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The Effect of Mulligan Traction Straight Leg Raise on Changes in Range of Motion (ROM) and Pain in Patients with Low Back Pain

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Abstract

Background: Low back pain (LBP) is a musculoskeletal condition that often causes limited mobility and increased pain intensity. Manual interventions such as the Mulligan Traction Straight Leg Raise (TSLR) are used to address impaired posterior tissue mobility and neurodynamic tension that contribute to limited range of motion (ROM) and pain.

Objective: This study aimed to determine the effect of Mulligan Traction Straight Leg Raise (TSLR) on changes in range of motion (ROM) and pain levels in individuals with low back pain (LBP).

Methods: This study employed a quasi-experimental design using a one-group pretest–posttest approach with total sampling, involving 23 respondents who met the inclusion criteria. Baseline assessments included measurements of range of motion (ROM) using a goniometer and pain intensity using the Visual Analog Scale (VAS). The intervention consisted of the Mulligan Traction Straight Leg Raise (TSLR), administered twice per week for a total of six sessions. Following the intervention period, ROM and pain were reassessed using the same instruments to evaluate changes from pretest to posttest.

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The Wilcoxon test was used to analyze differences before and after treatment. This study was conducted at Bhayangkara Hospital Makassar from April to October 2025.

Results: The findings revealed a significant improvement in range of motion (ROM), increasing from a mean value of 68.48 ± 11.62 at pretest to 82.83 ± 11.85 at posttest (p = 0.000). In addition, pain intensity showed a marked reduction, decreasing from an average score of 8.13 ± 1.55 to 4.13 ± 0.92 following the intervention (p = 0.000).

Conclusion: Mulligan TSLR administration has been shown to be effective in increasing ROM and reducing pain in people with low back pain. This technique can be recommended as a practical and clinically relevant intervention option in a physiotherapy rehabilitation program.

***Keywords*:** Mulligan Traction Straight Leg Raise; Pain; ROM; Low Back Pain.

1. Introduction

Low back pain (LBP) is pain or discomfort in the back of the body under the lower ribs to the pelvic bone. It is one of the most common health problems worldwide and can affect people of different ages, genders, and backgrounds.

Low back pain encompasses a spectrum of different types of pain (e.g. nociceptive, neuropathic, and nociplastic, or non-specific) that often overlap [1]. About 90% of diagnoses of low back pain (LBP) are non-specific (NSLBP; i.e. with unknown causes). In NSLBP patients, the hamstrings, iliopsoas, piriformis, and tensor fasciae latae muscles are overactive due to weak hip abductor muscles, extensors, and core muscles [2].

Non-specific Low Back Pain is one of the most common back pains, experienced by about 70–80% of people throughout their lives. The annual prevalence ranges between 15% and 45%. Non-specific back pain often leads to difficulty performing daily activities, leading to high absenteeism rates in many countries around the world. It also causes an economic burden on individuals, families, communities, industries, and governments [3].

Low Back Pain or lower back pain, pain felt in the lower back, is not a disease or diagnosis for a disease but is a term for pain felt in the anatomical area affected by various variations in the length of time the pain occurs. This pain is felt between the corner of the lower ribs to the fold of the lower hip, namely in the lumbar or lumbo-sacral region, the pain can radiate to the legs and legs [4].

Pain areas that are usually felt include the lower ribs to the lower buttocks folds and often the spread of pain to the legs and legs. Factors that affect the appearance of low back pain complaints are work position, work duration, body time index, work stress, and exercise habits [5]. Lower back pain in the world varies greatly every year with a rate of 15-45%.

Based on the results of Basic Health Research (2018), the prevalence of musculoskeletal diseases in Indonesia that have been diagnosed by health workers is 11.9% and based on diagnosis or symptoms is 24.7%. The

number of people with lower back pain in Indonesia is not known for sure, but it is estimated to be between 7.6% and 37% [6].In patients with back pain with disc prolapse and L5-S1 nerve root irritation with the use of a combination of exercise therapy, electrical stimulation and dry needling, pain reduction with a visual analoqe scale (VAS) number: 90 to 30 and an increase in the range of full lumbar flexi motion without pain [7].Mulligan Traction Straight Leg Raise is one of the techniques that has been defined as a means of increasing the Range of Motion (ROM) in subjects with complaints of low back pain or perceived pain. This technique is referred to as a painless technique so that when applied the patient does not feel pain. Regular interventions can restore normal mobility and reduce lower back pain [3].

