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Gender-Based Differences in Postural Stability in Young Adults with Non-Specific Low Back Pain: A Cross-Sectional Study

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Abstract

Background: Back pain that cannot be linked to a particular underlying medical issue, such as a fracture, infection, or herniated disc, is referred to as non-specific low back pain. It is the most prevalent type of low back pain and is frequently brought on by postural abnormalities, muscular imbalances, poor ergonomics, or prior injuries.

Aim of Study: This study aims to investigate and identify gender-based differences in postural stability; pain intensity and functional disability in young adults with non-specific Low back pain and compare it to healthy controls.

Patients and Methods: Sixty people participated in this cross-sectional study, which was carried out at the Biomechanics laboratory in the Faculty of Physical Therapy of Batterjee Medical College. The patients were divided into two groups, with 30 in Group A and 30 in Group B. The first group (A) consisted of control healthy volunteers, and the second group (B) featured patients with nonspecific low back pain. Postural Stability was assessed by the test of Sensory Integration (m-CTSIB), Balance Error Scoring System (BESS), and Limits of Stability (LOS) Test. Functional disability was assessed by the Oswestry Disability Index Arabic version. Pain intensity was assessed by the Visual Analouge Scale.

Results: There was a significant difference between groups in the limits of stability for both total (p=0.025) and female scores (p=0.024) with no significant differences between males (p=0.461). Furthermore, a significant difference was observed in the LOS time between groups in the total score (p=0.048) with no significant differences between males (p=0.115) and female scores (p=0.241).

Conclusion: Postural stability deficiencies are more common in women with NSLBP, most likely as a result of hormonal impacts that impact joint stability and muscle function, poorer core musculature, and changed pelvic anatomy. However, although they are still impacted by NSLBP, especially regarding muscle tension and neuromuscular control, men may show less severe balance deficiencies.

Key Words: *Center of pressure (COP) – Modified clinical test of sensory interaction in balance (m-CTSIB) – Non-specific low back pain (CNSLBP) – Postural stability.*

Introduction

MANY adults experience low back pain (LBP), a common condition that has a major influence on their day-to-day functioning. According to the Global Burden of Diseases, it is a major contributor to disability worldwide. According to the World Health Organization, low back pain is the leading cause of activity and occupational participation limitations in many parts of the world **[1]**.

It is estimated that a significant percentage of working people-up to 85% will experience low back pain (LBP) at some point in their lives. As a consequence, LBP places a heavy financial burden on people, families, different industries, and the government. It has been estimated that LBP's total direct and indirect financial effects in the US amount to $100 billion to $200 billion a year. Without accounting for lost productivity and other social costs, medical expenses alone in Canada are estimated to be between $6 billion and $12 billion **[2]**.

Non-specific LBP (NSLBP), according to the National Institute for Health and Care Excellence, is defined as lower back tightness, soreness, and/or stiffness of unclear cause that is accompanied by symptoms related to joint, disc, and connective tissue involvement **[3]**. The distress experienced by people with NSLBP cannot be clearly attributed to

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any specific medical diagnosis. Up to 85% of patients who present with isolated low back pain do not receive a definitive pathoanatomical diagnosis that would enable them to determine the source of their discomfort, per previous studies. Even while structural abnormalities might contribute to NSLBP, it is challenging to accurately identify these causes with the diagnostic techniques and knowledge available today **[1].**

It is essential to maintain postural stability in order to carry out daily tasks. The postural control of people with chronic CNSLBP is reduced **[4].** One common technique for evaluating postural control is the assessment of body sway using center of pressure (COP) trajectories **[5]**. Patients with particular low back pain (LBP) sway more in the anteroposterior direction. The exact mechanism behind poor postural control in patients with chronic non-specific low back pain (CNSLBP) is still unknown, despite reports of increased COP displacement **[6].**

Gender-specific differences in balance control and movement patterns are influenced by LBP's distinct effects on postural stability in men and women. Deficits in dynamic postural stability, reduced muscle activation, and altered movement patterns to reduce pain and discomfort are commonly linked to LBP in males **[7]**.

