

Adding the Neuromuscular Taping to Nerve Mobilization Interventions on the Hand Functional Abilities in Carpal Tunnel Syndrom

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ABSTRACT

Carpal tunnel syndrome (CTS) is a collection of symptoms and signs of disease caused by the squeezing of the median nerve in the carpal tunnel in the wrist. This CTS condition is one of the most common types of neuropathy. This syndrome arises with symptoms of pain, numbness, and weakness in the hands due to compression of the median nerve. Carpal tunnel syndrome is a syndrome associated with repetitive motion and a fixed position for a long duration so it affects the blood supply to the hands and causes pain. This study aimed to determine the effectiveness of adding neuromuscular taping intervention to the nerve mobilization which was previously usually given to Hand Functional Ability in carpal tunnel syndrome. **Methods:** A case study with pre and post-test research a design that compares the Hand Functional Ability values before and after being measured with a measuring instrument Wrist hand Disability Index (WHDI) to provide additional Neuromuscular Taping intervention in conditions of carpal tunnel syndrome for 3 weeks. **Result:** Analysis of differences scores with WHDI in the sample group with a significance value of 0.023 which shows < 0.05, which means there is an effect of giving additions Neuromuscular Taping Intervention in Nerve Mobilization noted changes in Hand Functional Ability levels in Carpal Tunnel Syndrome patients.

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AUTHORS' CONTRIBUTION

- Conception and design of the study;
- Acquisition of data;
- Analysis and interpretation of data;
- Manuscript preparation;
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INTRODUCTION

Carpal Tunnel Syndrome is a hand mononeuropathy accompanied by pain and decreased functional ability of the hand which causes almost 50% of all work-related injuries. This syndrome is caused by compression during repetitive movements of the median nerve at the wrist in the carpal tunnel in the fibrous canal along with the flexor digitorum tendon. Carpal Tunnel Syndrome is also associated with local ischemia and nerve

edema, caused by enlargement of the median nerve supported by enlargement of the synovial sheet of the flexor tendon as in flexor tenosynovitis (de Sire et al., 2022; De-Las-Peñas et al., 2017). Compression of the median nerve in Carpal Tunnel Syndrome causes pain, neurological symptoms, decreased functional ability and can interfere with work activities.

Risk Factors for Carpal Tunnel Syndrome include repetitive movements with force, pressure on muscles, temperature fluctuations, and unergonomic work postures (Rahman, 2020). Carpal Tunnel Syndrome symptoms include pain, numbness, paresthesias, and even muscle atrophy. Initial symptoms most often appear at night when the hand is resting and can interfere with sleep. As the disease progresses further, this condition causes a decrease in normal hand function, symptoms also appear during the day, especially when the wrist makes repetitive movements such as when typing, driving, holding objects and squeezing (Permata & Ismaningsih, 2020) (Anwar et al., 2019). In more severe symptom conditions without previous conservative treatment, surgical treatment is needed to improve the condition. In the early stages of complaints, conservative treatment carried out by a physiotherapist is the first treatment carried out (Martins & Siqueira, 2017).

Neuromuscular Taping is one of the newest innovative biomechanical therapy methods in 2013. The application of Neuromuscular Taping can stimulate skin mechanoreceptors which activate nerve impulses when mechanical loads (touch, pressure, vibration, and stretching) cause deformation (Hargiani, 2019). This causes the use of Neuromuscular taping to be given during activities because of the movements that occur in the wrist during use. Neuromuscular taping provides a stimulus to the afferent nerves to enlarge the intestinal space with folds for a decompressive effect. The study by Eparla, et al compared the results between taping and steroid injection in elbow epicondylitis, it was found that steroid injection, taping, and medication were effective in reducing pain, and functional scores at the end of the 2nd week and the only treatment that continued to be effective until week 4 is the taping group (Setianto et al., 2021).

METHODS

This study is case study with pre and post test research a design that compares the level of Hand Functional Ability before and after being measured with a measuring instrument Wrist Hand Dissability Index (WHDI) to provide additional Neuromuscular Taping intervention in conditions carpal tunnel syndrome for 3 weeks. The population used in this study were men and women aged 27 – 45 years with WHDI levels in the severe dissability category (WHDI Percentage score in 40% – 60%) and not currently undergoing steroid injection treatment. Subjects were randomly assigned to two groups, Group 1 (the control group with Nerve Mobilization Intervention) and Group 2 (treatment group with Adding NMT to Nerve Mobilization Intervention). In this study, it took about 3 (three) weeks, from 4th October to 23rd October 2023. The place of this research is in Physiotherapy Laboratory of Abdurrah University.

