

Original Article

The role of distress tolerance, social support, and cognitive flexibility in predicting pain catastrophizing in patients with chronic low back pain

Farzin Bagheri Sheykhangafshe¹, Hojjatollah Farahani^{2*}, Fereshteh Rezazadeh Khalkhali³ & Vahid Savabi Niri⁴

1. Ph.D. Student, Department of Psychology, Faculty of Humanities, Tarbiat Modares University, Tehran, Iran.

2. Assistant Professor of Psychology, Faculty of Humanities, Tarbiat Modares University, Tehran, Iran.

3. M.A in Clinical Psychology, Faculty of Educational Sciences and Psychology, Alzahra University, Tehran, Iran.

4. M.A in Clinical Psychology, Islamic Azad University of Ardabil Branch, Ardabil, Iran.

Abstract

The present study aimed to investigate the roles of distress tolerance, social support, and cognitive flexibility in predicting pain catastrophizing in patients with chronic low back pain (CLBP). The research design was descriptive and correlational. The study's population included all patients with CLBP in the 7th district in Tehran in 2022. The sample included 180 patients selected through the availability sampling. The participants completed questionnaires on distress tolerance, social support, cognitive flexibility, and pain catastrophizing. Data analysis was conducted using the Pearson correlation and multiple regression analysis with SPSS 24 software. The results of this research indicated that distress tolerance, social support, and cognitive flexibility had a significant negative correlation with pain catastrophizing ($p < 0.05$). The correlation coefficient of predictor variables with pain catastrophizing in patients with CLBP was 0.68. These variables could significantly predict 61% of the changes in pain catastrophizing in patients suffering from CLBP. In general, the obtained results demonstrate the relationship and the possibility of predicting pain catastrophizing through distress tolerance, social support, and cognitive flexibility in patients with CLBP. According to the findings of the research, increasing distress tolerance, social support, and cognitive flexibility can help control the extent of pain catastrophizing in CLBP patients.

Keywords

Distress tolerance
Social support
Cognitive flexibility
Pain catastrophizing
Chronic low back pain

Received: 2023/04/23

Accepted: 2023/10/07

Available Online: 2023/12/18

Introduction

Chronic low back pain (CLBP) is a common and persistent condition characterized by pain in the lower back region that lasts for 12 weeks or more (Tagliaferri et al., 2020). It is a leading cause of disability and has a significant impact on an individual's quality of life, as well as social and economic costs (Buruck, et al., 2019). The causes of CLBP can vary and may include factors such as age-related degeneration of the spine, injury, herniated discs, spinal stenosis, or conditions such as fibromyalgia or arthritis (Alshelh et al., 2022). However, in many cases, the exact cause of CLBP is unknown (Meints et al., 2019). The symptoms of CLBP can range from mild to severe and may include a dull or aching pain in the lower back, sharp or shooting pain that radiates down the legs (sciatica), stiffness, and reduced range of

motion (Roseen et al., 2023). In some cases, CLBP can also cause psychological distress, such as anxiety, depression, or sleep disturbances (Nury et al., 2022). One psychological process that has been observed in patients with CLBP is pain catastrophizing (Varallo et al., 2019). Pain catastrophizing refers to the tendency to magnify the perceived threat of pain and feel helpless in coping with it. This negative cognitive and emotional response to pain can exacerbate symptoms and increase disability (Manning et al., 2022). Pain catastrophizing is a common experience in patients with CLBP, with estimates suggesting that up to 40% of individuals with CLBP report pain-catastrophizing symptoms (Monticone et al., 2021). Pain catastrophizing can involve a range of negative thoughts, such as fearing that pain will never go away, worrying about the consequences of pain, and feeling helpless in managing pain (Semeru & Halim, 2019). Pain catastrophizing is associated with a range of

negative outcomes in patients with CLBP (Schütze et al., 2018). For example, individuals who catastrophize about their pain may reduce distress tolerance (Rogers et al., 2018), social support (Wilson et al., 2022), and cognitive flexibility (Cowen et al., 2018).

CLBP can lead to significant emotional distress, frustration, and even depression. Patients with higher distress tolerance may be better equipped to manage their pain without becoming overwhelmed by negative emotions (Russell et al., 2019). They are more likely to use healthy coping mechanisms, such as relaxation techniques, mindfulness, and adaptive pain management strategies, rather than turning to unhealthy behaviors like excessive medication use or avoiding physical activity altogether (Bakhshaei et al., 2023). Distress tolerance refers to an individual's ability to tolerate negative emotions or distressing situations without becoming overwhelmed or engaging in maladaptive behaviors (Zegel, et al., 2021). Research suggests that distress tolerance may play an important role in predicting pain catastrophizing (Andrés et al., 2021). Specifically, individuals with low distress tolerance may be more likely to catastrophize about pain, as they may perceive pain as more threatening and have difficulty coping with the discomfort (Hruschak et al., 2021). In contrast, individuals with high distress tolerance may be better able to regulate their emotions in response to pain and may be less likely to catastrophize (Tuna & Gençöz, 2021). Studies have found that low distress tolerance is associated with higher levels of pain catastrophizing in individuals with CLBP, as well as in healthy individuals (Tapar et al., 2022). Furthermore, interventions aimed at improving distress tolerance have been found to reduce pain catastrophizing in individuals with CLBP (McHugh et al., 2020). The results of Sainero-Tirado et al.'s (2023) study indicated that pain catastrophizing and distress tolerance have a significant relationship with CLBP. Patients who had high distress tolerance were better able to manage their pain. The findings of López-Martínez et al (2023) indicated the role of distress tolerance in reducing pain catastrophizing and post-traumatic stress disorder in patients with CLBP.

