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Reducing Lower Back Pain Using the Muscle Energy Technique Versus Transcutaneous Electrical Nerve Stimulation

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Abstract.

Working from home for a long time during the Covid-19 pandemic led to many complaints of musculoskeletal disorders, such as lower back pain. This is caused by stress or spasm in the back muscles which makes the stability of the abdominal and lower back muscles decrease. Treatments include the muscle energy technique (MET) and transcutaneous electrical nerve stimulation (TENS). MET can reduce pain through the provision of post-isometric relaxation stimulation, stimulating the proprioception and neurophysiology, and causing a hypoalgesic effect in the lower back area, while TENS blocks pain-conducting nerves. Studies have not yet determined conclusively which treatment is most effective. In this literature review, relevant articles published from 2015-2020 were found by searching in Google Scholar and PubMed. The keywords used included low back pain, muscle energy technique and transcutaneous electrical nerve stimulation. The population, intervention, comparison group, outcome and study design were considered in the selection of the articles. There were 6 journal articles that met the research criteria, namely 3 that examined the MET intervention and 3 for the TENS intervention. The results showed that MET with a dose of 3-5x/session can reduce pain after the second day, while TENS, when placed locally, can take roughly a month to reduce lower back pain. The findings showed that MET is more effective in reducing lower back pain than TENS.

Keywords: low back pain, muscle energy technique, transcutaneous electrical nerve stimulation

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1. Introduction

Work from home is currently one of the steps to prevent the spread of COVID-19, but an unsupportive work environment at home can caused complaints of musculoskeletal disorders (MSDs). One of the complaints of MSDs was low back pain [1]. Low back pain is caused by several factors that trigger excessive pain in the low back area, such as changed in body posture, changed in the structure of the spine, muscles, nerves, and cushioning between bones in the lumbar region. These changes caused by stress or spasm in the back muscles which made the stability of the abdominal and low back muscles to decreased [2].

Pain is a signal released by the body which indicated that something was happening in the body. Pain that felt for more than three months is in the chronic stage, so that if no further examination was carried out it can caused such as spasms, postural abnormalities, pain and muscle tissue's damaged. Damage in muscle tissue without further treatment can cause bad posture with pain in the low back area [3].

As many as 90% of back pain cases are caused by body position when at work [4]. The World Health Organization (WHO) also identified that cases of low back pain are the third highest disease. Low back pain was also one of the cases that caused the highest disability worldwide, with a prevalence of 7.2% measured using years lived with disability (YLD), which affected 4 out of 5 people in their life [5]. Low back pain even occupied the second most cases in Indonesia after influenza [6].

The high number of low back pain during the pandemic [1] required a solution so as not to interfered with work productivity during the pandemic, one of which is physiotherapy modalities, namely muscle energy technique (MET) and transcutaneous electrical nerve stimulation (TENS) [7]. MET is an exercise therapy that functions to improve musculoskeletal function by overcoming tension in muscles and joint dysfunction [8] and reducing pain [9] through the provision of post-isometric relaxation stimulation, stimulating proprioception and neurophysiology, resulting in a hypoalgesic effect in the lower back area [8]. On the other hand, TENS produces an electric current that conducts to the skin surface through electrodes placed in the pain area so that it provides a specific analgesic effect and can induce selective sensory stimulation in order to provide a sense of relaxation in the lower back muscle area thereby reducing pain felt in the lower back area [10]. Both MET and TENS effected in reducing low back pain, but which one is more effective isa still unknown.

2. Method

Literature review is the design of this study, where researchers analyze journal articles according to topics contained in the Google Scholar and PubMed databases. The keywords used are in accordance with the Medical Subject Heading (McSH) namely low back pain and Muscle Energy Technique and Transcutaneous Electrical Nerve Stimulation. The criteria used in selecting articles using PICOS are Population, Intervention, Comparation, Outcome and Study Design. The population of this study is a study that discusses the treatment of physiotherapy in cases of low back pain. The interventions chosen were MET and TENS. The two interventions will be compared. The outcome sought was the effect of MET and TENS on the reduction of low back pain and the study

design of the article used was an experimental design, a control and a randomized trial. Articles published in English or Indonesian in the 2015-2020 range.

