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Original Article

Comparative Effects of Core Stability Exercises and Endurance Training In Patients With Mechanical Low Back Pain

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ABSTRACT

Low back pain (LBP) is a major health problem resulting in psychosocial and physical disability. The prevalence of LBP and risk of recurrence is rising due to the sedentary lifestyle, poor postural awareness, and short-term oriented intervention plans. **Objective:** To compare the effects of core stability exercises and endurance training on the pain and functional disability in the population having mechanical LBP. **Methods:** It was a quasi-experimental study with74 patients with chronic LBP, divided equally into two groups containing 37 patients each. Both groups were treated with a baseline of moist heat pack in combination with interferential. Group A was treated with core stability exercises and group B was treated with endurance training five times a week. Pre and post-treatment scores were compared with NPRS for the intensity of pain and Oswestry Disability Index for functional disability scores. Data was analyzed by SPSS.25 on 74 patients. In type of pain, about 79% of patients were suffering from a moderate and severe type of pain while there were only 21% of patients came with mild pain in both groups. An Independent t-test was applied for changes between the group on NPRS scale. **Results:** The results show significant results with $p<0.05$. In core stability group the difference between pretreatment and post-treatment was 6.08 to 1.4 and in the stability group the difference was 6.13 to 1.10. In endurance training exercises on ODI, there was no one with severe disability, and 94.6 %were with minimal disability and only 5.4 % were with moderate disability. It shows that endurance training exercises were better than stability exercises. **Conclusions:** It is concluded that endurance training has more clinical differences in outcome measures of NPRS and ODI as compared to core stability exercises in patients with mechanical LBP.

INTRODUCTION

Low back pain (LBP) is a worldwide health issue that causes more impairment than any other medical disease. LBP is thought to affect up to 86 percent of people. Spinal stenosis, peripheral neuropathy, degenerative disc disease, Intervertebral Disc Herniation, peripheral neuropathy, and pinched nerves can be the few other illnesses that can be caused by LBP [1]. The vast majority of individuals with vague LBP will be seen in general care. There is a high recurrence rate due to mechanical reasons [2]. LBP can have a variety of reasons with multiple types of differentiated diagnosis. LBP has a wide range of causes. Symptoms produced by a specific pathophysiologic mechanism, such as herniated nucleus pulposus, infection, osteoporosis, rheumatoid arthritis, or fracture, are referred to as specific LBP [3]. Nonspecific LBP, is commonly known as "basic backache". It is a typical musculoskeletal "mechanical" back pain whose symptoms change with physical activity. Low back discomfort is frequently caused by lumbar instability, which can result in significant impairment [4]. Structural changes, such as the sagittal orientation of the facet and pedicle facet angle, blade horizontalization, degenerative changes in the

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intervertebral disc and articular cartilage, soft tissue adaptive shortening, sarcopenia, cinematic changes, and pain, are among the explanations presented in the literature [5]. LBP has been related to abnormalities in the geometry and activation of the abdominal and lumbar multifidus muscles. People with a history of LBP have been shown to have multifidus muscle atrophy, which is defined as reduction in muscle size and a change in muscular reliability [6,7]. Studies have shown that individuals with LBP have a substantial decrease in back extensor muscle endurance [8]. Self-care, pharmacotherapy NSAIDs, opioids, muscle relaxants, glucocorticoids, etc. physiotherapy, cognitive behavioral therapy, massage, physical therapy(laser therapy, TENS), spinal manipulation, acupuncture, and, in some cases, invasive interventions such as glucocorticoid injections and surgical procedures are all used to treat LBP [9]. Conservative approaches include behavioral and cognitive therapy, as well as therapeutic exercise techniques. Conservative treatments include TENS, Traction, and inferential massage. NSAIDs are also used to treat pain. If all of these techniques fail to relieve back pain, surgery may be the last resort [10]. Core stability training is a type of exercise that tests the spine's stability while also teaching muscular activity patterns and postures that guarantee adequate stability without overworking tissue [11]. Extensor muscle endurance has been identified as a significant risk factor for LBP. Reduced physical endurance may be both a cause and a result of LBP [12,13]. In elderly people with LBP, a high level of kinesophobia might potentially impair muscular function even further [14]. The core stability exercises are to retrain the synchronic activity of the paraspinal, abdominal, and gluteal muscles, lowering the risk of injury and discomfort, lumbar stability would be more effective than muscular strength [15,16]. Individuals with disc degeneration endure pain and incapacity that lasts for several months. These impairments lead to significant job disability and high public health care costs [17]. In repeated, long-term loading, poor trunk muscular endurance can lead to muscle fatigue and a reduction in muscle responsiveness to stresses [18]. Poor back muscle endurance has been shown to be a predictor of the first episode of LBP as well as long-term back-related disabilities Recent evidence suggests that interventions based on lumbar muscle stabilization exercises and back endurance-resistance exercises may improve back pain and function performance. However, it is still unclear which type of exercise is more effective for the treatment of MLBP [19]. The objective of this study is to compare the effects of core stability exercises and endurance training on the pain and functional disability in the population having mechanical LBP.

