EFFECTS OF LONG DURATION VERSUS SHORT-DURATION MUSCLE ENERGY TECHNIQUE ON PAIN AND FUNCTIONAL DISABILITY IN PATIENTS WITH MECHANICAL NECK PAIN

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ABSTRACT

Mechanical neck pain is one of the most common musculoskeletal disorders in the general population and has a large economic burden on the health care system. Muscle energy technique (MET) has been advocated for the treatment of pain and functional disability in mechanical neck pain. However, there is little evidence to support the optimal number of contract-relax cycles for relieving mechanical neck pain. Thus, the aim of this study was to investigate the effects of long-duration versus short-duration muscle energy techniques on pain and functional disability in patients with mechanical neck pain. Thirty participants with age between 18 – 50 years were made part of the study based on inclusion and exclusion criteria. The subjects were randomly allocated into two groups, either experimental group A (n=15) which received 10 repetitions of MET, or experimental group B (n=15) which received 5 repetitions of MET. Both groups were treated for one-time treatment only. A visual analogue scale (VAS) was used to measure the intensity of pain, and functional disability was assessed using the neck disability index (NDI) before treatment and immediately again after treatment. Both experimental groups A and B showed significant improvement in both VAS and NDI scores post-intervention ($p < .05$). However, both VAS and NDI scores showed better improvement in the experimental group A as compared to the experimental group B ($p < .05$). Long duration muscle energy technique was better than the short-duration muscle energy technique in improving pain and functional disability in patients with mechanical neck pain.

Keywords: *Duration; Functional disability; Muscle energy technique; Mechanical neck pain; Pain*

INTRODUCTION

Neck pain has become one of the most prevalent musculoskeletal disorders throughout the world and has become a concern among people. It causes a great financial burden due to the repetitive follow-up appointments with health care providers (Nagrale et al., 2010). According to a prevalence study done on musculoskeletal discomforts among office workers in Malaysia, the results showed that 69.7% of the 753 subjects showed a high pain severity score in the lower back, shoulder and neck (Shariat et al., 2016).

MET was chosen as the intervention for this study because it was found to be effective in decreasing pain intensity and improving functional disability in subjects that have mechanical neck pain. However, there is a lack of evidence in guiding the practitioner to decide on the number of contract-relax cycles to use in managing mechanical neck pain. Hence, this study is going to add to the scarce body of evidence available on whether a longer duration muscle energy technique has a better effect or the same effect as short-duration muscle energy technique on pain and functional disability in mechanical neck pain. MET approach has a good clinical effect on reducing neck pain in patients with acute neck pain and improves cervical range of motion in patients with chronic neck pain, and is better if combined with a traditional rehabilitative approach (Sbardella S et al., 2021).

Schenk, Adelman and Rousselle (1994) found that cervical axial rotation significantly improves after multiple MET sessions. Burns and Wells (2006) revealed that both MET and sham procedure groups had significant instant enhancement in the active range of motion of the cervical spine. However, the MET group had higher mean values, which indicates that MET is more effective than the sham procedure in improving cervical range of motion. MET protocols mention that the number of contract-relax cycles involved in the application of MET is recommended at between two and four repetitions (Goodridge and Kuchera, 1997) or three and five repetitions (Greenman, 1996). The application of repetition numbers used by the authors in most of the experimental studies was between two to five repetitions. There is little up-to-date evidence available on the optimum repetition number of contact-relax cycles. The main objective of this study was to find the effect of long duration and short duration MET on pain and functional disability in patients with mechanical neck pain. This is a Quasi-experimental, pre-test post-test, and comparative study design, and the research hypothesis was framed to find whether there was a significant difference between long duration and short duration MET on pain and functional disability in patients with mechanical neck pain.

