

The Impact of Core Stability Exercises on Improving Mobility and Reducing Pain in Low Back Pain

Harini Desi Utami¹, Rachmah Laksmi Ambardini²

^{1,2} Universitas Negeri Yogyakarta, Yogyakarta, DIY, 55281, Indonesia Corresponding

ABSTRACT: The objectives of this research are to determine: 1) the effect of William Flexion exercises towards complaints of lower back pain, 2) the effect of core stability exercises towards the complaints of lower back pain, 3) the difference in the effect between William Flexion and core stability exercises towards the complaints of low back pain. The type of this research was a two group pretest-posttest design experiment where the William Flexion and core stability exercise methods were treated routinely 3 times a week for 4 weeks. The research was conducted at the Karang Malang Campus, Yogyakarta State University, the research period was 4 weeks from mid-October to mid-November 2023. The research sample was for about 40 people, 20 people were given the treatment of William Flexion exercise group and 20 people were given the Core Stability exercise method. The data analysis technique used hypothesis testing with t test analysis. The results of the study showed that 1) There was an effect of William Flexion training on pain ($p < 0.05$), range of motion ($p < 0.05$) and function ($p < 0.05$) on complaints of lower back pain. 2) There is an effect of Core Stability exercises on pain ($p < 0.05$), range of motion ($p > 0.05$) and function ($p > 0.05$) in William Flexion and Core Stability exercises in cases of low back pain. It was concluded from this research that William Flexion and Core Stability exercises can reduce complaints of lower back pain. There is no significant difference between William Flexion and Core Stability exercises. The exercise application can be adjusted to suit your needs.

KEYWORDS: William Flexion exercises, Core Stability exercises lower back pain

I. INTRODUCTION

Back pain is the most common health problem in Western industrialized societies, causing suffering and hardship for those with spinal pain (Frost, 2019). The exact cause of musculoskeletal disorders depends on age; older people tend to experience musculoskeletal pain due to damage to body cells. The type of work or occupation, intensity of activity, poor posture habits, excessive inactivity during physical activities, injuries or trauma to any part of the body due to sudden movements, or accidents involving cars or motorcycles. The impact of musculoskeletal disorders on workers reduces efficiency, wastes time at work, and lowers work productivity. (Cindyastira, Russeng and Wahyuni, 2014).

The World Health Organization states that approximately 1.7 billion people suffer from musculoskeletal disorders; in 2020, no fewer than 247,620 people experienced spinal injuries at work within 14 days.

The Liberty Mutual Workplace Safety Index Mutual 2021 provides data showing that spinal injuries cost U.S. employers billions of dollars annually in worker compensation, lost productivity, and absenteeism. Lower back pain is the leading cause of disability worldwide with a global prevalence of 7.2%, affecting 4/5 of people throughout their lives their lives (Shebib, 2019). It is a medical condition affecting the bones, nerves, tendons, ligaments, and spinal discs (Mayasari & Saftarina, 2018). Different types of pain are experienced in back pain felt by children and adults. Moreover, if the back pain experienced by children is accompanied by other complaints, such as fever, weight loss, weakness, numbness, difficulty walking, pain that radiates to the lower limbs, bladder and bowel issues, and pain that can interfere with a child's sleep (American Academy of Orthopedic Surgeons, 2015). Children aged 8-12 years in Tuzla Canton showed that 624 children (48%) experienced musculoskeletal pain, and 214 children (16%) experienced chronic back pain. Another study indicates that the prevalence of lower back pain among school-aged children ranges from 25% to 55% among those aged 10 to

15 years (Macedo, Silva, Sousa., et al., 2015). Excessive activity can lead to damage in connective tissue, causing pain and impaired function that may worsen over time. Although there is no single exercise program suitable for everyone with low back pain, there

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are various forms of exercise or exercise therapy tailored to the type of complaint experienced, allowing adjustments to the duration and intensity provided (Roy, 2013: 5).

