

The Effect of Addition Kinesio Taping to McKenzie Exercise in Patient with Chronic Mechanical Low Back Pain

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ABSTRACT

Background: Chronic mechanical low back pain is considered a common problem and can reduce daily activities. Kinesio taping is a tape which has similar elasticity to skin. It designed to support lower back, improve postural alignment and reduce stress on the spine during activity.

Aim: To investigate the effect of addition kinesio taping to McKenzie Exercise for functional status in chronic mechanical low back pain patient.

Method: Randomized, controlled trial. Thirty patients with chronic mechanical low back pain was recruited. Participants were allocated into intervention group (n=15) received kinesio taping 7 times for 4 weeks and McKenzie Exercise 3 times a week for 4 weeks and control group (n=15) received McKenzie exercise 3 times a week for 4 weeks. Visual Analog Scale (VAS) and Roland Morris Low Back Pain and Disability Questionnaire (RMDQ) were used to evaluate functional status before and after intervention.

Results: The improvement of RMDQ score was greater in intervention group receiving Kinesio Taping and McKenzie (90.44 ± 9.58) than the control group (67.99 ± 7.84). There was a significant different for RMDQ score in intervention group compared with control group ($p=0,000$).

Conclusion: In this study, the functional status in patients with chronic mechanical low back pain who received kinesio taping with McKenzie exercise was better than those received McKenzie only.

Keywords: low back pain, kinesio taping, McKenzie exercise, functional status

INTRODUCTION

Low back pain (LBP) is one of the most common musculoskeletal disorders, up to 80% of individuals reporting LBP at some point in their life¹. Mechanical LBP is the general term that refers to any type of back pain caused by strain on muscles of the vertebral column and abnormal stress². Mechanical LBP has been a major public health burden for many years, responsible for substantial work disability and increase healthcare costs. Chronic LBP produces mobility restriction, long-term disability, and quality of life impairment. There are many causes of LBP, it sometimes occurs after a specific movement such as lifting or bending. Aging causes degenerative changes in the spine. These changes can start in 30 years old or younger and can make LBP, especially if overdo our activities³.

The prevalence of chronic LBP in Asia is 36.8 – 69.7%, in 2014 from study at RS Dr Hasan Sadikin Bandung is 35.7%⁴. The incidence of chronic LBP found at age 30-55 years and there was no difference of the ratio between men and women⁵.

Treatment for LBP depends on the diagnosis. If pain persists or worsens, more involved diagnostic and surgical procedures may be recommended. Rest for a few days allows injured tissue and even nerve roots to begin to heal, which in turn will help relieve mechanical lower back pain. Heat and ice packs help relieve most types of LBP by reducing inflammation. Medications a wide variety of over the counter and prescription medications is available to help reduce symptoms of lower back pain³.

Kinesio Taping (KT), developed by Kenzo Kase in the 1970s, is a technique that has been used in the clinical management of people with chronic back pain. The tape, which is attached to the skin, is thinner and more elastic than conventional tape. It can be stretched to 120–140% of its original length, producing a lesser mechanical restraint

and less restriction of mobility than conventional tape. Four beneficial effects have been claimed for KT: normalisation of muscular function, increase in lymphatic and vascular flow, reduction in pain and contribution to correcting possible joint misalignments, although the extent to which these mechanisms contribute to any clinical effects is unknown⁶.

The result from Paolini *et al.*⁷ study showed reductions in pain and disability over the 4-week intervention period yet no statistically significant differences between groups. This suggests that KT may have similar acute effects as exercise for chronic LBP, although more precise estimates are required. In the other studies from Sanchez *et al.*⁸, KT reduced disability and pain in people with chronic non-specific LBP, but these effects may be too small to be clinically worthwhile.

McKenzie method (MDT) is a treatment system developed by New Zealander physiotherapist Robin McKenzie, which consists of evaluation, treatment and prophylaxis stages, with the following bases: 1) classification of disorders related to spine and extremities; 2) centralization phenomenon and its reverse (peripheralization); 3) classification of patients according to three mechanical or non-mechanical syndromes of derangement, dysfunction or postural; 4) emphasis on education and active patient involvement. MDT focuses on the spine and its peripheral joints and is based on solid principles aiming at an accurate evaluation to get the determining mechanical diagnosis to develop a specific treatment adequate for each patient⁹.

