ISSN: 2476-5279; International Journal of Musculoskeletal Pain Prevention. 2026;11(3): 1468-1475

The Prediction of Pain Catastrophizing Based on Pain Metaphorical Perception and Resilience in Cancer Patients

ARTICLEINFO

Article Type
Cross sectional study

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How to cite this article

Tahami AS, Rezaei MR, Hojati Arjmand S. The Prediction of Pain Catastrophizing Based on Pain Metaphorical Perception and Resilience in Cancer Patients. Pain. Prev. 2026;11(3.): 1468-1475

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ABSTRACT

Aims: The purpose of this study was to examine the relationship between metaphorical perception of pain and resilience, with pain catastrophizing in cancer patients.

Method and Materials: This cross sectional study involved cancer patients in stages 1 and 2 who reside in Tehran. A total of 200 participants were selected through convenience sampling in 2025. They completed three questionnaires: the Standard Pain Catastrophizing Scale, the Pain Metaphorical Perception questionnaire, and the Connor-Davidson Resilience Questionnaire. Data analysis was performed using SPSS-26.

Findings: The results indicated a significant negative correlation between pain catastrophizing and pain metaphorical perception (r = -0.53, P = 0.01). Additionally, there was a significant negative relationship between resilience and pain catastrophizing (r=-0.493, P=0.01). Furthermore, 8.4% of the variance in pain catastrophizing was explained by pain metaphorical perception, and 6.9% by resilience.

Conclusion: The findings suggest that increased pain catastrophizing in cancer patients is negatively associated with their interpretation and coping mechanisms related to pain. Therefore, it is recommended that physicians and health psychologists consider these cognitive factors in their research on pain management for cancer patients.

Keywords: Pain Catastrophizing, Pain Metaphorical Perception, Resilience, Cancer Patients

Introduction

The experience and severity of pain and inadequate relief in cancer patients can be overwhelming and negatively impact their quality of life [1]. A review study found that the overall prevalence of pain across all types of cancer was 44.5%. 30.6% of patients experienced moderate-to-severe pain [2]. The high prevalence of cancer and its profound impact on various aspects of patients' lives, especially on the quality of pain, are particularly influential [3]. Pain in cancer is not simply a physical sensation, but a complex and multidimensional experience shaped by cognitive and emotional factors [4]. In other words, cancer, as one of the most challenging diseases, brings with it the experience of chronic pain for many patients. However, the intensity and distress caused by this pain are not simply a function of the physical pathology, but are also influenced by the individual's cognitive and emotional processes [5]. Cancer patients may perceive their pain differently and even distort it, exaggerating or catastrophizing it[6]. In addition to affecting patients' quality of life, pain is associated with individuals' personal characteristics [7].

Chronic pain is a complex experience beyond physical and psychological dimensions. In the meantime, pain catastrophizing refers to a tendency to focus on unpleasant pain, exaggerate its intensity, and feel helpless in the face of pain [8].

This way of thinking leads to a dramatic negative emotional reaction, such as anxiety, depression, and anger, and the emotions themselves also help to enhance the experience of pain [9].

In fact, the pain catastrophizing creates a negative feedback loop in which negative thoughts reinforce unpleasant feelings and affect the person's interpretation of the severity and nature of pain, thereby making it more difficult

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Article History
Received: Apr 22, 2026
Accepted: May 6, 2026
ePublished: Jun 30, 2026

to cope with pain [10].

Today, conceptual metaphors enter the psychological and mental domains [11]. Pain is one of the semantic fields expressed by conceptual metaphors. According to Lakoff's theory of conceptual metaphor, pain, like other metaphors, has two domains: the source and the target [12]. The source domain is based on our empirical or experimental world. At the same time, the target domain has an abstract identity [13]. The relationship between source and target domains is shaped by cognitive maps called conceptual maps. Accordingly, the deeper pain of our bodies is articulated through metaphors [14]. Moreover, metaphors are also effective in cancer treatment. One study indicated the lived experience of cancer patients. They stated metaphors in the cage or prison are the common metaphors of cancer pain [15]. Pain metaphors are based on embodied characteristics because pain is in our body organs [16].

Resilience means the ability of a person or system to face challenges, stresses, and problems. This helps people return to their normal state after difficult experiences and even learn from these experiences [17]. Resilience encompasses psychological, social, and environmental factors and can affect various aspects of an individual's life. The relationship between resilience and pain is also very noticeable. When people encounter physical or psychological problems, resilience can help them cope with these pains [18]. Individuals with high resilience can usually deal with their peers more effectively and are more likely to suffer [19]. Resilience can also help improve the healing process and accelerate recovery. In fact, resilience can act as a shield against the negative effects of pain[20].

