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Original Article

Sensorimotor, cognitive and affective behavior according to perceived level of disability in patients with chronic low back pain: an observational cross-sectional study

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Abstract

Objectives: The aim was to evaluate the influence of the level of disability on sensorimotor and psychological variables in nonspecific chronic low back pain (NCLBP). **Methods**: A cross-sectional observational study was performed with 90 participants, divided into one group with NCLBP (60 participants) and one asymptomatic group (30 participants). Symptomatic participants were divided into a "major" or "minor" disability group using the Roland Morris Disability Questionnaire score, resulting in two groups of 30 participants. All participants completed a series of self-administered questionnaires and performed sensorimotor tests. **Results**: There were no statistically significant differences in the sensorimotor variables except in pain intensity, which was greater in the NCLBP group with high lumbar disability. There were statistically significant differences between the symptomatic groups in the degree of self-efficacy, pain catastrophism and kinesiophobia. **Conclusions**: Patients with NCLBP and high levels of disability present greater pain intensity and significantly poorer results in psychological variables compared with those with NCLBP and low levels of disability. In contrast, there were no differences for sensorimotor variables between the patients with NCLBP and high levels of disability and those with low levels of disability.

Keywords: Disability, Nonspecific Chronic Low Back Pain, Psychological Factors, Self-Efficacy

Introduction

Low back pain (LBP) is the most prevalent musculoskeletal problem, so much so that the scientific evidence has indicated that approximately 80% of the world's population will experience an episode in their lifetime[1,2]. LBP is a multifactorial disorder, which increases its complexity, and presents a high risk of chronicity[3,4]. Worldwide, it is estimated that approximately 23% of the population experiences chronic LBP (CLBP)[5,6].

Studies have shown that approximately 90% of cases of CLBP are of a nonspecific nature (NCLBP), which is defined as persistent pain with no structural cause to explain the symptoms[7,8]. Research studies suggest that NCLBP is a complex clinical entity in which physical, cognitive, psychological, lifestyle, neurophysiological and societal factors interact and contribute to the maintenance of symptoms[9–13].

The involvement of psychosocial and functional factors and their contribution to maintaining the symptoms explains why, unlike in acute LBP, peripheral mechanisms are usually missing in CLBP, with a greater involvement of central mechanisms consistent with a central sensitisation process[9,14,15]. Central sensitisation is a state of nervous system hypersensitivity characterised by the presence of

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allodynia or secondary hyperalgesia. In patients with NCLBP, central sensitisation can manifest as a decrease in pain thresholds to pressure, widespread pain, an alteration in the temporal summation of stimuli, an influence of psychological variables and an alteration of functional variables[16–19].

A common finding in this type of central abnormality is an increased sensitivity to pressure[20,21]. In addition to this finding, studies have concluded that the factors that most contribute to symptom chronicity in patients with NCLBP are the presence of maladaptive coping behaviours, lack of self-efficacy, alteration of functional variables, a poorer perception of one's health condition and the presence of psychological factors[22].

In addition to these factors, one of the most important variables to assess in this population is disability. CLBP is the leading cause of disability, entailing a high socioeconomic cost[23,24], so much so that a study conducted in 2018 showed that the length of time lived with disability caused by low back pain increased by 54% between 1990 and 2015[25]. In this line, studies have shown that patients who present major levels of disability can present greater involvement of somatosensory, physical and psychological variables[26–29]. Numerous studies have determined that factors such as education, work activity, socioeconomic level, physical inactivity, pain intensity and duration, fatigue, depression, self-efficacy and fear of pain are determinants in disability[30,31]. In addition, a recent systematic review showed that a higher degree of kinesiophobia is associated with higher levels of pain intensity, pain severity and disability, as well as lower quality of life[32]. However, other authors have indicated that pain and disability are not necessarily correlated[27,33].

The assessment and analysis of the degree of disability is highly relevant in patients with LBP at risk of chronicity, given that a review conducted last year showed that disability together with pain intensity, emotional distress, expectations of recovery, pain catastrophism and physical demands at work are predictors of symptom maintenance; however, we do not know how differing degrees of disability can influence other factors of a psychological or sensorimotor nature[34].