3. Result

The search results for articles with keywords using the McSH method in the database got 20,020 journal articles. The selection results based on the year of publication (2015-2020) resulted in 5,706 journal articles. Based on the research design, language, full access and abstract selection, 6 journal articles were obtained, consisting of 3 MET intervention articles and 3 TENS intervention articles.

Table 1: The effect of MET on decreased low back pain.

Author	Study Design	Participant	Dosage	Time	Pain Scale	Mean Pain Score		Mean Reduction in Pain
						Pre	Post	
Ghasem et al., (2020)	*RCT*	45	3-5x /sessions; 5-10s hold/ position	5 weeks (2 sessions/ week)	VAS	6.20 ± 1.14	2.20 ± 0.77	4.00
Patel et al., (2018)	*RCT*	25	3-5x /sessions; 3-5s hold/ position	2 sessions in 2 days	VAS	5.28 ± 1.42	3.08 ± 1.46	2.20
Rishi & Arora, (2018)	Experimer	15	5x/ sessions; 7-10s hold/ position	2 weeks (5 sessions/ week)	NRS	8.07 ± 0.21	4.07 ± 0.18	4.00

Table 2: The effect of TENS on decreased low back pain.

Author	Study Design	Participant	Dosage	Time	Pain Scale	Mean Pain Score		Mean Reduction in Pain
						Pre	Post	
Garaud et al., (2018)	Open randomized monocentric study	22	Local; Continous; 80-100Hz; 50 to 100µs	6 month (3 to 4 daily sessions)	NRS	8	7	1
Alyazedi et al., (2015)	Experimental	20	Local 4-8Hz; patient tolerate	5 weeks (2 sessions/ week)	VAS	6.67±1.51	2.83±1.17	3.84
Verruch et al., (2019)	Randomized and Crossed-sectional	20	Local; 100Hz; 200 µs	4 weeks (1 sessions/wee	VAS	5	3	2

4. Discussion

The results of the analysis showed that both Muscle Energy Technique (MET) and TENS can reduced LBP, but there were differences in the healing time and reduction in pain scores. MET was found to reduce pain faster than TENS. MET is an exercise that has a relaxing effect on connective tissue so that it can reduce pain felt by individuals. MET manipulates soft tissue by involving passive involuntary contractions that are controlled in both direction and intensity [12].

MET through corrective forced, namely post isometric relaxation with reciprocal inhibition. Both techniques reduce contraction and tension in spasmed muscles and increase muscle strength. The contraction of agonist muscles during the intervetion of MET will stimulate the stretch receptors of the muscles or the golgi tendon organs [8], [16]. After the response seen in the tendon muscles, there was stretched of the muscle fibers which decreased the pain due to the reduction in muscle tension [12].

The results of the analysis showed that since the second day of MET with a dose of 3-5x /sessions; 3-5s hold/position has decreased pain scores. Pain scores reduction increased along treatment time, whereas TENS need up to 4 weeks to achieve the same reduction in pain scores. TENS is an electrotherapy modality commonly used in pain management. In pain conditions, TENS using conventional currents that designed to provide a tingling sensation that bring comfort at the sub-motor sensory level. These currents are usually referred to as low amplitude with high frequency, with parameters for these currents being a pulse of 50 to 125 us, a pulse frequency of 50 to 110 pps, and a submotor amplitude that produces paresthesias or a tingling sensation [13]. TENS is given with the patient lying on the bed and using two pads on the area of the low back that is experiencing pain [17].

TENS overcomes pain through gate control by inhibiting pain-conducting nerve fibers, namely Aδ and C. Inhibition occurs due to TENS stimulates Aβ nerve fibers which activate interneurons in the gelatinous substance which increases presynaptic control and causes the gate to close [18, 19]. Besides that, TENS also increases blood flow and endorphins to areas targeted by axonal reflexes, but TENS was a complementary modality in reducing pain. TENS can reduce pain but not significantly, so it still requires additional exercise therapy to combinated to increase its effect [20]. Less pain reduction in LBP treatmented by TENS may be due to peripheral nerve involvement other than C nerve fibers that amplify pain. Long-term stimulation of TENS can result in nerve fibers experiencing a refractory period [21, 22].

5. Conclusion

Based on the literature analysis, it is concluded that both MET and TENS can reduce LBP, but the comparison showed that there is a difference in the effect of MET and TENS on LBP reduction. MET is known to be more effective than TENS in decreasing LBP.

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