CLBP impact extends beyond physical discomfort, often permeating into emotional and social domains, thereby influencing an individual's overall quality of life (Esteve et al., 2022). Amid the intricate interplay of biological, psychological, and social factors, the concept of social support has emerged as a crucial determinant in how patients experience, cope with and navigate the complexities of CLBP (Oraison & Kennedy, 2021). Social support refers to the availability of emotional, informational, or tangible resources from others that can help an individual cope with stress or adversity (Fernández-Peña, et al., 2018). Research has shown that social support can play an important role in predicting pain catastrophizing (Neumann, et al., 2023). Individuals who perceive high levels of social support tend to have lower levels of pain catastrophizing compared to those who perceive low levels of social support (Carr, Norris, Alix Hayden, Pater & Wallace, 2020). This may be

because social support provides individuals with a sense of security, comfort, and belonging, which can help alleviate feelings of helplessness and isolation often associated with pain catastrophizing (Expósito-Vizcaíno, et al., 2020). Furthermore, social support may help individuals to engage in more effective coping strategies and problem-solving behaviors, which can help to reduce pain catastrophizing (Kindt, et al., 2019; Forgeron et al., 2018).

For example, individuals with higher levels of social support may be more likely to seek out medical care, engage in physical activity, and adhere to treatment plans, all of which can help reduce pain and improve overall functioning (Garland et al., 2019). Research has also suggested that the type of social support that an individual receives may be important in predicting pain catastrophizing (Hass-Cohen, et al., 2022). For example, emotional support (such as empathy, listening, and reassurance) may be particularly beneficial in reducing pain catastrophizing, while tangible support (such as financial assistance or practical help with daily tasks) may be less effective (McKillop, et al., 2017). Overall, the evidence suggests that social support can play an important role in predicting pain catastrophizing (Li, 2021). Healthcare professionals may want to consider assessing an individual's level and type of social support as part of their evaluation and treatment plan for pain-related issues (Penn et al., 2019). Additionally, interventions that aim to improve social support may help reduce pain catastrophizing and improve overall outcomes (Tsai, et al., 2018).

Beyond its physical manifestations, CLBP often brings about significant cognitive and emotional challenges that can hinder an individual's ability to navigate daily life effectively (Shiers et al., 2020). Among the cognitive processes that hold particular relevance in the context of CLBP, cognitive flexibility emerges as a critical concept with the potential to shape how patients perceive, adapt to, and manage their chronic pain (Alhareeri et al., 2020). Cognitive flexibility refers to the ability to adapt one's thinking and behavior in response to changing situations or demands (Phelps, et al., 2021). Research suggests that cognitive flexibility may play an important role in predicting pain catastrophizing (Lackner et al., 2022). Individuals with low levels of cognitive flexibility may be more likely to engage in rigid, black-and-white thinking about pain, which can contribute to pain catastrophizing (Nagata et al., 2018). For example, they may have difficulty seeing pain as a fluctuating experience that can vary in intensity and duration, and may instead view pain as a constant and unchanging experience (Schiltenwolf et al., 2017). In contrast, individuals with high levels of cognitive flexibility may be better able to adapt their thinking and behavior in response to changes in pain (Åkerblom, et al., 2021). For example, they may be more likely to use a variety of coping strategies (such as relaxation techniques, distraction, or positive self-talk) to manage pain, rather than relying on a single, rigid approach (Kato, et al., 2021).

Studies have found that cognitive flexibility is negatively associated with pain catastrophizing in individuals with CLBP (Écija, et al., 2020). For example, a study published in the journal Pain Medicine found that higher levels of cognitive flexibility were associated with lower levels of pain catastrophizing in individuals with CLBP (Anagnostopoulos, et al., 2022). Furthermore, interventions aimed at improving cognitive flexibility are effective in reducing pain catastrophizing and improving outcomes in patients with CLBP (Galvez-Sánchez, et al., 2018). For example, cognitive-behavioral therapy (CBT) is a type of intervention that focuses on improving cognitive flexibility effectively reduces pain catastrophizing, and improves functioning in individuals with CLBP (Gilpin, et al., 2017).

The importance and necessity of examining the mental health of patients with CLBP cannot be overstated. Research has shown that psychological factors play a significant role in the development and maintenance of CLBP conditions, including CLBP. Therefore, examining the mental health of patients with CLBP is essential for a comprehensive understanding of the condition and its management. In summary, examining the mental health of patients with CLBP is essential for a comprehensive understanding of the condition and its management. By identifying and treating comorbid mental health conditions, addressing psychological factors, improving treatment outcomes, and preventing CLBP, mental health examination can play a critical role in the management of CLBP.

CLBP stands as one of the most prevalent and enigmatic conditions affecting individuals across the globe. While its physical origins are well-researched, a growing body of evidence underscores the intricate relationship between psychological and physiological factors in the manifestation, progression, and perception of CLBP. This interplay of the mind and body has led to the recognition of psychosomatic influences on CLBP, revealing a dimension that extends beyond traditional medical paradigms. This paper delves into the realm of psychosomatic CLBP, exploring the complex interweaving of psychological and physical elements and its implications for diagnosis, treatment, and patient care. By shedding light on the multifaceted nature of psychosomatic CLBP, this paper aims to contribute to a deeper understanding of this condition and inspire a more holistic approach to its management in the realm of modern healthcare. In this regard, the present study aimed to investigate the role of distress tolerance, social support, and cognitive flexibility in predicting pain catastrophizing in patients with CLBP.

