Neurology Asia 2025; 30(4) : 1143 – 1152

Cognitive dysfunction in patients over 60 with non-specific chronic low back pain: A cross-sectional study

[1]Ramazan Yılmaz, [1]Savaş Karpuz, [1]Fatma Sümeyye Suna, [2]Havva Arslan, [3]Emine Akdere, [1]Halim Yılmaz

[1]Department of Physical Medicine and Rehabilitation, Konya Beyhekim Training and Research Hospital, University of Health Sciences, Konya, Turkey; [2]Department of Psychology, Konya Beyhekim Training and Research Hospital, University of Health Sciences, Konya, Turkey; [3]Department of Physical Medicine and Rehabilitation, Doğanşehir Şehit Esra Köse Başaran State Hospital, Malatya, Turkey

Abstract

Background: Although few studies in recent years have indicated a relationship between chronic low back pain (CLBP) and cognitive impairment, clear evidence is lacking, emphasizing the need for further research in this area. This study aimed to investigate the frequency of cognitive dysfunction and associated factors in patients over 60 with non-specific CLBP. *Methods:* A total of 107 consecutive participants, including 57 patients with nonspecific CLBP and 50 healthy controls matched for age, sex, and education, were enrolled in this prospective, cross-sectional, controlled study. Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA) and the Standard Mini-Mental Test (SMMT). Pain and fatigue severity was measured using the Visual Analog Scale (VAS), while depression, pain catastrophizing, functional disability, and quality of life were evaluated using the Beck Depression Inventory (BDI), Pain Catastrophizing Scale (PCS), Roland Morris Disability Questionnaire (RMDQ), and the Short Form-36 (SF-36) respectively. *Results:* The CLBP group showed significantly lower cognitive performance than the control group ($p < 0.001$). Significant impairments were observed in visuospatial abilities, attention, and executive functions. Beck Depression Inventory, PCS, and RMDQ scores were significantly higher in the CLBP group ($p < 0.001$), while SF-36 scores and sleep quality were notably lower ($p < 0.001$ for all).
Conclusions: Chronic low back pain patients exhibit significant cognitive impairments, higher levels of depression, pain catastrophizing, and functional disability, along with a lower quality of life. These findings emphasize the importance of incorporating cognitive and psychological evaluations into the multidisciplinary management of CLBP. Clinicaltrials.gov identifier: NCT06278467

Keywords: Catastrophization, chronic pain, cognitive dysfunction, low back pain

INTRODUCTION

Chronic Low Back Pain (CLBP) is one of the most common musculoskeletal issues worldwide and is a significant health problem that adversely affects daily living activities, work productivity, and quality of life.[1] Chronic Low Back Pain is typically defined as back pain lasting for more than three months and, in over 90% of cases, is classified as "nonspecific" pain without a specific disease or structural issue. Its characteristics encompass biophysical, psychological, and social dimensions that impair personal financial status and overall health, and cause functional disability, which tends to increase with age.[2] Affecting 36.1% of individuals aged 60 years or older, the etiopathogenesis of non-specific CLBP has largely remained unclear.[3]

Cognitive dysfunction refers to a condition where an individual's cognitive functions are impaired or diminished. These functions include cognitive processes such as attention, memory, problem-solving, language use, information processing speed, and executive functions. Cognitive dysfunction can result from various

Address correspondence to: Ramazan Yılmaz, MD, Department of Physical Medicine and Rehabilitation, Konya Beyhekim Training and Research Hospital, University of Health Sciences, Konya, Turkey. Tel: +090 5556232674, E-mail: drramazanyilmaz@yahoo.com

Date of Submission: 19 January 2025; Date of Acceptance: 19 July 2025

https://doi.org/10.54029/2025thf

conditions, including neurological diseases (e.g., Alzheimer's disease, dementia), brain injuries, psychiatric disorders, chronic pain, and the side effects of certain medications. This condition often negatively impacts a person's daily living activities, work performance, and social interactions.[4-5]

Pain, especially chronic pain, is often accompanied by depression and sleep disturbances, and in this way, it can lead to cognitive dysfunction.[5-6] The persistent presence of CLBP can negatively impact cognitive processes by triggering stress responses in the brain and increasing neuroinflammation.[6] In these patients, memory impairments and reductions in attentional capacity have been observed, and it has been suggested that chronic pain gradually reduces cognitive capacity over time.[3,6] Chronic pain may impair cognition by occupying significant resources in the dorsolateral prefrontal cortex (DLPFC), limiting its ability to perform typical functions such as executive tasks and working memory.[7] Another theory suggests that reduced cortical inhibition prolongs DLPFC activation during pain processing, preventing the brain from shifting attention away from the pain, and thus hindering normal cognitive functioning.[7]

Although the association between chronic pain and cognitive dysfunction has been demonstrated in numerous studies, research specifically investigating this relationship in the context of CLBP remains limited and relatively recent. In these few studies, the inclusion criteria for CLBP, as well as the cognitive assessment tools used, vary considerably, and none of them have focused exclusively on patients with non-specific CLBP.[8]

Given that both cognitive dysfunction and non-specific CLBP are significant issues in human life, it is necessary to present new evidence regarding the relationship between these two major problems. The socio-cultural determinants of pain perception and cognitive functioning are increasingly recognized as influential factors, highlighting the importance of incorporating region-specific and cross-cultural studies into the literature to ensure a comprehensive understanding of cognitive dysfunction. In this context, selecting an appropriate, practical, and widely applicable cognitive assessment tool is essential to accurately evaluate impairment and capture culturally relevant aspects. The Montreal Cognitive Assessment (MoCA) is a brief cognitive screening tool developed to detect mild cognitive impairment, and it is known for its reliability, sensitivity, and ease of use in clinical practice.