2. Material and Method

2.1. Description of the Study Area

The study was conducted at Bhayangkara Hospital, Makassar, Indonesia in April to October 2025. The interventions provided was *mulligan traction straight leg raise* for patients with low back pain.

2.2. Population and Sample

This study is a pre-experimental study with a single-group pretest-posttest design. The researcher administered a pre-test of pain to 23 participants who were to receive treatment. The researchers then applied the *mulligan traction straight leg raise* technique as the therapeutic intervention. Following the completion of the procedure, a post-test was conducted to evaluate changes in Range of Motion (ROM) and pain levels.

2.3. Collecting Data and Procedure Intervention

The data collection procedure was conducted through several systematic stages aligned with the research design. The first stage involved a pre-test to evaluate baseline Range of Motion (ROM) and pain levels in the respondents diagnosed with low back pain (LBP). ROM was measured using a goniometer, while pain intensity was assessed using the Visual Analog Scale (VAS) prior to the intervention.In the intervention phase, participants received the Mulligan Traction Straight Leg Raise technique as the therapeutic treatment. The intervention was administered twice per week for a total of six sessions. During each session, the Mulligan Traction Straight Leg Raise was applied to promote neurodynamic mobilization and reduce soft tissue restrictions commonly associated with low back pain.After completing all intervention sessions, a post-test was conducted to reassess ROM using the same goniometric procedure and to re-evaluate pain levels using the VAS. The comparison between pre-test and post-test results was used to determine the effectiveness of the *mulligan traction straight leg raise* intervention in improving ROM and reducing pain among individuals with low back pain.

2.4. Ethical consideration and clearance

Ethical approval for this study was obtained from The Ethics Committee, Health Polytechnics of Makassar, Department of Physiotherapy, Makassar, Indonesia.

3. Result

This study uses a type of quasi-experimental research using a pre-test post-test one-group design. This research was conducted in April – October 2025 in Bhayangkara Hospital Makassar. Range of Motion (ROM) and pain levels were measured before and after the intervention. The intervention was administered twice a total of six sessions. In the final session, post-test measurements were conducted to evaluate the changes in ROM and pain levels.

Table 1: Respondent Characteristics

Respondent Characteristics		**n**	**%**
Gender		7	30,4
a.	Man	16	69,6
b.	Woman		
Total		23	100,0
Age Group			
a.	18-45 years	3	13,0
b.	46-59 years	11	47,8
c.	≥ 60 years	9	39,1
Total		23	100,0

Table 1 shows the distribution of respondent characteristics by gender and age group. In terms of gender, the majority of respondents were female (69.6%), while males comprised 30.4%. In terms of age, the majority of respondents were in the 46–59 age range (47.8%), followed by the ≥60 age group (39.1%), and the 18–45 age group (13.0%). Overall, the number of respondents in this study was 23.

Table 2: Data Normality Test

Saphiro-Wilk	n	α
Pre test ROM score	23	0,000
Post test ROM score	23	0,000
Pre test pain score	23	0,001
Post test pain score	23	0,003

Table 2 shows the results of the Shapiro–Wilk normality test for the study variables. The analysis results indicate that all significance values for the pre-test ROM scores ($p = 0.000$), post-test ROM ($p = 0.000$), pre-test pain ($p = 0.001$), and post-test pain ($p = 0.003$) are below the α value of 0.05. Thus, it can be concluded that the data distribution for all variables is not normally distributed, so further hypothesis testing uses non-parametric statistical tests.