There is a lack of evidence as to whether the degree of disability affects sensorimotor or psychological variables in patients with NCLBP. Therefore, the main objective of this study was to investigate the influence of the degree of lumbar disability on sensorimotor variables. The secondary objective was to observe how the degree of lumbar disability affects psychological variables.

Materials and Methods

Study design

We conducted an observational cross-sectional study using non-probabilistic sampling to assess sensorimotor and psychosocial variables in asymptomatic individuals and individuals with NCLBP. The study was conducted according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) declaration[35]. The study also followed the principles of the Declaration of Helsinki, and the Ethics Committee of University La Salle approved the study (CSEULS-PI-126/2016). Written informed consent was obtained from all participants.

Participants

The sample consisted of 90 participants, 60 of whom had NCLBP and 30 of whom were asymptomatic. The patients with NCLBP were divided into 2 groups, one with "major" and the other with "minor" lumbopelvic disability based on the median score achieved in the Roland-Morris Disability Questionnaire[36]. This procedure for segmenting the sample on the basis of the median data has been used in other research studies with other study variables[37,38]. Both the major disability and minor disability groups consisted of 30 participants. The patients with NCLBP were recruited from the Primary Healthcare Center of Miraflores (Alcobendas, Spain), while the asymptomatic participants were recruited in the local community using leaflets, posters and social media between January 2020 and June 2021. The assessment of the symptomatic subjects was carried out at Primary Healthcare Center of Miraflores (Alcobendas, Spain), in a room with a stretcher dedicated solely to carrying out the research. As for the asymptomatic subjects, they were evaluated in a similar room at the La Salle University (Aravaca, Spain).

Inclusion criteria

We selected patients who met all of the following inclusion criteria: a) LBP for at least 6 months; b) the presence of NCLBP which is defined in the evidence as " ... tension, pain and/or stiffness in the lumbar region for which no specific cause of pain can be identified and which that it is not possible to identify a specific cause of the pain and has a duration of more than 3 months"[39]; c) not having undergone back surgery; d) having no specific spinal disease; and e) between 18 and 65 years of age. The participants were asked not to take any medication 24-48 h before the evaluation so as not to mask the symptoms that each patient usually presents with.

The inclusion criteria for the asymptomatic group were a) not having experienced any type of lumbopelvic pain in the 6 months prior to the intervention and b) not presenting any chronic musculoskeletal pain or systemic disease.

Exclusion criteria

The participants were excluded from the NCLBP group if they met any of the following criteria: a) presence of neurological signs (such as weakness perceived in the lower limbs); b) specific spinal disease; c) having undergone back surgery; and d) undergoing another physiotherapy for LBP at the same time.

The exclusion criteria applicable to all patients in the control and NCLBP groups were a) any cognitive disability that presents impairment for visualizing the audiovisual material;

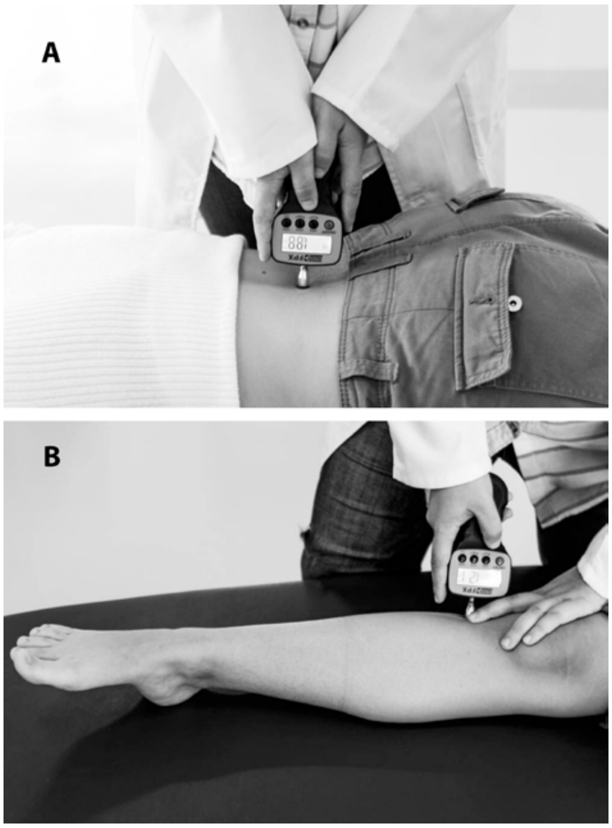

Figure 1. A) PPT evaluation on the spinous process of L2. B) PPT evaluation on the right leg.

