Med. J. Cairo Univ., Vol. 93, No. 2, Accepted 13/5/2024
DOI: 10.22608/MJCU. 611-618, June 2025
www.medicaljournalofcairouniversity.net

The Effect of Dynamic Neuromuscular Stabilization Approach on in Patients with Lumbar Disc Herniation: A Randomized Clinical Trial

NADER E. GHONIEMY, M.Sc.*; HUDA B. ABD ELHAMED, Ph.D.**; MAHMOUD ELSHERIF, M.D.*** and EBTESSAM F. GOMAA, Ph.D.**

The Department of Physical Therapy for Orthopedics and its Surgery, Faculty of Physical Therapy, Suez Canal University, Department of Physical Therapy for Musculoskeletal Disorders and its Surgery, Faculty of Physical Therapy, Cairo University** and Department of Orthopedic Surgery, Faculty of Medicine, Suez Canal University****

Abstract

Background: Lumbar disc herniation (LDH) is a common disorder affecting many people as it causes pain, functional disabilities, and decrease in core muscles endurance.

Aim of Study: To evaluate the effects of the dynamic neuromuscular stabilization (DNS) approach in terms of pain level, functional capacity, and core muscles endurance in patients with LDH.

Patients and Methods: Before starting the study, ethical approval was obtained from the Research Ethical Committee, Faculty of Physical Therapy, Cairo University (P.T.REC/012/005145). Sixty patient with LDH from both genders were referred from an Orthopaedic surgeon. Their age ranged from 18 to 40 years old and their BMI didn't exceed 25 kg/m^2. Patients were randomly allocated into two equal groups; Group A received the DNS approach while Group B received a selected physical therapy (PT) program. All patients received sessions of supervised intervention; three sessions per week for six weeks. Pain level, functional disability, and core muscles endurance were evaluated using the VAS, the Oswestry disability index - Arabic version, and the pressure biofeedback unit respectively.

Results: There were no significant differences between both groups in post-treatment mean values of pain level while there were significant differences between them in favor of the DNS group in post-treatment mean values of functional disability and core muscles endurance.

Conclusions: The DNS approach has a greater effect than the selected PT program in improving functional disability and increasing core muscles endurance while they were equal in decreasing pain level in patients with LDH.

Correspondence to: Dr. Nader Elsayed Ghoniemy,
The Department of Physical Therapy for Orthopedics and its Surgery, Faculty of Physical Therapy,
Suez Canal University

Key Words: *Dynamic neuromuscular stabilization approach – Lumbar disc herniation – Pain level – Functional disability – Core muscles endurance – Pressure biofeedback.*

Introduction

LUMBAR disc herniation (LDH), also known as a slipped or ruptured disc, occurs when the soft inner material of a disc protrudes through the outer layer of the disc. This can cause pressure on nearby nerves, leading to pain, numbness, or weakness in the lower back, buttocks, legs, and feet **[1]**. It is relatively common, with 5 to 20 cases per 1000 adults annually. It is most prevalent in the second to fourth decade of life, with a female to male ratio of 2 to 1 **[2]**.

Symptoms can vary in severity and may include tingling, numbness, or muscle weakness **[3]**. In some cases, severe compression of the nerves can lead to difficulties with bowel or bladder control **[4]**.

Poor muscle coordination (including decreased intrinsic postural muscle activity, increased superficial muscle activity, and lack of spinal flexibility), and poor muscle recruitment patterns may alter the normal effective stability of the spine in patients with lumbar disc herniation (LDH), its reported that balance control and proprioception are reduced in patients with lumbar disc herniation when compared with healthy control subjects. They also found that reduced proprioception is correlated with impaired balance. Possible mechanisms for this may be changes in function and structure throughout the nervous system that affect sensorimotor control **[5]**.

Diagnosis typically involves a physical examination, medical history review, and imaging tests such as X-rays, MRI scans, or CT scans **[6]**. Treatment options vary based on the severity of symptoms and individual circumstances. Most cases can be managed with conservative treatments, including rest, limited physical activity, pain medications such as nonsteroidal anti-inflammatory drugs (NSAIDs), physical therapy exercises and stretches to improve strength, flexibility, and posture, and heat or ice therapy for temporary pain relief. In some cases, corticosteroid injections around the affected nerve can help reduce inflammation and relieve pain [7].

The dynamic neuromuscular stabilization (DNS) approach is a therapeutic method that focuses on the restoration and optimization of the body's movement patterns and neuromuscular function [8].

It is based on the understanding that human movement is influenced by the integration of the musculoskeletal system, the central nervous system, and the inherent developmental patterns observed in infants [9].