Table 3: Pain pre test and post test intervention with *mulligan traction straight leg raise*

Score	n	Mean	SD	p-value
Pre test ROM score	23	68,48	11,622	0,000*
Post test ROM score	23	82,83	11,854	
ROM difference	23	14,35	6,087	
Pain pre-test	23	8,13	1,546	0,000*
Pain post-test	23	4,13	0,920	
Pain difference	23	4,00	1,279	

Description: * Wilcoxon test

Table 3 shows changes in ROM and pain scores before and after the Mulligan Traction Straight Leg Raise intervention. Based on the Wilcoxon test results, there was a significant increase in ROM scores, where the average value increased from 68.48 ± 11.62 in the pre-test to 82.83 ± 11.85 in the post-test ($p = 0.000$). The average difference of 14.35 indicates that the intervention had a positive impact on increasing flexibility of movement. In the pain variable, there was a significant decrease, where the average pain score decreased from 8.13 ± 1.55 before the intervention to 4.13 ± 0.92 after the intervention ($p = 0.000$), with an average difference of 4.00. These results indicate that the intervention had a significant effect in reducing respondents' pain levels.

4. Discussion

The study results showed that administering the Mulligan Traction Straight Leg Raise (TSLR) significantly increased range of motion (ROM) and reduced pain in patients with low back pain. After the intervention, there was an increase in the degree of motion of the straight leg raise and improved posterior tissue flexibility. Patients were able to elevate their legs to a greater degree than before the therapy. This confirms that the Mulligan TSLR technique is effective in increasing tissue mobility and reducing movement restrictions previously influenced by pain and muscle stiffness. Physiologically, the TSLR technique works through the principle of mobilization with movement, which combines traction with leg elevation to create a decompressive effect on lumbar structures and peripheral nerves. The applied traction helps relieve pressure on irritated soft tissues and nerve roots, while the SLR movement promotes nerve gliding, reduces neural tension, and increases posterior tissue flexibility. These mechanisms contribute to the increased ROM found in this study. Furthermore, mechanoreceptor stimulation from manual manipulation can inhibit pain transmission through a gate control mechanism, resulting in significant pain reduction.

Recent studies have shown that Mulligan Traction Straight Leg Raise (TSLR) has a significant effect in increasing the range of motion in people with low back pain and other lumbar conditions that involve neurodynamic limitations. Irshad and his colleagues (2021) reported that Mulligan traction leg raise resulted in a greater increase in straight leg lift ROM compared to slump stretching, suggesting that this technique effectively reduces posterior tissue resistance and improves neurodynamic flexibility. TSLR provides significant ROM improvement after several intervention sessions [8]. Research published by Iqbal (2024) also shows that the

Mulligan TSLR technique provides increased functional mobility and meaningful ROM in patients with lumbar disorders [9]. In addition, Ahmad and his colleagues (2024) found that TSLR significantly increased ROM while decreasing pain in non-specific low back pain sufferers. These findings consistently suggest that Mulligan TSLR can improve ROM through traction mechanisms, soft tissue mobilization, and improved neural mobility Reference [10].

The mechanisms most likely to explain these findings include: (1) decompression/traction that reduces mechanical resistance to the lumbar structure and allows for increased range of motion; (2) neurodynamic improvement (nerve glide) so as to reduce neural tension that limits SLR; and (3) neuromodulation through mechanoreceptor stimulation that suppresses nociceptive impulses so that pain is reduced and movement becomes less inhibited, all of which contribute to a measurable increase in ROM after intervention. Recent empirical evidence combining TSLR with proprioceptive exercise or compared with other stretching techniques also supports that Mulligan's traction + motion combination often provides greater ROM and function improvements than passive stretching alone [11,12]. Thus, the 2021–2025 evidence pool suggests that Mulligan TSLR is an effective manual intervention to improve ROM and lower pain in cases of low back pain associated with posterior tissue tension and neurodynamic disorders [13].