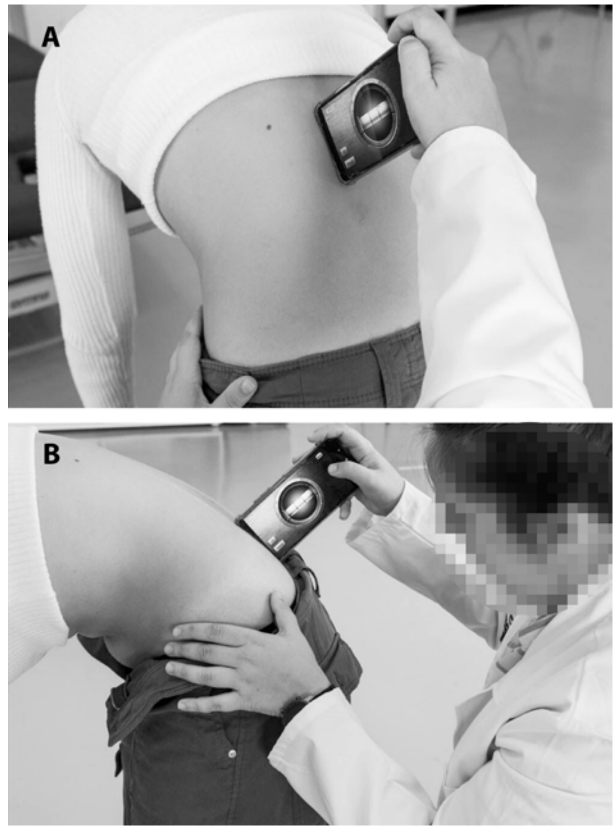

Figure 2. A) ROMF assessment at the level of the T12 process B) ROMF assessment at the level of the S2 process.

b) illiteracy; c) difficulties communicating or understanding; and d) insufficient comprehension of the language to follow the instructions for the measurements.

Procedure

After consenting to participate, all participants underwent a baseline assessment. Each participant had to complete a sociodemographic questionnaire, a set of self-report measures (low back pain disability, self-efficacy, pain catastrophism, fear of movement, depression and anxiety), and finally, a sensorimotor examination was performed (pain intensity, range of motion in flexion, lumbar extensor strength).

A trained physiotherapist (4 weeks of training in the assessment protocol), performed in the first place the pressure pain threshold (PPT) assessment. For this assessment, the participants were initially placed in prone position, and the physiotherapist applied pressure with an algometer on the spinous process of L2 (Figure 1A). The participant then indicated when they began to feel pain. Subsequently, the same application was performed in supine position at 3 cm caudally and medially from the anterior tibial tuberosity on the right leg (Figure 1B). As before, the participant indicated when they began to feel pain[40,41]. The assessment was performed by placing the algometer against the tissue vertically, increasing the force at a constant rate of 1 kg/cm^2. The researcher instructed the individuals: say “yes” when the sensation changes from pressure to a feeling of pain.

Subsequently, the range of motion in flexion (ROMF) was assessed. To this end, a digital inclinometer based on the iHandy mobile app was employed[42]. The protocol consisted of the following process: the participants stood up, with their arms along the sides of their bodies. The physiotherapist marked the spinous process of T12 and S2 to place the mobile device (Figure 2A, B). The patients then performed a maximum flexion of the trunk[43].

Lastly, the lumbopelvic strength assessment was conducted with the participants in 2 positions[44]. In the first position, the participants were asked to stand on the dynamometer platform, holding the handle with their hands with their elbows extended, their knees flexed 45° and the hips flexed until their index fingers were at the height of the kneecaps. The next position was the same except the knees were completely extended (Figure 3)[44].

The same assessment sequence was used for all

Figure 3. Lumbo-pelvic strength assessment.

participants to avoid a possible positive effect of the ROM and strength over the sensory responses.

Variables

Primary variables

Pain intensity

The self-reported pain intensity in the lumbar area was assessed using the numerical pain scale. In this scale, a score of 0 indicates "no pain", and a score of 10 indicates "the maximum pain intensity possible"[45]. It has been shown to have good validity (r=0.94, P<.001).