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Cases of low back pain caused by sacroiliac joint abnormalities account for approximately 13% of low back pain cases, 45% of pain originates from the disc area, and 15-20% of pain originates from the facet joints. Low back pain is divided into two types: acute low back pain and chronic low back pain. Acute lower back pain manifests as sharp, deep, and sudden pain. Additionally, the piercing pain prevents one from resting comfortably.

Any movement in the affected lumbar region intensifies the pain. Limited lumbar mobility is the initial response to symptoms of dysfunction. musculoskeletal disorders that can cause back pain. The degree of musculoskeletal pain, including lower back pain. About 80% of the population has experienced back pain at least once in their lives. Based on strong diagnostic data, the severity of back pain related to health can reach 11.9% depending on the diagnosis or symptoms, or 24.7% (Medicine et al., 2010).

Lower back pain is associated with muscle, tendon, and ligament strain in the back after performing heavy activities such as lifting heavy loads in an incorrect position, bending over for too long, standing or sitting in an incorrect position (Sherman et al., 2010). Research on lower back pain (LBP) in the workplace indicates that LBP can be caused by various factors, including infections, degenerative diseases, neoplasms, trauma, congenital diseases, metabolic disorders. Based on research conducted in Indonesia, the incidence of LBP is estimated to vary between 7.6% and 37%. In this context, it is stated that exercise can help reduce low back pain complaints. Therapeutic exercise is one way to address low back pain or lower back pain. Exercise therapy retrains the strength of the back and abdominal muscles, thereby increasing their elasticity and maintaining lumbar mobility. Exercises for the lower back are necessary to maintain the function of the back and abdominal muscles, which are important insupporting the body. Exercise therapy for lower back pain consists of various conservative therapeutic approaches, including medication, physical modalities, traction, education, the use of a brace, and exercise therapy. This study compared two (two) exercises to reduce lower back pain complaints, between the William Flexion exercise and Core stability. The William Flexion exercise has the advantage of improving lumbar flexibility and reducing disability in cases of myogenic lower back pain, increasing muscle elasticity and reducing lower back pain, helping to reduce lower back pain, especially in the abdominal muscles and gluteus maximus muscles, while Core stability has the advantage of improving lumbar flexibility and reducing disability in cases of myogenic lower back pain, helping to reduce lower back pain, especially in the abdominal muscles and gluteus maximus muscles, while Core stability has the advantage of improving lumbar flexibility and reducing disability in cases of myogenic low back pain, helping to reduce lower back pain, especially in the abdominal muscles and gluteus maximus muscles, helping to reduce lower back pain, especially in the abdominal muscles and gluteus maximus muscles.

The high risk of low back pain among academic staff in this study. One way to reduce lower back pain is to apply the William Flexion exercise. This simple exercise was first introduced by Dr. William's in 1937. The William Flexion exercise method Flexion exercise is designed to reduce back pain by strengthening the lumbar sacral muscles and stretching the lower back area. The primary muscles involved are the abdominal muscles and the gluteus maximus muscles (Luklukaningsih, 2010:124). William Flexion exercises aim to reduce pain and create stability in the lower trunk through strengthening activities for the abdominal, gluteus maximus, hamstring, lower back, and hip flexor muscles. This exercise method provides a stretching effect on the muscles. which experiences shortening by activating the Golgi tendon and muscle spindle, making the muscles relaxed and flexible so that muscle work becomes balanced. The flexibility and core stability resulting from the William Flexion Exercise are also excellent for improving flexibility and reducing complaints in cases of lower back pain (Skundric, et al, 2021).

The William Flexion Exercise includes floor sit-ups that require an upright body position and engage postural muscles, training the abdominal and core muscles that support the spine, thereby engaging other muscles such as the hip and lower back muscles, which can reduce lower back pain.