According to researchers, Mulligan Traction Straight Leg Raise (TSLR) is a technique that has high effectiveness because it is able to produce an increase in range of motion (ROM) as well as a decrease in pain in patients with low back pain. The combination of traction and leg elevation movement in this technique helps to reduce compression on the lumbar structure, release posterior tissue tension, and improve nerve mobility that was previously limited due to spasms or irritation. The resulting reduction in pain can also be explained through mechanoreceptor stimulation that reduces nociceptive activity, thus allowing the patient to move more freely without pain inhibition. With reduced pain, the ROM increases optimally because the patient can achieve a greater degree of motion in the absence of the body's protective mechanisms. Clinically, this technique is seen as an intervention that is safe, easy to apply, and provides immediate benefits to the patient's movement function. Therefore, researchers argue that Mulligan TSLR deserves to be recommended as an important part of low back pain rehabilitation programs, especially in patients with limited soft tissue mobility or neurodynamic disorders.

Previous research has shown that the Mulligan Traction Straight Leg Raise (TSLR) technique has a consistent effect on increasing range of motion (ROM) and reducing pain in low back pain sufferers. An initial study by Hall and his colleagues reported that the application of TSLR was able to significantly increase SLR ROM in LBP patients through the mechanism of traction and mobilization of posterior tissues [14]. This finding is supported by the results of a recent study by Mane and his colleagues (2025), which showed that TSLR intervention can effectively reduce pain while increasing hamstring muscle flexibility in young patients with complaints of low back pain [15]. Other studies using the Mulligan variant of the Bent Leg Raise (BLR) technique also resulted in significant increases in ROM and decreased disability, as reported by Adnan and his colleagues (2022) and Bhosle & Rizvi (2022) [16, 17], indicates that the mobilization approach with movement from the Mulligan concept is effective in addressing neurodynamic limitations and soft tissue tension. In addition, a review conducted by Wardhani & Muslim (2022) showed that most studies on the Mulligan

technique in LBP cases reported significant improvements in pain and function [18]. Overall, the previous literature provides strong evidence that TSLR and other Mulligan techniques are effective interventions in increasing ROM and reducing pain, thus supporting the theoretical and empirical basis of this study.

5. Limitation of Study

This study has several limitations that should be considered when interpreting the results. First, the relatively small sample size of only 23 respondents may limit the generalizability of these findings to the broader population of low back pain sufferers. The study used a pretest–posttest design without a control group, so a causal relationship between the Mulligan Traction Straight Leg Raise (TSLR) and changes in ROM or pain cannot be firmly established. Although ROM and pain measurements were performed directly by trained physiotherapists, the use of a manual goniometer and Visual Analog Scale (VAS) still has the potential to introduce measurement bias due to patient subjective perceptions and variations in the assessor's skills.

Furthermore, the intervention duration of only six sessions was insufficient to evaluate the long-term effects of the Mulligan TSLR technique, including the likelihood of symptom recurrence or the sustainability of functional improvements after therapy is discontinued. Individual variations among participants, such as levels of soft tissue tension, nerve flexibility, posture, physical activity habits, and other medical conditions, are also difficult to control for and could potentially influence therapy responses differently. This study also did not evaluate broader functional parameters, such as daily activity ability, muscle strength, spinal mobility, or quality of life, so a comprehensive picture of the long-term clinical impact of the intervention is not yet available.Finally, the study did not compare TSLR with other physiotherapy modalities, so it cannot be determined whether TSLR is superior, equivalent, or less effective than commonly used clinical interventions for low back pain. Therefore, further research with a more robust design, larger sample size, adequate control group, and evaluation of more extensive functional parameters is highly recommended to strengthen the scientific evidence regarding the effectiveness of Mulligan TSLR.

6. Conclusion

The results of this study demonstrate that the application of Mulligan Traction Straight Leg Raise (TSLR) is effective in improving both range of motion (ROM) and pain levels among individuals with low back pain. Following the intervention period, participants showed a significant increase in ROM accompanied by a meaningful reduction in pain intensity, indicating that the therapeutic effects of TSLR contribute substantially to functional improvement. Therefore, this technique can be considered a successful and clinically relevant intervention for managing low back pain, offering a practical and beneficial option within physiotherapy rehabilitation programs.

7. Abbreviation

LBP: Low Back Pain, TSLR:Traction Straight Leg Raise, ROM : range of motion, VAS: Visual Analog Scale

8. Competing interest

The authors declare that they have no competing interest

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