METHODOLOGY

Non-probability sampling was used in this study which is much easier, quicker and cheaper (Laerd Dissertation, 2012). Among the types of non-probability sampling, purposive sampling was chosen. Messages were sent out to the lecturers, students and staff of MAHSA University and also to friends and family members in the form of email and WhatsApp Messenger to inform them regarding this research. The interested participants were selected based on the criteria of males and females (Gupta, Jaiswal and Chhabra, 2008) with neck pain on the visual analogue scale (VAS) from 4-7 (Phadke et al., 2016) and neck disability index (NDI) from 5 - 34 points. Diagnostic criteria for mechanical neck pain include neck pain provoked by the movement of the neck, prolonged neck postures, or palpation of the cervical muscles, unilateral or bilateral neck pain, and irritation with joint compression (Van Schalkwyk and Parkin-Smith, 2000, p.324).

Thirty of the participants that fulfilled the criteria and were randomly allocated into two groups, either experimental group A (10 repetitions of MET) or experimental group B (five repetitions of MET). Participants with signs of severe pathology, history of surgery done on the neck in the past 1 year, history of fractures or trauma in the neck, signs of tumour around the neck and vascular syndromes were excluded from the study. Before the study was conducted, documentation related to this study was submitted to the Research & Ethics Committee of MAHSA University for ethical board clearance and was approved.

VAS was used to measure the pain intensity of mechanical neck pain in subjects for both experimental groups A and B before and after the application of MET. VAS has good test-retest reliability, which is better for literate ($r = .94$) than illiterate patients ($r = .71$) before and after attending a clinic for rheumatology outpatient (Ferraz et al., 1990). For construct validity, VAS and numeric rating scales with response options from no to unbearable pain have shown to be highly correlated, with correlations ranging from .71 to .78 (Prince et al., 1983). NDI was used to measure the functional disability of mechanical neck pain in subjects for both experimental groups A and B before and after the application of MET. The test-retest reliability of NDI in patients with mechanical neck pain is fair to moderate (Cleland et al., 2008). Validity is tested in different trials by comparing NDI with different instruments and showing that NDI has good construct validity (Vernon and Mior, 1991).

RESULTS

The computed total sample size is 24, assuming a confidence level of 95%. However, with possible anticipation of dropouts, all the 30 subjects who met the established criteria were made samples for this study.

Results were analysed using IBM SPSS Statistics Version 24. Parametric related and un-related t-test was used to analyse the pre-test and post-test results of VAS and NDI within and between the experimental groups A and B. The statistical significance of the p-value was set at $p < .05$. All results were tested using a 95% confidence level, where p-value $< .05$ indicates the presence of a significant difference.

The effects of MET on the pain and functional disability after one session of MET within the experimental group A and B are represented in Table 1.0 and Table 2.0 respectively. Table 1.0 shows that 10 repetitions of MET have significant effects ($p < .05$) on pain and functional disability in subjects with mechanical neck pain. This shows that those who received long-duration MET had reduced pain intensity and functional disability in mechanical neck pain.

Table 1.0: Changes in pain and functional disability within experimental group A after 10 repetitions of MET

Outcome measure	Mean ± SD Pre-test	Post-test	Mean Difference (95% CI)	t-value	p-value
VAS	5.87 ± 0.83	2.93 ± 0.88	2.93 (2.54, 3.32)	16.14	.000
NDI	20.00 ± 3.98	9.53 ± 3.54	10.47 (9.49, 11.45)	22.94	.000

$p < .05$ indicates significant effect within group.