Core stability exercises are designed to develop muscle strength, endurance, and flexibility in the muscles supporting the spine to repair damaged tissue and enable patients to return to normal daily activities while improving functional movement (Rajabi, 2018). This core stability exercise program is useful for stabilizing the spine. The core refers to the trunk muscles surrounding the spine and abdominal organs. Core stability and motor control have been proven important for initiating functional limb movements. Medical practitioners use core strengthening techniques to improve performance and prevent injuries. Core strengthening, often referred to as lumbar stabilization, has been used as a therapeutic exercise treatment for lower back pain conditions. The wide-ranging benefits of core stabilization include preventing injuries and alleviating lower back pain. Core Stability exercises have a very strong foundation in the treatment and prevention of lower back pain and musculoskeletal disorders, as evidenced by clinical use. Core stability is implemented according to a theoretical framework that dysfunction in the core muscles is associated with musculoskeletal injuries.

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Therefore, exercises that restore and enhance core stability are associated with injury prevention and rehabilitation. Common causes of lower back pain include muscle tension, improper posture, or non-ergonomic positioning of the trunk muscle group. Ergonomic, such as poor sitting habits, working in a bent position for extended periods, lifting loads in non-ergonomic positions, abnormal spinal alignment, or certain conditions like age-related diseases. Core stability exercises have undergone a process of development and refinement of clinical rehabilitation strategies focused on contemporary core stability programs involving motor control and muscle capacity. Both factors have a strong foundation as the development of core stability exercises, enhancing the efficacy of core stability exercises, particularly from a motor control perspective, and there is evidence of improvement related to the factors addressed in the intervention, not the cause of the intervention (Hodges, 2003). Core stability exercise methods have a strong basis for preventing musculoskeletal conditions and treating spinal disorders. Core stability training methods have a strong foundation for preventing musculoskeletal conditions and treating spinal disorders. The literature supporting exercise programs includes co-contracting muscles to provide joint stability, balance and disturbance exercises, and plyometric exercises. Both exercise methods, William Flexion Exercise and Core Stability Exercise, are equally effective in improving lumbar flexibility and reducing disability in cases of low back pain miogenic. William Flexion Exercise has a greater effect on lumbar flexibility than Core Stability Exercise, while William Flexion Exercise helps reduce lower back pain, especially in the abdominal muscles and gluteus maximus muscles/Exercises for the treatment of low back pain have been developed to maintain spinal stability, including William flexion and core stability exercises. To date, it is not yet known which exercise method is more effective for treating low back pain. Therefore, further research is needed on this issue.

II. METHOD

Type of Research

This research is a two-group pretest-posttest experimental design comparing different exercise therapy methods for back pain complaints. In this study, there was no control group; all participants received the William Flexion and Core Stability exercise method treatment routinely three times a week for four weeks.

Research Location

The research was conducted at the Karang Malang Campus of Yogyakarta State University Yogyakarta, with the research period lasting 4 weeks from mid-October to mid-November 2023.

Research Instruments

According to Sugiyono (2017: 148), research instruments are tools used to measure natural and social phenomena that are observed.

a. Visual Analog Scale (VAS)

Pain measurement using the visual analog scale (VAS). VAS is an instrument used to assess pain intensity using numbers. In the VAS method, the visualization is in the form of a 10 cm line, where the left end does not indicate pain, while the right end indicates severe pain. The VAS can be filled in with indicators of pain relief.

b. Modified Schober Test

The modified Schober test aims to measure the range of motion in the lumbar region.

Procedure:

The respondent stands upright in an anatomically correct position. Range of motion measurement is performed using a measuring tape. The examiner places the first mark at the midpoint aligned with the posterior superior iliac spine (PSIS). The second mark is placed above the first mark by drawing a straight line upward with the measuring tape at a distance of 15 cm. The subject is then asked to perform lumbar flexion (bending forward) and extension (standing upright) movements according to their ability, and the distance for flexion and extension is measured again and recorded. The range of motion of the lumbosacral joint is calculated by subtracting the measurement from the initial movement from the measurement from the final movement (in cm).