Range of motion in flexion

The ROMF was assessed with a digital inclinometer based on the iHandy mobile app, which has shown good intra-rater and inter-rater reliability with ICC 0.88 (0.75-0.94)[42].

Lumbar extensor strength

The lumbar region strength was measured using a foot dynamometer (Takei TM 5420, Takei Scientific Instruments Co. Niigata, Japan), which is a valid test for measuring the muscle strength of the lumbar region and has shown good reliability in both women (ICC=0.92; p<.001) and men (ICC=0.93; p<.001)[44,46].

Secondary variables

Pressure pain detection threshold

For the PPT evaluation, an algometer was employed to reveal the mechanical hyperalgesia presented by the participants[40,41]. Our study used a digital algometer (Fx.25 Force Gage, Wagner Instruments, Greenwich, USA), scientifically validated as an instrument for measuring the PPT[47]. The procedure used has shown excellent reliability for low back (ICC 0.86 to 0.99) and moderate to excellent reliability for tibia (ICC 0.53–0.90). The evaluator took 3 measurements, and the mean was employed in the data analysis[48,49].

Low back pain disability

We used the validated Spanish version of the Roland-Morris Disability Questionnaire (RMDQ) to assess the physical disability in daily life activities as a consequence of LBP, a questionnaire presented an internal consistency (Cronbach's alpha) of 0.84 to 0.93 and test–retest reliability ranging between 0.72 and 0.91[36].

Self-efficacy when dealing with chronic pain

The self-efficacy level was evaluated using the Self-efficacy when Dealing with Chronic Pain Questionnaire (CPSS), which has acceptable psychometric properties for assessing perceived self-efficacy and the ability to cope with the consequences of chronic pain (Cronbach α, 0.91)[50]. This scale is a 19-item self-administered instrument with three domains that assesses Self-Efficacy for Pain Management, Physical Functioning, and Coping with Symptoms, with higher scores indicating greater self-efficacy for managing pain[50]. The CPSS presented a reliability of 0.88, 0.87, and 0.90 for the Pain Management subscale, Physical Functioning subscale, and Coping with Symptoms subscale, respectively[51].

Pain catastrophism

To measure the catastrophism level when faced with painful experiences, we employed the Spanish version of the Pain Catastrophizing Scale, which is a reliable and validated measuring tool (Cronbach α, 0.79; ICC, 0.84). This scale is divided into three domains: rumination, magnification and hopelessness[52].

Fear of movement

Using the Tampa Kinesiophobia Scale (TSK-11), validated in Spanish by Gómez-Pérez et al. who demonstrated its reliability (Cronbach α, 0.79; ICC>0.7), we assessed the fear of pain and movement[53]. The questionnaire consists of 2 subscales, one related to the fear of physical activity and the other related to the fear of injury.

Table 1. Descriptive statistics of demographic data.

	Low level of diability (n=30)	High level of disability (n=30)	Asymptomatic group (n=30)	P value, One-way analysis of variance ANOVA or χ^2 test
Age [a]	49.76 ± 11.90	45.80 ± 11.84	40.20 ± 12.51	.011*
Sex[b]				
Female	22 (74.2)	22 (74.2)	18 (61.3)	.412
Male	8 (25.8)	8 (25.8)	12 (38.7)	
Height (cm) [a]	1.60 ± .09	1.62 ± .08	1.78 ± .53	.081
Weight (kg) [a]	66.40 ± 12.99	72.73 ± 19.84	65.73 ± 15.54	.223
EDUCATIONAL LEVEL[b]				
- No education	0 (-)	3 (10.0)	0 (-)	<.001**
- Obligatory education	17 (56.7)	12 (40.0)	0 (-)	
- High School/FP	10 (33.3)	14 (46.7)	8 (26.7)	
- University education	3 (10.0)	1 (3.3)	22 (73.3)	
MARITAL STATUS[b]				
- Single	4 (13.3)	6 (20.0)	14 (46.7)	.04*
- Married-partnered	21 (70.0)	23 (76.7)	16 (53.3)	
- Divorced/separated	5 (16.7)	1 (3.3)	0 (-)	

*Values presented in mean ± standard deviation, median and interquartile range or number (%); *P<.05; ** P<.01; [a] One-way analysis of variance ANOVA; [b] frequency statistics. Cm (centimeters), kg (kilograms).*

Depression and anxiety

The assessment of the level of depression and anxiety was performed using the Hospital Anxiety and Depression Scale (HADS) validated in the Spanish population[54,55]. The scale consists of 14 issues divided among anxiety and depression. The HADS presented an internal consistency (Cronbach's alpha) at 0.80 to 0.93 for the anxiety, and 0.81 to 0.90 for the depression subscales[55].