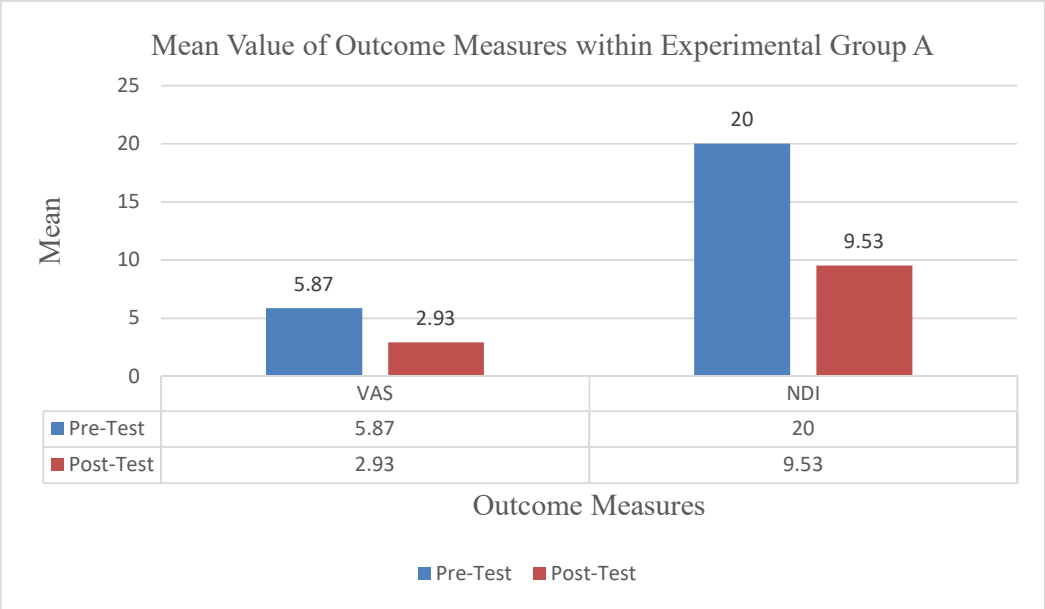

Figure 1.0: Mean Value of Outcome Measures within Experimental Group A

Table 2.0 showed that five repetitions of MET also have significant effects ($p < .05$) on pain and functional disability in subjects with mechanical neck pain. This shows that those who received short duration MET also had reduced pain intensity and functional disability in mechanical neck pain.

Table 2.0: Changes in pain and functional disability within experimental group B after five repetitions of MET

Outcome measure	**Mean ± SD**		**Mean Difference (95% CI)**	**t-value**	**p-value**
	Pre-test	**Post-test**			
VAS	5.73 ± 0.96	4.00 ± 0.85	1.73 (1.41, 2.06)	11.31	.000
NDI	20.27 ± 3.81	12.93 ± 4.18	7.33 (6.10, 8.57)	12.76	.000

$p < .05$ indicates significant effect within group.