Numerous studies have examined whether there are gender differences in older adults and even children in their postural stability and control. One study found that most static and dynamic postural control variables are the same for males and females, but that in females with nonspecific chronic LBP, greater fear of movement and pain intensity during activity is more closely linked to impaired dynamic balance **[7].** Additionally, A study assessed 198 young adults with low back pain (LBP), consisting of 69 men and 129 women, found a connection between chronic low back pain and female gender. The study also identified correlations between LBP in young adults and several potential risk factors, including chronic pain, reduced quality of life, and a previous history of low back pain **[8]**. However, there is little research examining how gender differences in postural stability affect young people with CNSLBP complaints which may be important for understanding the gender difference in their response to this pain and the consequent treatment that may be implemented for each. Therefore, the purpose of this study is to examine and determine whether there are gender-based variations in young people with non-specific low back pain in terms of postural stability, pain severity, and functional impairment. Furthermore, to compare the differences between both genders with healthy age-matched adults.

Patients and Methods

Study design:

This study was a cross-sectional investigation in which sixty participants took part to determine the gender-based variations in postural stability, pain intensity, and functional disability among patients with non-specific low back pain in young adults, this study was carried out at the Biomechanics laboratory in the physical therapy faculty of Batterjee Medical College during the period time from January 2024 to November 2024.

A total of 30 patients were assigned to Group A, and another 30 patients were assigned to Group B. Patients with nonspecific low back pain were in Group B, whereas control healthy volunteers were in Group A.

Participants:

This study, which was carried out following the 1964 Declaration of Helsinki's ethical criteria, involved thirty cases of non-specific low back pain in both genders. The Research Ethical Committee of Cairo University's Faculty of Physical Therapy approved it (P.T.REC/012/005303).

The cases included in this study were chosen based on the following criteria: Participants must be male or female, have a BMI of 29.9kg/m^2 or below, be between the ages of 18 and 26, and have a verified diagnosis of chronic non-specific low back pain (NSLBP) (defined as LBP lasting at least three monthswith no definite structural cause for their pain) **[9]**.

The subjects were excluded if they satisfied any one or more of the following criteria: Asymmetric Achilles tendon reflex, recent trauma, structural abnormalities, inflammatory illnesses, neurological disorders, symptoms of radiculopathy, leg pain, any upper or lower motor neuron problem as asymmetric Achilles tendon reflex, recent trauma, structural abnormalities, inflammatory illnesses. Postural stability may be impacted by recent surgery or severe trauma within the last six months. Systemic conditions that may have a substantial impact on postural stability or general health (such as rheumatoid arthritis and ankylosing spondylitis), a history of balance disorders (such as vestibular disorders or peripheral neuropathy), individuals presently enrolled in balance rehabilitation programs or NSLBP interventions that may have an impact on postural stability, taking medications known to impair balance, cognitive function, or central nervous system activity (e.g., sedatives, anticonvulsants, and antidepressants), or pregnancy.

Procedures:

Recording data: Firstly, medical history was taken from subjects to detect the excluded persons, a brief explanation of the study was given to all subjects, and all the subjects had to read and sign the sample consent form.

Assessment of postural stability:

Modified Clinical Test of Sensory Interaction in Balance (m-CTSIB):

Test of Sensory Integration, Modified Clinical Test of Sensory Integration in Balance (m-CTSIB) Testing: The subject was asked to stand on the Sensory Data-locked (SD-locked) platform of the Balance SystemTM (Version 4.X), which allows for the modification of foot position for stability. Tests will begin as soon as the optimal foot placement is determined in order to guarantee consistent foot position coordinates during the test session. Participants' balance was measured under a variety of settings following the three practice trials. The total performance was determined by calculating the mean score across the four test circumstances. The test circumstances include test with eye open and eye closed for each test to isolate the effect of visual feedback on the balance. The balance circumstance include standing on firm or stable surface and foam or unstable surface.

Balance Error Scoring System (BESS):

Double-leg, single-leg, and tandem stances on hard and foam surfaces one with eye open and one with eye closed are the six conditions that make up the Balance Error Scoring System (BESS). The floor shall be the hard surface. A medium-density foam block of 46 × 46 × 13cm served as the foam surface. BESS Score: After every trial was finished, we added together all of the mistakes committed in each trial to determine the BESS score for each condition. Errors in all BESS test situations add up to the final score, which normally ranges from 0 to 60 10.

