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RESEARCH ARTICLE

THE MODERATOR ROLE OF PAIN DURATION IN RELATION BETWEEN PAIN CATASTROPHIZING AND PAIN INTENSITY

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ABSTRACT

Purpose: Pain catastrophizing is one of the most important factors contributing to pain experience and duration of action. This study aimed to explore the moderator role of pain duration in the hypothetical relation between pain catastrophizing and pain intensity in patients with chronic musculoskeletal pain syndrome (CMPS).
Material and Methods: Seven hundred and eight patients with CMPS (mean age: 28.52 ± 7.75 years) participated in this cross-sectional and descriptive study. The pain intensity and catastrophizing of the patients was assessed with the Visual Analog Scale (VAS) and Pain Catastrophizing Scale (PCS), respectively. The time elapsed since the participants' first experience of pain (number of days) was recorded as pain duration.
Results: There was a positive correlation between pain duration ($r=0.181$, $p<0.001$), pain intensity ($r=0.432$, $p<0.001$) and total score of pain catastrophizing. According to univariate and multivariate regression analysis, pain duration adjusting for pain catastrophizing maintained its predictor effect on pain intensity ($p<0.001$). According to hierarchical model, the effect of pain catastrophizing on pain intensity was 44.7%, its effect increases to 48.5% adding pain duration.
Conclusion: The results of this study supports that pain duration has no critical effect on the relation between pain catastrophization to pain intensity in patients with CMPS.

Keywords: Pain catastrophizing, musculoskeletal pain, pain duration, moderator

INTRODUCTION

One of the common symptoms of musculoskeletal disorders is pain. Chronic musculoskeletal pain syndrome (CMPS) which has a quite high lifetime prevalance, is an indicator for the intensity of the underlying musculoskeletal disorders (1). Although the presence and duration of CMPS are associated with biopsychosocial, physical, and environmental factors, the factors contributing to the high prevalence and duration of action of CMPS remain unclear (2,3).

Pain catastrophizing, defined as an emotional response to anticipated or actual pain, has attracted much more attention in the last two decades (4-6). Pain catastrophizing has a multidimensional structure that consists of three aspects (magnification, rumination, and helplessness) (7). Magnification is defined as exaggeration of pain

intensity and threat, rumination is the cognitive process that focuses on pain and its effects, and helplessness is the belief that people with pain cannot cope with itAccording to many chronic pain models, pain catastrophizing has an essential role in the initiation and chronification of pain (8). The contribution of pain catastrophizing on pain intensity are conflicting (9-12). It has been reported that the higher the catastrophication of pain, the lower the pain threshold and the higher the pain intensity, but the mechanism of action is not clear (13,14).

Catastrophizing was found to be associated with pain behavior, health care use, hospital stay, and analgesic drug use. Several studies have reported that females experience more catastrophizing than males (15). Catastrophizing is correlated with increased pain experience and increases pain intensity up to 7% to 31% (16). In contrast, catastrophizing has been shown to be highly associated with disability and better predicts disability than disease-related variables or pain.13 The wide range of variance in pain ratings and the fact that catastrophizing was not predicts pain as good as disability suggested that there may be moderator variable between pain catastrophizing and pain (17). Chronic pain sufferers often have both high pain intensity and pain duration. In addition, it has been reported that high pain frequency can alter pain modulation (18). Therefore, we thought that the moderator variable might be the duration of pain. In the light of our hypothesis, the aim of current study was to examine the moderator role of pain duration in the hypothetical relationship between catastrophizing pain (with its sub-dimensions) and pain intensity in female patients with CMPS.

MATERIAL AND METHODS

Study Design

In this cross-sectional study, data were collected with an online survey database (Google Forms). The survey access link was shared at regular weekly intervals from the social media (facebook Denizli female's group). Access time to the survey database was 6 weeks. Personal informations such as name and e-mail address were not collected.

The research has been approved by Pamukkale University Non-Interventional Clinical Research Ethics Committee (Date: 13.04.2021, Number: 08) and performed in accordance with the Helsinki Declaration. Online informed consent was obtained from all participants prior to access study assessment form.

Participants

The study inclusion criteria were as follows: being a female, living in Denizli, being age between 18 and 45 years, being literate and have social media access, having musculoskeletal pain for at least 3 months, not receiving psychotherapy and not using heavy psychiatric drugs, not having undergone a surgical operation in the past year, not having a diagnosis of serious metabolic, orthopedic and neurological disease. A total of 900 patients assessed for eligibility. Ninety patients excluded because of not meeting the inclussion criteria (n=192). Finally, 708 patients were included into this study.