To the best of our knowledge, no controlled study has investigated the prevalence of cognitive dysfunction in older adults with non-specific CLBP using the MoCA, a brief and practical screening tool. This study aimed to fill that gap by evaluating cognitive function in patients over 60 years of age with non-specific CLBP, while also examining pain intensity, fatigue, sleep quality, depressive symptoms, disability, and quality of life—factors known to influence cognition and relevant to clinical practice.

METHODS

Study design

The study was designed as a prospective, cross-sectional, controlled, and hospital-based study. The Ethics Committee of the University of Health Sciences, Hamidiye Scientific Research Ethics Committee, approved this study (date: 03.11.2021, approval number: 31/5). This research was conducted per the Declaration of Helsinki, and all participants provided written informed consent before their involvement. The study was registered on ClinicalTrials.gov (NCT06278467).

Participants

Patients over the age of 60 who have been diagnosed with non-specific CLBP for at least 6 months and who applied to the Physical Medicine and Rehabilitation outpatient clinic of a tertiary training and research hospital between March 2022 and February 2024 were assessed for the study. Chronic low back pain is defined as low back pain lasting more than three months due to degenerative spinal disorders. Although CLBP is defined as lasting 3 months, it can be stated that pain-free intervals are quite common in low back pain, and the specific duration definition of low back pain has long been a subject of debate.[9] In this context, a duration of 6 months was chosen to ensure that the patient group in our study is more homogeneous and reliable in terms of the study outcomes. Low back pain, as is well known, is considered to be the area between the lower rib margins and the buttock creases, which may be accompanied by pain in one or both legs.[2] Patients with nonspecific CLBP were included in the study based on detailed anamnesis, examination, and laboratory and imaging findings. Patients with red flag symptoms and signs (for example, inflammatory rheumatic diseases such as axial spondyloarthritis, malignancy, infections, severe spondylolisthesis, and vertebral fractures)

were excluded from the study. Similar to the patient group, the control group also satisfied the exclusion criteria concerning medical conditions and medications.

Inclusion criteria

Being over 60 years old; Having a history of non-spesific CLBP; Experiencing pain with a severity of at least 3 according to the Visual Analog Scale (VAS).

Exclusion criteria

Individuals with neurological deficits; Inflammatory back pain or rheumatic diseases such as fibromyalgia, polymyalgia rheumatica, ankylosing spondylitis, and rheumatoid arthritis; Those who have undergone lumbar surgery; Widespread pain or significant pain in another anatomical area (e.g., symptomatic gonarthrosis, shoulder/neck pain); Use of medications or substances (e.g., opioids, benzodiazepines, excessive alcohol) that could cause cognitive impairment; Cerebrovascular disease, multiple sclerosis, Parkinson's disease, dementia, or other neurological disorders; Participants with known psychiatric disorders or intellectual disabilities, based on anamnesis and medical records, or those who have started psychiatric treatment in the last three months; Significant hearing, vision, speech, or communication problems; Uncontrolled and/or major systemic diseases (e.g., cardiovascular, pulmonary, hepatic, renal, hematologic, endocrine) or malignancies.

Procedure

Detailed histories and physical examinations were conducted for all participants. Socio-demographic and clinical characteristics were recorded. A consecutive cohort of 57 patients diagnosed with non-specific CLBP, along with a control group matched for age and gender, were included in the study. The control group consisted of pain-free, healthy individuals with similar age and sociodemographic characteristics to the patient group. They were primarily selected from companions of patients visiting the hospital, particularly relatives and friends of those in the patient group. The flow diagram of the study is summarized in Figure 1.

All participants' pain and fatigue levels, functional disability status, sleep quality, and nightly sleep duration were assessed by the same physician. The presence of neuropathic pain was assessed clinically and based on the