The interpretation of this measurement is that if the measurement result during lumbar flexion is less than 5 cm and during extension is less than 3 cm, it indicates a limitation in the range of motion of the lumbar-sacral joint

c. Modified Oswestry Disability Indeks (Modified Oswestry low back pain disability questionnaire)

The Modified Oswestry Disability Indeks is a measurement tool used to assess the level of disability in questionnaire form. Procedure. Each sample or respondent was given an explanation of the purpose and method of completing the ODI questionnaire. Respondents were asked to check the boxes provided that described the functional disability of the patient. For each question, there were six answer options with a total value of 5.

Data Analysis Techniques

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Data analysis techniques use the t-test (if the prerequisite test is met). There are two t-tests used, namely the paired t-test to test hypotheses 1 and 2 and the independent t-test to test hypothesis 3.

III. RESEARCH RESULT

The results of this research hypothesis test are based on data analysis and interpretation of the T-test analysis. a. Hypothesis test of the effect of Core Stability and William Flexion on the pain scale. The t-test results for the exercise group above can be stated as a significance value of 0.000, a calculated t-value and a table t-value of 2.093. If the significance value is $0.000 < 0.05$ and the t-value is > 2.262 , there is a significant difference between the pretest and posttest. In the t-test for the core stability exercise group, the results show that the reduction in pain is more significant in managing pain. Therefore, it can be concluded that the hypothesis that Core Stability and William Flexion exercises can reduce the pain scale has been proven. b. Hypothesis test: Core stability and William Flexion exercises can improve function. The t-table test results in Table 8 above show a significance value of 0.000, with the calculated t-value $>$ the t-table value of 2.262. If the significance value is $0.000 < 0.05$ and the calculated t-value $>$ the t-table value of 2.262, then there is a significant difference between the pretest and posttest. Therefore, it can be concluded that core stability and William Flexion exercises can improve function. c. Core stability hypothesis test The t-table test results in Table 8 above show a significance value of 0.000, with a t-count value $>$ ttable value of 2.262. If the significance value is $0.000 < 0.05$ and the t-count $>$ t table 2.262, then there is a significant difference between the pretest and posttest. It can be concluded that core stability training results in a more significant decrease in range of motion, which has been proven. d. Differences in Results Between the William Flexion and Core Stability Groups The results of the difference between the William Flexion and Core Stability groups can be tested using the Mann-Whitney U test. The results of the Mann-Whitney U test can be seen in the table below:

Test Statistics

MANN-WHITNEY U	181.000
WILCOXON W	391.000
Z	-.516
ASYP. SIG. (2- TAILED)	.606
EXACT SIG. [2*(1- TAILED SIG.)]	.620^B

a. Grouping Variable: Type of Exercise

b. Not corrected for ties.

Based on the results of the Mann-Whitney U analysis above, the U value is 181, and the Sig or P Value is $0.620 < 0.05$. If the p value is $>$ the critical limit of 0.05, then there is no significant difference between the two groups

Discussion

Lower back pain itself is not a diagnosis, but rather a musculoskeletal syndrome characterized by pain, tension, muscle stiffness, and discomfort in the lower back and surrounding areas. Lower back pain can be influenced by sitting habits, working positions that involve prolonged bending, lifting and carrying loads in non-ergonomic positions, spinal abnormalities, or certain diseases such as degenerative diseases. To reduce back pain in this study, exercises were performed using the William flexion exercise and core stability training.

1. The effect of core stability exercises showed

A reduction in pain. Based on the calculated t-value and the t-table value of 2.093, if the significance level is $0.000 < 0.05$ and the calculated t-value is $>$ t-table 2.262, there is a significant difference between the pretest and posttest. In the t-test for the core stability exercise group, the results showed that pain reduction was more significant in managing pain. Therefore, it can be concluded that the hypothesis that Core Stability and William Flexion exercises can reduce pain on the pain scale has been proven. This exercise method provides a stretching effect on muscles that have undergone shortening by activating the Golgi tendon organs and muscle spindles, making the muscles relax and become flexible, thereby balancing muscle function. Flexibility and core stability as effects of the William Flexion exercise are also highly beneficial for improving flexibility and reducing complaints in cases of lower back pain (Skundric et al., 2021). William flexion exercises include several movements such as floor sit-ups that require an upright body position and engage postural muscles, training the abdominal and core muscles that support the spine, thereby engaging other muscles such as the hip and lower back muscles, thereby reducing pain in the lower back. Core stability exercises undergo an evolving process and refined clinical rehabilitation strategies focused on contemporary core stability programs involving motor control and muscle capacity. Both factors have a strong foundation as the development of core stability