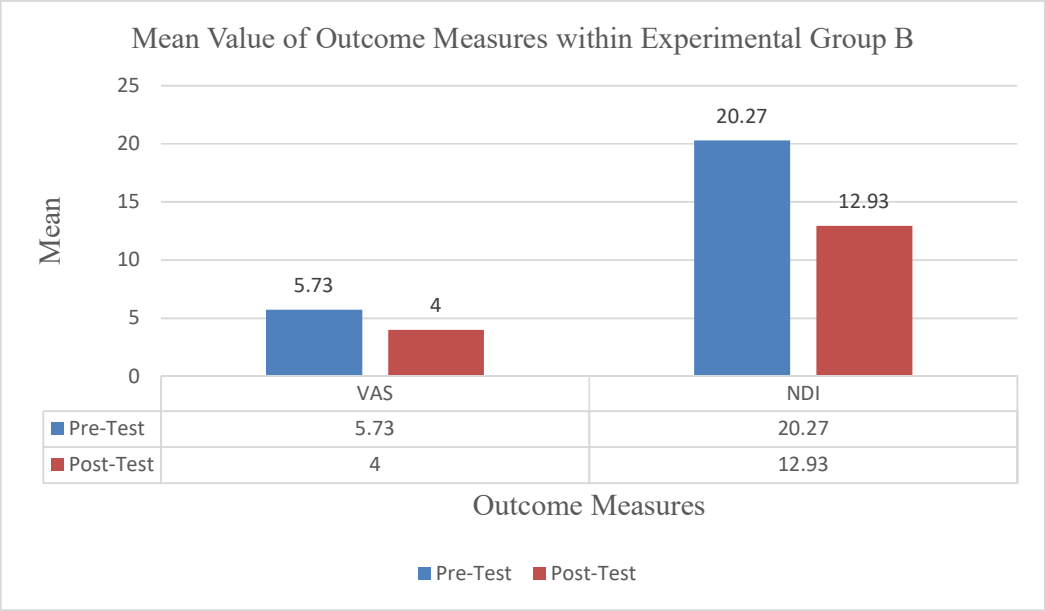

Figure 2.0: Mean Value of Outcome Measures within Experimental Group B

Table 3.0 shows the comparison of the mean difference in VAS and NDI between both groups after one session of intervention. It shows that there is a significant difference ($p < .05$) between the effects of long duration and short duration MET on pain and functional disability in subjects with mechanical neck pain. Experimental group A has a higher mean difference (2.93) than experimental group B (1.73) on VAS which shows that long-duration MET is more effective than short duration MET in reducing pain intensity in subjects with mechanical neck pain. Moreover, experimental group B has a higher mean difference (10.47) than experimental group B (7.33) on NDI which shows that long-duration MET is more effective than short duration MET in reducing functional disability in subjects with mechanical neck pain.

Table 3.0: Comparison of mean difference in VAS and NDI between experimental groups A and B after MET

Outcome measure	Mean ± SD Group A	Group B	Mean Difference (95% CI)	t-value	p-value
VAS	2.93 ± 0.70	1.73 ± 0.59	1.20 (0.71, 1.69)	5.05	.000
NDI	10.47 ± 1.77	7.33 ± 2.23	3.13 (1.63, 4.64)	4.27	.000

$p < .05$ indicates significant difference between groups.