The DNS approach emphasizes the importance of proper alignment, joint centration, and coordinated muscle activation to achieve efficient movement and prevent injuries [10].

The DNS approach aims to activate and retrain the deep stabilizing muscles that are responsible for maintaining postural control and stability via utilizing specific developmental positions, such as crawling or rolling [11]. These deep stabilizing muscles, including the diaphragm, pelvic floor, and transverse abdominis, act as a foundation for movement and provide stability to the spine and other joints [12].

The DNS techniques involve a combination of positioning exercise, and motor reprogramming to improve motor control, enhance postural stability, and optimize movement patterns [13]. This study was conducted to evaluate the effects of the dynamic neuromuscular stabilization (DNS) approach in terms of pain level, functional capacity, and core muscles endurance in patients with LDH.

Patients and Methods

Study design and sample size calculation: This study was conducted at the Orthopaedic Outpatient Clinics, Suez Canal University Hospital, Ismailia Government. From April 2024 – October 2024. A two-armed pre-test posttest randomized clinical trial design was used in this study.

Inclusion criteria: Patients were included in this study if they were referred from an Orthopaedic surgeon as LDH grade 2. Their age ranged from 18 to 40 years old and their BMI didn't exceed 25kg/m^2 as more than this value have high risk of LDH [14]. Patients with no sciatica involvement confirmed by clinical tests; Lasègue's test, Bragard test, and Slump test.

Exclusion criteria: Patients were excluded from this study if they had severe neurological deficits or cauda equina syndrome, history of spinal surgery or significant spinal deformity, other severe medical conditions that may interfere with the study or DNS intervention as spinal instability, cardiac disease. Additionally, pregnancy or planning to become pregnant during the study period.

Patients preparation and randomization: Patients met the inclusion criteria were randomly allocated using a computergenerated randomization sequence. The randomization process was concealed to minimize selection bias. Participants were divided randomly into two equal groups in number:

- Group A: The study group, consisted of 30 patients and received the DNS approach.
- Group B: The control group, consisted of 30 patients and received the selected PT program for LDH.

Both groups received three sessions per week for six weeks [9].

All the assessment procedures were done before initiating the study and after 6 weeks of treatment:

1- *Measurement of pain intensity using the visual analogue scale (VAS):* It is a simple and commonly used pain rating scale consisting of a horizontal line 100 millimeters in length. At one end is the anchor point "no pain," and on the other end is the anchor point "worst pain imaginable". The score is calculated by measuring the distance (mm) on the 10-cm line between the "no pain," anchor and the Participants were asked to mark with at the point that represents their current level of pain level [15].

2- *Assessment of Functional Disability using the Oswestry disability index - Arabic version:* It is a widely used selfadministered questionnaire designed to measure the level of disability in individuals with LBP. It is consisted of ten sections, each representing different activities of daily living (e.g., pain intensity, personal care, lifting, walking, sitting, standing). Within each section, there are six response options that range from 0 to 5, with 0 indicating "no disability" and 5 indicating "most severe disability." Participants will rate their level of disability in each section by selecting the appropriate response option for each activity [16,17]. The scores from each section were summed up, and a total percentage score was calculated for each participant, a total score was calculated, percentage of disability (score obtained divided by 50 and multiplied by 100) ranges from 0% (no disability) to 100% (complete disability). The interpretation of this scale is based on the scores; from 0 to 20% minimal disability, from 20 to 40% moderate disability, from 40 to 60% severe disability, from 60 to 80% crippling low back pain and above 80% the person is confined to bed.

3- *Measurement of Core Muscle Endurance:* Pressure biofeedback unit is a tool used to assess the activation and control of specific muscles involved in lumbar stabilization [18]. The pressure biofeedback test has been validated by imaging and electro-myography tests that are considered the gold standard measurements for transversus abdominis (TrA) performance [19,20]. These tests demonstrated that individuals with LBP have an impaired ability to depress the abdominal wall. Hides et al. [21] suggested that TrA is important in sustaining the spinal cord and that is its conditioning accompanied by functional improvement.

The TrA activation capacity was assessed by using the stabilizer PBU (Chattanooga Group, Australia). The PBU is consisted of a combined gauge/ inflation bulb connected to a pressure cell. It is a simple device that registers changing pressure in an air-filled pressure cell allowing body movement, especially spinal movement, to be detected during exercise [22].