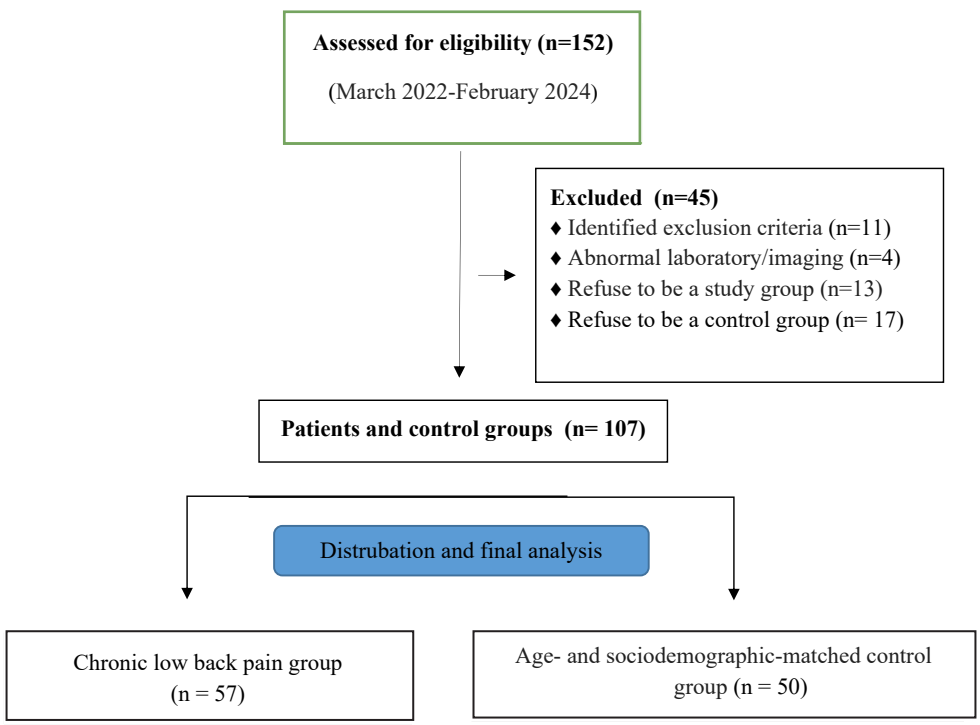

Figure 1. Flowchart of the enrollment process of the study cohort

Douleur Neuropathique 4 Questions (DN4).[10] Sleep quality was evaluated using a single 4-point (0 = very bad, 3 = very good) Likert-type question from item 6 of the Pittsburgh Sleep Quality Index.[11] Additionally, the average nightly sleep duration (in hours) over the past month was recorded.

The cognitive and psychosocial status of the participants was assessed by a blinded psychologist (HA), who was experienced in cognitive function and therapy and was unaware of the group assignments. Depressive mood was measured using the Beck Depression Inventory (BDI), pain catastrophizing was assessed with the Pain Catastrophizing Scale (PCS), quality of life was evaluated using the Short Form-36 (SF-36), and cognitive status was determined through the Standard Mini-Mental Test (SMMT) and the MoCA.

Evaluation parameters

Visual Analog Scale (VAS): Pain and fatigue levels were assessed using the VAS. A straight line 10 cm in length, divided into 10 intervals of 10 mm width, was used. The scale ranged from 0 (indicating no pain or fatigue) to 10 (indicating the most severe pain or fatigue), and patients were asked to mark the value that best represented their status over the past month.

Beck Depression Inventory (BDI): The BDI was developed by Beck in 1961 and validated in our country by Hisli (1988), consists of 21 items related to depressive symptoms such as pessimism, feelings of failure, lack of satisfaction, feelings of guilt, restlessness, fatigue, loss of appetite, indecisiveness, sleep disturbance, social withdrawal, etc. Each item includes a four-point self-assessment statement (0-3) determining a behavior specific to depression. The maximum total score is 63, and a score above 17 indicates an increased risk of depression.[12]

Pain Catastrophizing Scale (PCS): The PCS was developed by Sullivan and colleagues in 1995 to assess the catastrophic thinking associated with pain.[13] The Turkish version's reliability and validity were established by Süren and colleagues.[14] The scale has three subscales (rumination, magnification, and helplessness) and consists of 13 items. Each item is scored between 0 and 4, with a total score ranging from 0 to 52. Higher scores indicate a worse condition.

Roland Morris Disability Questionnaire (RMDQ): The RMDQ was developed to assess functional limitations and disability due to pain.[15] The Turkish version's reliability and validity study was conducted by Küçükdeveci and colleagues.[16] The questionnaire consists of 24 items, each scored as yes/no (0-1), with a total score ranging from 0 to 24. A score of 0 indicates no functional disability, while a score of 24 indicates maximum disability.

SF-36 Quality of Life Scale: The SF-36 Quality of Life Scale is the most widely used general quality of life scale in clinical research. The scale consists of 36 items that measure eight different dimensions: physical functioning, social functioning, role limitations due to physical problems, bodily pain, mental health, role limitations due to emotional problems, vitality, and general health perception. The subscales evaluate health on a scale from 0 to 100, with higher scores indicating better health. The reliability and validity study of the Turkish version was conducted by Koçyiğit and colleagues.[17]

Standard Mini-Mental Test (SMMT): Developed by Folstein and colleagues in 1975, the SMMT is a screening test for assessing cognitive functions and has been validated for the Turkish population.[18,19] The test is easily applicable in daily medical practice and is suitable for cognitive screening in the elderly. Cognitive status is assessed under five main headings: orientation (10 points), attention and calculation (5 points), registration memory (3 points), language (9 points), and recall (3 points). The total score is 30, and scores of 23 and below should be evaluated for dementia.

