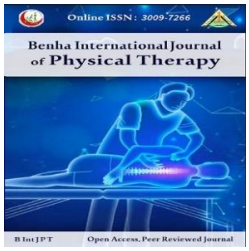
B Int J PT 2024 Jun;2(2):75 -86. DOI: 10.21608/BIJPT.2024.336636.1046

Benha International Journal of Physical Therapy

Online ISSN: 3009-7266 Home page: https://bijpt.journals.ekb.eg/




Original research

# Effect of biomechanical awareness and core stability exercises on mechanical low back pain among Egyptian Physiotherapists.

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**Article history:**
Submitted: 15-11-2024
Revised: 07-12-2024
Accepted: 09-12-2024

**Abstract**

**Background**: mechanical low back pain is common injury experienced by physiotherapists thus they require a good mechanical awareness about their position while working to avoid stress on low back area. **Purpose:** to investigate the impact of core stability exercises and biomechanical awareness on the intensity of low back pain, back muscle endurance, function and fatigue among Egyptian physiotherapists with mechanical low back pain. **Methods:** fifty-two of both genders' Egyptian physiotherapists with mechanical low back pain, participated in the study, their age ranged from25 to 40 years old. they were assigned randomly into two groups. group A:26 physiotherapists received biomechanical awareness advices while working and core stability exercises for 4 weeks. group B:26 physiotherapists received core stability exercises only for 4 weeks.. outcome measures included: the intensity of back pain was measured by Visual Analogue Scale (VAS), back muscle endurance (BME) was measured by Biering-Sorenson test, the level of function (disability) was measured by the Oswestry Disability Index (ODI) and fatigue was measured by Fatigue Severity Scale (FSS). **Results:** there was a significant improvement in all variables in the two groups (p=0.001) and there was statistically significant difference post-treatment between both groups in favor to group A (p= 0.001). **Conclusion:** biomechanical awareness advices while working with core stability exercises is effective more than core stability exercises alone in improving pain intensity, back muscle endurance, fatigue and function in physiotherapist with mechanical low back pain.

**Keywords:** Biomechanical Awareness, Core Stability Exercises, Mechanical Low Back Pain

## Introduction

Low back pain (LBP) is commonly defined as discomfort below the costal boundary and above the inferior gluteal folds, Whether or not leg pain is present[1]. lower back pain is a significant global public health issue[2]. among all musculoskeletal conditions, LBP is the most common and leading cause of disability[3].

Mechanical low back pain is defined as back discomfort that originates from the

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surrounding soft tissues, intervertebral discs, or spine itself. Acute or chronic traumatic injury, lumbar spondylosis, spondylolisthesis, spondylolysis, spinal compression fractures, and lumbosacral muscle tension are all included in this.[4]

overuse and repetitive trauma are frequent causes of persistent mechanical low back pain, which frequently develops as a result of work-related injuries.[4] and so far one of the most popular mechanical categories is to designate LBP as specific or non-specific.[5]

According a systematic analysis of the Global Burden of Disease( GBD) Study 2021 LBP impacted 619 million people worldwide in 2020, and it is predicted that this figure will rise to 843 million instances by the year 2050.[6]The estimated annual direct and indirect costs of treating LBP are $100 billion .[7]

Two systematic reviews made by Milhem et al.[8] and Vieira et al.[9] found that up to 80% of physiotherapists reported experiencing at least one episode of LBP throughout their careers, and 73% reported having at least one episode within the previous 12 months. other researches says physiotherapists have a high incidence and prevalence of LBP.[10,11,12]

Lower back pain also spreads between Egyptian physiotherapists.[11]according to another study[13], there are a lot of work-related musculoskeletal disorders (WRMDs) among Egyptian physiotherapists. and the most of these disorders was low back pain.

The causes of lower back discomfort are complex[2], and 37% of the risk is apparently attributed to occupational variables[14],there are many biomechanical risk factors that are connected to physical therapy which were connected to strenuous physical activities such patient transfers and handling manoeuvres, uncomfortable or protracted work positions, trunk flexion and rotational motions, and responses to a patient fall or sudden movement.[15,16]so, correction of this occupational and biomechanical risk factors help in treatment of LBP.

Appropriate biomechanical awareness as good ergonomics and proper mechanical positions while work will lessen the strain on the spine while working, lower the chance of an initial injury, and maybe lessen the effect that low back discomfort may have on work performance, which will lower the Oswestry disability index. Therefore, using appropriate biomechanics may reduce the impact of low back pain on daily living activities, leading to a lower disability score.[17]

For the treatment of mechanical LBP, core-strengthening and activation activities have shown promise.[18]the goal of Core Stability Exercises (CSE) is to improve and recover the ability to control the spine.[19] this approach is geared towards reeducating deep trunk muscle function, and coordination of deep and superficial trunk muscles during static, dynamic, and functional tasks.[20] CSE focusses on the core muscles, which include the rectus abdominis, transverse muscles, internal and external obliques, paraspinals, and the gluteal, pelvic floor, and hip muscles.[21]

There is a study done by Fan et al who recommends that we need to apply mechanical awareness as using of proper mechanical postures in the physical therapy profession.[22] so, the purpose of this study was to find out how biomechanical awareness affected Egyptian physiotherapists' mechanical low back pain.