During the assessment, the device was placed on TrA (above the anterior superior iliac spines) while the participants lie on prone position on firm surface. The depression of abdominal muscles on spinal cord will decrease the pressure by 4-10 mmHg. Before individuals were asked to contract the muscle, the device was inflated to a pressure of 70mmHg. The participants were instructed to draw the abdomen gently off the pressure sensor and sustain it for 10 seconds measured by stop watch.

The patients ability to maintain the pressure difference through 10 seconds will be calculated for both groups before and after the treatment [22].

Treatment procedures:

1- *The Dynamic Neuromuscular Stabilization Approach:* The DNS approach is a therapeutic method aimed at improving motor control, stability, and coordination of the lumbar spine and surrounding musculature [23]. The treatment was conducted for three sessions per week for six weeks, with each session lasting approximately 50 minutes for each participant [24]. Each session, the participant was guided through various DNS exercises and techniques aimed at activating and improving core stability and neuromuscular control of the lumbar spine.

These exercises included various positions like supine, prone, side lying, and kneeling, focusing on proper breathing patterns (Diaphragmatic breathing) and stabilization of the core musculature [23]. The DNS protocol included 5min of warm-up, 40 minutes of DNS exercises (4 different body parts, 10 minutes per part) accompanied with breathing exercises, and 5 minutes of cool-down.

Steps of the Dynamic Neuromuscular Stabilization Explanation of technique: Patients received a clear explanation of the DNS technique and its benefits. Warm-up: Engage in a general warm-up routine to prepare the body for exercise and reduce the risk of injury.

Moving forward / backward / sideways with upper limb motion in different planes for five minutes.

Cool Down: End the session with a cooldown routine to relax the muscles and promote recovery.

Streching exercises for hamstrings, calf and adductors muscles each muscle 30 seconds for three times.

Diaphragmatic Breathing Exercise: Patients were lying on their back on a flat surface (or in bed) with their knees bent. They could use a pillow under their head and their knees for support if that's more comfortable. Then they Place one hand on their upper chest and the other on their belly, just below the rib cage. Then they breathed in slowly through their nose, letting the air in deeply, towards their lower belly. The hand on the chest should remain still, while the one on the belly should rise. Then they were asked to tighten their abdominal muscles and let them fall inward as they exhale through pursed lips. The hand on the belly should move down to its original position. They can also practice this sitting in a chair, with their knees bent and their shoulders, head, and neck relaxed. Practice for five minutes [25].

The DNS exercises included diaphragmatic breathing, baby rock, rolling, side lying, oblique sitting, tripod, kneeling, squat, and prone.

In each position the patient must be able to maintain optimum diaphragmatic breathing and intra-abdominal pressure regulation.

The starting positions of the DNS protocol are shown in (Fig. 1). The focus of the first 2 weeks were to learn and practice basic DNS exercises. Then gradually increase the complexity of the exercises through making transitional dynamic motion between these positions. The increase in the complexity enabled the participants automate their performance [9].

2- *The Selected Physical Therapy Program:* The participants in Group B received the selected PT program for LDH. The treatment also lasted for three sessions per week for six weeks. The conventional therapy program was as follows:

A- Mckenzie Exercises: The McKenzie method included few generic exercises and some specific exercises as a treatment protocol and specialized assessment techniques. The exercise protocol was comprising of prone lying, prone press ups, extension in lying, extension in standing [26].

B- Transcutaneous Electrical Neuromuscular Stimulation: It was used to stimulate nerves and muscles, aiding in pain relief and muscle rehabilitation [27].

Self-adhesive electrodes was applied to the skin. Typical electrical stimulation parameters involved a frequency range of 50 to 100 Hz and a duration of 20 to 30 minutes per session. Participants were closely monitored during the session to ensure safety and efficacy.

C- *Ultrasound Therapy:* Ultrasound (US) therapy was applied to generate heat deep within tissues, reducing pain and promoting tissue healing **[28]**. The intensity was set at around 0.5 to 1.5W/cm^2, and the duration of each session was 5 minutes.

Fig. (1): Starting positions of the training protocol of the dynamic neuromuscular stabilization approach. (A) Baby rock. (B) Sidelying. (C) Oblique sit. (D) Tripod. (E) Kneeling. (F) Squat. (G) Prone.

Statistical analysis:

Unpaired ***t***-test was conducted for comparison of subject characteristics between groups. Chi squared test was conducted for comparison of gender distribution between groups. Normal distribution of data was checked using the Shapiro-Wilk test. Levene's test for homogeneity of variances was conducted to test the homogeneity between groups.