Sample Size calculation

A pilot study was conducted to determine the effect size of three variables (self-efficacy, pressure pain threshold, range of motion) among patients with minor and major disability NCLBP and asymptomatic subjects. The pilot study included 7 participants from each group and obtained an effect size f (Cohen's *f* statistic)[56]. The sample size was estimated with G*Power 3.1.7 for Windows (G*Power from the University of Düsseldorf, Germany)[57]. We chose to use a one-way ANOVA test to detect differences between groups for the self-efficacy variable, which was the only one in which statistically significant differences were obtained. In addition, we used an alpha error level of 0.05, a statistical power of 80% (1-b error) and an effect size f of 0.335. A total sample size of 90 participants (30 patients with NCLBP and major disability, 30 patients with NCLBP and minor disability, and 30 asymptomatic subjects) was estimated to ensure reliability.

Statistical Analysis

All data analyses were performed SPSS statistical package for social sciences, version 27.0 (SPSS Inc., Chicago, IL). The Kolmogorov-Smirnov test was performed and all variables were found to be normally distributed. The statistical analyses were conducted at a 95% confidence level and a *P* value less than 0.05 was considered statistically significant. Results are expressed as mean, standard deviation (SD), with 95% confidence intervals (95% CI). For comparison of the pain intensity between the two patients groups, a Student's *t*-test for independent samples was used. Effect sizes (Cohen's *d*) were calculated for outcome variables. According to Cohen's method, the magnitude of the effect was classified as small (0.20 to 0.49), medium (0.50 to 0.79), or large (≥0.8)[58]. One-way ANOVA was used to analyze the group factor for sensorimotor and psychological variables. Significant ANOVA findings were followed up with post hoc test using the Bonferroni correction. The relationship between sensorimotor and psychological variables was examined using Pearson correlation coefficients[59].

Results

Descriptive data

The study had a total sample of 90 participants, with 62 women and 28 men. The sample included 60 patients with NCLBP, divided into 2 groups depending on the degree of lumbar disability, as well as 30 participants. The results of this study demonstrate statistically significant differences in terms of age (F=4.73; P=.011) and between the groups for the variables of educational level (P<.001) and marital status (P=.04) (Table 1).

Table 2. Descriptive statistics of the multiple comparisons in the sensorimotor variables.

	Low level of disability (n=30)	High level of disability (n=30)	Asymptomatic group (n=30)	Difference of means (95% CI); Effect size (d) a) Low level of disability vs High level of disability b) Low level of disability vs Asymptomatic group c) High level of disability vs Asymptomatic group
Pain intensity [b]	6.52 ± 1.73	7.82 ± 1.40	-	-1.30 (-2.23 to -.36)*; d= -.83
SLE-S [a]	42.01 ± 24.38	38.98 ± 21.38	67.68 ± 27.28	a) 3.03 (-13.27 to 19.34); d= .13 b) -25.66 (-41.21 to -10.11)**; d= .99 c)-28.69 (-45 to -12.38)**; d= -1.17
SLE-MS [a]	46.76 ± 26.14	37.90 ± 19.03	72.87 ± 31.69	a) 8.85 (-8.83 to 26.55); d= .38 b) -26.11 (-42.99 to -9.22)*; d= -.89 c) -34.96 (-52.52 to -17.41)**; d= -1.33
PPDT lumbar [a]	2.85 ± 2.19	2.05 ± 1.46	6.63 ± 3.85	a) .80(-.89 to 2.50); d= .42 b) -3.78(-5.48 to -2.08)**; d= -1.20 c) -4.58(-6.28 to -2.88)**; d= -1.57
PPDT shin [a]	2.96 ± 2.60	2.62 ± 1.66	7.60 ± 3.17	a) .34(-1.27 to 1.95); d= .15 b) -4.64(-6.25 to -3.03)**; d= -1.60 c) -4.98(-6.60 to -3.37)**; d= -1.96
ROMF [a]	31.42 ± 11.07	25.93 ± 15.29	39.41 ± 11.23	a) 5.48(-2.20 to 13.48); d= .41 b) -7.98(-15.98 to .007); d= -.71 c) -13.47(-21.47 to -5.48)**; d= -1.00