METHODS

A quasi-experimental study was conducted. A sample size of 74 patients was calculated. The output of the sample size calculation from n4 Studies with 0.80 power of the study, with 5% margin of error and 95% confidence interval [20]. Participants were recruited from outpatient department of physiotherapy of private hospital after getting approval from ethical committee. Inclusion criteria was as follows, both male and female with age group of 35 to 55 years having mechanical LBP. Those participants were excluded who have any recent history of trauma or currently have any red flag sign, or any radiating pain, numbness or any other neurological signs. The pain was measured by Numeric Pain Rating Scale (NPRS), Functional mobility was taken on Oswestry disability index (ODI). NPRS is self-reported, single-dimensional 11point scale between 0 and 10 with test–retest reliability of r = 0.96 and validity correlations of 0.86 to 0.95 [21]. ODI is consists of 10 sections with 5 options in each section with total 50 score. The Categorical interpretation is as follows, 0% to 20%: Minimal disability, 21% to 40%: Moderate disability, 41% to 60%: Severe disability, 61% to 80%: Crippled, 81% to 100%: bed-bound or exaggerated symptoms [22]. After completion of thorough case history, physical assessment and examination by physiotherapist. All the participants were informed about their participation in the study, an oral explanation was given to them. Written informed consent was filled by all the participants along with basic socio-demographic details i.e. age, weight, height and BMI. Participants were allocated to parallel group with ratio of 1:1 (37 participants in each group). Assessment and examination of participants were done before and after the application of interventions by assessor physiotherapist. All selected participants were divided into Group A and Group B. The moist heat pack in combination with interferential was applied for 15 minutes. Moist heat pad were pre-immersed in ENRAUF NONIUS hydrocollator having temperature 600C [23]. They it was wrapped in 6 layers of towel before application. According to patient tolerance level, number of layers was increased or decreased. Session/set: 1 session per day/6 days per week. MINNATO interferential machine was used with the following; Model: Slimkine Input 220V Frequency: 50-60HZ. Output 0-48mA Mode: sweep Session/sets: 1 session per day/6 days a week.Group A: Core stability exercise group. This group was prescribed with following core stability exercises, a) Supine lying, Abdominal bracing, b) Supine lying, Abdominal bracing with heel slides, c) Supine lying, abdominal bracing with leg lifts, d) Supine lying, abdominal bracing with bridging. Progress if the patient was able to perform 30 repetitions with 8seconds hold. Exercises were performed under supervision, one session

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per day five times a week. Compliance was improved with the same home exercise program [24]. Group B: Endurance training group. The exercise protocol had 4 levels as follows, a) Bilateral shoulder lifts in prone position, b) Bilateral shoulder lifts with hands behind the head in the prone position, c) prone lying, both shoulders raised with bilateral arms elevated, d) Contra-lateral arm and leg lift in prone position. All the subjects started the protocol from level 1. As soon as the subjects could hold a given level position for least 10 seconds and repeat the exercise 25 times with break of 3 seconds between each effort. After that, they will progress to the next level. The exercise was performed under supervision, one session per day five times a week. Compliance is improved with the same home exercise program [7]. Data analysis was done by using IBM-SPSS 25. Descriptive statistics were done for all continuous data to obtain means and standard deviations. Frequencies and percentages were calculated for nominal and ordinal variables. To compare mean changes between groups, an independent t-test was used. The significance level was set at p=0.05.

