

Pain Catastrophizing, Depression and Their Impact on Pain Intensity

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Abstract: The objective of the study was to examine the relationship between catastrophizing and depression and their impact on pain severity in patients with orthopedic conditions. Pain Catastrophizing Scale (PCS), the Depression subscale of the Depression Anxiety Stress Scale 21 (DASS21-D) and the Numerical Rating Scale (NRS) were administered to 104 patients of an outpatient orthopedic clinic. In addition, 65 healthy individuals from the community, matched for age and gender, were used as a control group. PCS assesses pain catastrophizing, DASS21-D assesses depression symptomatology and NRS assesses pain severity. Multiple regression analyses, covarying for age and gender were used to estimate the predictive role of catastrophizing and depression on pain severity. Both catastrophic thinking and depression were statistically significant predictors of pain intensity. The PCS Helplessness subscale was found to be the strongest predictor.

Keywords: catastrophizing, depression, pain intensity, cognitive-behavioral therapy.

I. INTRODUCTION

Cognitive – Behavioral Therapy (CBT) posits that catastrophizing represents a cognitive distortion reflecting a person's tendency to assume the worst in a situation ^[1]. In the context of pain, in particular, catastrophizing has been defined by Sullivan (2001) as “an exaggerated negative mental set brought to bear during actual or anticipated painful experience” ^[2]

Cognitive-Behavioral Therapy has been described as the “gold standard” psychological intervention for patients with multiple pain problems” ^[3]. CBT efficacy has been assessed in many pain conditions such as back pain ^[4], arthritis ^[5] and fibromyalgia ^[6]. Vlaeyen & Linton (2000) proposed a cognitive behavioral model for pain, known as the fear avoidance model, in which catastrophizing is conceptualized as a highly important variable ^[7].

Catastrophizing is closely linked to greater pain intensity in clinical pain settings, as well as in healthy individuals participating in experimental pain environments, and it often leads to heightened pain experience. For instance, in chronic pain after spinal cord injury, catastrophizing has been found to account for 29% of the variance in pain intensity ^[8]. Furthermore, in patients with Osteoarthritis of the knee catastrophizing has been significantly linked to pain and could explain about 10% of pain variance ^[9]. Research on rheumatoid arthritis patients has shown that high scores on catastrophizing are positively related to pain intensity ratings ^[10], while research with patients who had undergone breast cancer surgery, showed that the intensity of pain experienced by patients was dependent on the degree of their catastrophizing, thus leading to the use of more analgesic medication ^[11]. Moreover, in cases of post-herpetic neuralgia, catastrophizing predicts the level of pain as long as 8 weeks after the cessation of treatment ^[12].

Neuroimaging studies suggest the presence of a strong link between catastrophizing about pain and increased activity in certain brain areas that influence pain perception ^[13]. A link between pain catastrophizing and the intensity of pain has also occurred after the employment of electrical median nerve stimulation in healthy individuals ^[14]. Finally, it is worth mentioning the findings of Weissman et al. (2008), according to which catastrophizing is associated with sensitivity to experimental multi-modal induced pain ^[15].

Despite the controversy about the dimension of causality between depression and pain^[12, 16], several studies have demonstrated the significant role of depression in pain conditions^[17-19]. The prevalence of depression in patients with pain conditions ranges from 5% to 85% and is associated with poorer treatment outcomes^[20]. Depression is also linked with greater pain intensity and more pain behaviors^[12], longer hospitalization^[21], and also predicts the onset of episodes of intense low back pain^[23].

Further research has demonstrated a link between catastrophizing and depression^[2, 10, 23, 24]. Patients exhibiting high ratings of catastrophizing also report higher ratings of pain intensity and higher levels of depression^[10]. Patients with frequent catastrophizing cognitions have also suffered higher levels of depression^[2]. A study in patients with chronic pain showed that severe depressive symptoms correlated with heightened catastrophizing^[23], while research on patients who had undergone amputation indicates that the existence of catastrophizing predicted depression to a significant degree^[24].

Although catastrophizing used to be regarded as simply a manifestation of depression^[25], later research has revealed that it is actually an independent entity^[26, 27].

In our study, we sought to assess the relationship among three different aspects of pain catastrophizing (rumination, magnification, and helplessness), depression, and their impact on pain intensity in a sample of patients with orthopedic problems.

II. BODY OF ARTICLE

Methods:

Subjects:

Participants of the study were 104 patients who visited an outpatient orthopedic clinic of a general hospital in Greece and 65 healthy individuals. The first group consisted of 55% female; mean age was 46 years (SD= 14.94). In the second group 58.5% were female; mean age was 46.4 years (SD= 15.16). The study was approved by the ethics committee of the hospital.

