



Predicting Pain Catastrophizing based on Pain Anxiety Symptoms and Cognitive Flexibility in Cancer Patients

ARTICLE INFO

Article Type
Original Article

Authors

Fateme Raiisi^{1*} PhD
Hossein Raiisi² Bc
Mahdi Kolivand³ MSc

How to cite this article

Raiisi F, Raiisi H, Kolivand M. Predicting Pain Catastrophizing based on Pain Anxiety Symptoms and Cognitive Flexibility in Cancer Patients. *IJMPP*. 2022; 7(3): 772-777.

¹ Cognitive science of language, Cognitive Science. Institute for Cognitive Science Studies, Phase 4 of Pardis City, Tehran, Iran

² General Psychology, University of Alame Amini Behnamir, Mazandaran, Iran

³ Clinical Psychology, Department Islamic Azad University, Rodehen branch. Rodehen, Tehran, Iran

* Correspondence

Address: Cognitive science of language, Cognitive Science. Institute for Cognitive Science Studies, Shahid Chamran Bulv, Cognitive science Bull; Edalat Sq, Phase 4 of Pardis City, Tehran, Iran
P.O.Box: 1658344575
Tel: 0098 21 76291130
Fax: 0098 21 76291140
E-mail: elhamaraiisi@gmail.com

Article History

Received: May 23, 2022
Accepted: Jun 20, 2022
ePublished: Jun 30, 2022

ABSTRACT

Aims: The purpose of this study was to investigate the prediction of pain catastrophizing based on pain anxiety symptoms and cognitive flexibility in cancer patients

Method and Materials: In this cross-sectional study all cancer patients in Tehran in 2021-22 were the target population. Among this population 250 cancer patients were selected via candidate and at reach sampling method. Then the selected patients completed the Paknejad et al.'s Pain Anxiety Symptoms (2014), Sullivan et al.'s Pain Catastrophizing Pain (1995), and Dennis et al.'s (2010) Cognitive Flexibility Questionnaire. For data analysis, Pearson correlation and step by step regression analysis were used. Data were analyzed by SPSS-24.

Findings: There was a relationship between cognitive flexibility and pain anxiety symptoms with pain catastrophizing ($P < 0.01$). The relationship between pain catastrophizing with pain anxiety symptoms was positive. However, there was a negative relationship between pain catastrophizing and cognitive flexibility. Moreover, catastrophizing pain could be predicted based on anxiety symptoms and cognitive flexibility.

Conclusion: To conclude, it seems in cancer patients some cognitive factors have important roles in pain catastrophizing as pain anxiety symptoms and cognitive flexibility.

Keywords: Cognitive Flexibility, Pain Anxiety Symptoms, Pain Catastrophizing, Cancer Patients.

Introduction

Pain is a suffering condition that can depend on psychological factors^[1,2], including personal^[3], and mental and cognitive factors^[4], and can be expressed in various ways^[5]. In another word cognitive factors play a major role in the expectancy and appraisal of pain^[6]. Pain catastrophizing as a cognitive variable refers to beliefs about pain and pain catastrophizing is characterized by cognitive-emotional regulation, pain worry, rumination, behavioral inhibition and activation about pain, and sensitivity to pain signs^[7]. According to appraisal theory, due to kinds of pain, our attention and information processing is changed^[8]. Studies indicated that there is a close relationship between neural pathways, cognitive and pain processing in healthy and

none healthy people^[9]. There are high correlations between pain catastrophizing and its psycho-affective correlates of fear of pain and anxiety sensitivity. Finally catastrophizing of pain provides conditions that lead to the development or treatment of different kinds of pain^[10]. Cognitive flexibility plays an important role in predicting different kinds of pain and its consequences, including pain anxiety^[11]. Cognitive flexibility refers to controlling difficult situations, multiple explanations for life events, and the ability to create multiple solutions for difficult situations^[12]. According to the theory of cognitive flexibility our learning depends on our context^[13]. In another word cognitive flexibility is a kind of executive function. Executive function is regulated in the prefrontal cortex and

anxiety impairs this region of the brain [14]. As a result pain and its anxiety can impair cognitive flexibility and learning [11].

It has been argued that many chronic kinds of pain are related to anxiety symptoms. Even, pain anxiety leads to unpleasant consequences and makes the disease worse [15]. Prevalence of anxiety is current in cancer patients. The pain anxiety symptoms interfere with chemotherapy and radiation therapy [16] and severe anxiety about these treatments may lead to withdrawal because high anxiety about the pain and consequences of treatment causes a lot of fatigue and strengthens the cessation of treatment [17].

