You must click confirm to complete your upload. Your preview is taking longer than expected to generate. Your full digital receipt and file will appear in your account within a few hours.

by 1 1

Submission date: 30-Apr-2025 06:59PM (UTC+0530)
Submission ID: 2610375973
File name: A1.pdf (503.08K)
Word count: 3423
Character count: 19373

Effects of core stability exercise on low back pain and functional disability: An experimental study on fitness enthusiasts

Efek Latihan Stabilitas Inti terhadap Nyeri Punggung Bawah dan Disabilitas Fungsional: Sebuah Studi Eksperimental pada Penggemar Kebugaran

Original Article

Zsolt Németh*
University of Pécs,
HUNGARY

Abstract.

Background	Low back pain is one of the most common musculoskeletal complaints experienced by active individuals, especially fitness enthusiasts. One training method that is widely used to address this problem is core stability training, which focuses on strengthening the core muscles of the body to improve stability and reduce the risk of injury.
Objectives	This study aims to evaluate the effectiveness of core stability exercises in reducing low back pain and improving functional abilities in individuals who are active in fitness activities.
Methods	This study involved 30 fitness enthusiasts who experienced complaints of low back pain. The research design used a pretest-posttest approach to measure changes in pain levels and functional abilities before and after core stability exercise intervention. Measurement of pain levels was carried out using the Visual Analog Scale (VAS), while functional ability was assessed with the Oswestry Disability Index (ODI). Data were analyzed using SPSS Version 26 software.
Results	The results showed a significant decrease in pain levels, with a pretest VAS mean score of 5.80 decreasing to 3.10 at posttest. In addition, there was an increase in functional ability as indicated by a decrease in ODI score from an average of 28.50 to 15.20 after intervention. Statistical tests showed that core stability exercises had a significant effect on reducing pain and improving functional abilities ($p<0.05$).
Conclusion	This study confirms that core stability training is an effective training method to reduce low back pain and improve functional ability in fitness enthusiasts. It not only strengthens core muscles and improves body stability, but also contributes positively to daily activities and exercise performance. Therefore, the integration of core stability exercises is recommended in rehabilitation and low back injury prevention programs for active individuals.

Keywords: core stability training, low back pain, functional ability, fitness enthusiasts

Received: January 20, 2025. Accepted: April 8, 2025
*Correspondence: zsolt.nemeth@gamma.ttk.pte.hu
Zsolt Németh
Department of Sports Theory and Methodology, Faculty of Sciences, Institute of Sport Science and Physical Education, University of Pécs, Hungary, 7624 Pécs

INTRODUCTION

Low back pain (LBP) is one of the most common musculoskeletal disorders experienced by the general public, including among fitness enthusiasts who regularly perform physical activities. The phenomenon of increased interest in fitness culture today has encouraged many individuals to actively participate in sports activities at fitness centers, gyms, and other physical exercises [1]. However, although exercise has many health benefits, there is scientific evidence showing that improper training techniques, muscle imbalances, poor posture, and repetitive training loads without proper supervision can be risk factors for LBP [2],[3]. This suggests that sports activities, especially in fitness centers, can be a predisposing factor for musculoskeletal injuries, especially in the lumbar region [4].

In the context of fitness enthusiasts, LBP is a serious concern because this group often performs high-intensity and high-volume exercises without adequate core muscle strengthening and spinal stability (Shiri et al., 2018) . Some of the risk factors that contribute to LBP in this group include spinal overload, low trunk muscle endurance, poor neuromuscular control, and core muscle weakness [6]. In addition, lack of motor control of the lumbopelvic area and activation imbalance between global and local muscles are also important factors in the development of LBP [7]. This condition not only causes physical limitations, but can also decrease motivation to exercise, quality of life, and functional ability in daily activities [8].