Montreal Cognitive Assessment (MoCA): The MoCA test evaluates cognitive features such as attention and concentration, executive functions, memory, language, visuospatial abilities, abstract thinking, calculation, and orientation. Developed by Nasreddine and colleagues, the test is recommended for use in the early stages of cognitive impairment.[20] Compared to the SMMT, the MoCA test, which requires more tasks to be performed, provides a more reliable assessment of mild cognitive impairment (MCI). The validation and reliability study was conducted to adapt the MoCA as a clinical screening tool for MCI in the Turkish population. In this test with a maximum score of 30, a cut-off value of 21 or lower was determined to indicate the threshold for MCI specific to the Turkish population.[21]

Statistical analysis

Power analysis was performed using G Power 3.1.9.7 software. A literature review was conducted to determine the sample size for the study. Based on the primary outcome of the study (MoCA score), for a t-test comparing two independent groups, with effect sizes ranging from 0.692 to 1.702, an alpha level of 5%, and a power of 90%, it was calculated that at least 47 patients per group would be required for an effect size of 0.692.[22-23]

SPSS® 26 (IBM Inc, USA) software was used for statistical analysis. Descriptive statistics of the categorical data in the study were presented using frequency and percentage values, while numerical data were shown using mean ± standard deviation (SD) or median (interquartile range [IQR]) values, depending on whether the data were normally distributed. The normality of the quantitative variables was assessed using histogram graphics, coefficient of variation, skewness and kurtosis values, normal Q-Q plot and detrended normal Q-Q plot graphics, and the Shapiro-Wilk Test. For the analysis between groups, the independent samples t-test was used for parametric data, and the Mann-Whitney U test was used for non-parametric data. The chi-squared test was employed to compare categorical data. Correlation analysis was performed using Pearson correlation analysis for normally distributed data and Spearman correlation analysis with Bonferroni correction for non-normally distributed data.

RESULTS

A total of 107 participants were included in the study, consisting of 42 women and 65 men, with a mean age of 68.5 ± 4.8 years (median: 68, IQR: 65-72). No significant differences were found between the groups in terms of age, gender, education level, BMI, smoking, alcohol use, marital status, employment status, or the presence of chronic diseases (Table 1). The average duration of low back pain among patients with CLBP included in the study was calculated as 8.1 ± 7.1 years (median: 5.0, IQR: 2.5- 15.0). The presence of neuropathic pain in these patients was assessed using the DN4 questionnaire and clinical features, and it was found that 47.4% of the patients had symptoms of neuropathic pain.

Table 1: Demographic characteristics of the participants

	Chronic Low Back Pain (n=57)	Control (n=50)	p
Age (y ± SD)	69.05 ± 5.5	68.50 ± 3.8	0.552[a]
Gender, Female, n (%)	42 (%73.7)	34 (%68.0)	0.531[b]
BMI (means ± SD)	30.32 ± 5.45	28.38 ± 5.26	0.064[a]
Education Level (n %)			
Noneducated	11 (%19.3)	9 (%18.0)	
Primary School (<8 y)	36 (%63.2)	24 (%48.0)	0.262[b]
High School (9-12 y)	5 (%8.8)	9 (%18.0)	
Collage (>13 y)	5 (%8.8)	8 (%16.0)	
Smoking Status			
Current Smoker	2 (%3.5)	0 (%0)	0.380[b]
Former Smoker	8 (%14.0)	6 (%12.0)	
Never Smoker	47 (%82.5)	44 (%88.0)	
Alcohol use			
Yes	5 (%8.8)	5 (%10.0)	1.000[c]
No	52 (%91.2)	45 (%90.0)	
Marital Status, n (%) married	47 (%87.5)	44 (%88.0)	0.314[b]
Employment Status, not working, n (%)	54 (%94.7)	47 (%94.0)	1.000[c]
Chronic Disease* (n %)			
Yes	46 (%80.7)	15 (%70.0)	0.198[b]
No	11 (%19.3)	35 (%30.0)	

BMI, body mass index; SD, standard deviation; y, years; [a] Mann-Whitney U test; [b] Pearson Chi-square test; [c] Fisher's Exact test *Including hypertension, diabetes, asthma, goiter, dermatitis, benign cardiac arrhythmia (no difference between groups)

In the comparison between groups, sleep quality was found to be significantly lower in the CLBP group compared to the control group (p <0.001), and no statistically significant difference was found in sleep duration (p = 0.301) (Table 2). The Beck Depression Inventory scores and RMDQ results were both significantly higher in the CLBP group (p <0.001), indicating that this group experienced greater functional limitations and depressive symptoms (p<0.001). Among the PCS subgroups, helplessness, magnification, and rumination scores were also found to be significantly higher in the CLBP group (p <0.001 for all) (Table 2).

Scores for physical functioning (p <0.001), physical role limitations (p <0.001), emotional role limitations (p = 0.003), social functioning (p = 0.011), and pain (p <0.001) assessed by the SF-36 scale were significantly lower in the CLBP group compared to the control group (Table 2).

In the CLBP group, 42 participants (74%) were found to have minimal cognitive impairment, while in the control group, it was detected in 15 participants (26%) (Table 2). The total MoCA scores were significantly lower in the CLBP group compared to the control group (p <0.001).