*SLE S: Standing Lumbar Extensor Strength; SLE MS: Mid-Seated Lumbar Extensor Strength; PPDT: Pressure Pain Detection Threshold; ROMF: Range of Motion in Flexion. *p<.05, **p<.001. [a] One-way analysis of variance ANOVA; [b] Student's t-test.*

Table 3. Descriptive statistics of multiple comparisons in psychological variables.

	Low level of disability (n=30)	High level of disability (n=30)	Asymptomatic group (n=30)	Difference of means (95% CI); Effect size (d) a) Low level of disability vs High level of disability b) Low level of disability vs Asymptomatic group c) High level of disability vs Asymptomatic group
Disability	4.73 ± 1.94	12.46 ± 3.76	.20 ± .61	a) -7.73 (-9.29 to -6.17)**; d= -2.58 b) 4.53 (2.97 to 6.09)**; d= 3.21 c) 12.26 (10.70 to 13.82)**; d= 4.55
Pain Catastrophism	18.20 ± 9.76	24.96 ± 11.24	10.46 ± 7.96	a) -6.76 (-12.91 to -.62)*; d= -.64 b) 7.73 (1.58 to 13.87)*; d= .89 c) 14.50 (8.35 to 20.64)**; d= 1.58
Fear of movement	25.73 ± 5.33	31.16 ± 6.00	21.46 ± 4.65	a) -5.43 (-8.81 to -2.05)*;d= -.95 b) 4.26 (.88 to 7.64)*; d= .85 c) 9.70 (6.32 to 13.07)**; d= 1.80
Self-efficacy	145.60 ± 27.45	117.70 ± 27.74	157.00 ± 17.02	a) 27.90 (12.40 to 43.39)**; d= 1.01 b) -11.40 (-26.89 to 4.09); d= -.55 c)- 39.30 (-54.79 to -23.80)**; d= -1.70
Anxiety	7.50 ± 3.67	9.16 ± 3.78	4.76 ± 2.82	a) -1.66 (-3.84 to .51); d= -.44 b) 2.73(.55 to 4.91)*; d= .83 c) 4.40(2.22 to 6.57)**; d= 1.31
Depression	5.80 ± 3.46	6.63 ± 3.27	1.73 ± 1.55	a) -.83(-2.65 to .99); d= -.24 b) 4.06(2.24 to 5.89)**; d= 1.51 c) 4.90(3.07 to 6.72)**; d= 1.91

**p<.05, **p<.001.*

Table 4. Correlation analysis examining the bivariate relationships between the psychological and sensorimotor variables.

		Pain Catastrophism	Fear of movement	Self-efficacy	Anxiety	Depression
Pain intensity	Low level of disability	.666**	.311	.064	.147	.029
	High level of disability	.296	.113	-.248	.233	.080
SLE-S	Low level of disability	-.131	-.127	.177	.202	-.131
	High level of disability	-.066	.181	.559**	.049	.214
SLE-MS	Low level of disability	-.107	-.099	.037	.348	-.085
	High level of disability	-.057	.188	.534**	.030	.287
PPDT LUMBAR	Low level of disability	-.137	.152	.315	-.142	-.377*
	High level of disability	-.294	.087	.153	-.093	-.017
PPDT SHIN	Low level of disability	-.050	.079	.318	.043	-.274
	High level of disability	-.142	-.090	.320	.046	-.191
ROMF	Low level of disability	-.035	.480**	.219	.059	.126
	High level of disability	-.052	-.045	.159	-.037	-.066

*SLE S: Standing Lumbar Extensor Strength; SLE MS: Mid-Seated Lumbar Extensor Strength; PPDT: Pressure Pain Detection Threshold; ROMF: Range of Motion in Flexion. *p<.05, **p<.001.*

Multiple intergroup comparisons of the sensorimotor variables

There were no statistically significant differences between the two symptomatic groups for any sensorimotor variable except for pain intensity, which was greater in the group with NCLBP with major lumbar disability (t=-2.81; P=.007; d= -.83). (Table 2).