Mixed MANOVA was conducted to investigate the effect of treatment on VAS, ODI and muscle endurance. The level of significance for all statistical tests was set at $p<0.05$. All statistical analysis was conducted through the statistical package for social studies (SPSS) version 25 for windows (IBM SPSS, Chicago, IL, USA).

Results

Subject characteristics:

There was no significant difference between groups in age, weight, height, BMI and gender distribution ($p>0.05$).

Effect of treatment on VAS, ODI and muscle endurance:

Mixed MANOVA revealed a significant interaction effect of treatment and time (F=60.03, p=0.001). There was a significant main effect time (F=1315.03, p=0.001). There was a significant main effect of treatment (F=13.11, p=0.001).

Within group comparison:

There was a significant decrease in VAS post treatment in both groups compared with that pretreatment ($p>0.001$). The percent of decrease in VAS of the study group was 69.80% and percent of decrease in VAS of the control group was 66.62% (Table 1, Fig. 2).

Table (1): Mean VAS, ODI and muscle endurance pre and post treatment of study and control groups.

	Pre-treatment Mean ± SD	Post-treatment Mean ± SD	MD	% of Change	*p*-value
VAS:					
Study group	7.65±0.69	2.31±0.51	5.34	69.80	0.001
Control group	7.64±0.65	2.55±0.52	5.09	66.62	0.001
MD	0.01	–0.24			
	p=0.95	*p*=0.08			

SD : Standard deviation.
MD: Mean difference.
p-value: Probability value.

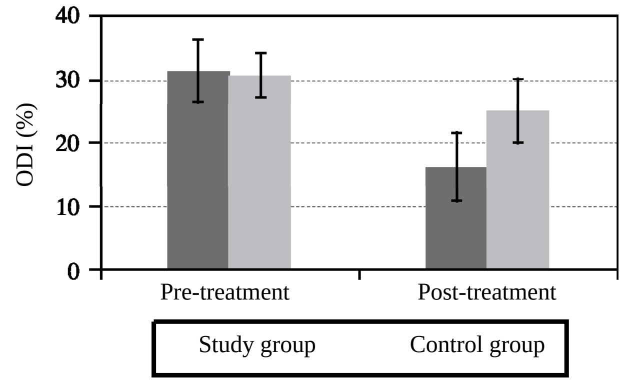

Fig. (2): Mean pain level pre and post-treatment of study and control groups.

There was a significant decrease in ODI post treatment in both groups compared with that pretreatment (p>0.001). The percent of decrease in ODIAR of the study group was 48.11%; and percent of decrease in ODI-AR of the control group was 18.22% respectively (Table 2, Fig. 3).

Table (2): Mean ODI pre and post treatment of study and control groups.

	Pre-treatment Mean ± SD	Post-treatment Mean ± SD	MD	% of Change	*p*-value
ODI (%):					
Study group	31.47±5.06	16.33±3.57	15.14	48.11	0.001
Control group	30.73±5.47	25.13±5.16	5.6	18.22	0.001
MD	0.74	–8.8			
	p=0.59	*p*=0.01			

ODI: Oswestry disability index.
SD : Standard deviation.
MD: Mean difference.
p-value: Probability value.

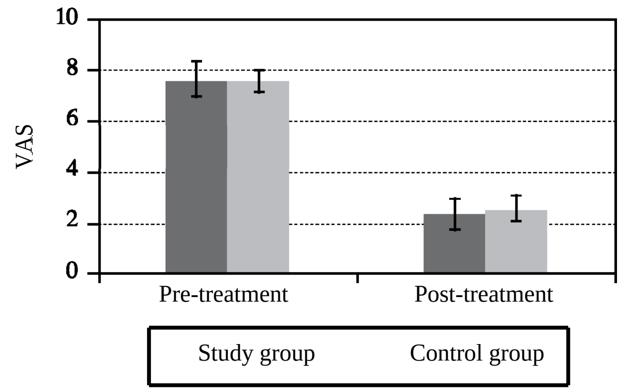

Fig. (3): Mean functional disability pre and post-treatment of study and control groups.

There was a significant increase in muscle endurance measured in time post treatment in both groups compared with that pretreatment (p>0.001). The percent of increase in muscle endurance of study and control groups were 37.93 and 14.54% respectively (Table 3, Fig. 4).

Between group comparison:

There was no significant difference between groups pre treatment (p>0.05). Comparison between groups post treatment revealed a significant decrease in ODI, and a significant increase in muscle endurance of study group compared with that of control group (p<0.001) (Table 2,3; Figs. 3,4).

There was no significant difference in VAS between groups post treatment (p>0.05) (Table 1, Fig. 2).

Table (3): Mean muscle endurance pre and post-treatment of study and control groups.