Limits of Stability (LOS) Test:

After standing on a platform, the participant was told to move a virtual dot on a computer screen with their hips, upper body, and torso in order to line up with targets that were arranged in eight different directions around a circle. The virtual dots were spaced every 45 degrees around the circle. Each participant's height is used by the Biodex Balance System (BBS) to determine relative location distances. The trial will be terminated if a participant is unable to finish the task without holding onto the handles for more than two seconds. The participant was allowed to hold their arms comfortably and adopt their preferred strategy for hitting the targets, simulating a normal clinical setting. They are also allowed to grasp the handles if necessary to regain balance **[11]**.

Postural stability indices:

The patient's demographic information was input into the device's software, and the test's specific settings were set up as follows: Shoes: Bare feet, position: standing on two legs, challenging Level: Medium (Level 5); visual Condition: Open eyes, trial Time: 30 seconds, rest Ten seconds is the interval. The Anterior-Posterior Stability Index (APSI), Mediolateral Stability Index (MLSI), and Overall Stability Index (OASI) are the Postural Stability Indices (PSIs) that were measured. The BALANCE SYSTEMTM SD software's specified indices were used to compute the deviations from the baseline position, and greater PSI scores are associated with poorer postural stability **[12]**.

Assessment of pain intensity: Under the guidance of the same examiner, the patients In group B used a visual analogue scale (VAS) to assess their level of pain at rest **[13]**.

Assessment of functional disability: Each participant In Group B was required to read the Oswestry Disability Index Arabic version in its whole in order to ascertain their level of proficiency in each of the following areas: Pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex (if relevant), social, and travel **[14]**.

Statistical analysis:

An analysis of the data was conducted using IBM SPSS Statistics 26 (IBM Corp, Armonk, NY, USA). For the quantitative and qualitative variables, the descriptive statistics were shown as the mean, standard deviation, and percentage, respectively. To determine if the results' distribution was normal or not, the Shapiro-Wilk test was employed. ANOVA was utilized to determine whether there was a significant difference between the study and control groups for every dependent variable. A significance level of $p<0.05$ was established.

Results

The distribution of females and males in the control group was 50% (15) and 50% (15) respectively, while in the study group, it was 60 % (18) and 40% (12) respectively (Table 1). No significant difference in age (p=0.661), weight (p=0.543), height (p=0.783) or BMI (p=0.567) between groups (Table 1).

Table (1): Descriptive statistics for demographic variables.

Variables	Mean ± SD		*t*-value	*p*-value	Sig.
	Group A (Control) N = 30	Group B (Study) N = 30			
Age (years)	21.53±2.649	21.87±3.181	–0.441	0.661	NS
Weight (Kg)	64.63±12.783	62.53±13.806	0.611	0.543	NS
Height (cm)	168.13±10.217	167.33±12.073	0.277	0.783	NS
BMI (kg/m^2)	22.79±3.556	22.26±3.614	0.567	0.567	NS
Sex distribution	Count (%)	Count (%)	χ2 value	*p*-value	Sig.
Females	15 (50%)	18 (60%)	0.600	0.439	NS
Males	15 (50%)	12 (40%)			

Sensory integration testing:

There was a significant difference between groups in the m-CTSIB Eye Open Firm for the total score (*p*=0.047) with no significant differences between males and females. There were no significant differences in the Overall sensory integration (m-CTSIB), m-CTSIB Eye Closed Firm, m-CTSIB Eye Open Foam m-CTSIB Eye closed Foam (Table 2).

Table (2): Between group differences for all domains of the sensory integration testing both total and gender based.