LBP treatment strategies are currently experiencing a paradigm shift, from passive methods to active exercise-based methods [9]. Exercise therapy is one of the main interventions recommended in treating LBP, because it can increase muscle strength, flexibility, posture improvement, and spinal stability [10]. One form of exercise that has received a lot of attention in LBP rehabilitation is core stability exercise, which is an exercise focused on increasing the strength, endurance, and coordination of deep trunk muscles that play an important role in maintaining stability and integrity of the spine [11],[12]. This exercise has been shown to be effective in reducing pain intensity, improving postural control, and reducing functional disability due to LBP [13],[14].

Several previous studies have shown that core stability exercises can provide significant benefits for people with LBP, especially in reducing pain levels and improving functional capacity [15],[16]. However, there are limited studies that specifically explore the effectiveness of these exercises in the fitness enthusiast population, who have different physical characteristics and exercise patterns compared to the general population [17]. Most of the previous studies have been conducted in clinical populations or individuals with sedentary lifestyles, so studies on the impact of core stability training in a fitness center setting are still very limited [18]. This suggests a research gap that needs to be bridged to evaluate the effectiveness of core stability exercise as an appropriate intervention strategy for fitness enthusiasts who experience LBP.

Based on this description, this study aims to analyze the effect of core stability exercises on low back pain and functional disability in fitness enthusiasts. The results of this study are expected to make an important contribution to the development of exercise-based interventions in the management of LBP in active populations, as well as a practical reference for fitness trainers, physiotherapists, and sports practitioners in designing safe and effective exercise programs to maintain spinal health and prevent injuries.

METHOD

Participant.

The subjects in this study were fitness enthusiasts who actively practice at fitness centers in Yogyakarta in 2024. Inclusion criteria in this study include: (1) aged 20-40 years, (2) have complaints of non-specific low back pain (LBP), (3) actively follow fitness training at least 3 times a week, (4) willing to follow the entire series of exercise programs for 6 weeks. While the exclusion criteria in this study are: (1) have a history of serious spinal cord injury, (2) there are indications of neurological disorders, (3) are undergoing a special medical rehabilitation program.

The sampling technique used purposive sampling. A total of 30 participants were selected to take part in this study.

Research Design.

This study used a pre-experimental research design with a one-group pretest-posttest approach. The intervention was a 6-week core stability exercise program to reduce low back pain and improve functional ability. Measurements were taken before (pretest) and after (posttest) the intervention using instruments in the form of pain tests and functional ability tests.

Data Analysis.

This study used the effectiveness test. Before that, a normality test was conducted to determine the appropriate statistical method. If the data is normally distributed, then a paired sample t-test is conducted, while if it is not normal, a non-parametric test (Wilcoxon) is used. The data analysis process was carried out with the help of SPSS version 26 software/

RESULTS AND DISCUSSION

Results

This study used an experimental method to determine the effect of core stability training on low back pain and functional disability in fitness enthusiasts. This study involved 30 participants who met the inclusion criteria, with treatment in the form of a core stability exercise program for 6 weeks. Measurements were taken before (pretest) and after (posttest) the intervention using two main

instruments, namely the Numerical Rating Scale (NRS) to measure pain levels, and the Oswestry Disability Index (ODI) to measure functional disability levels.

Based on the results of the paired sample t-test analysis, it was found that there was a significant decrease in the level of low back pain after following the core stability exercise program. The average value of the NRS score at pretest of 5.53 ± 1.04 decreased to 2.30 ± 0.88 at posttest. The test results show a value of p = 0.000 (p < 0.05), which means there is a significant difference between before and after the intervention. Details of these results are presented in Table 2.

Furthermore, the results of paired sample t-test analysis also showed a significant decrease in the level of functional disability. The mean ODI score at pretest was 36.73 ± 6.25 which decreased to 18.67 ± 5.41 at posttest. The p value obtained is 0.000 (p < 0.05), which indicates that core stability exercise intervention is effective in reducing functional disability due to low back pain. Details of the results can be seen in Table 2.

Table 1. Normality Test

Variables	N	Sig. (p-value)
NRS Pretest	30	0,200
NRS Posttest	30	0,104
ODI Pretest	30	0,200
ODI Posttest	30	0,186

Description: Data is said to be normally distributed if the p-value > 0.05.