RESULTS

Out of seventy-four patients in both groups, seventy-two percent (72%) were females compared to only twenty-eight percent (28%) males. The Characteristics of age, height, weight, and BMI in mean and SD are presented in table 1.

Variables	Group-A (n=37)		Group-B (n=37)	
	Mean	SD	Mean	SD
Age (yr), mean (SD)	49.8108	5.71955	50.1081	5.46597
Height (m), mean (SD)	5.4297	0.34389	5.3519	.46015
Weight (kg), mean (SD)	64.2703	10.16161	67.6216	9.66193
BMI (kg/m), mean (SD)	24.3484	3.14950	26.5370	3.68312

Table 1: Characteristics of Participants

In type of pain, about 79% of patients were suffering from moderate and severe type of pain while there were only 21% of patients who came with mild pain in both groups. About 40.5% in group A and 35.1% in group were suffering from LBP form 2 weeks to 3months. Frequency and percentage for both groups is presented in table 2. Independent t-test was applied for changes between the group on NPRS scale, the results shows significant results with p=0.00 as shown in table 3. The results of ODI in group A before treatment were 45.9 % with Minimal disability, 51.4 % with Moderate disability, and 2.7 % with severe disability. After the core stability exercises, there was no one with severe disability, and 89.9% were with minimal disability and only 10.8% were with moderate disability. In group B, there were 35.1 % with Minimal disability, 62.2 % with Moderate disability, and 2.7 % with severe disability. After the endurance training exercises, there was no one with severe disability, and 94.6 %were with minimal disability and only 5.4 % were with moderate disability. It shows that endurance training exercises are better than stability exercises. In core stability group, the difference between pretreatment and post-treatment was 6.08 to 1.4 and in stability group the difference was 6.13 to 1.10 (Table 3).

Variables		Group-A (n=37)		Group-B (n=37)	
Type of pain	Acute	10	27.0 %	6	16.2 %
	Sub-Acute	14	37.8 %	15	40.5 %
	Chronic	13	35.1 %	16	43.2 %
Duration of pain	Less than 2 weeks	9	24.3 %	6	16.2 %
	2weeks - 3 months	15	40.5 %	13	35.1 %
	more than 3 months	13	35.1 %	18	48.6 %

Table 2: Characteristics of Pain

Variables		Group-A (n=37)		Group-B (n=37)		p-value
		Mean	SD	Mean	SD	
NPRS	Pre-treatment	6.0811	1.51618	6.1351	1.68592	0.73
	Post-treatment	1.4054	1.11703	1.1081	.90627	0.00

Table 3: Within Group Outcome Variable Differences

DISCUSSION

The study is about the comparison of effects of core stability exercises and endurance training to reduce pain and disability in patients with mechanical LBP the results of this study are in line with the study done by Gunay et al. (2014) on muscle endurance exercises. It concluded that muscle endurance exercise may reduce the risk of back injuries and function loss. As a result, it aids in the prevention of LBP incidence and recurrence. Endurance training improves the trunk muscles' ability to withstand rapid, recurring, and long-term stress [10]. A study by Franca et al. found that both segmental stabilization and abdominal strength training are beneficial in managing pain and reducing functional impairment in individuals with persistent LBP. In comparison to the patients in the other group, segmental stability has just one extra effect: it increases the capacity of transverses abdominous muscle activation [9]. Agbonhalor et al studied the effects of a 10-weeks strength training program on pain intensity, muscle endurance, and kinesophobia in patients with non-specific LBP, the results show that if there is an increase in muscle endurance is beneficial in Mechanical LBP. Muscle strength exercise training is beneficial to people with LBP in order to reduce their discomfort. Strengthening the lumbar muscles should be regarded a crucial component in the treatment of people with LBP. This study suggested that core training exercises are better in LBP. The results are in contrast with this study. Although there is a significant change in core stability group but there is a greater mean difference in the endurance training group [11]. It is concluded that mechanical LBP is treated with core stability exercises and endurance training for trunk extensors after the use of a preparation modality, pain and

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disability can be more effectively managed in patients treated with endurance exercises as compared to core stability exercises.