## Methods

This was pre- and post-test parallel groups randomized controlled trial. It took place from April 2024 to October 2024.

***Sample size calculation:***

Sample size calculation was performed using G*POWER statistical software (version 3.1.9.7; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany). Calculation was made $\alpha = 0.05$, power = 80%, effect size = 0.4. Based on a previous study[23], which was the most relevant to this study and primary outcome was low back pain intensity measured by Visual Analogue Scale (VAS). and revealed that the required sample size for this study was 52 subjects.

***Participants:***

Fifty-two Egyptian Physiotherapists of both genders with mechanical LBP condition were selected from hospitals, clinics, and centers for Physical Therapy residing in Giza and Menoufia Governorate in Egypt. the inclusion criteria included Egyptian physiotherapists with

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mechanical low back pain. aged 25-40 years old, both sexes were included, their BMI range from 18.5 to 24.9 kg/m. and exclusion criteria consisted of students of physical therapy, physiotherapists who worked for less than two years, lumbar spine surgery, history of sever lumbar problem such as spondylolisthesis, tumor, fracture, who was suffered from vertigo and pregnancy.

***Randomization:***

Seventy-four Egyptian physiotherapists were screened before starting of study to select the subjects assessed for eligibility. sixty-six physiotherapists of both genders ensured by having a past history of mechanical LBP condition. during the assessment for eligibility, fourteen subjects were excluded because they refused to participate and other causes as shown in figure (1). Patients were included randomly distributed into two equal groups, Group A (Experimental Group): which consisted of 26 patients, Group B (Control Group): which consisted of 26 patients. The purpose, rationale, and benefits of this study were explained for each subject.

***Ethics approval and consent to participate:***

The research's protocol received approval from the Faculty of Physical Therapy's Ethical Committee at Cairo University (P.T.REC/012/005073) and Clinical Trails Registry (NCT06330792), prospectively registered, https://register.clinicaltrials.gov/. before beginning this study, each patient who provided informed consent was given a thorough explanation of the study's protocol. this work has been carried out by the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