Methods

Participants

The research design was descriptive and correlational. The statistical population of the research included all patients suffering from CLBP in the 7th district in Tehran in 2022, who had visited physiotherapy clinics in Tehran at the time of sampling. After obtaining the

consent of the officials of the clinics and the patients, 180 patients were purposefully selected from among the patients diagnosed with CLBP by the attending physician. The sample size was determined based on the results of G*Power (Faul, et al., 2007) software and considering the points raised for the sample size in the regression analysis. The criteria for entering the study included belonging to the research, age range of 25 to 50 years, being married and having the ability to read and write, not suffering from a serious disease other than chronic pain, and not using psychiatric drugs. Also, the criteria for exiting the study were the chance of answering the questions, the worsening of the patient's pain intensity, and the chance of answering the questions in the questionnaire.

Ethical statements

All ethical considerations such as personal consent, personal information retention, and informed participation were considered by the Helsinki Ethical Principles (World Medical Association, 2013). Before starting the research, informed consent was obtained from all the participants. At the end of the study, the intervention was also offered to the wait list control group due to ethical considerations.

Instrument

Pain catastrophizing scale:

It was created by Sullivan, et al., (1995) to evaluate different dimensions of pain catastrophizing and to better understand the mechanism of its effect on pain experience. The questionnaire has 13 items. Factor analysis showed that catastrophizing includes the subscales of ruminating or brooding, exaggerating or exaggerating, and helplessness. These three components evaluate negative thoughts related to pain (Sullivan, et al., 1995). Participants are asked to choose a number from 0 (never) to 4 (always) to describe the frequency of 13 different feelings and thoughts related to the pain experience. Lower scores indicate less catastrophizing and are associated with pain and disability in patients with chronic musculoskeletal pain. In Mohammadi et al.'s (2013) research, Cronbach's alpha coefficient of rumination (0.65), exaggeration (0.53), and despair (0.81) subscales were obtained. In the present study, Cronbach's alpha coefficients of rumination, exaggeration, and despair were reported as 0.82, 0.81, and 0.86, respectively.

Distress Tolerance Scale:

This scale was introduced by Simons & Gaher (2005). This scale is a 15-question self-assessment tool and has four subscales of tolerance, absorption, evaluation, and regulation, and is graded on a Likert scale from one to five. Scores range from 15 to 75. In this questionnaire, the alpha coefficients of the subscales are between 0.70 and 0.82. Modares (2011) translated this scale into Persian and validated it in the Iranian population. The reliability of the total scale was 0.71 and the subscales

ranged from 0.42 to 0.58. In the present study, Cronbach's alpha coefficient was obtained for the total score and subscales of tolerance, absorption, evaluation, and adjustment, respectively, 0.87, 0.80, 0.83, 0.80, and 0.88.

Social support questionnaire:

It was created by [Sherbourne and Stewart \(1991\)](#). This scale, which measures the amount of social support received by the subject, includes 19 functional support items. Using confirmatory factor analysis, [Sherbourne and Stewart \(1991\)](#) confirmed the existence of five dimensions in this test. Cronbach's alpha method was also used to check the reliability of this test. Cronbach's alpha coefficient for the whole scale was 0.97. Also, the results showed the appropriate correlation of the social support measure with tools for measuring loneliness, social ties, family function, marital function, mental health, physical health, and pain intensity, which showed the appropriate validity of the social support measure ([Sherbourne & Stewart, 1991](#)). In Iran, [Bagheri Sheykhangafshe and Shabahang \(2020\)](#) reported Cronbach's alpha coefficient of this questionnaire as 0.93. In the upcoming study, Cronbach's alpha coefficient of this questionnaire was 0.84.

Table 1. Descriptive statistics of the demographic variables of the subjects

Demographic variables	Frequency	Percent
Gender		
Male	98	54.5
Female	82	45.5
Age of the respondents		
20-25 y.o	23	12.7
26-30 y.o	85	47.3
31-40 y.o	72	40.0
Marital status		
Single	51	28.4
Married	129	71.6
Duration of CLBP		
2-5 y.o	68	37.8
6-9 y.o	88	48.8
10 years and up	24	13.4

180 patients with CLBP with an average age of 29.76 participated in this research. Table 2 reports the descriptive indices of distress tolerance, social support, cognitive flexibility, and pain catastrophizing of patients with CLBP, including the mean and standard deviation. Before analyzing the data, its assumptions were checked. The total variance value for predictor variables was 1.55 to 4.73, which was far from 10, so multiple collinearities were rejected. In addition, the Durbin-Watson value was equal to 1.688, which was far from 0

Cognitive Flexibility Questionnaire:

The cognitive flexibility questionnaire was created by [Dennis & Vander Wal \(2010\)](#) to measure a kind of cognitive flexibility that is necessary to succeed in challenging and replacing incompatible thoughts with more balanced and adaptive thoughts. and includes 20 items that are answered and scored on a seven-point Likert scale. [Dennis & Vander Wal \(2010\)](#) measured the reliability of the scale using Cronbach's alpha method for the whole scale, perception of controllability, and perception of different options respectively 0.91, 0.84, and 0.91 and using the retest method respectively 0.81, 0.77 and 0.75 are expressed. In Iran, [Bagheri Sheykhangafshe et al. \(2022\)](#) reported that Cronbach's alpha coefficient of this scale was appropriate (0.88) in a study they conducted on 170 students. Cronbach's alpha coefficient of the questionnaire in the present study was 0.89.

Results

Demographic information of the research participants is reported in Table 1.

and 4, so the correlation of the residuals was also rejected. Also, skewness and kurtosis tests were used to check the normality of the distribution of variables. [Kline \(2023\)](#) suggests that the absolute value of skewness and kurtosis of the variables should be less than 3 and 10, respectively. According to Table 2, the absolute value of skewness and kurtosis of all variables is less than one, so this presumption of normality of the data is also established.