The result of Ibrahimaj¹⁰ study in 2015, McKenzie method increases the mobility and reduces the pain in the lumbar region more on sub-acute stage. Short-term treatment of patients, (on subacute and chronic stage) with the McKenzie method is more effective in reducing pain.

McKenzie method is most effective in patients in sub-acute stage.

There are few studies that investigate the effect of KT on functional status, especially in chronic mechanical LBP so this study aimed to assess the effect of addition KT to McKenzie exercise for functional status in chronic mechanical LBP patient.

MATERIAL AND METHODS

Design and Samples: This study was a randomized controlled pre and post experimental conducted in Physical Medicine and Rehabilitation Department of one referral hospital in Semarang from August to September 2017. Thirty subjects who met the eligibility criteria were included after taking written informed consent.

The inclusion criteria were: subject with chronic mechanical LBP, duration > 12 weeks; age between 25 – 40 years; Schober test < 5 cm; normal BMI according WHO criteria (18.50 – 24.99 kg/m²); fill out informed consent to be included in the research and be able to understand the instruction in the McKenzie exercise. Subjects were excluded from the study if: systolic blood pressure > 200 mmHg and/or diastolic > 110 mmHg before exercise; had HNP, tumor in lumbar area; pregnant; had structural scoliosis, kyphosis, leg length discrepancy; spine X-ray (fracture, spondylolisthesis, osteoporosis, sacroiliitis, coxitis, bamboo spine); had allergy or skin infection or wound in KT area; got KT within the last month; got manual therapy/lumbar corset / analgetic/ physical modalities within the last week; history of spine surgery, laparotomy in last 2 years; a history/clinical signs of heart disease. All participants were required to complete the entire intervention program. Drop out criteria were: subjects who missed KT 1 time, missed 2 consecutive times of McKenzie exercise and absence of the evaluation test before and after intervention.

Ethical clearance: This study obtained the ethical clearance from the Ethics Committee of Medicine Research of Faculty of Medicine Diponegoro University/ Dr. Kariadi Hospital. All subjects provided an informed consent prior to their participation.

Treatments: The subjects were randomly divided into intervention and control groups. Intervention group were given a KT seven times for 4 weeks and Mc Kenzie exercise 3 times a week for 4 weeks while the control group was given McKenzie exercise 3 times a week for 4 weeks. Five minutes warm up was given before the McKenzie exercise and five minutes cooling down was given after the McKenzie exercise. Functional status was assessed before intervention and after four weeks of intervention.

Data Analysis: Data were collected, tabulated and

statistically analyzed using Statistical Package of the Social Sciences (SPSS) version 25.0. Descriptive data analysis showed the mean \pm SD. Data obtained from both groups pre- and post-intervention (at 4 weeks) regarding functional status was evaluated by Roland Morris Low Back Pain and Disability Questionnaire (RMDQ) and pain was evaluated using Visual Analog Scale (VAS) were statistically analyzed and compared using independent t-test (normal distribution data) or Mann Whitney (abnormal distribution data). Data was considered significant at $p < 0.05$.

RESULTS

This study consisted of 30 subjects with mechanical low back pain, 11 males and 19 females. The average age of the subjects in intervention group was 34.9 \pm 5.6 (Mean Standard Deviation). No statistically significant differences between the groups were found at baseline. The descriptive analysis result of age, sex, onset, BMI, VAS pre-intervention and RMDQ pre-intervention can be seen in Table 1.

VAS was evaluated in both groups before and after intervention. As can be seen from the table 2, the baseline of VAS level in intervention group (4.5 \pm 0.52) was greater than control group (4.4 \pm 0.51). However, after further analysis using the Mann Whitney test, there was no significant difference for baseline VAS level with $p=0.539$. There was a significant difference on VAS level after 4 weeks intervention ($p=0.011$) between both groups. Decreasing VAS level in intervention group and control group were statistically significant with $p=0.000$, from 4.5 \pm 0.52 at baseline to 1.1 \pm 0.35 in intervention group and from 4.4 \pm 0.51 at baseline to 1.7 \pm 0.49. Although VAS level in both groups decreased, the decrease of VAS level in intervention group (3.4 \pm 0.63) was higher than control group (2.7 \pm 0.70). There was a significant difference in the decrease of VAS level between both groups ($p=0,021$).