Data Collection

Demographic information of participants were recorded. The time elapsed since the participants' first experience of pain was recorded as days. This data was used to determine the pain duration. Pain intensity was assessed by the Visual Analog Scale (VAS), and the catastrophic behavior was assessed by the Pain Catastrophic Scale (PCS). This scale was developed by Sullivan et al (4) to investigate the effective catastrophic factors in the mechanism of pain. There are 13 questions in this scale and can be filled by patients in less than five minutes. Patients score the items between 0 and 4, considering their previous pain experiences and other factors associated with pain. Of these items, 8th, 9th, 10th, 11th items were rumination; 6th, 7th, 13th items magnification; 1st, 2nd, 3rd, 4th, 5th and 12th items were about the helplessness dimension (19).

Statistical Analysis

Data were analyzed by Statistical Package for the Social Sciences. Continuous variables were presented as mean ± standard deviation and median (maximum and minimum). The conformity of continuous variables to normal distribution was tested with the Shapiro-Wilk test. Spearman Correlation Coefficient was used to determine the relation between pain catastrophizing and pain intensity and duration. Hierarchical regression analysis was used to examine the moderator role of pain duration. Hierarchical multiple regression analyses were performed with the processing steps.

Table 1. Descriptive data of participants

Variables	Mean ± SD	Median (Min-Max)
Age (year)	28.52 ± 7.75	18-45 (25)
BMI	23.4 ± 4.31	14,84-51,07 (22,09)
Years of education	13.66 ± 3.15	5-21 (15)
Pain Intensity (VAS)	4.87 ± 1.8	0.62-10 (4.8)
Pain Duration (days)	457.19 ± 677.13	2-4680 (180)
PCS	21.89 ± 10.71	0-52 (20)
Rumination	6.65 ± 4.61	0-29 (6)
Magnification	5.92 ± 2.65	0-12 (6)
Helplessness	10.19 ± 5.2	0-24 (10)

SD: Standart Deviation; PCS: Pain Catastrophizing Scale; VAS: Visual Analog Scale; BMI: Body Mass Index

In the first step univariate regression analyses was done. Second step is the multivariate regression analyses of all variables. The third step is the analysis of adding pain catastrophizing to the relation between pain duration and pain intensity, or adding pain catastrophizing to the relation between pain intensity and pain duration. A p value was set at ≤ 0.05 level.

RESULTS

Seven hundred and eight female patients (the mean age of 28.52 ± 7.75) were included into this study. Descriptive data of patients were shown in Table 1.

The correlation between pain catastrophizing, pain intensity and pain duration was shown in Table 2. Pain duration showed weak and significant association with the total score of pain catastrophizing ($r=0.181$, $p<0.001$) and sub-dimensions of rumination ($r=0.149$, $p<0.01$) and helplessness ($r=0.262$, $p<0.001$). VAS score showed a moderate and significant association with the total score of pain catastrophizing ($r=0.432$, $p<0.001$), and helplessness ($r=0.44$, $p<0.001$). VAS score showed a weak and significant association with the sub-dimensions of rumination ($r=0.351$, $p<0.001$) and magnification ($r=0.273$, $p<0.001$). Pain duration ($b=0.261$, $p<0.001$) and pain catastrophizing ($b=0.451$, $p<0.001$) made significant contributions to the prediction of pain intensity. Once pain catastrophizing was controlled, pain duration significantly contribute to the prediction of pain intensity ($b=0.192$, $p<0.001$) (Table 3).

According to hierarchical model 1, the effect of pain duration on pain intensity was 26.1%. When pain catastrophizing was added to the the second step, this effect increased up to 48.5%. According to hierarchical model 2, the effect of pain catastrophizing on pain intensity was 44.7%. When pain duration was added to the second step, this effect increased up to 48.5% (Table 4). As a result, pain duration did not moderate the association between pain catastrophizing and pain intensity.

DISCUSSION

This study aimed to identify the moderator role of pain duration in the hypothetical relation between pain catastrophizing and pain intensity in patients with CMPS. Both pain duration and pain catastrophizing predicts pain intensity. Once pain catastrophizing was controlled, pain duration

Table 2. Correlation analysis chart

Variables		Pain Duration	Pain Intensity
PCS	**r**	0.181	0.432
	p	**<0.001**	**<0.001**
Rumination	**r**	0.149	0.351
	p	**0.037**	**<0.001**
Magnification	**r**	0.100	0.273
	p	0.165	**<0.001**
Helplessness	**r**	0.262	0.44
	p	**<0.001**	**<0.001**