Many studies have proven the correlation between pain and psychological variables. For example, a study showed, that anxiety about pain and its symptoms are related to psychological constructs such as pain perception and mental pain [18]. Another study indicated the correlation between pain anxiety and pain catastrophizing in patients with COVID-19 [19]. A systematic review showed; significant positive correlations with pain anxiety, pain catastrophizing subscales, and fear of pain in children and adolescents with chronic pain [20]. Pathways mediate the role of pain catastrophizing between anxiety and post-concussion symptoms among patients with mild traumatic brains [21]. A study demonstrated that lower cognitive performance was associated with higher pain severity, pain depression, pain anxiety, negative affect, alexithymia, and pain catastrophizing [22].

In this study, in addition to the psychological factors involved in pain and its extent, cognitive factors are emphasized. Because research has shown that physical pain can be catastrophic under the influence of mental and cognitive factors [7]. Most studies on pain focus on the psychological aspects of pain and less on the cognitive or mental aspects. Such studies draw researchers' attention

to the importance of cognitive factors in the processing and interpretation of pain and thus facilitate diagnosis and treatment. Based on this claim the purpose of this study was to assess the relationship between pain anxiety symptoms and cognitive flexibility in cancer patients with pain catastrophizing.

Method and Materials

In this cross-sectional study all cancer patients in Tehran in 2021-22 were the target population. Via candidate and at reach sampling method 250 cancer patients completed the online questionnaires of this study via Telegram WhatsApp and Email. Then, data were analyzed by SPSS-24. The tools of this study included as following.

Demographic questionnaire included questionnaire regarding age, gender, kind of pain, marriage status, academic level, duration of illness, and so on.

Pain Anxiety Symptoms Scale: This scale was developed by Paknejad et al. and it has 40 items. Scoring is in the form of 6-point Likert. In the Iranian sample, exploratory factor analysis demonstrated 3 factors avoidance-escape, fear of pain, and physical symptoms. The correlation analysis with the TSK scale, PCS, scales of DASS-21, pain self-efficacy beliefs, and pain behavior questionnaire showed the convergent and divergent validity [23].

Pain Catastrophizing Scale: This scale was designed by Sullivan et al. This questionnaire has 13 items. This questionnaire is based on the Likert scale, which is scored from 1 to 5. Scores range from 13 to 65. It has three subscales; (a) rumination, (b) magnification, and (c) helplessness. In Sullivan et al.'s study, mental rumination accounted for 41% of the total variance, magnification for 10% of the total variance, and helplessness for 8% of total variance [24]. In Iran, the alpha coefficient for the subscales of mental rumination, magnification, and helplessness

was 0.87, 0.60, and 0.79, respectively, and the total score of the Pain Catastrophizing Scale was 0.87^[25].

Cognitive Flexibility Questionnaire: This questionnaire was invented by Dennis et al. This questionnaire has 20 items. This questionnaire is based on the Likert scale, which is scored from 1 to 7. It has two subscales; problem-solving process and perception of controllability. Dennis et al. reported the internal consistency of this questionnaire using Cronbach’s alpha method for the whole questionnaire, perception of controllability, and problem-solving process; 0.91, 0.91, and 0.84, and they obtained 0.81, 0.77, and 0.75 respectively by retest method ^[26]. In Iran, the internal consistency of the total score of this questionnaire and its two factors, problem-solving process and perception of controllability, were obtained at 0.893 and 0.779 and 0.81 respectively ^[27].

Findings

In this study, 250 cancer patients (143 females and 107 males) participated. The mean age of participants was 46.09 years old (SD=6.25). The mean and standard deviation of patients’ responses to research variables and correlational results are presented in Table 1. Accordingly, there is the relationship between pain catastrophizing and cognitive flexibility is negative. But the relationship between pain catastrophizing and pain anxiety symptoms are positive and significant (P0.01<). In other words, cancer patients’ pain catastrophizing

