isometric relaxation (PIR) technique. Subjects lie supine, with the therapist's position on the left side of the subject and facing the subject. The therapist flexes the subject's hip passively to the extent of the perceived movement. The subject's left ankle was placed on the therapist's left shoulder, and then the subject was asked to put pressure on the therapist's shoulder for 7–10 seconds. After the

hamstring muscles contracted, the subject was instructed to relax, and in the relaxation phase, the therapist passively increased the subject's hip flexion.

Then the subject's legs were lowered on the bed to rest for about 10 seconds. This procedure is repeated again with a frequency of 2 repetitions (Agrawal, 2016). MET application with the reciprocal inhibition (RI) technique. Subjects lie supine, with the therapist positioned on the left side of the subject and facing it. The therapist flexes the subject's hip passively to the extent of the perceived movement. The subject's left ankle was placed on the therapist's left shoulder, and then the therapist's hands were on the quadriceps muscle.

Subjects were instructed to resist the therapist's resistance by bringing their legs to their shoulders for 7–10 seconds. After the quadriceps muscle contracted, the subject was instructed to relax, and in the relaxation phase, the therapist passively increased the subject's hip flexion. Then the subject's legs were lowered on the bed to rest for about 10 seconds. This procedure is repeated twice more at a frequency of two repetitions (Nambi, 2018).

Pre and post-test measurements with the Back Saver Sit and Reach Back Saver Sit and reach test is a method of measurement tool used to measure the flexibility or length of the muscles, lower back and hamstring muscles that experience functional limitations and pain with the subject sitting on the floor with one leg straight and the other leg bent, then the subject is asked to bend down as much as possible. With straight arms above the measuring ruler (Demir, 2019). Where also after doing this BSSART pain value with VAS.

The visual analog scale (VAS) is a pain rating scale 1–9, with the score based on a measurement placed at a single point along a 10 cm long line that represents the continuum between the two ends of the scale—"no pain" on the left end (0 cm) from the scale and "worst pain" at the far right of the scale (10 cm) Statistical analysis on the data normality test used the saphiro-test because the number of subjects was 21 or <50, the homogeneity test used the lavender test, the test results were different from the pre-post test using the statistical test group 1 with paired sample t-test, group 2 with Wilcoxon - test, the results of the analysis of pre-and post-test treatments for both groups with paired sample t-test (Hui, 2018). Ethical clearance number: 728/VI/HREC/2020, Dr. Moewardi General Hospital.

RESULTS

The research criteria used in this study included gender, age, and BMI (body mass index): The first research criterion is gender. The number of women is higher than that of men, namely 76.2% (16) for women and 23.8% (5) for men. The second research criterion is age. The age range used is classified into 2 age groups, the 15–19 year group, and the 20–23 year group.

The subjects were on average aged 20-23 years. The third research criterion was BMI (body mass index), based on data from both groups into 3 classifications, 1. Obesity was 23.5 - <25 Kg/m², 2. Type I obesity was 25 – 30 Kg/m² and type II obesity is 31 – 40 Kg/m². The average subject in type I obesity is 25 – 30 Kg/m², while in group 2 of the study.

Initial conditions of the subjects this study used the back saver sit and reach test (BSSNRT) and the VAS (Visual Analog Scale). Maximum stretching ability in a sitting position. In the initial conditions of the study subjects, group 1 had an average pain score of 4.227, while group 2 had an average pain score of 4.450. And for the subject's

initial condition BSSNRT values, group 1 averaged a BSSNRT score of 6.455, while group 2 averaged 9.600.