One study showed that there is a relationship between pain catastrophizing and anxiety resulting from pain and cognitive flexibility[21]. Another study indicated that there is a negative and significant relation between pain and resilience in cancer patients[22]. A study conducted on resiliency has a negative relationship with Pain catastrophizing and also reduces the effect of Pain catastrophizing on physical disability in cancer patients[23]. Another study showed that high resilience and low resilience are strong predictors of severe pain and higher stress. Overall, resiliency directly reduces the intensity of the pain catastrophizing [24]. A study found the relationships between pain metaphorical perception and psychological capital [25]. The variance in pain intensity is explained by the metaphorical perception of pain and quality of life [26].

As mentioned above, few studies consider all variables, and this issue was one of the reasons for conducting this research. Furthermore, the metaphorical perception and explanation is a new interdisciplinary concept in the field of pain. This concept is derived from the cognitive-verbal domain. In other words, cognitive causes, in addition to psychological causes, are effective in pain catastrophizing. The main question of this study is: Is it possible to predict the pain catastrophizing in cancer Patients based on the pain metaphorical perception and resilience?

Method and Materials

This study employed a descriptive correlational design. The statistical population consisted of all cancer patients in Tehran. Based on the target population and using the formula n=z2(1-p)/d2 (d2=0.06), 200 eligible cancer patients in stages 1 and 2 were selected through a convenience sampling method in 2025. Inclusion criteria were age between 50 and 70 years, a history of cancer, and being in the second and third stages of the disease. The exclusion criterion was refusal to continue completing the questionnaires due to medical conditions. The researchers visited the oncology departments at Nikan and Shariati hospitals in Tehran, informed the hospitals' education departments of the research goals, and asked stage 1 and 2 cancer patients to participate in the study. The researchers asked the cancer Patients to contact the main researcher through WhatsApp and email. The goals of this study were also explained to the patients. Patients were assured that their information would remain confidential. The questionnaires for

this study were uploaded to a Porsline platform and then sent to the patients. For data analysis, SPSS-26 was used.

The data were collected using three instruments:

Pain Catastrophizing Scale: This scale was developed by Sullivan et al. [27]. It comprises 13 items and assesses patients' thoughts and behaviors in response to pain (exaggeration, rumination, and despair). The scoring is based on five options (very low = 1 to very high = 5). This scale has three dimensions: exaggeration and mental rumination, and despair. Higher overall scores indicate greater pain intensity in the responder, and vice versa. In the study of Sullivan et al., the reliability was obtained by retest and twisted conduction. In Germany, Cronbach's alpha coefficients were 0.63 for exaggeration, 0.89 for mental rumination, and 0.83 for despair. In Iran, the face and content validity of the questionnaire were assessed by experts and professors, and construct validity was assessed using factor analysis. To assess reliability, Cronbach's alpha was calculated for all dimensions; the reliability was 0.70. Reliability was obtained using the test-retest method [28]. In this study, the questionnaire's internal consistency was 0.83, as determined using Cronbach's alpha.

Pain Metaphorical Perception Questionnaire: The Pain Metaphorical Perception Questionnaire was developed by Raiisi [29] and comprises 25 items across four subscales: object, force, human, and causality. Responses are collected using a Likert scale that ranges from "strongly disagree" [1] to "strongly agree"[5], resulting in a total score that can range from a minimum of 25 to a maximum of 125. The reliability of this questionnaire was assessed using internal consistency, with Cronbach's alpha values of 0.75 overall, 0.73 for the object subscale, 0.76 for force, 0.72 for human, and 0.77 for causality. Experts confirmed the content validity index, and a Cronbach's alpha of 0.69 was observed in this study, indicating strong internal consistency for this scale.

Resilience Questionnaire: This questionnaire was designed by Connor-Davidson [30]. It consists of five subscales: personal merit, negative affect, positive acceptance of change, control, and spiritual effects. The scoring method is based on the Likert scale with 5 levels (from completely false = 0 to always correct = 4). Accordingly, the scores ranged from 0 to 100. Connor and Davidson [30] found the Cronbach's alpha coefficient for the whole resiliency questionnaire to be 0.89. Moreover, the reliability coefficient of the test-retest method was 0.87 over a four-week interval. Connor and Davidson found a positive and meaningful correlation between the resiliency questionnaire and the Kubasa hardiness scale, and a significant negative correlation with perceived stress and the vulnerability questionnaire. In Iran, this questionnaire was validated by Mohammadi[31]. To assess reliability, Cronbach's alpha was calculated, yielding a coefficient of 0.89. The correlation between each subscale and the total score, except for item 3, ranged from 0.41 to 0.64. In this study, the questionnaire's internal consistency was 0.89, as determined using Cronbach's alpha.

Findings

In this study, 200 people with different kinds of cancer (breast cancer, liver cancer, blood cancer, and so on) participated. The gender of patients included 115 (58 percent) women and 85 (42 percent) men. The mean and standard deviation of the age were 48.84±7.33. The means and standard deviations of the variables with their subscales are presented in Table 1.