Multiple intergroup comparisons of the psychological variables

For the psychological variables, our study results demonstrated statistically significant differences only between the symptomatic groups for the self-efficacy level (F=20.29; P<.001), pain catastrophism (F=16.61; P=.026) and fear of movement (F=24.68; P<.001), with the NCLBP group with major disability levels showing lower scores on self-efficacy and higher scores on catastrophizing and fear of movement (Table 3).

Correlation analysis

Table 4 shows the correlation analysis that examined the possible relationship between the psychological and sensorimotor variables, taking into account the disability. In the greater disability group, the moderate correlation was between the lumbopelvic strength and the self-efficacy level (r=.559, P<.001). For the group with less disability, there was a correlation between ROMF and the fear of movement (r=.480, P<.0001).

Discussion

The study's main objective was to investigate the influence of the degree of lumbar disability on sensorimotor variables in patients with NCLBP. Our study results indicate that the patients with NCLBP had significantly less lumbopelvic strength, significantly lower PPT and lower ROMF than the asymptomatic participants. Between the two symptomatic groups, however, there were differences only in pain intensity.

These findings are in line with those of previous research, such as the study by Imamura et al. that demonstrated that patients with NCLBP presented significantly lower PPTs than asymptomatic participants; however, the authors did not segment the sample according to disability[10]. Although we might think that disability should be related to somatosensory variables, the available evidence indicates that this relationship does not necessarily exist[60–62]. A meta-analysis showed that the strength of correlation between PPTs and pain intensity and disability was low in patients with CLBP and chronic neck pain; in fact, pain threshold measures explained approximately 2% of the variance in pain or disability[63]. In 2005, a study conducted in the same population, segmented on the basis of the Oswestry lumbar disability scale, showed that there were no differences in PPT between those patients with more disability and those with less disability[64]. A recent study showed that the clinical improvement of patients with NCLBP did not depend on the improvement of somatosensory variables but on the perceived disability and pain intensity, which would explain why there were no significant differences in our study in the PPTs between the symptomatic groups[65]. We hypothesise that perceived disability is a cognitive construct involving psychological and psychosocial variables and might explain why, regardless of the degree of disability, there were no significant differences for the somatosensory variables.

Another important finding in our study is the correlation established between strength and self-efficacy in the patients with high perceived disability. It is important to note that self-efficacy is defined as the ability for a participant to have to perform an action or behaviour in an optimal manner; therefore, the self-efficacy variable might be more clearly associated with motor variables[66]. In line with these results, other research studies on patients with NCLBP in which the sample was segmented based on other psychological variables have found significant differences in sensorimotor variables. La Touche et al. showed that patients with NCLBP who present a lower level of self-efficacy in turn show a moderate negative correlation between ROMF and lumbar strength on one hand and the degree of lumbar disability on the other[38]. By contrast, Nieto-García et al. found no significant differences between patients with NCLBP and asymptomatic participants for any functional variable such as those analysed in the present study. Those findings could be due to the fact that Nieto-García's study compared patients with NCLBP who presented with high levels of physical activity and a high perception of self-efficacy[67].

The patients' physical activity level might be of great importance, as previous studies have indicated; in fact, in a recent study, a therapeutic exercise intervention showed an improvement in disability and self-efficacy in addition to the expected improvement in motor variables in patients with CLBP[68]. Similarly, another study found strong correlations between disability and lumbar strength and self-efficacy[26]. In contrast, a recent study, demonstrated no correlation between low back disability and motor variables such as strength and ROM but found a correlation with pain intensity, considering that the sample of patients with NCLBP was not segmented according to the degree of disability[69]. Another research study observed a correlation between disability and pain intensity, but the authors also indicated no correlation between disability and functional variables[70]. Those previous results would also explain why our results did not show significant differences in motor variables based on the degree of disability.

It is important to consider that the differences in age and educational level might influence these results. Previous studies have found that age and educational level are risk factors for LBP[71–73]. In particular, age might correlate with perceived disability but not so directly with pain intensity, and age has been associated with a higher demand for health services for LBP[74,75]. Studies have related educational level to the available coping skills, which in turn might be indirectly related to the degree of self-efficacy[76–79]. It has been observed that in patients with chronic back pain, the presence of greater fear of movement is associated with lower educational levels and higher levels of disability, which might be in line with our results[80]. Likewise, a cohort study identified that patients with CLBP and a less favourable prognosis of recovery had associated high disability, high pain intensity and lower educational level[81].