The final state of subject pain scores with VAS in Group 1 was an average pain score of 2,091, while Group 2 had an average pain score of 2,000. The average score of group 1's BSSNRT was 12,909, while group 2's average was 13,800. The statistical analysis used to test the normality of the data is the Shapiro-Wilk test because the number of subjects is 21 or <50. with the following results:

Tabel 1. Normality test

Shapiro Wilk Test	p	Explanation
Pre test group 1 VAS	0,871	Normal
Pre test group 2 VAS	0,001	Abnormal
Pre test group 1 BSSNRT	0,582	Normal
Pre test group 2 BSSNRT	0,137	Normal

Tabel 2. Homogeneity test

Lavene test	p	Explanation
Pre test (1&2) VAS BSSNRT	0,081 0,473	Homogen

Tabel 3. Paired sample t – test

Result	p	Explanation
Pre – post VAS	0,000	Hypothesis accepted
Pre – Post BSSNRT	0,000	Hypothesis accepted

Tabel 4. Wilcoxon test and paired t test

Wilcoxon test	p	Explanation
Pre – post VAS	0,007	Hypothesis accepted
Paired t test	p	Explanation
Pre – post BSSNRT	0,000	Hypothesis accepted

Tabel 5. Independent sample t test

Result	p	Explanation
post VAS	0,863	Hypothesis rejected
Post BSSNRT	0,786	Hypothesis rejected

Tabel 6. The results of the mean difference between the two groups

Group	Mean	Difference
Pre – post VAS group 1	4.227 – 2.091	2.136
Pre – Post BSSNRT group 1	12.909–6.455	6.455
Pre – post VAS group 2	4.450 – 2.00	2.45
Pre – Post BSSNRT group 2	13.800–9.600	4.2

DISCUSSION

Neuromuscular taping and post-isometric relaxation and neuromuscular taping and reciprocal inhibition were equally good for reducing pain and increasing hamstring flexibility in overweight adolescents. Post-isometric relaxation is aimed at reducing tone after isometric contractions, which will cause relaxation of the agonist's muscle. The

process of the reciprocal inhibition exercise mechanism caused by the opposite contraction reflex can reduce activation in the target muscle (Sathe et al., 2020).

The neuromuscular recording is an innovative biomechanical therapy with compression and decompression stimulation to produce a positive effect on the musculoskeletal system. NMT has the function of activating the lymphatic system, skin, muscles, and veins, normalizing muscle tension, and influencing posture. The use of NMT in the absence of tension causes wrinkling so that the space between the skin is exposed and the underlying layer.

After the space is open, the blood circulation that carries oxygen is smooth, increases lymphatics, and improves tissue regeneration, so it can increase muscle flexibility due to getting adequate oxygen intake (Yadav et al., 2019). Post-isometric stretches, such as MET, result in greater changes in the range of motion and muscle extensibility. The management of MET in the first 30 seconds is so good that it results in an increase in muscle length in combination with changes in its functional range of motion.

The increase in muscle extensibility also involves neurophysiological factors (including strain tolerance) and viscoelastic changes in the muscle). The effectiveness of MET is attributed to the inhibition of the Golgi tendon reflex, which is activated when an isometric contraction is initiated during stretching (A. R. Ahmed, 2011). This study has relevance to previous research (Agrawal, 2016), which stated that the PIR technique given for 3 weeks of hamstring improved significantly ($P = 0.001$).

And there is an increase in hamstring flexibility. RI also shows an increase in hamstring flexibility. Using the relaxation technique, mutual inhibition works on antagonistic contractions with submaximal contractions. Based on the study of the effect of NMT on strength, flexibility, and proprioception in hamstring muscle, this is very relevant Fenech, (2015) to the use of NMT in cases of hamstring flexibility.

There is no significant increase in tapping NMT in healthy people (no complaints), but there is a significant improvement in the hamstring for two days. This means that during the installation of the gastrocnemius, the strength and stability of the hamstring will increase. This could mean that the increase in strength is not really dependent on the central nervous system but is related more to direct muscle spindle stimulation during the tapping action.

CONCLUSIONS

Although from the statistical test results obtained for neuromuscular taping and post isometric relaxation and neuromuscular taping and mutual inhibition of the final results on pain and hamstring flexibility there was no significant difference the two treatments still had a good effect on reducing pain and increasing hamstring flexibility in adolescents obesity. And a suggestion for this study: if this exercise could be given at every opportunity of the teenagers' daily activities, offering regular light exercises can actually increase hamstring flexibility and reduce pain, both of which are complaints experienced by today's overweight teenagers.