Variables	Mean ± SD				ANOVA			
	Group A (Control) N = 30		Group B (Study) N = 30		MS	*F*-value	*p*-value	Sig.
	Mean	SD	Mean	SD				
Overall sensory integration (m-CTSIB):								
Total	1.032	0.277	1.1027	0.269	0.075	1.004	0.321	NS
Males	1.047	0.242	1.123	0.248	0.039	0.643	0.430	NS
Females	1.017	0.316	1.089	0.288	0.043	0.470	0.498	NS
m-CTSIB Eye Open Firm:								
Total	0.424	0.149	0.555	0.322	0.259	4.110	0.047*	S
Males	0.413	0.146	0.539	0.216	0.107	3.289	0.082	NS
Females	0.435	0.157	0.566	0.382	0.140	1.532	0.225	NS
m-CTSIB Eye Closed Firm:								
Total	0.896	0.331	0.950	0.3577	0.044	0.372	0.544	NS
Males	0.892	0.315	1.035	0.411	0.136	1.051	0.315	NS
Females	0.900	0.358	0.894	0.317	0.000	0.003	0.959	NS
m-CTSIB Eye Open Foam:								
Total	0.799	0.461	0.773	0.241	0.010	0.075	0.785	NS
Males	0.866	0.594	0.816	0.216	0.017	0.077	0.784	NS
Females	0.732	0.278	0.744	0.258	0.001	0.018	0.895	NS
m-CTSIB Eye closed Foam:								
Total	2.016	0.588	2.142	0.554	0.239	0.733	0.395	NS
Males	2.033	0.409	2.110	0.539	0.039	0.177	0.678	NS
Females	1.998	0.740	2.163	0.579	0.224	0.519	0.477	NS

SD = Standard deviation.
MS = Mean square.
F-value = F-statistic.
p-value = Probability.
Sig. = Significance.
NS = Non-significant.

Balance error scoring system:

There was a significant difference between groups in the BESS SLS Foam for the female score only (p=0.025) with no significant differences between males and total scores. Furthermore, a significant difference was observed in the BESS errors between total (p=0.005) and female scores (p=0.025) with no significant differences between males (p=0.069). There were no significant differences in the overall BESS, BESS DLS Firm, BESS SLS Firm, BESS Tandem LS Firm, BESS DLS Foam, and BESS Tandem LS Foam (Table 3).

Table (3): Between-group differences for all domains of the Balance error system, both total and gender-based.

Variables	Mean ± SD				ANOVA			
	Group A (Control) N = 30		Group B (Study) N = 30		MS	F-value	p-value	Sig.
	Mean	SD	Mean	SD				
BESS:								
Total	2.630	0.699	2.6750	0.578	0.030	0.074	0.787	NS
Males	2.7027	0.39287	2.7283	0.580	0.004	0.019	0.892	NS
Females	2.5573	0.920	2.6394	0.590	0.055	0.096	0.758	NS
BESS DLS Firm:								
Total	1.359	0.468	1.4027	0.667	0.029	0.086	0.770	NS
Males	1.2507	0.304	1.503	0.712	0.426	1.550	0.225	NS
Females	1.4673	0.580	1.336	0.647	0.142	0.372	0.546	NS
BESS SLS Firm:								
Total	2.734	0.905	2.499	0.591	0.828	1.418	0.239	NS
Males	2.7433	0.567	2.696	0.618	0.015	0.043	0.837	NS
Females	2.7240	1.172	2.367	0.551	1.041	1.323	0.259	NS
BESS Tandem LS Firm:								
Total	2.409	1.137	2.513	0.947	0.161	0.147	0.702	NS
Males	2.5187	1.055	2.499	1.141	0.003	0.002	0.964	NS
Females	2.300	1.240	2.522	0.828	0.404	0.377	0.543	NS
BESS DLS Foam:								
Total	2.567	0.624	2.789	1.016	0.735	1.033	0.314	NS
Males	2.5107	0.398	2.827	0.723	0.666	2.088	0.161	NS
Females	2.624	0.802	2.763	1.192	0.159	0.148	0.703	NS
BESS SLS Foam:								
Total	3.154	0.877	3.666	1.209	3.932	3.526	0.065	NS
Males	3.3607	0.787	3.334	1.053	0.005	0.006	0.941	NS
Females	2.948	0.940	3.888	1.283	7.226	5.552	0.025*	S
BESS Tandem LS Foam:								
Total	3.561	1.315	3.280	1.080	1.115	0.770	0.384	NS
Males	3.794	0.808	3.737	1.290	0.021	0.019	0.890	NS
Females	3.327	1.677	2.988	0.822	0.940	0.573	0.455	NS
BESS errors:								
Total	6.83	2.972	9.47	3.937	104.017	8.550	0.005*	S
Males	7.40	2.613	10.08	4.641	48.002	3.609	0.069	NS
Females	6.27	3.283	9.06	3.472	63.637	5.543	0.025*	S