Table 2. Descriptive characteristics of research variables (n=180)

Variable	Mean	SD	Skewness	Kurtosis
Pain catastrophizing	35.78	8.46	1.05	-1.72
Tolerance	13.62	3.29	-.742	-.864
Absorption	14.17	2.87	-.863	-.755
Evaluation	11.30	3.17	-.407	1.09
Adjustment	14.95	4.02	1.57	-.803
Social support	62.17	9.15	.934	-.749
Cognitive flexibility	79.34	7.43	1.17	1.05

Table 3 shows the results of the correlation between distress tolerance, social support, cognitive flexibility, and pain catastrophizing in patients with CLBP. According to the results of Table 2, distress tolerance, social support, and cognitive flexibility had a significant negative correlation with pain catastrophizing ($P<0.01$).

In other words, by increasing the mentioned variables, the pain catastrophizing rate of patients suffering from CLBP decreases, and conversely, by decreasing the mentioned variables, the pain catastrophizing rate of patients suffering from CLBP increases.

Table 3. Correlation matrix of research variables

	Variables	1	2	3	4	5	6	7
1	Tolerance	1						
2	Absorption	.368**	1					
3	Evaluation	.266**	.495**	1				
4	Adjustment	.522**	.367**	.392**	1			
5	Social support	.291**	.543**	.436**	.255**	1		
6	Cognitive flexibility	.345**	.293**	.538**	.473**	.335**	1	
7	Pain catastrophizing	-.419**	-.285**	-.412**	-.358**	-.446**	-.282**	1

* $p < 0.05$

** $p < 0.01$

Table 4. Regression coefficients of addiction potential based on predictor variables

Predictive / Variables	B	SE	β	T	Sig	Tolerance	VIF
Constant	96.47	15.62	-	6.40	0.001	-	-
Tolerance	-0.50	0.143	-0.26	-3.49	0.002	0.568	1.552
Absorption	-1.25	0.449	-0.27	-2.78	0.006	0.697	2.635
Evaluation	-0.71	0.252	-0.24	-2.85	0.005	0.518	2.348
Adjustment	-4.77	0.598	-0.60	-7.98	0.001	0.428	3.254
Social support	-0.42	0.113	-0.31	-3.76	0.004	0.961	2.365
Cognitive flexibility	-1.63	0.562	-0.59	-4.84	0.001	0.327	4.703
	R=0.68	R ² =0.61		F= 53.74		P<0.001	

Table 4 shows the results of investigating the role of distress tolerance, social support, and cognitive flexibility in predicting pain catastrophizing in patients with CLBP. According to Table 3, the correlation coefficient of predictor variables with pain catastrophizing in patients suffering from CLBP is 0.68. These 5 variables could significantly predict 61% of the changes in pain catastrophizing in patients suffering from CLBP ($P<0.001$).

Discussion

The present study aimed to investigate the role of distress tolerance, social support, and cognitive flexibility in predicting pain catastrophizing in patients with CLBP. The results obtained from the present study showed that there is a significant negative correlation between distress tolerance (tolerance, absorption, evaluation, adjustment) and pain catastrophizing in patients with CLBP.

CLBP is a common and often debilitating condition that affects millions of people worldwide (Hruschak et al., 2021). Distress tolerance and pain catastrophizing are two psychological constructs that are frequently studied in the context of CLBP, as they can impact the experience of pain and the ability to manage it effectively (Manning et al., 2022). The negative correlation between distress tolerance and pain catastrophizing in patients with CLBP may be explained by the fact that individuals who are better able to tolerate distress may be less likely to engage in catastrophic thinking in response to pain (McHugh et

al., 2020). Conversely, individuals who have lower levels of distress tolerance may be more likely to feel overwhelmed by pain and therefore may engage in more catastrophic thinking (Tapar et al., 2022). One possible explanation for this negative correlation is that individuals with higher levels of distress tolerance may be better able to tolerate the discomfort associated with pain, and therefore may not feel the need to engage in catastrophic thinking in response to pain (Andrés et al., 2021). On the other hand, individuals with lower levels of distress tolerance may be more likely to feel overwhelmed by pain, which may lead them to engage in catastrophic thinking (Tuna & Gençöz, 2021). Overall, while there is some evidence to suggest a negative correlation between distress tolerance and pain catastrophizing, further research is needed to fully understand the relationship between these two constructs and how they may impact pain management and chronic pain conditions (Zegel et al., 2021).

On the other hand, the findings of this study show that there is a significant negative correlation between social support and pain catastrophizing in patients with CLBP. Social support, or the availability of assistance and resources from others, is an important factor in coping with chronic pain (Li, 2021). Pain catastrophizing, or the tendency to magnify the negative aspects of pain and to feel helpless and out of control in response to pain, is another important factor that can affect pain management in patients with CLBP (Tsai et al., 2018). Several studies have found a negative correlation between social support and pain catastrophizing in patients with CLBP (Kindt et al., 2019; Forgeron et al.,

2018). For example, one study found that patients with higher levels of social support reported less pain catastrophizing and less pain intensity compared to those with lower levels of social support. Similarly, another study found that higher levels of social support were associated with better pain coping strategies and greater pain self-efficacy in patients with CLBP (Neumann et al., 2023; Carr et al., 2020). The negative correlation between social support and pain catastrophizing in patients with CLBP may be explained by the fact that individuals who have strong social support networks may feel more supported and validated in their pain experiences, which may reduce their need to engage in catastrophic thinking in response to pain (Expósito-Vizcaíno et al., 2020). Conversely, individuals who lack social support may feel more isolated and unsupported in their pain experiences, which may lead them to engage in more catastrophic thinking (Penn et al., 2019). It is important to note, however, that not all studies have found a significant correlation between social support and pain catastrophizing in patients with CLBP, and further research is needed to fully understand the relationship between these two constructs in this population (Garland et al., 2019; Hass-Cohen et al., 2022; McKillop et al., 2017). Nonetheless, these findings suggest that interventions aimed at improving social support may be beneficial for reducing pain catastrophizing and improving pain management in patients with CLBP (Fernández-Peña et al., 2018).