PCS: Pain Catastrophizing Scale

Table 3. Univariate and multivariate regression analysis results

	Univariate Regression					Multivariate Regression				
DV: Pain Intensity	**β**	**t**	**p**	**95% C.I. Lower**	**95% C.I. Upper**	**β**	**t**	**p**	**95% C.I. Lower**	**95% C.I. Upper**
Pain Duration	0.192	50.176	**<0.001**	0.000	0.001	0.261	6.451	**<0.001**	0.000	0.001
PCS	0.415	110.166	**<0.001**	0.058	0.082	0.451	12.06	**<0.001**	0.064	0.088

DV: Dependent Variable; Std Beta: Standart Beta; C.I.: Confidence Interval; Pain Catastrophizing Scale

Table 4. Results of hierarchical regression analysis

DV: Pain Intensity		**Independent**	**β**	**t**	**p**	**%95 C.I. Lower**	**%95 C.I. Upper**	**R^2**
Hierarchical model 1	**Step 1**	**Pain Duration**	0.261	6.451	**<0.001**	0.000	0.001	0.261
	Step 2	**Pain Duration**	0.192	5.176	**<0.001**	0.000	0.001	0.485
		Pain Catatstrophizing	0.415	11.166	**<0.001**	0.058	0.082	
Hierarchical model 2	**Step 1**	**Pain Catatstrophizing**	0.447	11.921	**<0.001**	0.063	0.088	0.447
	Step 2	**Pain Catatstrophizing**	0.415	11.166	**<0.001**	0.058	0.082	0.485
		Pain Duration	0.192	5.176	**<0.001**	0.000	0.001	

DV: Dependent Variable; Std Beta: Standart Beta; C.I.: Confidence Interval

maintained a predictor effect on pain intensity. According to hierarchical analyses, pain duration did not moderate the association between pain catastrophizing and pain intensity in patients with CMPS.

The duration of past pain experience indicates how long participants have lived with pain. We hypothesized that the time that the participants have lived with pain may explain the contribution of pain catastrophizing to reported pain levels. Consistent with the study hypotheses, both pain duration and pain catastrophizing predicted pain intensity in our sample. The relationship between catastrophizing and pain was examined by considering many different control variables (20,21). According to the results, catastrophic thinking and depression were statistically significant predictors of pain intensity. Other control variables such as age, culture, ethnicity, literacy level, socio-economic status and pain frequency are pivotal to understanding the multifactorial structure of the pain. The other mentioned before should be evaluated to conclude the variables that contribute this association.

The association between pain intensity and pain catastrophizing was found weak at the current study and concluded that pain duration does not moderate the mentioned association. Increased activity in the anterior cingulate cortex and insula and decreased activity in the prefrontal areas are related to pain catatstrophizing (22). This is called central sensitization of pain. Due to central sensitization, pain is no longer dependent on the presence or duration of harmful environmental stimuli. (23). According to this mechanism, it is possible that the pain duration did not play a moderator role in the association between pain intensity and catastrophizing. And also, based on cross-sectional studies, it is not possible to prove whether the pain duration leads to catastrophizing pain, but once activated, this cycle may reinforce each other. Such activation integrates all aspects of pain and facilitates cingulate cortex (24). Since there is no validated scale assessing the duration of pain, the authors of current study prefered to question with the time elapsed since participants' first experience of pain. Considering that it is difficult for the participants to remember their past pain experiences, more objective data could be obtained if the number of painful days in the last 1 year were questioned. Cano et al evaluated pain duration as the time elapsed from the first experience of pain and concluded that the interaction between pain duration and catastrophizing was important for perceived willing partner responses, but not for pain intensity (25). Kjøgx et al revealed that the pain frequency is the moderator in the relationship between pain and catastrophizing (26). In this study, not only the duration of the pain, but also the frequency of the pain, how many days the pain lasted on average, and how many days they felt pain in the last one month were questioned. Considering that pain should be evaluated in multiple ways, it may be a more accurate approach to evaluate the frequency of pain with these parameters.

Other contributing factors related to this association such as pain type, pain localization, psychosocial status, age, etc were not analyzed in this study. The limitation of this study is that other contributing factors could be analyzed to eliminate the confounding factors for this association between pain and catastrophizing. Also collected data with an online survey database and we could not prevent the same person from filling out the form twice. This issue was a handicap for the authors to distinguish between data duplication.

CONCLUSION

In conclusion, this study supports that the duration of pain is a predictor, but not a moderator, in the relation between pain catastrophizing and pain intensity in patients with CMPS. Control variables other than pain duration that contribute to this relation should be clarified in future studies.

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