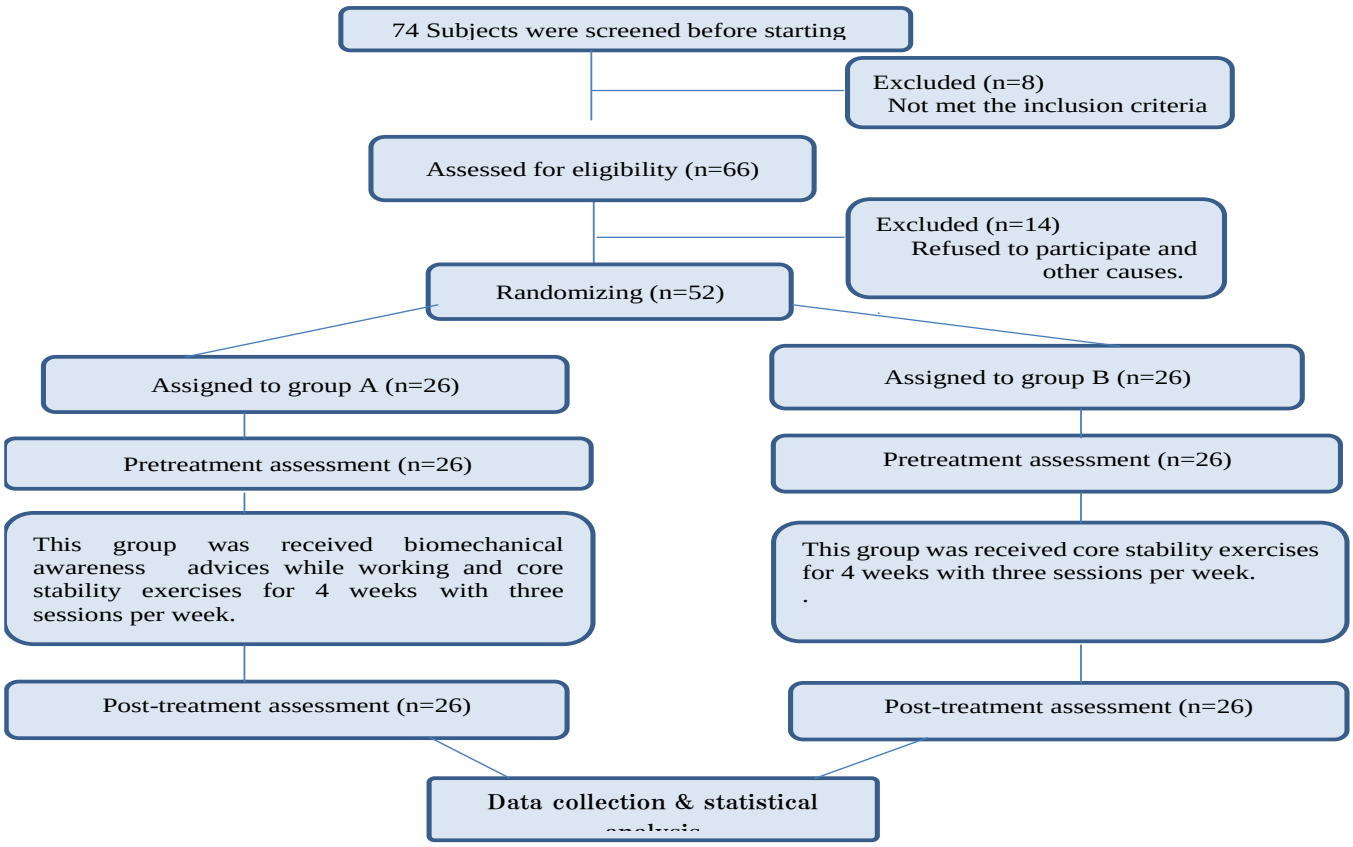


**Figure (1): The study's flow chart.**

**Clinical assessment:**

***1-pain assessment:***

**Visual Analogue Scale (VAS):** which is a valid and reliable measure to assess pain intensity level by patients by making a mark determining a decimal number from 0 to 100 (mm) on line with 'no pain' to the left and severe pain could be to the right. the subjects will rate their perception of pain by making a mark on the VAS line. the distance

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from the left to the mark will be measured and the accuracy will be adjusted to one decimal place.[24]

The subjects were sitting in a relaxed position then we gave them the visual analogue scale (VAS) then they were instructed to mark his/her level of pain on visual analogue scale. then, the distance measured by ruler in millimeter (mm) from 0 to his/her mark and recorded in his file.[25]

***2- Back muscle endurance assessment:***

**The Sorensen test:** this test has a good validity and reliability in the evaluation of trunk muscles endurance.[26]The Sorensen test was found to be the most clinically beneficial and simple to administer for both subjects and clinicians in a 2001 review of isometric back extension endurance tests.[27] The Sorensen test typically gauges how long a person can lie on a table with their unsupported trunk horizontal.

The patients were lied on the examining table in prone position. the anterior superior iliac spines' level matched the table's edge. the lower body was strapped to the table in three places: at the knee creases, at the level of the greater trochanter of the femur, and at the ankles as near the malleoli as feasible. before beginning the test, the subjects were being allowed to rest the upper half of their body on a chair. with the arms folded across the chest, they were being instructed to isometrically maintain the upper body in a horizontal position as long as possible. The timer was being set. if the patient/client can hold the position for 4 minutes (240 seconds) or if they are unable to hold the position for 4 minutes after starting the test, the stop time was being noted.[28] The patients were being instructed to assume a horizontal position if the sagittal plane is deviated and the patient cannot return to the horizontal position, the test was being stopped.[29]

***3- Level of function (disability) assessment:***

**The Oswestry Disability Index (ODI):** which is a valid and accurate tool for assessing disability for individuals with low back pain.[30] the ODI criteria for evaluating patients' functional impairment are based on ten factors: the degree of pain, ease of personal care, lifting, working, sitting, standing, sleeping, sex life, social life, and travel. the participant received appendix which contained Oswestry Disability Index (ODI) used to determine the level of function (disability) associated with non-specific lower back pain among physiotherapists. a verbal explanation about the questionnaire content and main aim explained to participant then the subject instructed to mark and answer the questionnaire.

***4- Fatigue assessment:***

**The Fatigue Severity Scale (FSS):** which is valid and reliable for measuring fatigue in people with chronic illnesses.[31]

Using this scale, you can assess how fatigue affects you. nine statements on the FSS questionnaire rate how severe your fatigue symptoms are. after reading each statement, participants should circle a number between 1 and 7 that best describes how they've been feeling over the past week and how much they agree or disagree with the statement.

***Interventions:***

Physiotherapists was randomly subdivided into two equal groups in number.

Group (A) (Experimental Group): This group received biomechanical awareness advices while working and core stability exercises.

Group (B) (Control Group): This group received core stability exercises .

both group received also traditional stretch and strength.

***1-Biomechanical awareness advices for physiotherapists during session:***

consist of group of biomechanical awareness advices to help physiotherapist to working in correct position and consume his energy, this group instructed to do these advices for 4 weeks.

- You must consume your energy by keeping your center of gravity near to patient when dealing with him and use stride standing position with slight knee flexion.
- You should avoid uncomfortable positions such as trunk flexion.
- You should use Devices such as transfer belts and sliders to reduce the physical force needed by physiotherapists to move patients. This equipment helps to reduce the risk of injury for workers and patients.
- You should avoid prolonged working positions.
- You should wear suitable clothes to avoid restriction of movement while treatment.

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- You must use McKenzie method exercises like lying and Standing Extension. There are good for people who are "flexion intolerant" or having pain when bending forward or sitting. Patient stand with hand on buttocks and extend upper trunk backward and hold for 10-30 seconds and perform 3-5 sets depending upon his comfort level then he lying prone on extended hand and hold for 10-30 seconds and perform 3-5 sets.[32]

***2-Core stability exercise.***

Core stabilization exercise Program: the procedure for core stabilization exercises comprises of diagrams of each exercise as shown in figure (2). which consist of sit-up-1, sit-up-2, backextension-1, back extension-2, front plank, back bridge, quadruped exercise, and side bridge. for the 4-week exercise program. Intensity of exercise is based on the participant exercise performance. all exercises involve a hold for 10 s with 10 repetitions. each exercise session is performed for 30 min, with three sessions per week.[21]