	Pre-treatment Mean ± SD	Post-treatment Mean ± SD	MD	% of Change	*p*-value
Core muscle endurance (sec):	7.83±0.91	10.80±1.00	–2.97	37.93	0.001
Study group	7.77±0.77	8.90±0.92	–1.13	14.54	0.001
Control group	0.06	1.9			
MD	*p*=0.76	*p*=0.001			

SD : Standard deviation.
MD: Mean difference.
p-value: Probability value.

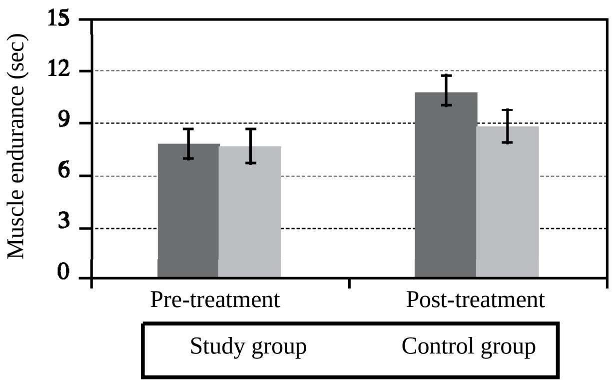

Fig. (4): Mean core muscle endurance pre and post-treatment of study and control groups.

Discussion

The current study aimed to compare three main parameters; pain level, functional disability, and core muscle endurance of the DNS versus control group in patients with LDH. The results demonstrated the effectiveness of DNS approach on patients functional abilities and core muscle endurance while the improvement was similar in both groups in terms of pain level. To the authors' knowledge, this is the only study till now demonstrating the effectiveness of DNS on related parameters in patients with LDH, therefore it was difficult to compare our data with the relevant literature.

The effectiveness of DNS approach has been investigated in different neuromuscular pathophysiologies such as stroke **[29,30]**. Different studies reported the superior effects of the DNS in improving the diaphragm movement, abdominal muscle endurance and motor performance. Despite the heterogeneity of the study protocols, the reported increase in neuromuscular activation following the DNS approach seems consistent with the current study results, indicating that the DNS approach is likely to be associated with improved functional abilities and core muscle endurance *[24,29]*.

The role of developmental kinesiology has been studied and discussed to describe the determinants of spinal stability for movement and musculoskeletal function. Patients with lumbar disc herniation demonstrate impaired stability due to muscle weakness and lack of control suggesting that training timing of both general and deep (core) muscles should be considered when designing intervention programs. The DNS approach emphasizes the importance of precise muscular timing and coordination for efficient movement as well as with stand compressive loading, which occurs in static or sustained postures. It has been reported that the DNS aims to alter movement behavior by means of a physical and cognitive learning process *[24,30]*.

The findings of the current study are in line with other recent published studies that demonstrate the effect of DNS approach on functional movement patterns and functional balance performance in patients with non-specific LBP regarding functional movements as deep squat, in-line lunge, hurdle step, shoulder flexibility, rotatory trunk stability, total functional movement screening score and Timed-up and go test score *[31]*.

As one of the strengths of the current study, we provide high evidence to support the positive effect of DNS on improving functional balance in LDH patients as a consequence of improved core muscles endurance. In line with our results, the DNS approach is reported to reduce postural perturbation and spinal compression and improve postural control leading to higher levels of functional control *[23,32]*.

Although the precise cause of LBP remains elusive, previous research has found that patients with LBP demonstrated neuromuscular, morphometric, or histologic changes in TrA or lumbar multifidus (LM) *[33]*.

Compared with asymptomatic individuals, patients with LBP displayed reduced TrA/LM thickness change during contraction, delayed feedforward activation of TrA/deep LM during trunk or limb movement *[34]*. Given the anatomic positions of TrA/LM and the impairments of these muscles in LBP patients, TrA/LM are postulated to play an important role in maintaining intervertebral stiffness/ stability and preventing LBP recurrence *[35]*.

It has been suggested that lumbar muscle strengthening programs in individuals with LDH can be effective in preventing muscle atrophy and lumbar spinal degeneration *[36]*. In addition, it was demonstrated that the lumbopelvic motor control function had decreased in patients with chronic LBP and the prevalence of chronic LBP increased in patients with low lumbopelvic motor control function *[37]*. As a result of chronic pain, the quality of life decreases due to the limitation of activities of daily living and disability *[38]*.