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exercises, the increased efficacy of core stability exercises, particularly from the perspective of motor control, and there is evidence of improvement related to the factors addressed in the intervention, not the cause of the intervention. Core stability exercise method have a strong foundation for preventing musculoskeletal conditions and treating spinal disorders. Supporting literature for exercise programs includes simultaneous muscle contractions to provide joint stability, balance exercises and disruptions, as well as plyometric exercises

2. Core Stability Exercise Results

That Improve Function The t-test results show that the calculated t-value > the table t-value of 2.262. If the significance level is $0.000 < 0.05$ and the calculated t-value > the table t-value of 2.262, therefore, there is a significant difference between the pretest and posttest. It can be concluded that core stability exercises and William Flexion can improve function. Core stability has been proven to be a spinal stabilization exercise program. Core stability is implemented in accordance with the theoretical framework that dysfunction in the core muscles is related to injuries (musculoskeletal). Therefore, exercises that restore and improve core stability are related to injury prevention and rehabilitation. Common causes of lower back pain include muscle tension, poor posture, or non-ergonomic positioning of the trunk muscle group, such as poor sitting posture, prolonged bending while working, lifting heavy objects in a non-ergonomic position, abnormal spinal alignment, or certain diseases like age-related conditions. age-related conditions. Core stability is an active exercise designed to strengthen muscles and enhance stability to support the spine and help prevent lower back pain. By strengthening the muscles that stabilize the lumbar region and spine, pain can be reduced and functional ability improved. Core stability improves trunk stability, pelvic floor stability, simultaneous contraction of the abdominal muscles, multifidus muscles, and enhances motor performance of the spinal muscles in the central region, which are postural muscles. Therefore, by performing core stability exercises, a normal posture can be formed with balanced muscle distribution in the lower back area. With normal body posture and stable muscle work balance, blood circulation is improved, and local metabolism becomes optimal, thereby reducing or even eliminating pain (Zuhri & Rustanti, 2022).

3. Core Stability Exercise Results

Showed a Decrease in Range of Motion The t-test results in Table 8 above show a significance value of 0.000, where the calculated t-value is greater than the t-table value of 2.262. Thus, there is a significant difference between the pretest and posttest. Therefore, it can be concluded that core stability exercises resulted in a more significant decrease in range of motion, which has been proven. These results indicate that the difference obtained is based on the improvement in the reduction of lower back pain. From the percentage obtained, it is known that William flexion exercises have a better effect compared to core stability exercises.

V. CONCLUSIONS

A. Conclusion

Based on the results of the research and previous discussions, several conclusions were obtained, namely:

1. The results of the first t-test showed a significant difference between the pretest and posttest, concluding that William Flexion and Core Stability exercises can reduce the pain scale has been proven.
2. he results of the second t-test show a significant difference between the pretest and posttest, concluding that Core stability and William Flexion exercises can improve function, which has been proven.
3. The results of the third t-test show a significant difference between the pretest and posttest, concluding that core stability exercises have resulted in a more significant reduction in range of motion, which has been proven. Based on the results of the Mann-Whitney U analysis above, it can be concluded that there is No. significant difference between Core stability exercises and William Flexion exercises.

B. Recommendations

Based on the above conclusions, there are several recommendations that can be made, namely:

1. For employees who have lower back pain (Low Back Pain) can reduce it by performing William Flexion or Core Stability exercises independently.
2. For future researchers, it is recommended to consider conducting this study using different subjects, both in term of quantity and quality level..

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