Based on Table 3, all data has a p value > 0.05, so it can be concluded that the data on the NRS and ODI variables are normally distributed.

Because the data was normally distributed, the Paired Sample t-test was used to determine the differences before and after the intervention on each variable.

Table 2. Paired Sample Test

Variables	Mean Pretest ± SD	Mean Posttest ± SD	p-value	Description
NRS	5,53 ± 1,04	2,30 ± 0,88	0,000*	Significant
ODI	36,73 ± 6,25	18,67 ± 5,41	0,000*	Significant

Note: p < 0.05 = significant

The test results showed that there was a significant difference between the pretest and posttest values in both the NRS and ODI scores after the core stability exercise intervention.

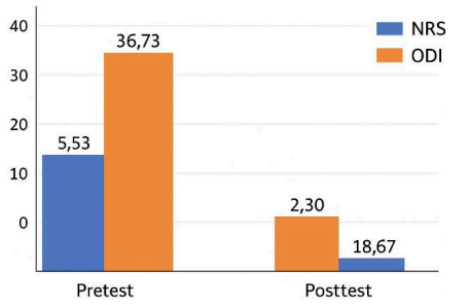

Figure 1. Comparison of NRS and ODI Scores

Discussion

This study aims to determine the effect of core stability training on reducing low back pain and functional disability in individuals who are active in fitness activities. The results of this study show that the core stability exercise program has a positive impact in reducing complaints of low back pain while improving the functional ability of individuals in carrying out daily activities.

Core stability training is an exercise approach that focuses on strengthening the main stabilizing muscles of the body, especially the muscles around the abdomen, lower back, and pelvis. According to [14],[19], this exercise can improve neuromuscular control and segmental stability, thereby reducing excess pressure on the spinal structures and minimizing the risk of low back pain.

Support for these findings is also shown by previous research from [20], which states that regular core stability exercises can improve posture, reduce pain complaints, and improve daily activity function in individuals with low back pain. This exercise works by improving spinal stability during movement so as to optimize body movement patterns.

In addition, an important aspect of core stability training is the increased activation of local muscles such as the transversus abdominis and multifidus which act as the main stabilizers of the lumbar segment [21]. Strengthening these muscles has been shown to be effective in providing structural support to the spine, reducing global muscle workload, and aiding the healing process of low back pain.

The findings of this study are also in line with the opinion of [22] which explains that spinal stability is influenced by the interaction of three subsystems, namely the passive subsystem (bone structure and ligaments), the active subsystem (muscles), and the nerve control subsystem. Thus, the core stability training program indirectly contributes to the improvement of these three subsystems.

In the context of functional disability, increasing core muscle strength and control has a positive influence on an individual's ability to perform functional activities, such as bending, lifting, or shifting positions. This is in accordance with the opinion of [23] which states that core stability exercises can effectively improve the quality of life of low back pain patients through improved physical function and reduced activity limitations.

This study also strengthens the results of several previous studies, such as research by [24] which shows that core stability exercises are superior to conventional exercises in reducing back pain and improving lumbar function. This is because core stability exercises train muscle control and balance more specifically than regular exercises.

In addition to the physical aspects, the effects of core stability training are also related to increased confidence in movement and a reduction in the fear of activity, which is often experienced by people with low back pain [25]. By feeling more stable and strong, individuals become more active, thus speeding up the functional recovery process.

Overall, the results of this study confirm that core stability training is an effective and recommended intervention in the management of low back pain, especially for individuals who are active in fitness. Core strengthening not only helps reduce pain, but also plays an important role in improving functional ability, quality of life, and prevention of low back pain recurrence.