Regarding the findings of pain level, the VAS was used to assess the pain level in both groups and there was an improvement in VAS scores in both groups. The current study results are in line with other recent published studies that evaluated the effects of core muscle endurance and PT programs on patients with LBP *[39,40]*.

Limitations:

The current work took a step in getting evidence of the best treatment modalities in the management of LDH and its related disabilities but it faced some limitations that included the physiotherapist was not blinded to the group allocation during treatment.

Additionally, this study is the only clinical trial that focusing on the positive effects of the DNS approach on measured parameters, it was difficult to compare findings to other reports.

Conclusion:

The DNS approach and the selected PT program are effective in reducing pain level, improving functional disability, and increasing core muscles endurance for patients with LDH with a greater effect for the DNS approach in improving functional disability, and increasing core muscles.

References

1- FENYO A., SHINIS D, SHELEF I., BENKOWITZ E., KNOLLER N., KRAMER M. and OHANA N.: Lumbar disc herniation: Protrusion, extrusion or bulge? The proper use of the terms-how and when will it be defined as a disease?. Harefuah, 158 (12): 807-11, 2019.

2- AL QARAGHLI M.I. and DE JESUS O.: Lumbar Disc Herniation. 2023 Aug 14. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing, 2023 Jan–. PMID: 32809713.

3- GUPTA A., CHHABRA H.S., NAGARJUNA D. and ARORA M.: Comparison of functional outcomes between lumbar interbody fusion surgery and discectomy in massive lumbar disc herniation: A retrospective analysis. Global spine journal. 11(5):690-6, 2021.

4- DAI F., DAI Y.X., JIANG H., YU P.F. and LIU J.T.: Non-surgical treatment with XSHHD for ruptured lumbar disc herniation: A 3-year prospective observational study. BMC musculoskeletal disorders, 21: 1-8, 2020.

5- HLAING S.S., PUNTUMETAKUL R., KHINE E.E. and BOUCAUT R.: Effects of core stabilization exercise and strengthening exercise on proprioception, balance, muscle thickness and pain related outcomes in patients with subacute nonspecific low back pain: A randomized controlled trial. BMC musculoskeletal disorders, 22: 1-3, 2021.

6- SEMAAN H., CURNUTTE B., COOPER M., OBRI J., ELSAMALOTY M., OBRI T. and ELGAFY H.: Overreporting of the disc herniation in lumbar spine MRI scans performed for patients with spondylolisthesis. Acta Radiologica, 62 (3): 388-93, 2021.

7- BERRY J.A., ELIA C., SAINI H.S. and MIULLI D.E.: A review of lumbar radiculopathy, diagnosis, and treatment. Cureus, 11 (10), 2019.

8- KOBESOVA A., ULM R. and KOLAR P.: Dynamic neuromuscular stabilization. Rehabilitation of the Spine. A Patient-Centered Approach, 3rd ed. Wolters Kluwer, Los Angeles, USA, 2019.

9- MAHDIEH L., ZOLAKTAF V. and KARIMI M.T.: Effects of dynamic neuromuscular stabilization (DNS) training on functional movements. Human movement science. 70: 102568, 2020.

10- MARAND L.A., DEHKORDI S.N., ROOHI-AZIZI M. and DADGOO M.: Effect of Dynamic Neuromuscular Stabilization on balance, trunk function, falling, and spasticity in people with multiple sclerosis: A randomized controlled trial. Archives of Physical Medicine and Rehabilitation, 104 (1): 90-101, 2023.

11- MANJU K.: Effectiveness of Dynamic Neuromuscular Stabilization Exercises in Patients of Non Specific Chronic Low Back Pain with Movement Control Impairment.

12- SHARMA K. and YADAV A.: Dynamic neuromuscular stabilization-a narrative. International Journal of Health Sciences and Research, 10 (9): 221-31, 2020.

13- MOHSENI G., MOHAMMAD ALI NASAB FIROUZJAH E.: The Effect of Dynamic Neuromuscular Stabilization Exercises on Balance and Fear of Falling in Female Elderly. Elderly Health Journal, 9 (1): 16-22, 2023.

14- ZHOU J., MI J., PENG Y., HAN H. and LIU Z.: Causal associations of obesity with the intervertebral degeneration, low back pain, and sciatica: A two sample Mendelian randomization study. Frontiers in endocrinology, 12: 740200, 2021.

15- KERSTEN P., TENNANT A. and KUCUKDEVECI A.: Reply on "How should we use the Visual Analogue Scale (VAS) in Rehabilitation Outcomes?", 44 (7): 609-610, 2012.

16- VIANIN M.: Psychometric properties and clinical usefulness of the Oswestry Disability Index. Journal of chiropractic medicine, 7 (4): 161-163, 2008.