Statistical analysis using IBM SPSS Statistics Program version 24, IBM, US. Shapiro-Wilk test is used to verify data normality. To analyze the V02 Max score, paired

sample t-tests and independent t-tests were performed. P value < 0.05 was used as the criterion for statistical significance.

RESULTS AND DISCUSSION

The criteria for respondents can be seen based on the distribution both of group sample data based on gender, age (years), weight (kg), height (m) and weight (kg) and Body Mass Index (BMI). The results of the sample homogeneity test analysis are presented in **Table 1** below:

Table 1.
Distribution Sample

Characteristics	Homogeneity Levene test
	P-Value
Gender	0.660
Age	0.458
Weight (kg)	0.777
Height (m)	0.331
IMT Categories	0.399
WHDI's Score Pre	0.628

Based on **Table 1**, the result showed that sample's data were homogen on both of group sample. Analysis of different tests on the results of the WHDI Score examination after the research was carried out between each Group, the following results were obtained on **Table 2**:

Table 2.
Analysis Pre and Post test Each Group

Groups	Paired Sampel t-Tes				
	Mean	Std Deviation	Paired Sampel Corelation	Sign	P-Value
Group 1 Pre – Post	1.50	0.707	0.467	0.174	0,001
Group 2 Pre –Post	2.60	0.516	0,250	0,486	0,001

Based on **Table 2**, the Paired Sampel Corelation showed on Group 1 and Group 2 is significant < 0,05 that mean there were differences in WHDI scores before and after in each group.

To determine the effect of intervention in both groups on WHDI scores, a difference test analysis was carried out on scores after treatment between the two groups as shown in **Table 3**:

Table 3.
Analysis of difference tests after treatment in the two groups

Groups	Paired Sampel t-Tes			
	Mean	Std Deviation	Paired Sampel Corelation	P-Value
Group 1 Post	2.20	0.789	0.05	0.023
Group 2 Post	1.20	0.422		

Based on **Table 3**, the result showed that P value < 0.05 that mean there were significant effects in both groups after the intervention.

From the analysis of the data that has been describe that adding Neuromuscular Taping on Nerve Mobilization Intervention has an effect on increasing the functional ability of the hand in sufferers of carpal tunnel syndrome. The rationale for using dynamic exercises as a treatment of Carpal Tunnel Syndrome is derived from cadaver and in vivo ultrasound studies showing median nerve and tendon excursions through the carpal tunnel during the wrist and/or finger movement. Basically, the exercises involve a sequence of finger movements (for tendon gliding) and wrist and fingers movements (for median nerve gliding) (Martins & Siqueira, 2017).

With adding the application of neuromuscular taping has a positive effect on nerve gliding training. This is because the effect is influenced by the application of neuromuscular taping. The application of NMT is able to stimulate skin mechanoreceptors. These receptors activate nerve impulses when mechanical loads (touch, pressure, vibration, stretching, and itching) cause deformation. Activation by an adequate stimulus causes local depolarization, which triggers nerve impulses along afferent fibers to the central nervous system. The therapeutic effect of NMT uses decompression stimulation to obtain positive effects on the musculoskeletal, vascular, lymphatic and nervous systems, improve blood circulation, and relieve pain. Correct application can also help improve joint alignment, muscle tone, support during movement, and improve body stability and posture (Permata & Ismaningsih, 2020).

According to Blow (2012), the NMT technique without pulling on the tape can result in a skin lift or lifting of the skin so that the space between tissues in the muscle area, blood vessels will dilate or become larger so that they can provide better nutrition to the muscle tissue area. The increase in space in muscle tissue allows dilation of the lymphatics so that drainage is smoother. Placing taping on the surface of the skin by exteroception will be responded to by receptors in the skin in the form of mechanoreceptors which then stimulate free nerve endings or free nerve endings located in the joints, muscles and epidermis (Sa'adiyah & Prasajo, 2022).

The increased space in the muscle tissue allows the lymph channels to widen so that drainage is smoother. Placing taping on the surface of the skin exteroceptively will be responded to by receptors in the skin in the form of mechanoreceptors which then stimulate free nerve endings located in the joints, muscles and epidermis. The free nerve endings are type C nerve fibers which are then stimulated allows inhibition caused by stimulation of exteroceptive mechanoreceptors in the skin. Free nerve endings come from gray matter located in the spinal cord which originates from exteroceptors which carry sensory receptors in the skin, then will be conveyed to the brain so that interconnections occur which can affect the epiphysis and subcortical areas which release endorphins throughout the body feeling relaxed and comfortable.