SD = Standard deviation.
p-value = Probability.
MS = Mean square.
Sig. = Significance.
F-value = F-statistic.
NS = Non-significant.

Limits of stability:

There was a significant difference between groups in the limits of stability for both total (p=0.025) and female scores (p=0.024) with no significant differences between males (p=0.461). Furthermore, a significant difference was observed in the LOS time between groups in the total score (p=0.048) with no significant differences between males (p=0.115) and female scores (p=0.241) (Table 4).

Table (4): Between-group differences for Limits of stability, both total and gender-based.

Variables	Mean ± SD				ANOVA			
	Group A (Control) N = 30		Group B (Study) N = 30		MS	*F*-value	*p*-value	Sig.
	Mean	SD	Mean	SD				
Limits of stability:								
Total	48.43	12.966	39.93	15.474	1083.750	5.318	0.025*	S
Males	51.67	13.205	37.17	18.045	1401.667	5.818	0.024*	S
Females	45.20	12.307	41.78	13.739	95.822	0.557	0.461	NS
LOS time:								
Total	41.73	6.291	48.00	15.811	589.067	4.068	0.048*	S
Males	41.20	6.120	48.92	17.026	396.980	2.673	0.115	NS
Females	42.27	6.628	47.39	15.424	214.668	1.428	0.241	NS

SD = Standard deviation. *p*-value = Probability.
MS = Mean square. Sig. = Significance.
F-value = F-statistic. NS = Non-significant.

Postural stability tests:

There was a significant difference between groups in the Ant/Post index for the female score only (p=0.028) with no significant differences between males (p=0.304) and total (p=0.398) scores. Furthermore, a significant difference was observed in the Med/Lat index between groups in the female scores (p=0.016) with no significant differences between groups in the total (p=0.529) and male (p=0.156) scores. There were no significant differences in the Postural stability Overall index (Table 5).

Table (5): Between group differences for postural stability tests both total and gender based.

Variables	Mean ± SD				ANOVA			
	Group A (Control) N = 30		Group B (Study) N = 30		MS	*F*-value	*p*-value	Sig.
	Mean	SD	Mean	SD				
Ant/Post index:								
Total	0.293	0.1617	0.260	0.1404	0.017	0.726	0.398	NS
Males	0.260	0.1352	0.325	0.1865	0.028	1.103	0.304	NS
Females	0.327	0.1831	0.217	0.0786	0.099	5.344	0.028*	S
Med/Lat index:								
Total	0.200	0.1259	0.180	0.1186	0.006	0.401	0.529	NS
Males	0.153	0.0743	0.225	0.1712	0.034	2.141	0.156	NS
Females	0.247	0.1506	0.150	0.0514	0.076	6.541	0.016*	S
Postural stability Overall index:								
Total	0.387	0.1737	0.373	0.1818	0.003	0.084	0.773	NS
Males	0.353	0.1552	0.450	0.2468	0.062	1.546	0.225	NS
Females	0.420	0.1897	0.322	0.1003	0.078	3.592	0.067	NS

SD = Standard deviation. *p*-value = Probability.
MS = Mean square. Sig. = Significance.
F-value = F-statistic. NS = Non-significant.

Gender-based differences in the NSLBP group:

In this study, an independent sample *t*-test was performed to test the significant differences between males and females in the NSLBP group. The results revealed no significant difference between males and females for all indices of postural stability Except the Ant/Post index which was significantly different between males and females (*p*=0.036) as shown in table (Table 6).