and pain anxiety symptoms has direct relationship. But the relationship between pain catastrophizing and cognitive flexibility is indirect (Table 1). As shown, the R² value obtained for cognitive flexibility is (0.24). This means that 24% of the variance in the rate of pain catastrophizing can be explained by cognitive flexibility. In other words, 24% of the variance observed in the pain catastrophizing variable is justified by this variable. The observed R-value (0.63) also indicates that the present linear regression model can be used for prediction. In addition, the calculated F ratio (3.402) is at least 99% significant at the confidence level. Therefore, it can be concluded that there is a significant correlation between the studied variable and pain catastrophizing. Furthermore, the value obtained for the pain anxiety symptoms (0.15) means that 15% of the variance of the pain catastrophizing variable can be explained by the pain anxiety symptoms. In other words, 15% of the observed scatter in the pain catastrophizing variable is justified by this variable. The observed R-value (0.82) also indicates that the present linear regression model can be used for prediction. In addition, the calculated F ratio (6.31) is at least 99% significant at the confidence level. Therefore, it can be concluded that there is a significant correlation between the studied variable and the pain catastrophizing variable, and pain catastrophizing can be predicted based on these variables. Consequently, there is sufficient evidence to support these hypotheses (Table 2).

Table 1) Statistical indicators and correlation matrix between variables

Variable	Mean	Standard deviation	Pain Catastrophizing	Cognitive Flexibility	Pain anxiety symptoms
Pain Catastrophizing	52	2.61	1		
Cognitive Flexibility	157	1.17	-0.35**	1	
Pain anxiety symptoms	171	2.84	0.64**	-0.51**	1

(**) Significance at the level of 0.01

Table 2) Regression model for predicting pain catastrophizing

Predictors	Non-standardized coefficient	Standardized coefficient	T	Sig
Cognitive Flexibility	3.26	-	2.36**	0.001
Pain anxiety symptoms	4.16	-	5.78**	0.001

Cognitive flexibility: R:0.63/ R²: 0.24/F: 5.39

Pain anxiety symptoms: R: 0.82/ R²: 0.15/ F: 6.31

Discussion

The purpose of this study was to predict pain catastrophizing based on pain anxiety symptoms and cognitive flexibility in cancer patients. Accordingly, the results showed that there is a significant relationship between cognitive flexibility and Pain anxiety symptoms with the pain catastrophizing in cancer patients. The relationship between pain catastrophizing with pain anxiety symptoms is positive and cognitive flexibility is negative. This hypothesis was tested by Pearson correlation analysis and showed that these relationships are significant. Therefore, there is sufficient evidence to support this assumption. The results of this study are almost consistent with the studies of Raiisi et al. [18], Ghasemi et al.[19], and Fisher et al. [20]. In explaining this finding, we can say that mental and cognitive factors always play a role in perceiving pain. In other words, in many incurable diseases, pain is exaggerated. One type of pain exaggeration is catastrophic pain [28]. The experience of pain being catastrophic has a complex cognitive process. Catastrophic pain can challenge a patient’s cognitive flexibility and lead to symptoms of psychological pathology such as anxiety [29]. Therefore, it is an intertwined process.

Another finding of this study indicated that catastrophizing pain can be predicted based on anxiety symptoms and cognitive flexibility. This hypothesis was tested by step by step regression analysis and showed that this prediction is significant.

Therefore, there is sufficient evidence to support this assumption. The results of this study are almost consistent with the studies of Raiisi et al.[18], Greenberg[21] and Galvez-Sánchez et al.[22]. In explaining this finding, we can say; that catastrophizing of pain is accompanied by mental rumination and a feeling of helplessness from the pain that leads to pain magnification. This process may exacerbate physical pain and the patient may avoid or avoid aggressive treatment. Because of cognitive factors, patients lose the power to control pain and cannot solve this problem [30]. There were several limitations of the study, the most important of which was the lack of cooperation of cancer patients and the cross-sectional nature of this study. Therefore, in future studies, it is suggested that researchers address cognitive variables and cognitive interventions in pain.

Conclusion

There is a relationship between cognitive flexibility and pain anxiety symptoms with pain catastrophizing. The relationship between pain catastrophizing with pain anxiety symptoms is positive but the relationship between pain catastrophizing and cognitive flexibility is negative. To conclude, it seems in cancer patients some cognitive factors have important roles in pain catastrophizing as well as pain anxiety symptoms and cognitive flexibility

Acknowledgments: The author hereby announces her gratitude and appreciation to all participants who contribute to this study.

Authors' Contribution: FR (corresponding author) was principal author and helped in writing introduction and discussion as well as methodology designing and statistical analysis. HR helped in introduction writing and MK, contributed to sampling.

Conflicts of Interests: There is no conflict of interest for this study.

Ethical Permission: In this study, all ethical principles were respected. Written consent was obtained from all participants.

Funding/Support: no financial support.