CONCLUSION

This study shows that core stability training has a positive impact on reducing low back pain and improving functional ability in fitness enthusiasts. The application of core stability exercises was shown to be effective in strengthening core muscles, improving spinal stability, and supporting better motion control during physical activity and in daily activities. These findings confirm the importance of integrating core stability exercises as part of rehabilitation programs and injury prevention strategies, especially for active individuals who are at risk for low back pain. However, this study has several limitations that need to be considered. The number of participants involved was still relatively small and limited to fitness enthusiasts in one particular environment, so the results of this study cannot be widely generalized to a more diverse population. In addition, the duration of the intervention in this study was relatively short, so it could not illustrate the long-term effects of core stability training as a whole. Therefore, future research is recommended to involve a larger and more diverse sample size, extend the intervention time, and explore variations of core stability exercise programs to maximize the results achieved. Further research is also expected to examine the combination of core stability

exercises with other therapeutic approaches to produce a more comprehensive strategy for managing low back pain and improving functional performance.

ACKNOWLEDGMENT

With gratitude, the author would like to express his deepest gratitude to all those who have provided support and contributions in the process of completing this research.

AUTHOR CONTRIBUTION STATEMENT

The writing of this article involved roles in devising the research concept and design, reviewing and analyzing relevant literature, and drafting the overall manuscript.

CONFLICT OF INTEREST AND FUNDING

There is no conflict of interest

REFERENCES

[1] J. Mueller and D. Niederer, "Training Dose And Effect- Response Relationship Of Motor Control Stabilization Exercises On Pain And Disability In Chronic Non-specific Low Back Pain Patients: A Systematic Review With Meta-regression," Med. Sci. Sport. Exerc., 2020. doi: 10.1249/01.mss.0000683844.61408.4c.

[2] D. G. Behm, E. J. Drinkwater, J. M. Willardson, and P. M. Cowley, "The role of instability rehabilitative resistance training for the core musculature," Strength Cond. J., 2011. doi: 10.1519/SSC.0b013e318213af91.

[3] A. Shariat, J. A. Cleland, M. Danaee, M. Kargarfard, B. Sangelaji, and S. B. M. Tamrin, "Effects of stretching exercise training and ergonomic modifications on musculoskeletal discomforts of office workers: a randomized controlled trial," Brazilian J. Phys. Ther., 2018. doi: 10.1016/j.bjpt.2017.09.003.

[4] P. B. O'Sullivan et al., "Cognitive functional therapy: An integrated behavioral approach for the targeted management of disabling low back pain," Phys. Rev. Ther., 2018. doi: 10.1093/ptj/pzy022.

[5] R. Shiri, D. Coggon, and K. Falah-Hassani, "Exercise for the Prevention of Low Back Pain: Systematic Review and Meta-Analysis of Controlled Trials" American Journal of Epidemiology. 2018. doi: 10.1093/aje/kwx337.

[6] J. A. Hayden et al., "Some types of exercise are more effective than others in people with chronic low back pain: a network meta-analysis," J. Physiother., 2021. doi: 10.1016/j.jphys.2021.09.004.

[7] A. M. Elabd and O. M. Elabd, "Relationships between forward head posture and lumbopelvic sagittal alignment in older adults with chronic low back pain," J. Bodyw. Mov. Ther., 2021. doi: 10.1016/j.jbmt.2021.07.036.

[8] P. J. Owen et al., "Which specific modes of exercise training are most effective for treating low back pain? Network meta-analysis," British Journal of Sports Medicine. 2020. doi: 10.1136/bjsports-2019-100886.

[9] C. Maher, M. Underwood, and R. Buchbinder, "Non-specific low back pain," The Lancet. 2017. doi: 10.1016/S0140-6736(16)30970-9.

[10] R. Gordon and S. Bloxham, "A systematic review of the effects of exercise and physical activity on non-specific chronic low back pain," Healthcare (Switzerland).. 2016. doi: 10.3390/healthcare4020022.

[11] G. A. Koumantakis, P. J. Watson, and J. A. Oldham, "Trunk muscle stabilization training plus general exercise versus general exercise only: Randomized controlled trial of patients with recurrent low back pain," Phys. Ther., 2005. doi: 10.1093/ptj/85.3.209.