Pearson's correlation coefficient was used to examine the relationship between the pain metaphorical perception and resilience with pain catastrophizing. The results indicated that the correlation coefficient of pain catastrophizing with pain metaphorical perception is negative and significant (r=-0.49) (P=0.01). In a similar vein, as pain catastrophizing increases in patients, their pain metaphorical perception is altered. The correlation between resilience and pain catastrophizing is negative and meaningful (r=-0.42) (P=0.01). All variables and their subscales are significant at the 0.01 and 0.05 levels (Table 2).

Linear regression analysis is used to predict pain catastrophizing based on the

Table 1) Descriptive Indicators of the Main Variables

Main Variable	Subscales	Number	Mean	Standard Deviation
Pain catastrophizing	Exaggeration	200	17.36	6.89
	Rumination	200	16.45	6.84
	Despair	200	17.20	7.65
	Pain catastrophizing	200	36.78	10.25
Pain metaphorical perception	Object	200	29.88	5.35
	Force	200	31.04	6.29
	Human	200	32.17	7.44
	Causality	200	31.43	6.78
	Pain metaphorical perception	200	42.17	10.75
Psychological resilience	Personal merit	200	65.51	14.31
	Negative affect	200	64.16	13.37
	Positive acceptance of change	200	60.37	12.44
	Control	200	59.68	10.54
	Spiritual effects	200	62.02	11.14
	Psychological resilience	200	83.16	15.98

Table 2) Correlation Matrix Subscales of pain catastrophizing, pain metaphorical perception, and resilience

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Exaggeration	1													
2. Rumination	0.75**	1												
3. Despair	0.62**	0.68**	1											
4. Pain catastrophizing	0.71**	0.76**	0.73**	1										
5. Object	-0.31**	-0.33**	-0.35**	-0.33**	1									
6. Force	-0.34**	-0.35**	-0.39**	-0.38**	-0.38**	1								
7. Human	-0.34**	-0.33**	-0.35**	-0.33**	-0.31**	-0.33**	1							
8. Causality	-0.37**	-0.31**	-0.35**	-0.36**	0.63**	0.69**	0.66**	1						
9. Pain metaphorical perception	-0.49**	-0.44**	-0.49**	-0.48**	0.89**	0.76**	0.77**	0.73**	1					
10. Personal merit	-0.37*	-0.38*	-0.34*	-0.36*	0.45**	0.43**	0.43**	0.45**	0.47**	1				
11. Negative affect	0.31*	0.29*	0.28*	0.24*	-0.35**	-0.33**	-0.39**	-0.38**	-0.40**	0.73**	1			
12. Positive acceptance of change	-0.33*	-0.37*	-0.38*	-0.32*	-0.41**	0.38**	0.36**	0.31**	0.37**	0.63**	0.61**	1		
13. Control	-0.25*	-0.27*	-0.28*	-0.29*	0.32**	0.35**	0.34**	0.38**	0.36**	0.60**	0.63**	0.66**	1	
14. Spiritual effects	-0.38*	-0.33*	-0.34*	-0.39*	0.54**	0.58**	0.50**	0.55**	0.53**	0.63*	0.66*	0.65**	0.69**	1
15. Resilience	-0.39**	-0.35**		-0.42**	0.17*	0.19*			0.28**					1

(**) Significance at level 0.01 and (*) significance at level 0.05

metaphorical perception of pain and resilience. The R2 value obtained for the metaphorical perception of pain was 0.084. In other words, 8.4% of the variance in pain catastrophizing is explained by pain metaphorical perception. That is, 8.4% of the observed variance in pain catastrophizing is explained by this variable. The observed R value (0.55) also represents the linear regression model established for this study. In addition, the F calculated for this variable (10.01) is significant at the 0.95 level. Therefore, it can be concluded that there is a significant association between the metaphorical perception of pain and its subscales and pain catastrophizing. Another finding indicated that the value of R2 for psychological resilience was 0.069. In other words, 6.9% of the variance in pain catastrophizing is explained by resilience. That is, 6.9% of the observed variance in pain catastrophizing is explained by this variable. The observed R value (0.61) also represents the linear regression model established for this study. In addition, the F calculated for this variable (8.36) is significant at the 0.95 level. Therefore, it can be concluded that there is a significant association between resilience and its subscales with pain catastrophizing (Table 3).