Table (6): Independent sample *t*-test for gender based difference in NSLBP group.

	t-value	*p*-value	Sig.	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
m-CTSIB	0.338	0.738	NS	0.0344	-0.174	0.2431
mCTSIB Eye Open Firm	-0.221	0.827	NS	-0.027	-0.277	0.223
m-CTSIB Eye Closed Firm	1.061	0.298	NS	0.1411	-0.131	0.4136
m-CTSIB Eye Open Foam	0.79	0.436	NS	0.0714	-0.114	0.2565
m-CTSIB Eye closed Foam	-0.254	0.801	NS	-0.053	-0.484	0.377
BESS	0.407	0.687	NS	0.0889	-0.359	0.5366
BESS DLS Firm	0.669	0.509	NS	0.1678	-0.346	0.6816
BESS SLS Firm	1.526	0.138	NS	0.3286	-0.113	0.7698
BESS Tandem LS Firm	-0.064	0.949	NS	-0.023	-0.758	0.7124
BESS DLS Foam	0.164	0.871	NS	0.0633	-0.726	0.8526
BESS SLS Foam	-1.24	0.225	NS	-0.554	-1.468	0.3608
BESS Tandem LS Foam	1.949	0.061	NS	0.7492	-0.038	1.5366
BESS errors	0.694	0.493	NS	1.028	-2.005	4.06
Limits of stability	-0.794	0.434	NS	-4.611	-16.5	7.277
LOS time	0.255	0.801	NS	1.528	-10.74	13.798
Postural stability Overall index	1.978	0.058	NS	0.1278	-0.005	0.2601
Ant/Post index	2.203	0.036*	S	0.1083	0.0076	0.2091
Med/Lat index	1.757	0.09	NS	0.075	-0.013	0.1625

Discussion

Recent research has highlighted significant gender-based differences in postural stability among young adults with non-specific low back pain (NSLBP) **[8]**. Specifically, within Group B (patients with NSLBP), females exhibit poorer postural stability compared to males, characterized by greater postural sway and reduced balance control. Furthermore, between-group comparisons (NSLBP vs. healthy controls) reveal significant differences across all measures of postural stability, including static and dynamic balance, proprioception, and neuromuscular control.

Across all age categories, chronic low back pain (CLBP) is one of the most prevalent illnesses worldwide **[6]**. Eighty to ninety percent of CLBP cases are nonspecific, incurable, and challenging to treat **[15]**. Postural control is essential to our activities of daily living. Postural control was compromised in patients with chronic non-specific low back pain (CNSLBP) **[4]**.

Young individuals with NSLBP exhibit gender-based variations in postural stability, with females frequently exhibiting more severe deficiencies because of things like smaller core muscles, changed biomechanics, and the impact of hormones **[16]**. NSLBP results in decreased postural control in both sexes, although the abnormalities show up in different ways. For people with non-specific low back pain, gender-specific rehabilitation techniques can be required to promote recovery and enhance postural stability. Therefore, the purpose of this study was to investigate and identify gender-based differences in postural stability, pain intensity and functional disability in young adults with non-specific Low back pain.

In this study, the proportion of females and males was 60% (18) and 40% (12) in the study group, respectively, compared to 50% (15) and 50% (15) in the control group. Consistent with our research, Bento et al. **[17]** discovered that women had a higher prevalence of LBP (60.9%) compared to men (39.1%) **[17]**, supporting evidence from France

[18], Qatar [19], and Saudi Arabia [20], but in Sweden [21] the reverse was noted.

The current study found no significant differences between males and females in group B, although there was a significant difference between groups in the m-CTSIB Eye Open Firm for the total score. Overall sensory integration (m-CTSIB), m-CTSIB Eye Closed Firm, m-CTSIB Eye Open Foam, and m-CTSIB Eye Closed Foam did not differ significantly.