Table 2: Comparison between groups

	Chronic Low Back Pain (n=57)	**Control (n=50)**	Z	p
VAS-Pain	7.26 ± 1.60	0.24 ± 0.71	-9.246	<0.001
VAS-Fatigue	4.91 ± 3.41	1.00 ± 2.21	-6.082	<0.001
Sleep Quality	1.58 ± 1.27	2.70 ± 1.64	-3.866	<0.001
Sleep Duration	6.95 ± 2.77	5.90 ± 2.70	-1.035	0.301
BDI	11.65 ± 7.36	6.50 ± 6.16	-3.984	<0.001
RMDQ	16.51 ± 5.95	2.02 ± 4.84	-8.145	<0.001
PCS				
Helplessness	6.31 ± 8.07	1.44 ± 3.33	-3.924	<0.001
Magnification	3.30 ± 3.85	0.66 ± 1.90	-4.954	<0.001
Rumination	3.84 ± 5.41	0.60 ± 1.85	-4.304	<0.001
Total	13.4 ± 16.6	2.70 ± 6.90	-4.774	<0.001
SF-36				
Physical functioning	41.22 ± 23.72	82.90 ± 19.87	-7.124	<0.001
Role limitations physical	19.3 ± 36.61	74.51 ± 41.18	-5.795	<0.001
Role limitations emotional	56.20 ± 48.37	82.31 ± 37.94	-3.018	0.003
Energy/Vitality	58.20 ± 28.38	65.90 ± 23.68	-1.249	0.212
Mental health	69.05 ± 19.42	70.26 ± 15.75	-0.006	0.995
Social functioning	78.72 ± 21.77	88.31 ± 18.15	-2.539	0.011
Pain	30.70 ± 24.26	82.75 ± 20.39	-7.742	<0.001
General health perceptions	51.57 ± 18.52	63.88 ± 19.18	-3.393	0.001
SMMT	23.49 ± 4.37	25.74 ± 2.90	-2.561	0.010
MCI (n %)	42 (%74)	15 (%26)		<0.001*
MoCA				
Visuospatial and executive functions	2.64 ± 1.65	3.10 ± 1.50	-3.314	0.001
Naming	1.85 ± 0.83	2.50 ± 0.76	-4.254	<0.001
Attention	3.21 ± 2.01	4.22 ± 2.01	-2.754	0.006
Language	0.75 ± 1.00	1.60 ± 1.10	-3.966	<0.001
Abstraction	1.03 ± 0.86	1.42 ± 0.78	-2.352	0.019
Memory	1.57 ± 1.40	2.22 ± 1.76	-1.808	0.071
Orientation	5.10 ± 1.17	5.56 ± 0.92	-2.779	0.005
Total	16.19 ± 6.43	21.24 ± 6.80	-3.948	<0.001

Z: Z-score from Mann-Whitney U test, * Pearson's chi-squared test, VAS: Visual Analog Scale, BDI: Beck Depression Inventory, RMDQ: Roland-Morris Disability Questionnaire, PCS: Pain Catastrophizing Scale, SF-36: Short Form (36) Health Survey, SMMT: Standardized Mini-Mental Test, MoCA: Montreal Cognitive Assessment, MCI: mild cognitive impairment

Significant differences were particularly observed in the subdomains of visuospatial and executive functions (p = 0.001), naming (p <0.001), attention (p = 0.006), language (p <0.001), abstraction (p = 0.019), and orientation (p = 0.005) (Table 2). No significant correlation was found between VAS pain and fatigue scores and SMMT and MoCA scores. On the other hand, a strong positive correlation was observed between SMMT and MoCA scores (Rho = 0.771, p <0.001). Finally, a moderate positive correlation was noted between BDI and VAS fatigue (Rho = 0.457, p = 0.000), between BDI and RMDQ (Rho = 0.554, p = 0.000), and between BDI and PCS (Rho = 0.513, p = 0.000) (Table 3).

DISCUSSION

The present study demonstrates that patients over 60 years of age with non-specific CLBP exhibit lower cognitive performance compared to pain-free individuals of similar age and educational background. Furthermore, these patients show a higher prevalence of depression, greater levels of pain catastrophizing, and functional disability scores, while their quality of life is significantly lower. Our study is distinctive in its selective focus on non-specific CLBP patients and utilization of the MoCA, a practical and user-friendly tool shown to be more sensitive than other cognitive tests in detecting early and mild cognitive impairment. Furthermore, this research was conducted in a multidisciplinary setting within a tertiary-level physical medicine and rehabilitation outpatient clinic, enhancing its clinical relevance and applicability.

The term 'pain catastrophizing' refers to a psychological concept that describes an individual's tendency to magnify pain, exaggerate its effects, and feel helpless in the face of pain. This can lead to a more intense perception

Table 3: Correlation of pain level, mood, disability, and cognitive test results

		VAS Pain	VAS Fatigue	BDI	RMDQ	MoCA Total	SMMT	PCSTOTAL
VAS Pain	Spearman's rho	—						
	df	—						
	p-value	—						
VAS	Spearman's rho	0.401**	—					
Fatigue	df	55	—					
	p-value	0.002	—					
BDI	Spearman's rho	0.094	0.457***	—				
	df	55	55	—				
	p-value	0.488	<.001	—				
RMDQ	Spearman's rho	0.143	0.447***	0.554***	—			
	df	55	55	55	—			
	p-value	0.288	<.001	<.001	—			
MoCA	Spearman's rho	-0.091	-0.164	-0.213	-0.216	—		
Total	df	55	55	55	55	—		
	p-value	0.502	0.223	0.112	0.106	—		
SMMT	Spearman's rho	-0.071	-0.044	-0.042	-0.238	0.771***	—	
	df	55	55	55	55	55	—	
	p-value	0.598	0.744	0.755	0.074	<.001	—	
PCSTOTAL	Spearman's rho	0.188	0.211	0.513***	0.284*	-0.011	0.102	—
	df	55	55	55	55	55	55	—
	p-value	0.162	0.115	<.001	0.032	0.933	0.452	—