Table 3) Linear regression analysis predicting pain catastrophizing based on pain metaphorical perception and resilience

Variables	Non- standardized	Dependent variable: Pain catastrophizing	T	Sig
Fixed number of pain metaphorical perception	2.28	-	4.89	0.001
Object	0.12	0.01	0.25	0.001
Force	0.14	0.02	0.21	0.001
Human	0.10	0.04	0.23	0.001
Causality	0.13	0.05	0.20	0.001
Fixed number of resilience	3.16	-	5.37	0.001
Personal merit	0.54	-0.14	0.81	0.005
Negative affect	0.51	-0.15	0.85	0.001
Positive acceptance of change	0.50	-0.14	-0.76	0.003
Spiritual effects	0.57	-0.11	-0.82	0.006

Pain metaphorical perception; Adjusted R=0.55, R^2=0.084, F= 10.01
Resilience; Adjusted R=0.61, R^2=0.069, F= 8.36

Discussion

The purpose of this study was to predict pain catastrophizing based on pain metaphorical perception and resilience in cancer Patients. The main finding of this study was that there is a metaphorical perception of pain catastrophizing and resilience. Findings revealed that as pain catastrophizing increases, the metaphorical perception of pain changes, and vice versa. If pain catastrophizing increases, the resilience decreases. In confirming the relationship between pain metaphorical perception and resilience with pain catastrophizing, some studies demonstrated that pain catastrophizing is intertwined with pain metaphorical perception and resilience. This study is aligned with the studies by Zho et al. [20], Raiisi et al. [21], Míguez et al. [22], Mir Ahmadi et al. [23], Genest et al. [24], Mahmmod Noroozi et al. [25], and Bolkhari et al. [26].

The relation between pain catastrophizing and the metaphorical perception of pain is usually described in cognitive-linguistic terms as the mechanisms by which meaning is attached to experience. Still, pain catastrophizing is more associated with negative distortions and the reinforcement of threatening emotions, while metaphors are more generally associated with intelligible experiences. Studies have shown that people who describe pain through violent or devastating metaphors (pain like a knife) describe it as if something would explode, and often report higher levels of pain. This pattern shows that metaphorical language can reflect

negative cognitive processes and help shape the mental experience of pain [32]. Cognitive linguistics studies indicate that the metaphors of pain are not merely reflections of experience but also form experience [33]. Thus, hostile metaphors can reinforce the catastrophizing cycle: the description of pain as an enemy, weapon, explosion, or force makes the person feel threatened and threatening, and this heightened emotional experience reinforces catastrophizing.

Pain catastrophizing and resilience are two cognitive- emotional mechanisms that act in nearly opposite directions. Pain catastrophizing includes a scale of threat, rumination about pain, and a feeling of helplessness; it increases the intensity of perceived pain, anxiety, and disability [34]. In contrast, resilience is the ability to cope with pressure and to maintain emotional and cognitive functions in difficult situations. Studies show that when resilience is low, a person is more likely to resort to catastrophizing patterns in response to pain. The relationship between the two is described as inverse and cyclic. People with higher levels of resilience usually feel more control over experience, and they tend to be more depressed and use more effective coping strategies; these characteristics prevent the formation or continuation of pain. In contrast, catastrophizing reduces the sense of empowerment, increases the sense of threat, and erodes mental resources, thereby reducing resilience. This cycle can increase pain intensity and slow recovery. .

Conclusion

There is a significant positive correlation between pain catastrophizing and pain metaphorical perception. In other words, as pain catastrophizing increases among patients, their metaphorical perception of pain changes. Another finding was a negative correlation between resilience and pain catastrophizing. In other words, as pain catastrophizing increases in cancer Patients, the resilience and its factors decrease. Moreover, 8.4% of the variance in pain catastrophizing is explained by pain metaphorical perception, and 6.9% is explained by resilience. The present study had some limitations. We had a lot of challenges finding samples and patients with different kinds of cancer in stages 1 and 2. Due to their condition, they did not cooperate completely. Reciprocal interactions between conceptual metaphors and pain catastrophizing explain why new psychological interventions (such as language- based therapy and metaphor) attempt to change the transformative metaphors to help reduce anxiety and negative pain perception. Resilience serves as a protective factor against the negative effects of catastrophizing. While resilience is strengthened (through training in cognitive-behavioral skills, mindfulness, meaning, or social support), mindfulness intensity decreases, and improvements in indices such as pain intensity, anxiety, and daily function can be seen. Interventions that focus on resilience not only help to improve coping with pain, but also indirectly reduce pain experience by reducing anxiety.

Acknowledgment

We are grateful to all those who participated in this study.

Authors' contribution

All authors participated in designing and conducting the study. Furthermore, they read and confirmed the final version of the manuscript.

Conflict of Interest

The authors declare no conflict of interest.

Ethical Approval

All ethical principles were considered in this study. The participants were informed about the purpose of the research and its stages. They were also assured about the confidentiality of their information. The participants were free to leave the research at any time and not provide personal information other than their age. The first author is the designer, methodologist, and writer of this article, and the second and third authors assisted in data collection and analysis.

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