Regarding this concern, research by Lomond and Sansom, [22] found that during unstable Tandem Standing (TS), emerging adults with CLBP had large, significant increases in postural sway. Lower balance scores during circumstances favoring visual or vestibular input during the sensory organization test (SOT) indicated that participants with CLBP relied more on somatosensory input [22]. Furthermore, a prior study by Caffaro et al. [23] discovered that those with cLBP had higher body sway compared to controls, which is consistent with earlier research [24,25,26]. This increase in body sway could be brought on by disturbance in deep trunk muscle motor control in people with LBP, which is typified by delayed neuromuscular recruitment [27], in addition to modifications in the neuromuscular receptors [28]. Gill and Callaghan [29] demonstrated that LBP may have an impact on proprioceptive receptors [29]. Consequently, proprioceptive dysfunctions may result in poor postural control in people with LBP [30,31]. Additionally, some research has shown that in patients with LPB, postural sway and pain severity are linearly associated [26,32,33].

Additionally, Caffaro et al. [23] found that intra-group significant differences in conditions 3 (Involved participants standing on a firm surface with their eyes open) and conditions 4 (involved standing on a foam surface with their eyes closed only) became apparent when the visual input was eliminated. Visual information helps with postural control, serves as a reference for verticality, and reports position data and head movement in relation to surrounding objects. According to this research, those with cLBP may prioritize visual input over the somatosensory and vestibular systems, setting them apart from people without LBP [23]. The likelihood of a mixture of proprioceptive information changes brought on by the illness is not disregarded by this hypothesis [28,30,31], or these individuals' dependence on visual information.

This study showed that there was a significant difference between groups in the limits of stability for both total and female scores, with no significant differences between males. Furthermore, a significant difference was observed in the LOS time between groups in the total score, with no significant differences between male and female scores in group B.

In another investigation, Kahraman et al. [7] found that the dynamic postural control was represented by a medium effect size in the LOS test, with a substantially greater reaction time difference in females. Compared to men, women in their study group experienced comparatively higher degrees of pain and impairment, which could lead to bias regarding the differences between the sexes. However, none of the other factors of both static and dynamic postural control differed significantly between males and females, according to Kahraman et al. [7]. However, the fear of movement level was substantially associated with more LOS test variables in females than in males (i.e., movement velocity, endpoint excursion, and maximum excursion, as well as reaction time). However, among males, the correlations between the two LOS test variables and the degree of fear of movement were significantly greater. However, only in female participants did the LOS factors show a correlation with the severity of discomfort throughout the activity [7].

Additionally, LBP has distinct effects on postural stability in both men and women, which influences gender-specific differences in movement patterns and balance control, according to Kahraman et al. [7]. Deficits in dynamic postural stability, which are linked to decreased muscle activation and altered movement techniques intended to alleviate pain and discomfort, are commonly observed in males with LBP. Furthermore, research suggests that males with LBP might have reduced trunk muscle endurance and proprioceptive deficits, which would hinder their ability to maintain balance when engaging in dynamic activities. On the other hand, women with LBP frequently experience changes in their static and dynamic postural stability, which are linked to hormone fluctuations, pelvic shape, and psychological factors. Hormonal fluctuations during the menstrual cycle may impact neuromuscular control and worsen LBP symptoms [34].

Our research revealed that, while there were no significant differences between the male and total scores, there was a significant difference between the groups in the Ant/Post indices for the female score alone. The Postural Stability Overall index showed no discernible variations.

In line with our research, Kahraman et al. [7] found no discernible difference between male and female subjects with nonspecific CLBP in terms of static postural control. The static postural control abilities of 7979 healthy adults were examined by Era et al. [35], who found that generally speaking, males tended to have more pronounced postural sway velocities than healthy females. This discrepancy between research may also indicate that nonspecific CLBP impacts females significantly more than it does males. Nonetheless, there is proof that individuals with LBP have poorer static and dynamic postural control [36,37,38]. Furthermore, Kahraman et al. [7] suggested that compared to males, females with chronic nonspecific LBP exhibit poorer dynamic balance control skills. Furthermore, a systematic review of research on youth and adults found that except in two studies, those with low back pain exhibited more postural sway, particularly in the AP direction, than healthy people [26]. In individuals 75 years of age and older who live in the community, it was shown that ML sway was comparable between the groups, even though AP sway was noticeably higher in the pain group than in the pain-free group [39].