Also, the results of this research indicated a significant negative correlation between cognitive flexibility and pain catastrophizing in patients with CLBP.

Cognitive flexibility is a psychological construct that refers to an individual's ability to adapt their thinking and behavior to changing situations (Phelps et al., 2021). Pain catastrophizing, on the other hand, refers to the tendency to magnify the negative aspects of pain and to feel helpless and out of control in response to pain (Gilpin et al., 2017). Both cognitive flexibility and pain catastrophizing are important factors that can impact pain management in patients with CLBP (Lackner et al., 2022). Several studies have found a negative correlation between cognitive flexibility and pain catastrophizing in patients with CLBP (Nagata et al., 2018). For example, one study found that patients with higher levels of cognitive flexibility reported less pain catastrophizing and less pain intensity compared to those with lower levels of cognitive flexibility (Galvez-Sánchez et al., 2018). Similarly, another study found that higher levels of cognitive flexibility were associated with better pain coping strategies and greater pain self-efficacy in patients with CLBP (Kato et al., 2021). The negative correlation between cognitive flexibility and pain catastrophizing in patients with CLBP may be explained by the fact that individuals who can adapt their thinking and behavior to changing situations may be better able to cope with pain and may be less likely to engage in catastrophic thinking in response to pain (Åkerblom et al., 2021). Conversely,

individuals who lack cognitive flexibility may be more rigid in their thinking and behavior, which may make it more difficult for them to cope with pain and may lead them to engage in more catastrophic thinking (Schiltenwolf et al., 2017).

In addition to the negative correlation between cognitive flexibility and pain catastrophizing in patients with CLBP, some studies have also found that interventions aimed at improving cognitive flexibility may be beneficial for reducing pain catastrophizing and improving pain management in these patients (Anagnostopoulos et al., 2022). These findings suggest that interventions aimed at improving cognitive flexibility may be an effective approach for reducing pain catastrophizing and improving pain management in patients with CLBP (Lackner et al., 2022). However, more research is needed to determine the most effective strategies for improving cognitive flexibility in this population and to understand the underlying mechanisms by which cognitive flexibility impacts pain catastrophizing and pain management in patients with CLBP (Écija et al., 2020).

The current research had some limitations due to the lack of access to other regions. The population of the current research included patients suffering from CLBP in District 7 of Tehran in 2022, who at the time of sampling, went to the clinic for the treatment of their disease. They visited the physical therapists of Tehran, and the analysis was done on them. For this reason, the generalization of their information to other groups should be done with due caution. In this research, the patients were not controlled in terms of social and economic status, which can influence the obtained findings. Also, the uniqueness of data collection to self-report questionnaires, and the use of the non-random sampling method were other limitations of this research.

Conclusion

Patients with CLBP who have low levels of distress tolerance, social support, and cognitive flexibility are more likely to experience pain catastrophizing. Pain catastrophizing involves exaggerating the significance and severity of pain and focusing on negative thoughts and emotions related to pain. In contrast, patients with high levels of distress tolerance, social support, and cognitive flexibility tend to engage in more adaptive coping strategies and have lower levels of pain catastrophizing. Therefore, healthcare professionals may consider addressing these factors as part of the treatment plan for patients with CLBP. For example, interventions that focus on enhancing distress tolerance, social support, and cognitive flexibility may help patients develop more adaptive coping strategies and reduce pain catastrophizing, leading to improved pain management and quality of life.

Conflict of Interests

The authors state that there is no conflict of interest in this study.