References

1. Tehranizadeh M, Raiisi F. The Relationships between Depression, Pain Self-Efficacy, Physical Disability, and Chronic Pain. *IJMPP*.2020;5(3):373-379. <http://ijmpp.modares.ac.ir/article-32-45078-en.html>.
2. Raiisi F, Amini F, Khani MM. Investigating the relationship between Skeletal-muscular Pains and Quality of Life among Nursing and Midwifery Students. *IJMPP*.2020;5(2):336-343. Corpus ID: 221755429.
3. Amini F, Raiisi F. The Relationship between Musculoskeletal Pain and Demographic Variables in Nursing and Midwifery Students. *IJMPP*. 2019;4(4):256-262.
4. Khera T, Rangasamy V. Cognition and Pain: A Review. *Front Psychol*. 2021; 21;12:673962. doi:10.3389/fpsyg.2021.673962.
5. Raiisi F. Conceptual Metaphors of Pain in Persian: A Cognitive Analysis. *IJMPP*. 2021;6(2): 496-501. <http://ijmpp.modares.ac.ir/article-32-50132-en.html>.
6. Bustan S, Gonzalez-Roldan AM, Schommer C, Kamping S, Löffler M, Brunner M, et al. Psychological, cognitive factors and contextual influences in pain and pain-related suffering as revealed by a combined qualitative and quantitative assessment approach. *PLoS ONE*, 2018; 13(7):e0199814. <https://doi.org/10.1371/journal.pone.0199814>.
7. Petrini L, Arendt-Nielsen L. Understanding Pain Catastrophizing: Putting Pieces Together. *Front Psychol*. 2020;16;11:603420. DOI: 10.3389/fpsyg.2020.603420.
8. Mahmoodi-Aghdam M, Dehghani M, Ahmadi M, Khorrami Banaraki A, Khatibi A. Chronic Pain and Selective Attention to Pain Arousing Daily Activity Pictures: Evidence From an Eye-Tracking Study. *Basic Clin Neurosci*.. 2017;8(6):467-478. Doi: 10.29252/nirp.bcn.8.6.467
9. Lee J, Ahn SW, Wachholtz A, Lee JH. Attentional Patterns Toward Pain-Related Information: Comparison Between Chronic Pain Patients and Non-pain Control Group. *Front Psychol*. 2020; 5;11:1990. doi:10.3389/fpsyg.2020.01990.
10. Burri A, Ogata S, Rice D, Williams F. Pain catastrophizing, neuroticism, fear of pain, and anxiety: Defining the genetic and environmental factors in a sample of female twins. *PLoS ONE*, 2018;13(3):e0194562. <https://doi.org/10.1371/journal.pone.0194562>.
11. Aghayousefi A, Tarkhan M, Mohammadi N, Afshar H. The Role of Psychological Inflexibility and Pain Acceptance in Predicting Resiliency in Chronic Pain Patients. *J. Health Psychol*.,2017;5(17):23-38. https://hpj.journals.pnu.ac.ir/article_3364.html?lang=en.
12. Carvalho AA, Moreira A. Criss-crossing Cognitive Flexibility Theory based research in Portugal: an overview. *Digit. Educ. Rev.*, 2005;1-26. <http://www.ub.es/multimedia/iem>.
13. Feng X, Perceval GJ, Feng W, Feng C. High cognitive flexibility learners perform better in probabilistic rule learning. *Front. Psychol.*, 2020;11,415. <https://doi.org/10.3389/fpsyg.2020.00415>.
14. Park J, Moghaddam B. Impact of anxiety on prefrontal cortex encoding of cognitive flexibility. *Neurosci*..2017;14; 345:193-202. DOI: 10.1016/j.neuroscience.2016.06.013.
15. Gómez Penedo JM, Rubel JA, Blättler L, Schmidt SJ, Stewart J, Egloff N, Grosse Holtforth M. The Complex Interplay of Pain, Depression, and Anxiety Symptoms in Patients With Chronic Pain: A Network Approach. *Clin J Pain*.2020;36(4):249-259.doi: 10.1097/AJP.0000000000000797.
16. Muscat P, Weinman J, Farrugia E, Callus R, Chilcot J. Illness perceptions predict distress in patients with chronic kidney disease. *BMC Psychol*, 2021;9,75. <https://doi.org/10.1186/s40359-021-00572-z>.
17. Schreier AM, Johnson LA, Vohra NA, Muzaffar M, Kyle B. Post-Treatment Symptoms of Pain, Anxiety, Sleep Disturbance, and Fatigue in Breast Cancer Survivors. *Pain Manag Nurs*. 2019;20(2):146-151.doi:10.1016/j.pmn.2018.09.005.
18. Raiisi F, Reyhaninejad kafi Z, Rahmani R. Predicting Pain Anxiety Symptoms based on Pain Perception with the mediating role of Mental Pain in Musculoskeletal Patients. *IJMPP*. 2022;7(2):702-707. URL: <http://ijmpp.modares.ac.ir/article-32-59518-en.html>.
19. Ghasemi M, Behnaz F, Hassanzad N, Taheri F. Evaluating the Relationship Between Depression and Pain Anxiety with Pain Catastrophizing in Patients with COVID-19. *Anesth Pain Med*. 2022; 4;12(1):e119354. DOI: 10.5812/aapm.119354.
20. Fisher E, Heathcote LC, Eccleston C, Simons LE,