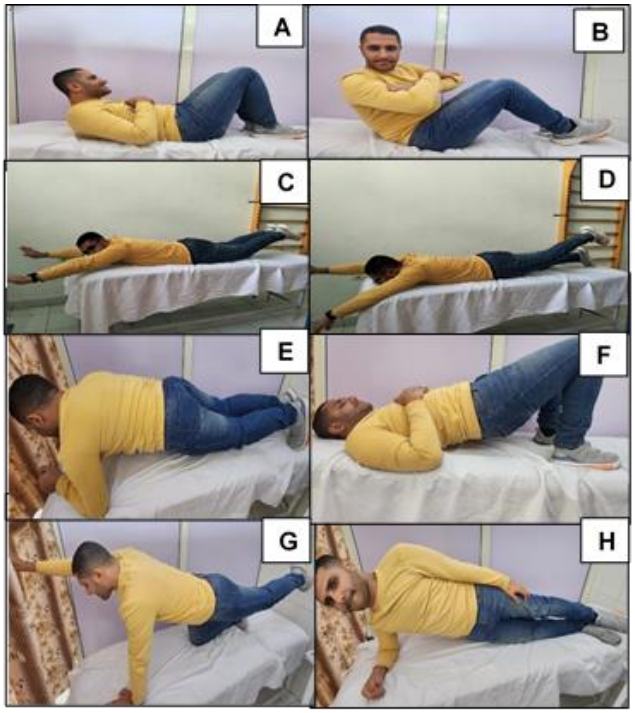


**Figure (2)**: Core stability exercises: (A) sit-up-1, (B) sit-up-2, (C) back extension-1, (D) back extension-2, (E) front plank, (F) back bridge, (G) quadruped exercise, and (H) side bridg

***Data analysis***

Data were expressed as mean± SD. Unpaired t-test and chi square were used to compare between subjects Characteristics of the two groups. Shapiro-Wilk and Kolmogrov-smirnov tests were used for testing normality of data distribution. Wilcoxon and Mann-Whitney tests were used to compare within and between groups' effects for variables (intensity of low back pain by VAS, back muscle endurance by Sorensen test, function disability by ODI and back fatigue by FSS). Data analysis was done using the statistical package for the social sciences computer program (SPSS Inc., Chicago, Illinois, USA; version 20 for Windows).

A P-value of 0.05 or less was deemed significant

## Results

***Subject characteristics*:**

As shown in table (1); There was no significant difference between both groups in the mean value of age, weight, height, BMI and sex distribution ($p>0.05$).

**Table (1): Demographic data of subjects of both groups**

| Demographic data | Group A (n=26) | Group B (n=26) | t-value | p-value |
|---|---|---|---|---|
| Age (years) | 30.65±3.5 | 31.53±3.39 | 0.48 | 0.359 |
| Weight (kg) | 72.65±6.83 | 70.85±6.94 | 0.95 | 0.349 |
| Height (cm) | 173.42±7.3 | 172.88±7.52 | 0.69 | 0.794 |
| BMI (kg/m$^2$) | 24.12±0.77 | 23.67±1.18 | 1.59 | 0.117 |
| Sex<br>Males<br>Females | N (%)<br>11 (42%)<br>15 (58%) | N (%)<br>14 (54%)<br>12 (46%) | $\chi^2$= 0.69 | 0.579 |

Data was expressed as mean ± standard deviation, $\chi^2$: chi square, p- value: significance level

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***Normality test:***

The data were examined for the presence of extreme scores, homogeneity of variance, and normality assumption. Shapiro-Wilk test for normality showed that all measured variables were not normally distributed.

**I- The effect of biomechanical awareness on the intensity of LBP intensity:**

**Within group comparison**

Group A: The median (IQR) of VAS pre and post-treatment of group A was 5 (4, 6) and 1 (0, 1.25) respectively. There was a statistically significant decrease in VAS in group A post-treatment by 80% compared with that of pre-treatment (p = 0.001).

Group B: The median (IQR) of VAS pre and post-treatment of group B was 4 (4, 5) and 2 (1, 3) respectively. There was a statistically significant decrease in VAS in group B post-treatment by 50% compared with that of pre-treatment (p = 0.001) (Table 2).

**Between groups comparison**

There was no statistically significant difference in the median values of VAS pretreatment between both groups (p= 0.104), while there was statistically significant difference post-treatment between both groups (p= 0.001) in favor to group A (Table 2).

**II- The effect of biomechanical awareness on back muscles endurance:**

**Within group comparison**

Group A: The median (IQR) of time of back muscle endurance pre and post-treatment of group A was 67.5 (40, 121) and 112.5 (77, 175) sec respectively. There was a statistically significant increase in time of back muscle endurance in group A post-treatment by 67% compared with that of pre-treatment (p = 0.001).

Group B: The median (IQR) of time of back muscle endurance pre and post-treatment of group B was 50 (30, 70) and 66.5 (52, 91) sec respectively. There was a statistically significant increase in time of back muscle endurance in group B post-treatment by 33% compared with that of pre-treatment (p = 0.001) (Table 2).

**Between groups comparison**

There was no statistically significant difference in the median values of time of back muscle endurance pretreatment between both groups (p= 0.111), while there was statistically significant difference post-treatment between both groups (p= 0.001) in favor to group A (Table 2).