Neuromuscular taping applications may provide benefits in the management of the activity/rest domain (activity/exercise, energy balance, and cardiovascular/pulmonary responses), and the comfort domain (physical comfort). Nursing diagnoses include acute pain, chronic pain, impaired physical mobility, impaired walking, fatigue, and risk for unstable blood pressure. Impaired physical mobility is the predominant nursing diagnosis

that can be alleviated by NMT. NMT can be used for acute pain, chronic pain, impaired physical mobility, fatigue, and risk for unstable blood pressure (Kristianto et al., 2020).

CONCLUSION

The application of Neuromuscular Taping is a conservative intervention in the treatment of Carpal Tunnel Syndrome at the level of Severe Disability Hand Functional Ability. The addition of Neuromuscular taping to Nerve Mobilization is effective in improving the functional ability of the hand in Carpal Tunnel Syndrome conditions.

REFERENCES

- Anwar, I., Ameer, A., Azam, S., Khalid, M., & Asim, H. M. (2019). Hand Function among Patients with Carpal Tunnel Syndrome. *Open Journal of Therapy and Rehabilitation*, 07(04), 170–177. <https://doi.org/10.4236/ojtr.2019.74012>
- De-Las-Peñas, C. F., Cleland, J., Palacios-Ceña, M., Fuensalida-Novo, S., Pareja, J. A., & Alonso-Blanco, C. (2017). The effectiveness of manual therapy versus surgery on self-reported function, cervical range of motion, and pinch grip force in carpal tunnel syndrome: A randomized clinical trial. *Journal of Orthopaedic and Sports Physical Therapy*, 47(3), 151–161. <https://doi.org/10.2519/jospt.2017.7090>
- de Sire, A., Curci, C., Ferrara, M., Losco, L., Spalek, R., Cisari, C., Invernizzi, M., & Solaro, C. (2022). Efficacy of kinesio taping on hand functioning in patients with mild carpal tunnel syndrome. A double-blind randomized controlled trial. *Journal of Hand Therapy*, 35(4), 605–612. <https://doi.org/10.1016/j.jht.2021.04.011>
- Hargiani, F. X. (2019). Aplikasi Neuromuscular Taping Kasus Bell's Palsy Pada Pengalaman Praktek Fisioterapi di Klinik Kineta Sidoarjo. *Jurnal Ilmiah Fisioterapi*, 2(1), 10–14.
- Kristianto, H., Waluyo, A., Yunir, E., Gayatri, D., & Blow, D. (2020). Neuromuscular taping application opportunities in nursing: A literature review. *Central European Journal of Nursing and Midwifery*, 11(3), 143–151. <https://doi.org/10.15452/cejnm.2020.11.0018>
- Martins, R. S., & Siqueira, M. G. (2017). Conservative therapeutic management of carpal tunnel syndrome. *Arquivos de Neuro-Psiquiatria*, 75(11), 819–824.
- Permata, A., & Ismaningsih, I. (2020). Aplikasi Neuromuscular Taping Pada Kondisi Carpal Tunnel Syndrom Untuk Mengurangi Nyeri. *Jurnal Ilmiah Fisioterapi*, 3(1), 12–17. <https://doi.org/10.36341/jif.v3i1.1226>
- Rahman, F. (2020). Studi Kasus: Program Fisioterapi Pada Carpal Tunnel Syndrome Case Study: Physiotherapy Programs in Carpal Tunnel Syndrome. *Jurnal Fisioterapi Dan Rehabilitasi*, 4(2), 58–66. <https://doi.org/10.33660/jfrwhs.v4i2.116>
- Sa'adiyah, I., & Prasajo, S. (2022). *The Effect of Neuromuscular Taping (NMT) on Pain Reduction and Increased Flexibility of Low Back Pain (LBP) in Broom Craftsmen*. 000, 793–804.
- Setianto, C., Rahmy, S., & Sudjatmoko, A. (2021). Efektifitas Neuromuscular Taping (NMT) sebagai Terapi Non-Farmakologi pada Penderita Carpal Tunnel Syndrome di RS Saiful Anwar, Malang: Sebuah Laporan Kasus. *Jurnal Klinik Dan Riset Kesehatan*, 1(1), 60–66. <https://doi.org/10.11594/jk-risk.01.1.8>