Comparison and difference of RMDQ score in intervention and control group are shown in table 3. At baseline, RMDQ score in control group (9.2 \pm 4.84) was higher than the intervention group (8.47 \pm 4.52) and there was no significant difference for RMDQ score in both group ($p=0.616$). There was a change of RMDQ mean score after four weeks of intervention. Based on the statistical test, there was a significant difference in RMDQ score after intervention ($p=0.000$). Although there was a decrease of RMDQ score in both groups, the value of improvement RMDQ in intervention group (90.44 \pm 9) was higher than control group (67.99 \pm 7). There was a significant difference of value of improvement RMDQ between both groups ($p=0000$).

Table 1. Characteristic of subjects

Variables	Intervention group (n=15)	Control group (n=15)	p
Age (year)	34.9 \pm 5.6	31.5 \pm 6.0	0.126 ^y
Gender			1.000 ^z
Male	6 (40%)	5 (33.3%)	
Female	9 (60%)	10 (66.7%)	
Onset (week)	17.2 \pm 4.6	15.1 \pm 2.7	0.161 ^y
BMI (kg/m ²)	22.52 \pm 1.05	22.36 \pm 1.51	0.735 ^x
VAS Pre-intervention	4.5 \pm 0.52	4.4 \pm 0.51	0.539 ^y
RMDQ pre –intervention	8.5 \pm 4	9.12 \pm 4.9	0.616 ^x

Significant ($p < 0.05$); ^x Independent sample t test; ^y Mann Whitney test; ^z Chi Square test; BMI: Body Mass Index; VAS: Visual Analog Scale; RMDQ: Roland Morris Low Back Pain and Disability Questionnaire

Table 2: Comparison and difference of VAS in intervention and control group

VAS	Intervention group (n=15)	Control group (n=15)	p
Pre-intervention	4.5 ± 0.52	4,4 ± 0,51	0.539 ^y
Post intervention	1.1 ± 0.35	1,7 ± 0,49	0.011 ^{*y}
P value	0.000 ^{*w}	0.001 ^{*w}	
Δ VAS	3.4 ± 0.63	2.7 ± 0.70	0.021 ^{*y}

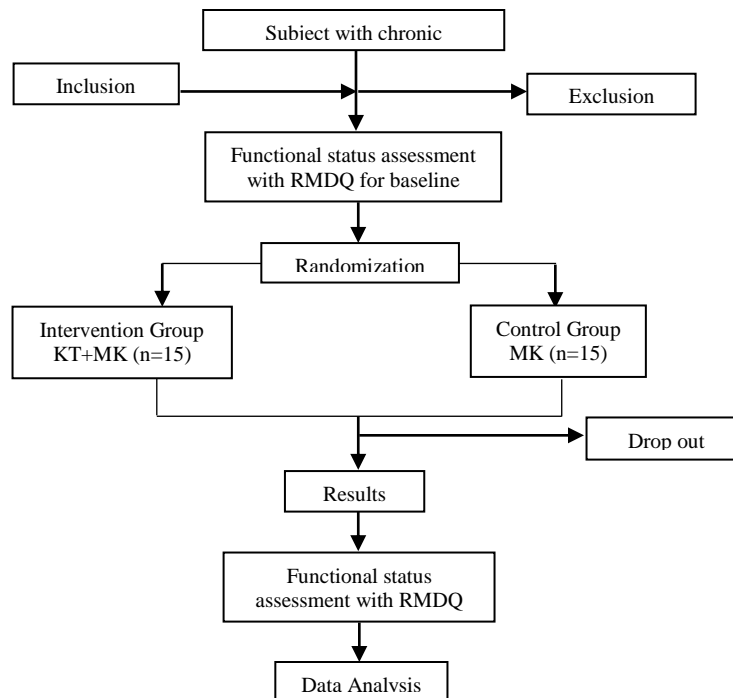
*Significant ($p < 0.05$); ^y Mann-Whitney test; ^w Wilcoxon test; VAS: Visual Analog Scale