**III- The effect of biomechanical awareness on back function:**

**Within group comparison**

Group A: The median (IQR) of ODI pre and post-treatment of group A was 27 (25.75, 28) and 8 (6, 8.5) respectively. There was a statistically significant decrease in ODI in group A post-treatment by 70% compared with that of pre-treatment (p = 0.001).

Group B: The median (IQR) of ODI pre and post-treatment of group B was 26 (25, 27) and 12 (10, 15) respectively. There was a statistically significant decrease in ODI in group B post-treatment by 54% compared with that of pre-treatment (p = 0.001) (Table 2).

**Between groups comparison**

There was no statistically significant difference in the median values of ODI pretreatment between both groups (p= 0.262), while there was statistically significant difference post-treatment between both groups (p= 0.001) in favor to group A (Table 2).

**IV- The effect of biomechanical awareness on fatigue:**

**Within group comparison**

Group A: The median (IQR) of FSS pre and post-treatment of group A was 4.6 (4.4, 5) and 1.95 (1.4, 2.7) respectively. There was a statistically significant decrease in FSS in group A post-treatment by 58% compared with that of pre-treatment (p = 0.001).

Group B: The median (IQR) of FSS pre and post-treatment of group B was 4.5 (4.4, 4.8) and 3 (2.8, 3.3) respectively. There was a statistically significant decrease in FSS in group B post-treatment by 33% compared with that of pre-treatment (p = 0.001) (Table 2).

**Between groups comparison**

There was no statistically significant difference in the median values of FSS pretreatment between both groups (p= 0.161), while there was statistically significant difference post-treatment between both groups (p= 0.001) in favor to group A (Table 2).

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**Table (2): Median (IQR) of LBP intensity, back muscles endurance, ODI and FSS pre and post treatment of both groups.**

| Measured variables | Group A (n=26) | Group B (n=26) | z-value | P-value |
|---|---|---|---|---|
| **VAS** (cm) | | | | |
| Pre-treatment | 5 (4, 6) | 4 (4, 5) | -1.6 | 0.104 |
| Post-treatment | 1 (0, 1.25) | 2 (1, 3) | -3.5 | 0.001* |
| % of change | 80% | 50% | | |
| P-value[1] | 0.001* | 0.001* | | |
| **Back muscles endurance** (sec) | | | | |
| Pre-treatment | 67.5 (40, 121) | 50 (30, 70) | -1.59 | 0.111 |
| Post-treatment | 112.5 (77, 175) | 66.5 (52, 91) | -3.43 | 0.001* |
| % of change | 67% | 33% | | |
| P-value[1] | 0.001* | 0.001* | | |
| **ODI** | | | | |
| Pre-treatment | 27 (25.75, 28) | 26 (25, 27) | -1.12 | 0.262 |
| Post-treatment | 8 (6, 8.5) | 12 (10, 15) | -5.05 | 0.001* |
| % of change | 70% | 54% | | |
| P-value[1] | 0.001* | 0.001* | | |
| **FSS** | | | | |
| Pre-treatment | 4.6 (4.4, 5) | 4.5 (4.4, 4.8) | -1.4 | 0.161 |
| Post-treatment | 1.95 (1.4, 2.7) | 3 (2.8, 3.3) | -4.47 | 0.001* |
| % of change | 58% | 33% | | |
| P-value[1] | 0.001* | 0.001* | | |

IQR: interquartile range, ODI: Oswestry disability index, FSS: Fatigue Severity Scale, P-value: significance level between groups, P-value[1]: significance level within group, *: significant

## Discussion

The aim of this study was to investigate the effect of biomechanical awareness on the intensity of low back pain, back muscle endurance, function level and fatigue among Egyptian Physiotherapists.

In this study, authors found that there was a significant improvement in the two groups, with significant preference to the bio-mechanical awareness group A which was better in all variables than group B.

Following therapy, there was a significant improvement in pain intensity, back muscle endurance, fatigue and function in the two groups (p=0.001) and there was statistically significant difference between both groups in favor to biomechanical awareness group (p= 0.001).

According to a study by Buker et al.[33] that examined issues with the physician's muscle-skeleton system, the majority of doctors complain of low back pain, in this study, 123 physicians (69 consultants, 54 surgeons) with a mean age of 37.97±9.03 years were chosen at random. a questionnaire with 22 questions about musculoskeletal issues, physical attributes, and work performance was used to assess each participant. the study's findings demonstrated that prolonged use of the same posture and repetitive tasks during the workday increases the risk of musculoskeletal issues among physicians.

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other study done by Toraman et al.[34] who found improvement in LBP and, a reduction in lumbar disability by using oswestry disability index as result of good body mechanic behaviors. Study included convenience sample of 290 workers who work at car production industry, the research data were collected using the worker's sociodemographic data form, the body mechanics behaviors form, and oswestry disability index, a significant difference has been found between ODI classification and paying attention to the proper sitting position ($P < 0.05$), the head, shoulder, and back positions when walking ($P < 0.05$), and the position of the spine when lifting anything ($P < 0.01$).