Other authors have suggested that the segmentation of the sample by other psychological variables might lead to significant differences in sensorimotor variables. Sullivan et al. segmented the sample based on the level of catastrophizing, level of fear of movement and the degree of depression, thereby finding differences in the temporal summation of mechanical stimuli in the patients with NCLBP[37]. Christe et al. showed that higher levels of pain-related fear, catastrophizing and depression were significantly associated with reduced ROM[82].

Regarding the study's secondary objective, our results indicate that there were statistically significant differences between the patients with NCLBP for all the variables except for anxiety and depression. Accordingly, there were significant differences only between the symptomatic and asymptomatic groups. Studies such as those mentioned earlier (e.g., La Touche et al.) have shown that NCLBP and a lower degree of self-efficacy have a greater influence on psychological variables and a greater level of disability[38]. Similarly, the aforementioned study by Nieto-García et al. found significant differences between asymptomatic groups and patients with NCLBP in whom, in line with our results, the levels of catastrophism and fear of movement were significantly higher in the individuals with NCLBP[67]. Moreover, Bair et al. indicated that pain intensity had a considerable correlation with psychosocial factors, highlighting among them anxiety, depression and catastrophism[83], factors that can be determinants when the degree of disability is major or minor[84,85]. Another study obtained similar results, observing a significant relationship between disability and depressive symptoms and higher levels of fear when faced with pain[30].

We can therefore state that disability is a variable of considerable relevance for patients with NCLBP, so much so that recent studies have concluded that disability is a predictor of fear when faced with pain and the difficulty when performing motor activities[86]. The literature also supports the contention that disability has a considerable influence on self-efficacy beliefs[30], which can directly influence motor planning[66].

Lastly, we should point out that there is a lack of evidence regarding the analysis of sensorimotor and psychological variables addressing disability. We have found only one study similar to ours in which segmentation of the sample was performed; however, a different tool was used to classify the patients; in that case, the Oswestry lumbar disability questionnaire[64]. The segmentation performed in the present study was based on the median of the result of disability quantified with the Roland Morris questionnaire, a method that has been employed in previous studies and has demonstrated to be a valid tool. In our opinion, the Roland Morris questionnaire is an interesting and widely used tool[37,38].

Clinical implications

Based on our results, we believe that it is clinically relevant to analyse the degree of disability of patients with NCLBP, given that it might lead to a more exhaustive evaluation of psychological variables that could be involved in the pain experience and chronicity[34]. In addition to the importance of analysing and identifying these variables, it can also help physiotherapists propose new lines of treatment to affect these psychological variables, such as therapeutic education and the prescription of exercise and other strategies from a cognitive-behavioural perspective[87,88].

Limitations

This study presents important limitations that need to be considered. First, our results showed statistically significant differences in age between the groups which may have influenced the results. Scientific evidence indicates that it can be expected a positive correlation between perceived disability and age, and in young patients the disability is associated with greater pain intensity and less associated among elderly patients[74,75]. In our results the group with the highest degree of perceived disability had the lowest mean age (and greater intensity). Another limitation is the difference in educational levels between the groups, because the literature reflects a relationship between higher lumbar disability levels and lower educational levels[89]. Lastly, an important limitation is the lack of assessment of physical activity, given that it has been shown to be a determinant for the degree of lumbar disability[31].

It is also important to point out that in this study we have divided the sample based on disability but making the subdivision according to the median statistic, this could be a limitation taking into account that there are possibly more levels of low back disability that could influence differently on the sensorimotor and psychological variables.

Conclusion

In conclusion, the results of this study suggest statistically significant differences based on lumbar disability in patients with NCLBP in pain intensity but not for the rest of the sensorimotor variables. Moreover, we have shown that those patients with NCLBP and major levels of lumbar disability showed significantly lower levels of self-efficacy, increased pain catastrophism and increased fear of movement compared with the symptomatic group with minor levels of lumbar disability.

Ethics approval

The study followed the principles of the Declaration of Helsinki, and the Ethics Committee of University La Salle approved the study (CSEULS-PI-126/2016).

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