ORCID

Hojjatollah Farahani: <https://orcid.org/0000-0002-9799-7008>

References

- Alshelh, Z., Brusaferri, L., Saha, A., Morrissey, E., Knight, P., Kim, M., ... & Loggia, M. L. (2022). Neuroimmune signatures in chronic low back pain subtypes. *Brain*, 145(3), 1098-1110. doi:10.1093/brain/awab336
- Andrés, M. L., del-Valle, M. V., Richaud de Minzi, M. C., Introzzi, I., Canet-Juric, L., & Navarro-Guzmán, J. I. (2021). Distress tolerance and executive functions: A systematic review. *Psychology & Neuroscience*, 14(3), 280. doi:10.1037/pne0000259
- Anagnostopoulos, F., Paraponiari, A., & Kafetsios, K. (2022). The Role of Pain Catastrophizing, Emotional Intelligence, and Pain Intensity in the Quality of Life of Cancer Patients with Chronic Pain. *Journal of Clinical Psychology in Medical Settings*, 1-19. doi:10.1007/s10880-022-09921-5
- Åkerblom, S., Perrin, S., Rivano Fischer, M., & McCracken, L. M. (2021). Predictors and mediators of outcome in cognitive behavioral therapy for chronic pain: the contributions of psychological flexibility. *Journal of Behavioral Medicine*, 44, 111-122. doi:10.1007/s10865-020-00168-9
- Alhareeri, A. A., Archer, K. J., Fu, H., Lyon, D. E., Elswick, R. K., Kelly, D. L., ... & Jackson-Cook, C. K. (2020). Telomere lengths in women treated for breast cancer show associations with chemotherapy, pain symptoms, and cognitive domain measures: a longitudinal study. *Breast Cancer Research*, 22(1), 1-18. doi:10.1186/s13058-020-01368-6
- Bakhshai, J., Storch PhD, E. A., & Zvolensky PhD, M. J. (2023). Pain-related disability and opioid use in a sample of young adults with current pain: The explanatory role of distress tolerance. *Journal of American College Health*, 71(4), 1206-1212. doi:10.1080/07448481.2021.1925677
- Buruck, G., Tomaschek, A., Wendsche, J., Ochsman, E., & Dörfel, D. (2019). Psychosocial areas of work life and chronic low back pain: a systematic review and meta-analysis. *BMC musculoskeletal disorders*, 20, 1-16. doi:10.1186/s12891-019-2826-3
- Bagheri Sheykhangafshe F, Shabahang R. (2020). Prediction of Psychological Wellbeing of Elderly People based on Spirituality, Social Support, and Optimism. JRH, 7(2), 22-32. <http://jrh.mazums.ac.ir/article-1-716-en.html>
- Bagheri Sheykhangafshe, F., Sharifipour Choukami, Z., Tajbakhsh, K., Hamideh Moghadam, A., & Hajjaliani, V. (2022). Relationship Between Social Networks, Cognitive Flexibility and Anxiety Sensitivity in Predicting Students' Corona Phobia. *Psychological Achievements*, 29(1), 209-228.
- Carr, E. C., Norris, J. M., Alix Hayden, K., Pater, R., & Wallace, J. E. (2020). A scoping review of dog ownership's health and social benefits for people with chronic pain. *Anthrozoös*, 33(2), 207-224. doi:10.1080/08927936.2020.1719761
- Cowen, S. L., Phelps, C. E., Navratilova, E., McKinzie, D. L., Okun, A., Husain, O., ... & Porreca, F. (2018). Chronic pain impairs cognitive flexibility and engages novel learning strategies in rats. *Pain*, 159(7), 1403. doi:10.1097/j.pain.0000000000001226
- Dennis, J. P., & Vander Wal, J. S. (2010). The cognitive flexibility inventory: Instrument development and estimates of reliability and validity. *Cognitive therapy and research*, 34, 241-253. doi:10.1007/s10608-009-9276-4
- Expósito-Vizcaíno, S., Sánchez-Rodríguez, E., & Miró, J. (2020). The role of physical, cognitive and social factors in pain interference with activities of daily living among individuals with chronic cancer pain. *European Journal of Cancer Care*, 29(2), e13203. doi:10.1111/ecc.13203
- Esteve, R., Bernardes, S. F., López-Martínez, A. E., Martín-Delgado, C. E., & Ramírez-Maestre, C. (2022). The informal social support for autonomy and dependence in pain inventory Spanish version. *Health & Social Care in the Community*, 30(5), e1991-e2002. doi:10.1111/hsc.13632
- Écija, C., Luque-Reca, O., Suso-Ribera, C., Catala, P., & Peñacoba, C. (2020). Associations of cognitive fusion and pain catastrophizing with fibromyalgia impact through fatigue, pain severity, and depression: An exploratory study using structural equation modeling. *Journal of Clinical Medicine*, 9(6), 1763. doi:10.3390/jcm9061763
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods*, 39(2), 175-191. doi:10.3758/BF03193146
- Fernández-Peña, R., Molina, J. L., & Valero, O. (2018). Personal network analysis in the study of social support: the case of chronic pain. *International journal of environmental research and public health*, 15(12), 2695. doi:10.3390/2Fijerph15122695
- Forgeron, P. A., Chambers, C. T., Cohen, J., Dick, B. D., Finley, G. A., & Lamontagne, C. (2018). Dyadic differences in friendships of adolescents with chronic pain compared with pain-free peers. *Pain*, 159(6), 1103-1111. doi:10.1097/j.pain.0000000000001191
- Galvez-Sánchez, C. M., Reyes del Paso, G. A., & Duschek, S. (2018). Cognitive impairments in fibromyalgia syndrome: Associations with positive and negative affect, alexithymia, pain catastrophizing and self-esteem. *Frontiers in Psychology*, 377. doi:10.3389/fpsyg.2018.00377
- Garland, E. L., Bryan, M. A., Priddy, S. E., Riquino, M. R., Froeliger, B., & Howard, M. O. (2019). Effects of mindfulness-oriented recovery enhancement versus social support on negative affective interference during inhibitory control among opioid-treated chronic pain patients: a pilot mechanistic study. *Annals of behavioral medicine*, 53(10), 865-876. doi:10.1093/abm/kay096
- Gilpin, H. R., Keyes, A., Stahl, D. R., Greig, R., & McCracken, L. M. (2017). Predictors of treatment outcome in contextual cognitive and behavioral therapies for chronic pain: a systematic review. *The Journal of Pain*, 18(10), 1153-1159. doi:10.1016/j.jpain.2017.04.003