Also, there is study that found statistically positive correlation between barriers to perform body mechanics and degree of back pain on nurses, 200 nurses were chosen for this study as a convenience sample using the following tools: lifestyle patterns and demographic questionnaire, scale of back pain , checklist for observing body mechanics, body mechanics questionnaire obstacles and questionnaire on common nursing care activities, the study suggested that nurses participate in a program designed to improve body mechanics safety and create back pain prevention techniques.[35]

Another study found good posture increase back muscle endurance, the subjects were 24 industrial workers with flexion-provoked LBP and 21 healthy industrial workers. measurements were made of back muscular endurance, lifestyle data, and lumbo-pelvic posture when sitting, standing, and lifting. the findings concluded that participants with a history of flexion injury and discomfort, there is a possible association between flexed spinal postures, decreased back muscular endurance, physical inactivity, and lower back pain.[36]

Current study results respond to the systematic review conducted by Richarz et al., which concluded that devices for mechanical lifting and transferring showed a good cost-benefit ratio and have to be taken into consideration for clinical use. they recommended also more studies and larger sample sizes should be the focus of future research on this topic. these qualitative research enhancements would also help and direct the future economic assessment of capital-intensive investments made by healthcare facilities in suitable mechanical patient handling equipment.[37]

There is a little review in effect of biomechanical awareness on fatigue but study[38] found that fatigue is a common symptom in patients with chronic low back pain and the current study found an improvement in fatigue because of applying good mechanical advices while working. so, we recommend for more research on relation between biomechanical awareness and general fatigue.

Another study[39] done on 147 Egyptian physical therapists who work in the government hospitals in Egypt, their LBP assessed using Nordic Questionnaires (NQ), and their foot postures assessed using the Foot Posture Index (FPI). study found no statistically significant association between LBP and foot postures in Egyptian physiotherapists.

An additional study discovered unclear relationships between mechanical behavior, and low back pain, study examined the connection between 64 call center employees' occupational sitting patterns and back pain. a textile pressure mat was used to measure and characterize sitting behavior over a 400-hour period, and pain questionnaires assessed both acute and chronic lower back pain.[40]

Exercises for core stability prevent modest and frequent injuries to the spine's articular structures and enhance the body's ability to maintain the spinal cords' natural position while carrying out daily tasks. The spine-stabilizing muscles' increased endurance and harmony allow for this.[41]

Like current study, the study's findings[20] demonstrate that, when compared to regular physical therapy exercise for an equivalent amount of time, the clinical and therapeutic benefits of a six-week core stabilization exercise program are more successful in reducing pain. at the second, fourth, and sixth weeks of treatment, this study demonstrated a substantial decrease in pain in both groups, with a p-value of less than 0.05, on the VAS, the core stabilization group saw a mean decrease of 3.08, whereas the group that often

engaged in physical therapy exercises saw a mean decrease of 1.71.

Systematic review done by Frizziero et al.[42] who discovered that core stability had substantial therapeutic effects in patients with low back pain, improving quality of life, functional impairment, and back muscular endurance.

Alqhtani et al.[43]who sought to determine how well intense dynamic back exercise (IDBE) and core strengthening exercise (CSE) affected individuals with chronic non-specific low back pain in terms of pain, core muscular endurance, and functional impairment. a three-arm parallel-group randomized control design served as the study's foundation. a total of 45 individuals with chronic LBP were enlisted and assigned at random to the CSE, IDBE, and control groups. CSE was given to the CSE group, and IDBE to the IDBE group. but no intervention was given to the control group. the degree of pain, functional disability, and core muscular endurance were evaluated using a numerical pain rating scale, the Oswestry Disability Index, core flexors, extensors, and side bridge tests. and results were functional disability, core flexors, and side bridge endurance tests were all improved more by the experimental group CSE than by IDBE.

And other study[44] support improvement back muscle endurance after application core stabilization exercises**,** another one[45] showed that core stability exercises were useful for reducing fatigue**.**

Chang et al.'s study[46] examined four approaches to assessing core strength training: motor control exercises, trunk balance, stabilization, and segmental stabilization. the findings of numerous scales and assessment tools indicate that core strength training is superior to conventional resistance training in reducing persistent low back pain.

After these discussions, we recommend applying biomechanical awareness alongside core stability exercises to improve outcomes for patients with mechanical low back pain, such as lowering the severity of LBP, boosting lower back muscular endurance, lowering lumbar disability, and lowering fatigue.

**Limitation**

Despite our positive findings, it is important to recognize the limitations of the current study: small patients' sample, brief follow-up period, testing for electromyography or cable tensiometry to assess back muscular strength are not available and the study is not comprehensive enough to examine different subgroups (e.g., age or disease severity).

**Conclusion:**

Biomechanical awareness advices while working with core stability exercises is better than core stability exercises alone in improving low back pain intensity, boosting back muscle endurance, decrease level lumbar disability and decrease of fatigue in Egyptian physiotherapists who complain of mechanical low back pain.

**DECLARATIONS**

**Consent to publish:** I certify that each author has given their consent to submit the work.

**Competing interests:** None.

**Funding:** No fund.

**Conflicts of interest:** absence of conflicts of interest.

**References**

1. Koes BW, Van Tulder M, Thomas S. Diagnosis and treatment of low back pain. Bmj. 2006 Jun 15;332**(**7555):1430-4.

2. Hartvigsen J, Hancock MJ, Kongsted A, Louw Q, Ferreira ML, Genevay S, Hoy D, Karppinen J, Pransky G, Sieper J, Smeets RJ. What low back pain is and why we need to pay attention. The Lancet. 2018 Jun 9;391(10137):2356-67.