CONCLUSION

It is concluded that endurance training has more clinical differences in outcome measures of NPRS and ODI as compared to core stability exercises in patients with mechanical LBP.

REFERENCES

[1] Khan AN, Jacobsen HE, Khan J, Filippi CG, Levine M and Lehman RA, Jr et al., Inflammatory biomarkers of low back pain and disc degeneration: a review. Annals of the New York Academy of Sciences. 2017;1410(1):68-84. doi.org/10.1111/nyas.13551

[2] Da Silva T, Mills K, Brown BT, Herbert RD, Maher CG and Hancock MJ. Risk of Recurrence of Low Back Pain: A Systematic Review. The Journal of orthopaedic and sports physical therapy. 2017;47(5):305-13. doi.org/10.2519/jospt.2017.7415

[3] Russo M, Deckers K, Eldabe S, Kiesel K, Gilligan C and Vieceli et al., Muscle Control and Non-specific Chronic Low Back Pain. Neuromodulation : journal of the International Neuromodulation Society. 2018;21(1):1-9. doi.org/10.1111/ner.12738

[4] Pandya RP and Shukla YU. Effect of Lumbar Stabilization Exercises on Stable versus Unstable Surface on Pain and Function in Mechanical Low Back Pain-an Evidence Based Study. International Journal of Science and Healthcare Research. 2021;6(2):273-9. doi.org/10.52403/ijshr.20210448

[5] Felicio DC, Pereira DS, Diz JBM, Queiroz BZ, Silva JPD and Leopoldino AAO et al., Anterior Trunk Mobility Does Not Predict Disability in Elderly Women With Acute Low Back Pain: Brazilian Back Complaints in the Elders (BACE-Brazil) Study Results. Spine. 2017;42(20):15528.doi.org/10.1097/BRS.0000000000002151

[6] Emami F, Yoosefinejad AK and Razeghi M. Correlations between core muscle geometry, pain intensity, functional disability and postural balance in patients with nonspecific mechanical low back pain. Medical engineering & physics. 2018;60:39-46. doi.org/10.1016/j.medengphy.2018.07.006

[7] Cortell-Tormo JM, Sánchez PT, Chulvi-Medrano I, Tortosa-Martínez J, Manchado-López C and Llana-Belloch S et al., Effects of functional resistance training on fitness and quality of life in females with chronic nonspecific low-back pain. Journal of back and musculoskeletal rehabilitation. 2018;31(1):95-105. doi.org/10.3233/BMR-169684

[8] Bolarinde SO, Christie CJ, Olagbegi OM, Alli AR and Abass AO. Effects of an eight-week lumbar stabilization exercise programme on selected variables of patients with chronic low back pain. Bangladesh Journal of Medical Science. 2020;19(3):467-74.doi.org/10.3329/bjms.v19i3.45864

[9] Frizziero A, Pellizzon G, Vittadini F, Bigliardi D and Costantino C. Efficacy of Core Stability in Non-Specific Chronic Low Back Pain. Journal of functional morphology and kinesiology. 2021;6(2). doi.org/10.3390/jfmk6020037

[10] La Vecchia C, Bosetti C, Lucchini F, Bertuccio P, Negri E and Boyle P et al., Cancer mortality in Europe, 2000-2004, and an overview of trends since 1975. Annals of Oncology. 2010;21(6):1323-60. doi.org/10.1093/annonc/mdp530

[11] Weismann K and Grønhøj Larsen F. Pernio of the hips in young girls wearing tight-fitting jeans with a low waistband. Acta dermato-venereologica. 2006;86(6):557-8. doi.org/10.2340/00015555-0151