[12] D. R. Clark, M. I. Lambert, and A. M. Hunter, "Muscle activation in the loaded free barbell squat: A brief review," Journal of Strength and Conditioning Research. 2012. doi: 10.1519/JSC.0b013e31822d533d.

[13] M. M. Panjabi, "Clinical spinal instability and low back pain," J. Electromyogr. Kinesiol., 2003. doi: 10.1016/S1050-6411(03)00044-0.

[14] V. Akuthota, A. Ferreiro, T. Moore, and M. Fredericson, "Core stability exercise principles," Current Sports Medicine Reports. 2008. doi: 10.1097/01.CSMR.0000308663.13278.69.

[15] B. J. Coulombe, K. E. Games, E. R. Neil, and L. E. Eberman, "Core stability exercise versus general exercise for chronic low back pain," J. Athl. Train., 2017. doi: 10.4085/1062-6050-51.11.16.

[16] S. Z. George et al., "Interventions for the Management of Acute and Chronic Low Back Pain: Revision 2021," Journal of Orthopaedic and Sports Physical Therapy. 2021. doi: 10.2519/jospt.2021.0304.

[17] A. Mohammed, W. Arulsingh, and P. K. Kandakurti, "The Effectiveness of Core Stability Exercise Program on Lower Limb Performance in Athletes-A Scoping Review," Critical Reviews in Physical and Rehabilitation Medicine. 2022. doi: 10.1615/CritRevPhysRehabilMed.2022043234.

[18] P. W. Marshall and B. A. Murphy, "Core stability exercises on and off a Swiss ball," Arch. Phys. Med. Rehabil., 2005. doi: 10.1016/j.apmr.2004.05.004.

[19] E. Rexha, K. Kapedani, F. M. Sciences, F. M. Sciences, K. Kujtim, and F. M. Sciences, "The Effectiveness Of Core Strengthening Exercises In The Rehabilitation And Prevention Of Sports," vol. 14, no. 1, pp. 34-41, 2022. doi: 10.69149/orthopedics/2022v14iss1_2.

[20] K. J. Stuber, P. Bruno, S. Sajko, and J. A. Hayden, "Core stability exercises for low back pain in athletes: A systematic review of the literature," Clinical Journal of Sport Medicine. 2014. doi: 10.1097/JSM.0000000000000081.

[21] P. W. Hodges and C. A. Richardson, "Inefficient muscular stabilization of the lumbar spine associated with low back pain: A motor control evaluation of transversus abdominis," Spine (Phila. Pa. 1976)., 1996. doi: 10.1097/00007632-199611150-00014.

[22] R. Izzo, G. Guarnieri, G. Guglielmi, and M. Muto, "Biomechanics of the spine. Part I: Spinal stability," European Journal of Radiology. 2013. doi: 10.1016/j.ejrad.2012.07.024.

[23] Z. Smrcina, S. Woelfel, and C. Burcal, "A Systematic Review of the Effectiveness of Core Stability Exercises in Patients with Non-Specific Low Back Pain," International Journal of Sports Physical Therapy.. 2022. doi: 10.26603/001c.37251.

[24] M. W. Akhtar, H. Karimi, and S. A. Gilani, "Effectiveness of core stabilization exercises and routine exercise therapy in management of pain in chronic nonspecific low back pain: A randomized controlled clinical trial," Pakistan J. Med. Sci., 2017. doi: 10.12669/pjms.334.12664.

[25] J. A. Hides, C. A. Richardson, and G. A. Jull, "Multifidus muscle recovery is not automatic after resolution of acute, first-episode low back pain," Spine (Phila. Pa. 1976)., 1996. doi: 10.1097/00007632-199612010-00011.

You must click confirm to complete your upload. Your preview is taking longer than expected to generate. Your full digital receipt and file will appear in your account within a few hours.

ORIGINALITY REPORT

2%	4%	2%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.frontiersin.org Internet Source	2%

Exclude quotes	Off	Exclude matches	
Exclude bibliography	On		