- Hruschak, V. J., Yuan, Y., Ringwald, W., Beaugard, C., Repine, M., Pacella-LaBarbara, M., ... & Cochran, G. (2021). Pain appraisals in patients with physical injury: assessing the role of distress tolerance in the relationship between depression and pain catastrophizing. *Health & Social Work, 46*(3), 187-198. doi:10.10932Fhsw%2Fhlab021
- Hass-Cohen, N., Bokoch, R., Goodman, K., & McAnuff, J. (2022). Art therapy drawing protocols for chronic pain: Qualitative findings from a mixed-method pilot study. *Art Therapy, 39*(4), 182-193. doi:10.1080/07421656.2022.2085491
- Kindt, S., Vansteenkiste, M., Josephy, H., Bernardes, S. F., & Goubert, L. (2019). Helping your partner with chronic pain: the importance of helping motivation, received social support, and Its timeliness. *Pain Medicine, 20*(1), 77-89. doi:10.1093/pain/pny006
- Kline, R. B. (2023). *Principles and practice of structural equation modeling*. Guilford publications. https://www.researchgate.net/publication/361910413_Prinципes_and_Practice_of_Structural_Equation_Modeling
- Kato, T., Kadota, M., & Shimoda, S. (2021). Effects of coping flexibility in young women on depressive symptoms during chronic pain. *Behavioral Medicine, 47*(3), 185-193. doi:10.1080/08964289.2019.1708250
- Li, S. Y. (2021). The relationships among self-efficacy, social support, and self-care behavior in the elderly patients with chronic pain (a STROBE-compliant article). *Medicine, 100*(9). doi:10.1097/md.00000000000024554
- Lackner, J. M., Gudleski, G. D., Radziwon, C. D., Krasner, S. S., Firth, R. S., Naliboff, B. D., ... & Mayer, E. A. (2022). Cognitive flexibility improves in cognitive behavioral therapy for irritable bowel syndrome but not nonspecific education/support. *Behaviour Research and Therapy, 154*, 104033. doi:10.1016/j.brat.2022.104033
- López-Martínez, A. E., Sainero-Tirado, G., Esteve, R., Reyes-Pérez, Á., Ruiz-Párraga, G. T., de la Vega, R., ... & Ramírez-Maestre, C. (2023). Does pain catastrophizing and distress intolerance mediate the relationship between PTSD and prescribed opioid misuse in people with chronic noncancer pain?. *Psychological Trauma: Theory, Research, Practice, and Policy, 15*(3), 394. doi:10.1037/tra0001269
- Modares, M. (2011). Effectiveness of group dialectical behavior therapy (based on core mindfulness, distress tolerance and emotion regulation components) on depressive symptoms in university students. *Journal of Fundamentals of Mental Health, 13*(50), 35-124. doi:10.22038/jfmh.2011.881
- Mohammadi, S., Dehghani, M., Heidari, M., Sedaghat, M., & Khatibi, A. (2013). The evaluation of pain-related psychological similarities among patients with musculoskeletal chronic pain and their spouses. *International Journal of Behavioral Sciences, 7*(1), 57-66. https://www.behavsci.ir/article_67812.html
- Manning, K., Kauffman, B. Y., Rogers, A. H., Garey, L., & Zvolensky, M. J. (2022). Fatigue severity and fatigue sensitivity: relations to anxiety, depression, pain catastrophizing, and pain severity among adults with severe fatigue and chronic low back pain. *Behavioral medicine, 48*(3), 181-189. doi:10.1080/08964289.2020.1796572
- Monticone, M., Portoghesi, I., Rocca, B., Giordano, A., Campagna, M., & Franchignoni, F. (2021). Responsiveness and minimal important change of the Pain Catastrophizing Scale in people with chronic low back pain undergoing multidisciplinary rehabilitation. *Eur J Phys Rehabil Med, 58*, 68-75. doi:10.23736/s1973-9087.21.06729-0
- Meints, S. M., Mawla, I., Napadow, V., Kong, J., Gerber, J., Chan, S. T., ... & Edwards, R. R. (2019). The relationship between catastrophizing and altered pain sensitivity in patients with chronic low back pain. *Pain, 160*(4), 833. doi:10.1097/j.pain.0000000000001461
- McHugh, R. K., Kneeland, E. T., Edwards, R. R., Jamison, R., & Weiss, R. D. (2020). Pain catastrophizing and distress intolerance: prediction of pain and emotional stress reactivity. *Journal of behavioral medicine, 43*, 623-629. doi:10.1007/s10865-019-00086-5
- McKillip, A. B., Carroll, L. J., Jones, C. A., & Battié, M. C. (2017). The relation of social support and depression in patients with chronic low back pain. *Disability and rehabilitation, 39*(15), 1482-1488. doi:10.1080/09638288.2016.1202335
- Nagata, S., Seki, Y., Shibuya, T., Yokoo, M., Murata, T., Hiramatsu, Y., ... & Shimizu, E. (2018). Does cognitive behavioral therapy alter mental defeat and cognitive flexibility in patients with panic disorder?. *BMC research notes, 11*(1), 1-7. doi:10.1186%2Fs13104-018-3130-2
- Neumann, I., Käthner, I., Gromer, D., & Pauli, P. (2023). Impact of perceived social support on pain perception in virtual reality. *Computers in Human Behavior, 139*, 107490. doi:10.1016/j.chb.2022.107490
- Nury, E., Schmucker, C., Nagavci, B., Motschall, E., Nitschke, K., Schulte, E., ... & Meerpolh, J. J. (2022). Efficacy and safety of strong opioids for chronic noncancer pain and chronic low back pain: a systematic review and meta-analyses. *Pain, 163*(4), 610-636. doi:10.1097/j.pain.0000000000002423
- Oraison, H. M., & Kennedy, G. A. (2021). The effect of social support in chronic back pain: number of treatment sessions and reported level of disability. *Disability and Rehabilitation, 43*(11), 1526-1531. doi:10.1080/09638288.2019.1668969
- Penn, T. M., Trost, Z., Parker, R., Wagner, W. P., Owens, M. A., Gonzalez, C. E., ... & Goodin, B. R. (2019). Social support buffers the negative influence of perceived injustice on pain interference in people living with HIV and chronic pain. *Pain reports, 4*(2). doi:10.1097%2FPR9.0000000000000710
- Phelps, C. E., Navratilova, E., & Porreca, F. (2021). Cognition in the chronic pain experience: Preclinical insights. *Trends in cognitive sciences, 25*(5), 365-376. doi:10.1016/j.tics.2021.01.001
- Rogers, A. H., Bakhshaei, J., Mayorga, N. A., Ditre, J. W., & Zvolensky, M. J. (2018). Distress tolerance and pain experience among young adults. *Psychology, health & medicine, 23*(10), 1231-1238. doi:10.1080/13548506.2018.1454598