- Palermo TM. Assessment of Pain Anxiety, Pain Catastrophizing, and Fear of Pain in Children and Adolescents With Chronic Pain: A Systematic Review and Meta-Analysis. *J Pediatr Psychol.* 2018;43(3):314-325.doi: 10.1093/jpepsy/jsx103.
21. Greenberg J, Mace RA, Funes CJ, Silverberg ND, Iverson GL, Caplan DN, Vranceanu AM. Pain Catastrophizing and Limiting Behavior Mediate the Association Between Anxiety and Postconcussion Symptoms. *Psychosomatics.* 2020;61(1):49-55. doi: 10.1016/j.psym.2019.09.004.
 22. Galvez-Sánchez CM, Reyes Del Paso GA, Duschek S. Cognitive Impairments in Fibromyalgia Syndrome: Associations with Positive and Negative Affect, Alexithymia, Pain Catastrophizing, and Self-Esteem. *Front Psychol.* 2018;22;9:377. doi: 10.3389/fpsyg.2018.00377.
 23. Paknejad M, Asghari A, Rahiminezhad A, Rostami R, Taheri A. Factorial Structure and Psychometric Properties of the Pain Anxiety Symptoms Scale (PASS-20). *Appl. Psychol. Res. J.*, 2014, 5(3):71-94. Doi: 10.22059/JAPR.2014.52307. [In Persian].
 24. Sullivan MJL, Bishop SR, Pivik J. The Pain Catastrophizing Scale: Development and validation. *Psychol. Assess.*, 1995;7(4):524-532. <https://doi.org/10.1037/1040-3590.7.4.524>
 25. Taherizadeh S, Samari A, Ahi G. Structural modeling of pain perception in people with chronic pain syndrome based on behavioral inhibition system: mediated by pain catastrophe and perceived social support. *JAP.* 2021;12(2):19-31. URL: <http://jap.iums.ac.ir/article-1-5574-en.html>. [In Persian].
 26. Dennis JP, Vander Wall JS. The Cognitive Flexibility Inventory. Instrument Development and Estimates of Reliability and Validity. *Cogn Ther Res.* 2010;34(3):241-253. DOI: 10.1007/s10608-009-9276-4.
 27. Kohandani M, Abolmaali Alhosseini K. Factor structure and psychometric properties of Persian version of cognitive flexibility of Dennis, Vander Wal and Jillon. *Journal of Psychological Methods and Models.* 2017;8(29):53-70. http://jpm.miau.ac.ir/article_2556.html?lang=en.
 28. Curatolo M, La Bianca G, Cosentino G, Baschi R, Salemi G, Talotta R, Romano M, Triolo G, De Tommaso M, Fierro B, Brighina F. Motor cortex tRNS improves pain, affective and cognitive impairment in patients with fibromyalgia: preliminary results of a randomised sham-controlled trial. *Clin Exp Rheumatol.* 2017;35 Suppl 105(3):100-105. PMID: 28681715.
 29. Hechler T, Endres D, Thorwart A. Why Harmless Sensations Might Hurt in Individuals with Chronic Pain: About Heightened Prediction and Perception of Pain in the Mind. *Front Psychol.* 2016, 25, 7:1638. doi: 10.3389/fpsyg.2016.01638.
 30. khodapanah M, taghiloo S, golshani F, baghdasarians A. The relationship between chronic pain and pain catastrophizing with body mass index: The mediating role of eating behaviors. *J Appl Psychol.*, 2020; 14(3): 312-291. doi: 10.52547/apsy.2021.216317.0.