3. Safiri S, Kolahi AA, Cross M, Hill C, Smith E, Carson-Chahhoud K, Mansournia MA, Almasi-Hashiani A, Ashrafi-Asgarabad A, Kaufman J, Sepidarkish M. Prevalence, deaths, and disability-adjusted life years due to musculoskeletal disorders for 195 countries and territories 1990–2017. Arthritis & rheumatology. 2021 Apr;73(4):702-14.

4. Will JS, Bury DC, Miller JA. Mechanical low back pain. American family physician. 2018 Oct 1;98(7):421-8.

5. O'Sullivan P. Diagnosis and classification of chronic low back pain disorders:

maladaptive movement and motor control impairments as underlying mechanism. Manual therapy. 2005 Nov 1;10(4):242-55.

6. Ferreira ML, De Luca K, Haile LM, Steinmetz JD, Culbreth GT, Cross M, Kopec JA, Ferreira PH, Blyth FM, Buchbinder R, Hartvigsen J. Global, regional, and national burden of low back pain, 1990–2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. The Lancet Rheumatology. 2023 Jun 1;5(6): e316-29.

7. Laroche F, Perrot S, editors. Managing sciatica and radicular pain in primary care practice. Springer Healthcare Limited; 2013 Nov 19.

8. Milhem M, Kalichman L, Ezra D, Alperovitch-Najenson D. Work-related musculoskeletal disorders among physical therapists: A comprehensive narrative review. International journal of occupational medicine and environmental health. 2016 Jul 4;29(5):735-47.

9. Vieira ER, Schneider P, Guidera C, Gadotti IC, Brunt D. Work-related musculoskeletal disorders among physical therapists: a systematic review. Journal of back and musculoskeletal rehabilitation. 2016 Jan 1;29(3):417-28.

10. Iqbal Z, Alghadir A. Prevalence of work-related musculoskeletal disorders among physical therapists. Medycyna Pracy. Workers' Health and Safety. 2015 Sep 14;66(4):459-69.

11. Mohamed IT, Kandil OA, Mohammed MM, Abd Elmageed SF. Prevalence of low back pain among physical therapists in Cairo-Egypt. International Journal of Therapies and Rehabilitation Research. 2017;6(4):21.

12. Pellissier B, Sarhan FR, Telliez F. Work-related, non-specific low back pain among physiotherapists in France: prevalence and biomechanical and psychosocial risk factors, as a function of practice pattern. International Journal of Environmental Research and Public Health. 2023 Feb 28;20(5):4343.

13. Khairy WA, Bekhet AH, Sayed B, Elmetwally SE, Elsayed AM, Jahan AM. Prevalence, profile, and response to work-related musculoskeletal disorders among Egyptian physiotherapists. Open access Macedonian journal of medical sciences. 2019 May 5;7(10):1692.

14. Punnett L, Prüss-Ütün A, Nelson DI, Fingerhut MA, Leigh J, Tak S, Phillips S. Estimating the global burden of low back pain attributable to combined occupational exposures. American journal of industrial medicine. 2005 Dec;48(6):459-69.

15. Vieira ER, Svoboda S, Belniak A, Brunt D, Rose-St Prix C, Roberts L, da Costa BR. Work-related musculoskeletal disorders among physical therapists: an online survey. Disability and rehabilitation. 2016 Mar 12;38(6):552-7.

16. Muaidi QI, Shanb AA. Prevalence causes and impact of work-related musculoskeletal disorders among physical therapists. Journal of back and musculoskeletal rehabilitation. 2016 Jan 1;29(4):763-9.

17. Ferguson SA, Marras WS. 27 Biomechanical Principles for Reducing Low Back Pain. iSpine: Evidence-Based Interventional Spine Care. 2011 Mar 28:258.

18. Bhadauria EA, Gurudut P. Comparative effectiveness of lumbar stabilization, dynamic strengthening, and Pilates on chronic low back pain: randomized clinical trial. Journal of exercise rehabilitation. 2017 Aug;13(4):477.

19. Areeudomwong P, Buttagat V. Comparison of core stabilisation exercise and proprioceptive neuromuscular facilitation training on pain-related and neuromuscular response outcomes for chronic low back pain: a randomised controlled trial. The

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Malaysian journal of medical sciences: MJMS. 2019 Nov;26(6):77.

20. Akhtar MW, Karimi H, Gilani SA. Effectiveness of core stabilization exercises and routine exercise therapy in management of pain in chronic non-specific low back pain: A randomized controlled clinical trial. Pakistan journal of medical sciences. 2017 Jul;33(4):1002.

21. Hlaing SS, Puntumetakul R, Khine EE, 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. 2021 Dec;22:1-3.

22. Fan LJ, Liu S, Jin T, Gan JG, Wang FY, Wang HT, Lin T. Ergonomic risk factors and work-related musculoskeletal disorders in clinical physiotherapy. Frontiers in Public Health. 2022 Dec 20; 10:1083609.

23. Wang H, Fan Z, Liu X, Zheng J, Zhang S, Zhang S, Yu Q, Lo WL, Chen X, Wang C. Effect of progressive postural control exercise versus core stability exercise in young adults with chronic low back pain: A randomized controlled trial. Pain and Therapy. 2023 Feb;12(1):293-308.