17- YASZEMSKI A., LEDONIO C., GARBER T. and POLLY D.W.: Oswestry Disability Index: Is Telephonic Administration Valid?. Global Spine Journal, 6 (1): 0036, 2016.

18- ROWLAND T. and SPARKES V.: Reliability of the pressure biofeedback unit. InOrthopaedic Proceedings, 91 (2): 283-283, 2009.

19- HODGES P.W. and RICHARDSON C.A.: Inefficient muscular stabilization of the lumbar spine associated with low back pain: A motor control evaluation of transversus abdominis. Spine, 21 (22): 2640-50, 1996.

20- RICHARDSON C., HODGES P. and HIDES J.: Therapeutic exercise for lumbopelvic stabilization. Edinburgh: Churchill Livingstone, 31 (6): 175-178, 2004.

21- HIDES J., WILSON S., STANTON W., MCMAHON S., KETO H., MCMAHON K., BRYANT M. and RICHARDSON C.: An MRI investigation into the function of the transversus abdominis muscle during "drawing-in" of the abdominal wall. Spine, 31 (6): 175-8, 2006.

22- FRANÇA F.R., BURKE T.N., HANADA E.S. and MARQUES A.P.: Segmental stabilization and muscular strengthening in chronic low back paina comparative study. Clinics, 65 (10): 1013-7, 2010.

23- FRANK C., KOBESOVA A. and KOLAR P.: Dynamic neuromuscular stabilization & sports rehabilitation. International journal of sports physical therapy, 8 (1): 62-73, 2013.

24- SON M.S., JUNG D.H., YOU J.S., YI C.H., JEON H.S. and CHA Y.J.: Effects of dynamic neuromuscular stabilization on diaphragm movement, postural control, balance and gait performance in cerebral palsy. Neuro Rehabilitation, 41 (4): 739-46, 2017.

25- HA T.W. and LEE M.M.: Effects of different diaphragm breathing methods on the diaphragm thickening ratio and pulmonary function in young adults. Journal of the Korean Society of Physical Medicine, 14 (1): 25-33, 2019.

26- AQIL F., IQBAL M.A., KARIM S., IQBAL M.U., AKRAM M.J., MEHREEN Z. and MUFTI R.: Comparison of Mckenzie approach versus Lumbar Stabilization Exercises in the treatment of chronic low back pain. Rehman Journal of Health Sciences, 3 (1): 24-31, 2021.

27- ARIEL E., LEVKOVITZ Y., GOORARYEH I. and MOTTI R.: The effects of TENS, interferential stimulation, and combined interferential stimulation and pulsed ultrasound on patients with disc herniation-induced radicular pain. Journal of Back and Musculoskeletal Rehabilitation, 35 (2): 363-71, 2022.

28- FORSLUND C., PERSSON J., STRÖMQVIST B., LIDGREN L. and MCCARTHY I.D.: Effects of highintensity focused ultrasound on the intervertebral disc: A potential therapy for disc herniations. Journal of Clinical Ultrasound, 34 (7): 330-8, 2006.

29- LEE N.G., YOU J.S., CHUNG H.Y., JEON H.S., CHOI B.S., LEE D.R., PARK J.M., LEE T.H., RYU I.T. and YOON H.S.: Best core stabilization for anticipatory postural adjustment and falls in hemiparetic stroke. Archives of physical medicine and rehabilitation, 99 (11): 2168-74, 2018.

30- YOON H.S., CHA Y.J. and YOU J.S.: Effects of dynamic core-postural chain stabilization on diaphragm movement, abdominal muscle thickness, and postural control in patients with subacute stroke: A randomized control trial. Neuro Rehabilitation, 46 (3): 381-9, 2020.

31- KARARTI C., ÖZSOY İ., ÖZYURT F., BASAT H.Ç., ÖZSOY G. and ÖZÜDOĞRU A.: The effects of dynamic neuromuscular stabilization approach on clinical outcomes in older patients with chronic nonspecific low back pain: A randomized, controlled clinical trial. Somatosensory & Motor Research, 40 (3): 116-25, 2023.

32- KOLAR P., SULC J., KYNCL M., SANDA J, NEUWIRTH J., BOKARIUS A.V., KRIZ J. and KOBESOVA A.: Stabilizing function of the diaphragm: Dynamic MRI and synchronized spirometric assessment. Journal of applied physiology, 109 (4): 1064-71, 2010.