Note. * p < .05, ** p < .01, *** p < .001 VAS: Visual analogue scale, SMMT: Standard Mini Mental Test, MoCA: Montreal Cognitive Assessment Scale, BDI: Beck Depression Inventory, RMDQ: Roland Morris Disability Questionnaire, PCS: Pain Catastrophizing Scale

of the pain experience and higher levels of emotional distress.[13-14] There is some evidence that catastrophizing, as a cognitive response or an ongoing coping strategy, may lead to delayed recovery. In our study, pain catastrophizing was found to be high in patients with CLBP, in line with previous literature.[25-26] Considering its potential impact on pain perception and disability, it remains an important factor to address during the follow-up of patients with CLBP. It is well known that the presence of depressive symptoms in CLBP is associated with negative effects on treatment, leading to high disability levels.[27] Our study found a correlation between the high BDI scores observed in CLBP patients and pain intensity and disability severity; however, no significant correlation was found with MoCA scores. This result may be explained by the limited capacity of the BDI to assess psychiatric conditions and the complex nature of the relationship between depression and cognitive functions.[28] Indeed, brain atrophy observed in patients with CLBP has been shown to follow a pattern distinct from that seen in individuals with depression.[29] This suggests that chronic pain may exert effects on the central nervous system independently of psychosocial disturbances.

The present study reveals that sleep quality in patients with CLBP is significantly lower compared to the control group. It is well known in the literature that chronic pain disrupts sleep patterns, which in turn have negative effects on cognitive performance.[30-31] This decline in sleep quality is thought to further reduce individuals' quality of life by limiting their participation in daily activities. However, the absence of a significant difference in sleep duration in our study suggests that sleep quality, rather than sleep duration, is a more determining factor[11], indicating that the impaired sleep quality of patients with low back pain may have contributed to increased sleep duration.

The association between decreased quality of life and mental distress in CLBP has been highlighted in previous studies.[32] Significant impairments in cognitive functions, particularly in visuospatial abilities, attention, language, and abstract thinking, were identified in individuals with CLBP in this research. Both the SMMT and MoCA were used to assess cognitive functions. While MoCA is recognized as a more sensitive screening tool for detecting mild cognitive impairment, the SMMT is a shorter test commonly used to evaluate overall cognitive performance. MoCA has demonstrated superior sensitivity and specificity in identifying mild cognitive impairments in individuals over 60 years of age, making it particularly valuable for detecting early or subtle cognitive changes associated with chronic low back pain.[33] By capturing different dimensions of cognitive functioning, the combined use of these two tools enabled a more comprehensive and robust evaluation of cognitive health in the study population. This approach aligns with current literature emphasizing the importance of sensitive screening methods in older adults.

A population-based study by Weiner *et al*. found that CLBP patients performed significantly worse on executive function and memory tasks compared to healthy controls.[29] A systematic review by Moriarty *et al*. identified significant impairments in attention and executive functions among individuals with chronic pain.[34] Similarly, Abd-Elsayed and Gyorfi emphasized that CLBP can lead to a decline in problem-solving abilities, slower information processing speed, and memory impairments.[35] Moreover, a recent systematic review and meta-analysis demonstrated significant impairments in cognitive domains such as problem-solving, information processing speed, and delayed memory in individuals with CLBP. In their analysis, they reviewed a total of 11 studies, of which only four were included in the meta-analyses.[36] These findings highlight the detrimental effects of CLBP on cognitive functions and underscore the importance of incorporating cognitive interventions into the management process for these patients.

A recent study by Corti *et al*. in 2021 found mild cognitive impairment in 16% of 31 patients with CLBP and emphasized the CLBP-cognitive dysfunction relationship.[37] In that study, which reported a much lower rate of MCI compared to ours, cognition was not associated with depression, anxiety, stress, or fatigue. Unlike that study, our research included only patients with non-specific CLBP, and the mean age in our sample was approximately 12 years higher. Taken together, these findings suggest that the factors influencing cognitive function are highly complex and multifactorial.[29] It is evident that region-specific factors may influence both pain perception and cognitive test performance. In this context, a cross-sectional, uncontrolled study conducted in Türkiye reported a mean MoCA score of approximately 23 among 115 CLBP patients with a mean age of 48.4 ± 11.8 years.[38] Considering that the patient population in our study was approximately 20 years older, and that

the MoCA is a cognitive screening tool known to be more sensitive in individuals over the age of 60[39], direct comparison of the findings between the two studies may not be entirely rational.

Evaluating the limitations and strengths of our study will facilitate a clearer understanding of its findings. This study has several limitations. First, comprehensive computer-based neuropsychological batteries, which might prevent instruction bias or inconsistencies arising from human factors, were not used in the assessment of cognitive functions. Second, the fact that the study was conducted in a single center may limit the generalizability of the results. Despite these limitations, we believe that this study represents an important contribution to addressing the ambiguity in the literature, as it is the first to investigate the frequency of cognitive dysfunction and related factors in CLBP among individuals over the age of 60. It utilizes MoCA as a valuable and practical measurement tool for early cognitive impairment, taking into account culture-specific cutoff values.