24. Kamper SJ. Pain intensity ratings. Journal of Physiotherapy. 2012 Jan 1;58(1):61.

25. Kocjan J. Kinesiophobia (fear of movement) level among patients with diagnosis of cervicogenic headache. Journal of Education, Health and Sport. 2017 Jul 20;7(7):390-7.

26. Ghroubi S, Jribi S, Jdidi J, Yahia A, Elleuch W, Chaaben M, Dammak J, Elleuch MH. Study of the validity and reproducibility of the Biering-Sorensen test in chronic low back pain. Annals of Physical and Rehabilitation Medicine. 2015 Sep 1;58:e88.

27. Moreau CE, Green BN, Johnson CD, Moreau SR. Isometric back extension endurance tests: a review of the literature. Journal of manipulative and physiological therapeutics. 2001 Feb 1;24(2):110-22.

28. Kothapalli M. The Biering–Sorensen test as a screening tool to observe lower back muscle strength and sub-clinical back strain in computer users: a cross sectional study. Health, Sports & Rehabilitation Medicine. 2023 Apr 1;24(2).

29. Tekin Y, Ortancil O, Ankarali H, Basaran A, Sarikaya S, Ozdolap S. Biering-Sorensen test scores in coal miners. Joint Bone Spine. 2009 May 1;76(3):281-5.

30. Vianin M. Psychometric properties and clinical usefulness of the Oswestry Disability Index. Journal of chiropractic medicine. 2008 Dec 1;7(4):161-3.

31. Lerdal A. Fatigue severity scale. InEncyclopedia of quality of life and well-being research 2021 Nov 23 (pp. 1-5). Cham: Springer International Publishing.

32. Garcia AN, Costa LD, da Silva TM, Gondo FL, Cyrillo FN, Costa RA, Costa LO. Effectiveness of back school versus McKenzie exercises in patients with chronic nonspecific low back pain: a randomized controlled trial. Physical therapy. 2013 Jun 1;93(6):729-47.

33. Büker N, Aslan E, Altuğ F, Cavlak U. An analysis study of musculoskeletal problems in medical doctors. DPU Fen Bilim Enst. 2006; 10:163-70.

34. Toraman AU, Ardahan M, Balyacı ÖE. The effect of the body mechanic behaviors on the low back pain. Nursing Practice Today. 2014;1(2):107-15.

35. Moustafa HM, Mohamed MA, El-Tahry SI, Ibrahim NM. Relationship between back pain with nursing activities and the use of body mechanics among nurses working in general hospitals. Port Said Scientific Journal of Nursing. 2022 Apr 30;9(1):119-44.

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36. O'Sullivan PB, Mitchell T, Bulich P, Waller R, Holte J. The relationship beween posture and back muscle endurance in industrial workers with flexion-related low back pain. Manual therapy. 2006 Nov 1;11(4):264-71.

37. Richarz HU, Tamayo A, Rahmig J, Siepmann T, Barlinn J. The impact of mechanical devices for lifting and transferring of patients on low back pain and musculoskeletal injuries in health care personnel—A systematic review and meta-analysis. Journal of Occupational Health. 2023 Jan;65(1): e12423.

38. Wada T, Tanishima S, Osaki M, Nagashima H, Hagino H. Relationship between sarcopenia and pain catastrophizing in patients with lumbar spinal stenosis: A cross-sectional study. Osteoporosis and Sarcopenia. 2019 Dec 1;5(4):132-6.

39. salwa f, ibrahim he, el-marakby al, ebtessam fg. Prevalence of Work-Related Low Back Pain among Physical Therapists with Different Foot Postures at Fayoum, Egypt: A Survey Study. The Medical Journal of Cairo University. 2019 Mar 1;87(March):941-51.

40. Bontrup C, Taylor WR, Fliesser M, Visscher R, Green T, Wippert PM, Zemp R. Low back pain and its relationship with sitting behaviour among sedentary office workers. Applied ergonomics. 2019 Nov 1; 81:102894.

41. Haladay DE, Miller SJ, Challis J, Denegar CR. Quality of systematic reviews on specific spinal stabilization exercise for chronic low back pain. Journal of orthopaedic & sports physical therapy. 2013 Apr;43(4):242-50.

42. Frizziero A, Pellizzon G, Vittadini F, Bigliardi D, Costantino C. Efficacy of core stability in non-specific chronic low back pain. Journal of functional morphology and kinesiology. 2021 Apr 22;6(2):37.

43. Alqhtani RS, Ahmed H, Ghulam HS, Alyami AM, Al Sharyah YH, Ahmed R, Khan A, Khan AR. 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. 2024 Jan 15;13(2):475.

44. Zarei H, Norasteh AA. Effects of core stability training program on trunk muscle endurance in deaf children: a preliminary study. Journal of Bodywork and Movement Therapies. 2021 Oct 1; 28:6-12.

45. Afrasiabifar A, Mosavi A, Mohammadian-Behbahani M, Hoseinichenar N. The effectiveness of core stability exercises on nurse fatigue. Journal of Nursing and Midwifery Sciences. 2018;5(1):9-14.

46. Chang WD, Lin HY, Lai PT. Core strength training for patients with chronic low back pain. Journal of physical therapy science. 2015;27(3):619-22.

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