[12] Agbonhalor E and Subulade A. Effects of 10-weeks strength training programme on pain intensity, muscle endurance and kinesophobia in patients with non-specific low back pain. Turkish Journal of Kinesiology. 2020:40-8. doi.org/10.31459/turkjkin.686739

[13] Bazargan M, Loeza M, Ekwegh T, Adinkrah EK, Kibe LW and Cobb S et al., Multi-Dimensional Impact of Chronic Low Back Pain among Underserved African American and Latino Older Adults. International journal of environmental research and public health. 2021;18(14). doi.org/10.3390/ijerph18147246

[14] Ishak NA, Zahari Z and Justine M. Kinesiophobia, Pain, Muscle Functions, and Functional Performances among Older Persons with Low Back Pain. Pain research and treatment. 2017; 2017:3489617. doi.org/10.1155/2017/3489617

[15] Narouei S, Barati Ah, Akuzawa H, Talebian S, Ghiasi F and Akbari A et al., Effects of core stabilization exercises on thickness and activity of trunk and hip muscles in subjects with nonspecific chronic low back pain. Journal of Bodywork and Movement Therapies. 2020;24(4):138-46. doi.org/10.1016/j.jbmt.2020.06.026

[16] França FR, Burke TN, Hanada ES and Marques AP. Segmental stabilization and muscular strengthening in chronic low back pain: a comparative study. Clinics (Sao Paulo, Brazil). 2010;65(10):1013-7. doi.org/10.1590/S1807-59322010001000015

[17] Chang NJ, Chou W, Hsiao PC, Chang WD and Lo YM. Acute effects of Kinesio taping on pain, disability and back extensor muscle endurance in patients with low

DOI:https://doi.org/10.54393/pbmj.v5i1.193

back pain caused by magnetic resonance imaging-confirmed lumbar disc degeneration. Journal of back and musculoskeletal rehabilitation. 2018;31(1):85-93. doi.org/10.3233/BMR-169681

[18] günay uçurum S, yıldırım Ya and Karadibak D. The effect of the muscle endurance training on the chronic low back pain. Fizyoterapi Rehabilitasyon. 2014;25:28-34. doi.org/10.7603/s40680-014-0004-y

[19] Nowotny AH, Calderon MG, de Souza PA, Aguiar AF, Léonard G and Alves BMO et al., Lumbar stabilisation exercises versus back endurance-resistance exercise training in athletes with chronic low back pain: protocol of a randomised controlled trial. BMJ open sport & exercise medicine. 2018;4(1):e000452. doi.org/10.1136/bmjsem-2018-000452

[20] Ngamjarus C and Chongsuvivatwong V. n4Studies: Sample size and power calculations for iOS. The Royal Golden Jubilee Ph D Program-The Thailand Research Fund & Prince of Songkla University. 2014.

[21] Young Ia Pt D, Dunning J Pt DPT, Butts R Pt P, Mourad F Pt DPT and Cleland Ja Pt P. Reliability, construct validity, and responsiveness of the neck disability index and numeric pain rating scale in patients with mechanical neck pain without upper extremity symptoms. Physiotherapy theory and practice. 2019;35(12):132835.doi.org/10.1080/09593985.2018.1471763

[22] Garg A, Pathak H, Churyukanov MV, Uppin RB and Slobodin TM. Low back pain: critical assessment of various scales. European spine journal : official publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research Society. 2020;29(3):503-18. doi.org/10.1007/s00586-019-06279-5

[23] Ostrowski J, Herb CC, Scifers J, Gonzalez T, Jennings A and Breton D. Comparison of Muscle Temperature Increases Produced by Moist Hot Pack and ThermoStim Probe. Journal of sport rehabilitation. 2019;28(5):459-63. doi.org/10.1123/jsr.2017-0294

[24] Kim B and Yim J. Core Stability and Hip Exercises Improve Physical Function and Activity in Patients with Non-Specific Low Back Pain: A Randomized Controlled Trial. The Tohoku journal of experimental medicine. 2020;251(3):193-206. doi.org/10.1620/tjem.251.193