33- DANNEELS L.A., VANDERSTRAETEN G.G., CAMBIER D.C., WITVROUW E.E., DE CUYPER H.J. and DANNEELS L.J.: CT imaging of trunk muscles in chronic low back pain patients and healthy control subjects. European spine journal, 9: 266-72, 2000.

34- MARSHALL P. and MURPHY B.: Delayed abdominal muscle onsets and self-report measures of pain and disability in chronic low back pain. Journal of Electromyography and kinesiology, 20 (5): 833-9, 2010.

35- HIDES J.A., JULL G.A. and RICHARDSON C.A.: Long-term effects of specific stabilizing exercises for first-episode low back pain. Spine, 26 (11): 243-8, 2001.

36- SUN D., LIU P., CHENG J., MA Z., LIU J. and QIN T.: Correlation between intervertebral disc degeneration, paraspinal muscle atrophy, and lumbar facet joints degeneration in patients with lumbar disc herniation. BMC musculoskeletal disorders, 18: 1-7, 2017.

37- JUNG S.H., HWANG U.J., AHN S.H., KIM H.A., KIM J.H. and KWON O.Y.: Lumbopelvic motor control function between patients with chronic low back pain and healthy controls: A useful distinguishing tool: The STROBE study. Medicine, 99 (15): e19621, 2020.

38- KOSE G., TASTAN S., TEMIZ N.C., SARI M. and IZCI Y.: The effect of low back pain on daily activities and sleep quality in patients with lumbar disc herniation: A pilot study. Journal of Neuroscience Nursing, 51 (4): 184-9, 2019.

39- ALQHTANI R.S., AHMED H., GHULAM H.S., ALYAMI A.M., AL SHARYAH Y.H., AHMED R., KHAN A. and KHAN A.R.: Efficacy of Core-Strengthening and Intensive Dynamic Back Exercises on Pain, Core Muscle Endurance, and Functional Disability in Patients with Chronic Non-Specific Low Back Pain: A Randomized Comparative Study. Journal of Clinical Medicine, Jan 15; 13 (2): 475, 2024.

40- BADR M., ELKHAWAGA H., FAWAZ K., KASEM M. and FAYEZ E.: Effects of multimodal physical therapy on pain, disability, H-reflex, and diffusion tensor imaging parameters in patients with lumbosacral radiculopathy due to lumbar disc herniation: A preliminary trial. Cureus, Jun 30; 16 (6): e63501, 2024.

تأثير نهج التثبيت العصبى العضلى الديناميكى على النتائج السريرية فى المرضى الذين يعانون من فتق القرص القطنى

مقدمة: فتق القرص القطنى اضطراب شائع يصيب فئة كبيرة متعددة ويؤثر على حياتهم.

الهدف: أجريت هذه الدراسة لفحص تأثيرات نهج التثبيت العصبى العضلى الديناميكى فى متغيرات مستوى الألم، الإعاقة الوظيفية، وتحمل العضلة المستعرضة البطنية.

العينة والطرق: شارك فى هذه الدراسة ستون مريضاً من كلا الجنسين تم تشخيصهم من جراح عظام. تراوحت أعمارهم بين ١٨ إلى ٤٠ عاماً ولم يتخطى مؤشر كتلة الجسم لديهم ٢٥ كجم. تم توزيع المرضى على مجموعتين متساويتين، المجموعة أ تلقت العلاج بنهج التثبيت العصبى العضلى الديناميكى، بينما المجموعة ب تلقت العلاج ببرنامج العلاج الطبيعى المختار. وقد تلقى جميع المرضى العلاج الخاضع للإشراف ثلاث جلسات أسبوعيا لمدة ستة أسابيع متتالية. وقد تم قياس مستوى الألم باستخدام المقياس البصرى التناظرى، والإعاقة الوظيفية باستخدام النسخة العربية – استبانة اوسويسترى لقياس نسبة العجز، وتحمل العضلة المستعرضة البطنية باستخدام وحدة الارتجاع البيولوجى للضغط.

النتائج: لم توجد اختلافات معتبرة بين المجموعتين فى قيم المتوسطات بعد العلاج لمتغير مستوى الألم، بينما وجدت اختلافات معتبرة بين المجموعتين فى قيم متوسطات بعد العلاج لمتغيرات الإعاقة الوظيفية وتحمل العضلة المستعرضة البطنية.

الاستنتاج: نهج التثبيت العصبى العضلى له تأثير أفضل عن برنامج العلاج الطبيعى المختار فى تحسين الإعاقة الوظيفية وزيادة تحمل العضلة المستعرضة البطنية، بينما تساوى تأثيرهم فى تقليل مستوى الألم.