In conclusion, CLBP significantly impairs cognitive functions in patients over 60 years of age, particularly in visuospatial abilities, attention, language, and abstract thinking. Additionally, these patients experience higher levels of depression, pain catastrophizing, and functional disability, which contribute to a reduced quality of life. In conclusion, the present study supports and expands upon previous findings that CLBP is linked to cognitive impairment. This underscores the necessity for a more multidisciplinary and interdisciplinary approach to CLBP, particularly emphasizing the enhancement of pain management strategies. Addressing cognitive and psychological factors alongside physical symptoms may improve overall patient outcomes and quality of life. Effectively treating back pain with a proactive approach can prevent its chronicity and potentially improve cognitive function in older adults. Future studies should explore the long-term effects of cognitive interventions in this population to further understand their potential benefits in treatment strategies.

DISCLOSURE

Financial support: None

Conflict of interest: None

REFERENCES

1. Zhou T, Salman D, McGregor AH. Recent clinical practice guidelines for the management of low back pain: a global comparison. *BMC musculoskelet Disord* 2024;25:344. https://doi.org/10.1186/s12891-024-07468-0
2. Foster NE, Anema JR, Cherkin D, *et al*. Prevention and treatment of low back pain: evidence, challenges, and promising directions. *Lancet* 2018;391: 2368-83. https://doi.org/10.1016/S0140-6736(18)30489-
3. Bartley EJ, Makhoul M, Palit S, Robinson ME, Fillingim RB. Examining physical and cognitive function in chronic low back pain through the use of a multisystem resilience framework. *Pain Med* 2023;24: 547-55. https://doi.org/10.1093/pm/pnac156
4. Dhakal A, Bobrin BD. Cognitive deficits. In: StatPearls [Internet]. Treasure Island (FL):2024; StatPearls Publishing; Available from: https://www.ncbi.nlm.nih.gov/books/NBK559052/ Accessed 29 September 2024
5. Higgins DM, Martin AM, Baker DG, Vasterling JJ, Risbrough V. The relationship between chronic pain and neurocognitive function: A systematic review. *The Clin J Pain* 2018;34:262-75. https://doi.org/10.1097/AJP.0000000000000536
6. Roth RS, Geisser ME, Theisen-Goodvich M, Dixon PJ. Cognitive complaints are associated with depression, fatigue, female sex, and pain catastrophizing in patients with chronic pain. *Arch Phys Med Rehabil* 2005;86:1147-54. https://doi.org/10.1016/j.apmr.2004.10.041
7. Berryman C, Staton TR, Bowering KJ, Tabor A, McFarlane A, Moseley GL. Evidence for working memory deficits in chronic pain: A systematic review and meta-analysis. *Pain* 2013;154: 1181-96. https://doi.org/10.1016/j. pain.2013.0.002
8. Zhou Z, Hui ES, Kranz GS, *et al*. Potential mechanisms underlying the accelerated cognitive decline in people with chronic low back pain: A scoping review. *Ageing Res Rev* 2022;82:101767. https://doi.org/10.1016/j.arr.2022.101767
9. Herman PM, Qureshi N, Arick SD, *et al*. Definitions of chronic low back pain from a scoping review, and analyses of narratives and self-reported health of adults with low back pain. *J Pain* 2023;24:403-12. https://doi:10.1016/j.jpain.2022.10.012
10. Unal-Cevik I, Sarioglu-Ay S, Evcik D. A comparison of the DN4 and LANSS questionnaires in the assessment of neuropathic pain: validity and reliability of the Turkish version of DN4. *J Pain* 2010;11:1129-35. https://doi.org/10.1016/j.jpain.2010.02.003
11. Dereli M, Kahraman T. Validity and reliability of the Turkish version of single-item Sleep Quality Scale in healthy adults. *Sleep Med* 2021;88: 197-203. https://doi.org/10.1016/j.sleep.2021.10.032
12. Hisli N. Beck Depresyon Envanterinin gecerliligi uzerine bir calisma (A study on the validity of Beck Depression Inventory.). *Psikoloji Dergisi* 1999;6:118-22.
13. Sullivan MJ, Bishop SR, Pivik J. The pain catastrophizing scale: development and validation. *Psychological Assessment* 1995;7:524. https://doi.org/10.1037/1040-3590.7.4.524
14. Ugurlu M, Karakas Ugurlu G, Erten S, Caykoylu A. Validity of Turkish form of Pain Catastrophizing Scale and modeling of the relationship between pain-related disability with pain intensity, cognitive, and