REFERENCES

- Agrawal, S. S. (2016). Comparison between post isometric relaxation and reciprocal inhibition manuevers on hamstring flexibility in young healthy adults: randomized clinical trial. *International Journal of Medical Research & Health Sciences*, 5(1), 33. <https://doi.org/10.5958/2319-5886.2016.00008.4>

- Ahmed, A. R. (2011). A comparative study of Muscle Energy Technique and Dynamic Stretching on Hamstring Flexibility in Healthy Adults. *Bull. Fac. Ph. Th. Cairo Univ*, 16(1), 1–6.
- Ahmed, H., Iqbal, A., Anwer, S., & Alghadir, A. (2015). Effect of modified hold-relax stretching and static stretching on hamstring muscle flexibility. *Journal of Physical Therapy Science*, 27(2), 535–538. <https://doi.org/10.1589/jpts.27.535>
- Bahrudin, M. (2018). Patofisiologi Nyeri (Pain). *Saintika Medika*, 13(1), 7. <https://doi.org/10.22219/sm.v13i1.5449>
- Boora, M., & Sharma, S. (2016). Study on Effectiveness of Static Stretching and Massage on Hamstring Flexibility in Normal Adults. *IOSR Journal of Sports and Physical Education*, 03(03), 01–05. <https://doi.org/10.9790/6737-03030105>
- Demir, E. (2019). The effects of kinesio tape and stretching on hamstring muscles flexibility. *Annals of Clinical and Analytical Medicine*, 10(01). <https://doi.org/10.4328/jcam.5829>
- Fenech, P. (2015). The effect of Kinesio Tape on strength , flexibility and proprioception in hamstrings muscles . *Researchgate*, October, 0–17. <https://doi.org/10.13140/RG.2.1.4692.8080>
- Holey, L. (2006). Muscle Energy Techniques. In *Physiotherapy* (Vol. 82, Issue 8). [https://doi.org/10.1016/s0031-9406\(05\)66417-6](https://doi.org/10.1016/s0031-9406(05)66417-6)
- Hui, E. G. M. (2018). Learn R for applied statistics: With data visualizations, regressions, and statistics. In *Learn R for Applied Statistics: With Data Visualizations, Regressions, and Statistics*. <https://doi.org/10.1007/978-1-4842-4200-1>
- Li, S., Garrett, W. E., Best, T. M., Li, H., Wan, X., Liu, H., & Yu, B. (2020). Effects of flexibility and strength interventions on optimal lengths of hamstring muscle-tendon units. *Journal of Science and Medicine in Sport*, 23(2), 200–205. <https://doi.org/10.1016/j.jsams.2019.09.017>
- Marcolin, G., Buriani, A., Giacomelli, A., Blow, D., Grigoletto, D., & Gesi, M. (2017). Neuromuscular taping application in counter movement jump: biomechanical insight in a group of healthy basketball players. *European Journal of Translational Myology*, 27(2). <https://doi.org/10.4081/ejtm.2017.6665>
- Nambi, G. (2018). Effect of Reciprocal inhibition and Post Isometric relaxation; types of muscle energy technique in Piriformis syndrome? A Comparative study. *Physical Medicine and Rehabilitation Research*, 3(1). <https://doi.org/10.15761/pmrr.1000162>
- Sathe, S. S., Rajandekar, T., Thodge, K., & Gawande, V. (2020). Comparison between

immediate effects of met and passive stretching techniques on hamstring flexibility in patients with hamstring tightness: An experimental study. *Indian Journal of Forensic Medicine and Toxicology*, 14(4), 6857–6862. <https://doi.org/10.37506/ijfmt.v14i4.12701>

Yadav, H., Lehri, A., & Scholar, P. (2019). Effect of Proprioceptive Neuromuscular Facilitation on Flexibility in Males with Hamstring Tightness. *International Journal of Health Sciences & Research (Www.Ijhsr.Org)*, 9(5), 191. www.ijhsr.org