Table 3. Comparison and difference of RMDQ in intervention and control group

RMDQ	Intervention group	Control group	p value
Pre-intervention	8.47 ± 4.52	9.2 ± 4.84	0.616 ^y
Post-intervention	2.8 ± 1.15	0.87 ± 0.83	0.000 ^{*y}
Value of improvement RMDQ	90.44 ± 9	67.99 ± 7	0.000 ^{*x}

* Significant ($p < 0,05$); ^x Independent sample t test; ^y Mann Whitney test; Value of improvement RMDQ = [(pre – post): pre] x 100%

Figure



DISCUSSION

In this study, subjects of the intervention and control groups were 15 subjects and there was no drop out. Characteristics of the subjects were no significant differences between two groups in age, onset, BMI, pre-VAS, and pre RMDQ. These variables did not affect the difference of the results of this study.

Castro Sanchez *et al*¹¹ compared the short-term effects of KT vs placebo tape application to the lumbar spine in chronic non-specific LBP. The result was KT reduced disability and pain in people with chronic non-specific LBP, but these effects may be too small to be clinically significant⁸. Other study examined the effect of KT in improving pain and function in 8 subjects with non-specific LBP, but it was not effective on disability and pain. That study was conducted on a small sample size of 8 hence it was not enough to get proper conclusion, whereas exercise therapy improved moderately the disability and pain of participants.

In our study, a significant greater reduction in pain of the subjects with chronic mechanical LBP was obtained immediately after treatment in intervention group. The result was significant when we compared VAS of both

groups with p-value of 0.021.

Kinesio tape exhibits its effects through the activation of neurological and circulatory systems with movement. It is used to support the fascia, muscles, and joints while offering unrestricted range of motion. KT is also suggested to reduce injury recovery time by decreasing pain. The benefits depending on the amount of stretch applied are to provide a positional stimulus through the skin, align fascial tissues, to create more space by lifting fascia and soft tissues above area of pain/inflammation, to provide sensory stimulation to assist or limit motion, and to assist in the removal of oedema by directing exudates toward a lymph duct. Free-ending unmyelinated nerve fibres are abundant around joint capsules, ligaments, and the outer parts of the intraarticular meniscus. They mediated pain when the joint strained and operated in excitatory reflex to protect the capsule. Kinesio Tape can improve joint function by stimulating the proprioceptors within the joint by application over the ligaments and biomechanically supporting the joint. The proprioceptors in the ligaments and joint capsules provide information to the nervous system that allows the musculoskeletal system to provide the appropriate perception of support and movement to the injured joint and provide feedback into the tissues/joints they heal^{2,6,7,12}.

The best estimate effect of KT in pain in this study (improvement of 3,4 cm on a 10-cm VAS) was higher than the minimum clinically significant effect from Hagg *et al.*¹³ study in 2003 (2 cm). Although the effect on pain was mild, it was long-lasting, being sustained for four weeks after the end of the therapy. The mechanism by which four weeks of taping would cause a long-lasting reduction in pain was not clear. Perhaps the week of taping engendered a greater confidence in the participants to remain active despite their pain. Perhaps the taping gave the participants a greater awareness of the back while moving, thus preventing movements that were detrimental to the healing of the affected lumbar tissues. Pain could prevent people for doing activity, so this also affects the functional status.

Decrease of RMDQ score showed in both groups, but the value of improvement RMDQ in intervention group (90.44±9) was higher than control group (67.99±7). When the result of RMDQ both groups were compared, it was significantly improved ($p=0.000$). The components of the scale: pain; activities like sitting, standing, walking, stair climbing, sleeping, dressing, transferring; appetite; and emotion have effectively improved in KT with McKenzie than only with McKenzie technique.

There were no serious side effects of KT, it was simple, did not require special equipment and could be received by participants well. This was demonstrated by the enthusiasm and absence of drop out during the study. The limitations of this study were short duration of intervention and subjectivity of RMDQ. Further research is suggested on outcomes after KT applications for longer time periods.

CONCLUSIONS

Subjects with chronic mechanical LBP had significantly greater in reducing pain and improving functional status obtained after treatment of addition KT to McKenzie exercise rather than McKenzie exercise only.

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