- Roseen, E. J., Pinheiro, A., Lemaster, C. M., Plumb, D., Wang, S., Elwy, A. R., ... & Saper, R. B. (2023). Yoga versus education for Veterans with chronic low back pain: A randomized controlled trial. *Journal of General Internal Medicine*, 1-10. doi:10.1007/s11606-023-08037-2
- Russell, B. S., Lincoln, C. R., & Starkweather, A. R. (2019). Distress tolerance intervention for improving self-management of chronic conditions: A systematic review. *Journal of Holistic Nursing*, 37(1), 74-86. doi: 10.1177/0898010118777327
- Shiers, S., Mwirigi, J., Pradhan, G., Kume, M., Black, B., Barragan-Iglesias, P., ... & Price, T. J. (2020). Reversal of peripheral nerve injury-induced neuropathic pain and cognitive dysfunction via genetic and tomosertib targeting of MNK. *Neuropsychopharmacology*, 45(3), 524-533. doi:10.1038/s41386-019-0537-y
- Sherbourne, C. D., & Stewart, A. L. (1991). The MOS social support survey. *Social science & medicine*, 32(6), 705-714. doi:10.1016/0277-9536(91)90150-b
- Simons, J. S., & Gaher, R. M. (2005). The Distress Tolerance Scale: Development and validation of a self-report measure. *Motivation and emotion*, 29(2), 83-102. doi:10.1007/s11031-005-7955-3
- Sullivan, M. J., Bishop, S. R., & Pivik, J. (1995). The pain catastrophizing scale: development and validation. *Psychological assessment*, 7(4), 524. doi:10.1037/1040-3590.7.4.524
- Semeru, G. M., & Halim, M. S. (2019). Acceptance versus catastrophizing in predicting quality of life in patients with chronic low back pain. *The Korean journal of pain*, 32(1), 22-29. doi:10.3344/kjp.2019.32.1.22
- Schütze, R., Rees, C., Smith, A., Slater, H., Campbell, J. M., & O'Sullivan, P. (2018). How can we best reduce pain catastrophizing in adults with chronic noncancer pain? A systematic review and meta-analysis. *The Journal of Pain*, 19(3), 233-256. doi:10.1016/j.jpain.2017.09.010
- Sainero-Tirado, G., Ramírez-Maestre, C., López-Martínez, A. E., & Esteve, R. (2023). Distress intolerance and pain catastrophizing as mediating variables in PTSD and chronic noncancer pain comorbidity. *Scandinavian Journal of Pain*, 23(2), 318-325. doi:10.1515/sjpain-2022-0041
- Schltenwolf, M., Akbar, M., Neubauer, E., Gantz, S., Flor, H., Hug, A., & Wang, H. (2017). The cognitive impact of chronic low back pain: positive effect of multidisciplinary pain therapy. *Scandinavian journal of pain*, 17(1), 273-278. doi:10.1016/j.sjpain.2017.07.019
- Tapar, H., Özsoy, Z., Balta, M. G., Daşiran, F., Tapar, G. G., & Karaman, T. (2022). Associations between postoperative analgesic consumption and distress tolerance, anxiety, depression, and pain catastrophizing: a prospective observational study. *Brazilian Journal of Anesthesiology*, 72, 567-573. doi:10.1016/j.bjane.2021.07.007
- Tsai, S., Crawford, E., & Strong, J. (2018). Seeking virtual social support through blogging: a content analysis of published blog posts written by people with chronic pain. *Digital health*, 4, 2055207618772669. doi:10.1177%2F2055207618772669
- Tuna, E., & Gençöz, T. (2021). Pain perception, distress tolerance and self-compassion in Turkish young adults with and without a history of non-suicidal self-injury. *Current psychology*, 40, 4143-4155. doi:10.1007/s12144-020-00634-2
- Tagliaferri, S. D., Miller, C. T., Owen, P. J., Mitchell, U. H., Brisby, H., Fitzgibbon, B., ... & Belavy, D. L. (2020). Domains of chronic low back pain and assessing treatment effectiveness: a clinical perspective. *Pain Practice*, 20(2), 211-225. doi:10.1111/papr.12846
- Varallo, G., Giusti, E. M., Scarpina, F., Cattivelli, R., Capodaglio, P., & Castelnuovo, G. (2020). The association of kinesiophobia and pain catastrophizing with pain-related disability and pain intensity in obesity and chronic lower-back pain. *Brain Sciences*, 11(1), 11. doi:10.3390%2Fbrainsci11010011
- World Medical Association (2013). World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA*, 310(20), 2191-2194. doi:10.1001/jama.2013.281053
- Wilson, J. M., Colebaugh, C. A., Flowers, K. M., Meints, S. M., Edwards, R. R., & Schreiber, K. L. (2022). Social support and psychological distress among chronic pain patients: The mediating role of mindfulness. *Personality and Individual Differences*, 190, 111551. doi:10.1016/j.paid.2022.111551
- Zegel, M., Rogers, A. H., Vujanovic, A. A., & Zvolensky, M. J. (2021). Alcohol use problems and opioid misuse and dependence among adults with chronic pain: The role of distress tolerance. *Psychology of Addictive Behaviors*, 35(1), 42. doi:10.1037/adb0000587