According to certain research, individuals with LBP may have a neuromuscular and sensory system that contributes to their reduced postural control. However, Mazaheri et al. [40] discuss the inexplicable physiological effects of chronic pain behavior that lead to a decline in coping mechanisms and psychological aspects in individuals with LBP. Therefore, persons with LBP have been found to exhibit abnormal postural and neuromuscular responses during a variety of dynamic exercises [41]. Kahraman et al. [7] indicate that female coping mechanisms for chronic pain are less developed, which may lead to a lack of postural control during dynamic balance.

Limitations:

- *Cross-Sectional Design:* Cannot establish causality or track changes over time.
- *Non-Specific Low Back Pain:* Results may not apply to individuals with specific causes of low back pain.
- *Confounding Variables:* Factors like physical activity, musculoskeletal strength, or psychological conditions may influence the results but are not always controlled for.
- *Sample Size and Demographics:* Limited sample size reduces generalizability across diverse populations.

Conclusion:

To sum up, the research on gender-based variations in postural stability in young people with non-specific low back pain (NSLBP) reveals that compared to healthy controls significant disparities in how each gender feels and makes up for deficiencies in postural control. Postural stability deficiencies are more common in females with NSLBP, most likely as a result of hormonal impacts that impact joint stability and muscle function, poorer core musculature, and changed pelvic anatomy. However, although they are still impacted by NSLBP, especially regarding muscle tension and neuromuscular control, males may show less severe balance deficiencies.

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Ethical approval:

All study procedures were carried out and approved by the faculty of physical therapy at Cairo University and per the declaration of Helsinki. Before recruitment, all study participants were required to receive a thorough description of the study's purpose, goals, and methodology. The approval and written informed consent of the subjects were obtained by the lead investigator.

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الاختلافات القائمة على الجنس في استقرار الوضعية لدى الشباب البالغين الذين يعانون من آلام أسفل الظهر غير المحددة: دراسة مقطعية

المقدمــة: تُعد آلام أسفل الظهرحالة شائعة تؤثر بشكل كبير على الأداء اليومي وتُعتبر سببًا رئيسيًا للإعاقة عالميًا، حيث يُعانى منها ما يصل إلى ٨٥٪ من العاملين خلال حياتهم. وتُشكل عبئًا اقتصاديًا كبيرًا يُقدَّر بين ١٠٠ و٢٠٠ مليار دولار سنويًا فى الولايات المتحدة. ويُشير مصطلح آلام أسفل الظهر غير المحددة السبب إلى الألم غير المرتبط بتشخيص طبى واضح، حيث تفتقر نحو ٨٥٪ من الحالات إلى تحديد دقيق للمصدر. يُعد التوازن الحركى ضروريًا للمهام اليومية وغالبًا ما يكون مضطربًا لدى مرضى آلام أسفل الظهر غير المحددة السبب المزمن، ويُستخدم تحليل تذبذب مركز الضغط لتقييم التوازن. عادةً ما يميل المرضى إلى التذبذب بشكل أكبر فى الاتجاه الأمامى الخلفى، بينما لا تزال الآلية الدقيقة لهذا الاضطراب غير واضحة. تؤثر الفروق بين الجنسين على الاستجابة للألم، حيث يُظهر الذكور ضعفًا في التوازن الديناميكى، بينما تُعانى الإناث من شدة ألم وخوف أكبر من الحركة. وقد ربطت دراسة بين الألم المزمن فى الشباب والجنس الأنثوى، إلى جانب عوامل خطر أخرى مثل انخفاض جودة الحياة وتاريخ سابق للألم. مع ذلك، لا تزال الأبحاث محدودة حول تأثير الفروق بين الجنسين فى التوازن لدى الشباب، مما دفع هذه الدراسة إلى استكشاف تلك الفروقات من حيث التوازن، شدة الألم، والقصور الوظيفى، مقارنةً بأشخاص أصحاء من نفس الفئة العمرية.

الهدف من الدراسة: تهدف هذه الدراسة إلى التحقيق فى الفروقات بين الجنسين من حيث الاستقرار الوضعى، وشدة الألم، والإعاقة الوظيفية لدى البالغين الشباب الذين يعانون من آلام أسفل الظهر غير المحددة، ومقارنتها مع أفراد أصحاء من نفس الفئة العمرية.