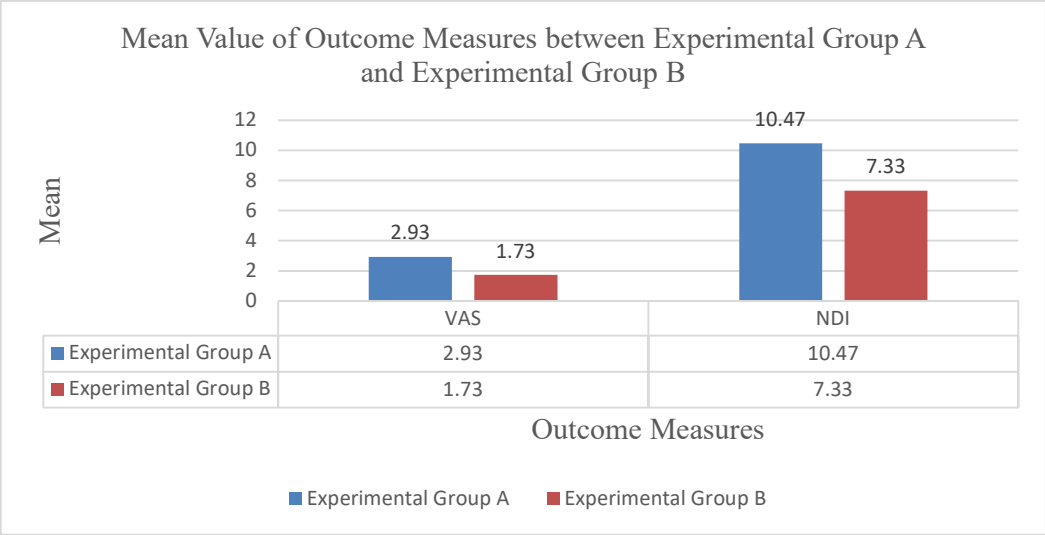

Figure 3.0: Mean Value of Outcome Measures between Experimental Group A and B

DISCUSSION

The present study was undertaken to evaluate the effect of long duration versus short-duration MET on pain and functional disability in patients with mechanical neck pain. The results of the present study proved that there is a significant difference ($p < .05$) between the effects of long duration and short duration MET on pain and functional disability in patients with mechanical neck pain. Both experimental groups A and B showed significant improvement in pain and functional disability after receiving their respective treatments. However, the results of experimental group A showed that long-duration MET is more effective than short duration MET in reducing pain and functional disability in patients with mechanical neck pain. Within the available literature, this is the first study that investigated the effects of long-duration versus short-duration MET on pain and functional disability in patients with mechanical neck pain.

MET reduced pain may be the increasing stretch tolerance of muscle. The muscle and joint mechanoreceptors and proprioceptors will be stimulated when stretching and isometric contraction are occurring simultaneously (Chaitow, 2008). This would cause the sensation of pain to be reduced and make the consecutive stretch easier and more tolerable. According to Melzack and Wall's gate control theory, the incoming messages of pain are inhibited at the dorsal horn of the spinal cord when the large-diameter mechanoreceptors are stimulated. MET and stretching increase muscle's stretch tolerance and may also cause changes in the spinal cord and in the higher centres of the central nervous system. Nociceptors are a muscle that is

activated by minor trauma and activation of nociceptors transmits impulses to other axons in the same nociceptor and to the spinal cord. The release of chemicals lowers the nociceptive threshold of muscles. Responses of muscle could involve the shortening of the injured muscle itself as a defensive action.

There was significant improvement found in NDI for both experimental groups A and B which may be due to the fact that NDI evaluates several components of neck pain which include pain intensity and activity of daily living. The reduction of pain is suggested to cause improvement in NDI score. Experimental group A had a better improvement in NDI score because the reduction of pain intensity in experimental group A was better than in experimental group B which led to improvement in functional disability. Previous studies concluded that almost every type of physiotherapy intervention will have a significant improvement in neck disability and an increase in the functional status in patients with mechanical neck pain (Ylinen et al., 2003; Gross et al., 2015; Evans et al., 2002).

Although the efficacy of MET on pain and functional disability has been investigated by numerous studies, there is no information, to our knowledge, regarding the effects of long-duration versus short-duration MET on pain and functional disability. In this study, the results show that long-duration MET (10 repetitions) is more effective than short duration MET (five repetitions) in reducing pain intensity and improving functional disability in mechanical neck pain. The reason for the subjects in experimental group A to have a better reduction in pain after long-duration MET might be due to greater activation of muscle stretch receptors by higher repetitions of isometric contraction. These muscle receptors will then cause the release of endogenous opioids and also cause the pituitary gland to release beta-endorphins. These secretions may cause the pain to reduce (Kachanathu et al., 2014, p.93). On the opposite side, lower repetitions of isometric contraction have released lesser endorphins in subjects of experimental group B compare to experimental group A. The improvement of the NDI score in experimental group A is better than in experimental group B because of the greater reduction of VAS score in experimental group A.

CONCLUSION

This study aimed to compare the effects of long-duration versus short-duration MET on pain and functional disability in subjects with mechanical neck pain. Based on data analysis, there

were significant improvements in pain and functional disability after receiving MET in both experimental groups A and B. However, experimental group A showed more improvement in pain and functional disability when compared to experimental group B. Thus, it is concluded that long-duration MET is more effective than short duration MET in improving pain and functional disability in patients with mechanical neck pain.

In the future, MET can be used by clinicians in addressing pain and functional disability in patients with mechanical neck pain during physiotherapy management. Long duration MET can be applied to their MET protocol as it has shown to be more effective than short duration MET in managing pain and functional disability in subjects with mechanical neck pain. Thus a physiotherapist will find it beneficial to incorporate long-duration MET into clinical practice and have a better result in managing mechanical neck pain.

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