emotional factors. *Psychiatry Clin Psychopharmacol* 2017;27:189-96. https://doi.org/10.1080/24750573.2017.1322672
15. Roland M, Morris R. A study of the natural history of back pain: part I: development of a reliable and sensitive measure of disability in low-back pain. *Spine* 1983;8:141-144. https://doi.org/10.1097/00007632-198303000-00004
16. Küçükdeveci AA, Tennant A, Elhan AH, Niyazoglu H. Validation of the Turkish version of the Roland-Morris Disability Questionnaire for use in low back pain. *Spine* 2001;26: 2738-43. https://doi.org/10.1097/00007632-200112150-00024
17. Kocyigit H. Kisa Form-36 (KF-36)'nm Turkce versiyonunun guvenilirligi ve gecerliligi. *Ilaç ve tedavi dergisi* 1999;12: 102-6.
18. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state": a practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res* 1975;12:189-98. https://doi.org/10.1016/0022-3956(75)90026-6
19. Güngen C, Ertan T, Eker E, Yaşar R, Engin F. Reliability and validity of the standardized Mini Mental State Examination in the diagnosis of mild dementia in Turkish population. *Turk Psikiyatri Derg* 2002;13:273-81
20. Nasreddine ZS, Phillips NA, Bedirian V, *et al*. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. *J Am Geriatr Soc* 2005;53:695-9. https://doi.org/10.1111/j.1532-5415.2005.53221.x
21. Selekler K, Cangöz B, Uluç S. Power of discrimination of Montreal Cognitive Assessment (MOCA) Scale in Turkish patients with mild cognitive impairment and Alzheimer's disease. *Turk J Geriatrics* 2010 ;13: 166-171
22. Karpuz S, Yilmaz R, Akdere E, Küçük A, Cop H, Yilmaz H. Frequency of cognitive dysfunction in individuals with cervicogenic headache. *Neurol Asia* 2023;28:329-36. https://doi.org/10.54029/2023rzc
23. Ferreira Kdos S, Oliver GZ, Thomaz DC, Teixeira CT, Foss MP. Cognitive deficits in chronic pain patients, in a brief screening test, are independent of comorbidities and medication use. *Arq Neuropsiquiatr* 2016;74:361-6. https://doi.org/10.1590/0004-282X20160071
24. Wertli MM, Eugster R, Held U, Steurer J, Kofmehl R, Weiser S. Catastrophizing—a prognostic factor for outcome in patients with low back pain: a systematic review. *Spine J* 2014;14:2639-57. https://doi.org/10.1016/j.spinee.2014.03.003
25. Simon CB, Lentz TA, Bishop MD, Riley JL 3rd, Fillingim RB, George SZ. Comparative associations of working memory and pain catastrophizing with chronic low back pain intensity. *Phys Ther* 2016;96:1049-56. https://doi.org/10.2522/ptj.20150335
26. Bakhshi Feleh F, Mofateh R, Orakifar N, Lohrasbi S. Comparison of cognitive functions between individuals with chronic low back pain with high and low pain catastrophizing and pain-free controls: A cross-sectional study. *Clin J Pain* 2024;40(11):646-54. https://doi: 10.1097/AJP.0000000000001244.
27. Wong JJ, Tricco AC, Côté P, *et al*. Association between depressive symptoms or depression and health outcomes for low back pain: A systematic review and meta-analysis. *J Gen Intern Med* 2022;37: 1233-46. https://doi.org/10.1007/s11606-021-07079-8
28. Chang MC. Mild cognitive impairment and major depressive disorder as confounders in the study on association between chronic low back pain and brain atrophy. *Pain* 2023;164:e237. https://doi.org/10.1097/j.pain.0000000000000285
29. Weiner DK, Rudy TE, Morrow L, Slaboda J, Lieber S. The relationship between pain, neuropsychological performance, and physical function in community-dwelling older adults with chronic low back pain. *Pain Med* 2006;7:60-70. https://doi.org/10.1111/j.1526-4637.2006.00091.x
30. Sayar K, Arikan M, Yontem T. Sleep quality in chronic pain patients. *Can J Psychiatry* 2002;47:844-8. https://doi.org/10.1177/070674370204700905
31. Kelly GA, Blake C, Power CK, O'keeffe D, Fullen BM. The association between chronic low back pain and sleep: a systematic review. *J Clin Med* 2011;27:169-81. https://doi.org/10.1097/AJP.0b013e3181f3bdd5
32. Hnatešen D, Pavić R, Radoš I, *et al*. Quality of life and mental distress in patients with chronic low back pain: A cross-sectional study. *Int J Environ Res Public Health* 2022;19: 10657. https://doi.org/10.3390/ijerph191710657
33. Ciesielska N, Sokołowski R, Mazur E, Podhorecka M, Polak-Szabela A, Kędziora-Kornatowska K. Is the Montreal Cognitive Assessment (MoCA) test better suited than the Mini-Mental State Examination (MMSE) in mild cognitive impairment (MCI) detection among people aged over 60? Meta-analysis. *Psychiatria Polska* 2016;50:1039-52. https://doi.org/10.12740/PP/45368
34. Moriarty O, McGuire BE, Finn D. The effect of pain on cognitive function: a review of clinical and preclinical research. *Prog Neurobiol* 2011;93: 385-404. https://doi.org/10.1016/j.pneurobio.2011.01.00
35. Abd-Elsayed A, Gyorfi M. Chronic low back pain and cognitive function. *Pain Pract* 2023;23: 463-4. https://doi.org/10.1111/papr.13202
36. Pereira Nery ECH, Rocha NP, Cruz VT, Silva AG. Systematic review and meta-analysis on the association between chronic low back pain and cognitive function. *Pain Pract* 2023;23: 399-408. https://doi.org/10.1111/papr.13194
37. Corti EJ, Gasson N, Loftus AM. Cognitive profile and mild cognitive impairment in people with chronic lower back pain. *Brain Cogn* 2021;151: 105737. https://doi.org/10.1016/j.bandc.2021.105737
38. Oz M, Demirel A, Ozel Asliyuce Y, Ulger O. Education level is a strong determinant of cognitive function as measured by MoCA in people with chronic low back pain. *Musculoskelet Sci Pract* 2022;58:102503. https://doi: 10.1016/j.msksp.2022.102503.
39. Cardoso J, Apagueno B, Lysne P, *et al*. Pain and the Montreal Cognitive Assessment (MoCA) in aging. *Pain Med* 2021;22(8):1776-83. https://doi: 10.1093/pm/pnab003.