Measures:

Pain severity:

The 11-point Numerical Rating Scale^[28] was used for the assessment of pain severity. Patients were asked to rate their current pain intensity by circling a number between 0 (no pain) and 10 (extreme pain).

Depression:

For the assessment of depression, we used the depression subscale of the Greek version of Depression Anxiety Stress Scale 21^[29]. The DASS21-D is a seven item self report measure assessing depressive symptomatology. Participants are asked to rate how often they have experienced each symptom over the past week on a scale from 0 (not at all) to 3 (most of the time). The application of DASS- D in a Greek population showed good reliability (Cronbach's alpha = 0, 94)^[29].

Pain Catastrophizing:

Catastrophizing was measured by the Greek version of the original Pain Catastrophizing Scale^[30]. PCS is a 13-item instrument; each item is rated on a 5-point scale from 0 (not at all) to 4 (all the time). Respondents are asked to reflect on a past painful experience and report the degree to which they have experienced each of the 13 PCS thoughts and feelings when experiencing pain. PCS is comprised of three distinct subscales that assess three types of negative thinking in relation to pain: rumination, magnification and helplessness. Two of the authors (L.S. & G.S.) adapted PCS into Greek by a translation – back translation process. Coefficient alphas of the original PCS were: 0.87 for total PCS, 0.87 for rumination, 0.66 for magnification, and 0.78 for helplessness.

Alphas in our study were 0.94, 0.90, 0.76, and 0.89, respectively.

Statistical Analysis:

A Multivariate analysis of covariance (MANCOVA) was conducted to compare the two groups for pain catastrophizing, entering age and gender as covariates. A second MANCOVA was conducted to compare male and female patients for

pain severity, depression and the three PCS subscales (rumination, magnification, and helplessness), entering age as a covariate. Bivariate correlational analyses were also used for age, pain catastrophizing, depression, and pain severity in the patient group. In a multiple stepwise linear regression analysis for patients, pain intensity was used as the independent variable, while age, DASS21-D and PCS subscales were entered as independent variables. (SPSS, v.22, default alpha level of .05 for entry to model and .1 for removal).

Results:

A comparison between patient and control group found no statistically significant differences in PCS and its subscales, as well as in DASS21-D (One Way ANOVA, $p < 0.05$ in all comparisons). The MANCOVA comparing patients and controls with respect to pain catastrophizing, entering age and gender as covariates, yielded no significant differences (all $ps, p > 0.35$). The MANCOVA comparing male and female patients for pain severity, depression, rumination, magnification and helplessness showed no differences between genders (all $ps, p > .2$).

Bivariate correlational analyses among age, pain catastrophizing, and depression, showed that, pain intensity correlated with pain catastrophizing ($r = 0.51, p < 0.001$), depression ($r = 0.39, p < 0.001$) and age ($r = 0.27, p < 0.05$). Age, correlated with the PCS helplessness subscale ($r = 0.22, p < 0.001$), and depression also correlated with PCS rumination ($r = 0.52, p < 0.001$), PCS magnification ($r = 0.51, p < 0.001$) and PCS helplessness ($r = 0.46, p < 0.001$) (Table 1).

Multiple stepwise linear regression analysis showed that pain catastrophizing, age and depression were significant predictors of pain severity. (Table 2, Figure 1)

Discussion:

Aim of the present study was to assess the relationships between pain catastrophizing and depression, as well as their impact on pain intensity in a sample of outpatients with orthopedic problems. We found a significant correlation between catastrophizing and pain. The helplessness dimension of catastrophizing, and depression explained a significant proportion of variance in pain intensity.

Previous research supports a strong relationship between catastrophic thinking and depression [2, 10, 23, 24]. Consistent with these findings, our results confirmed the significant correlation between the two, with depression being also positively correlated with all three of the catastrophizing subscales.

Our finding that the stronger predictor of pain intensity was the helplessness dimension of catastrophizing (accounting for the 25% of the pain intensity variance) is in line with findings of several studies that have emphasized the role of catastrophizing and depression as predictors of pain intensity [8, 9, 10, 11]. Sullivan et al. (2001), for example in their review of the relationship between catastrophizing and pain, concluded that catastrophizing can predict 7 to 31% of the variance in pain [2]. The results of our regression analysis support those of a previous study in pain [31] which suggests that in chronic pain patients, catastrophizing plays a more important role than depression in pain severity and the way patients cope with pain.

The helplessness subscale of catastrophizing was the best predictor of pain intensity. This is consistent with previous findings that suggest a strong relationship of helplessness with pain severity [32, 33, 34, 35]. Hill (1993) examined the way of patients with phantom limb pain cope with pain, and found that patients who had a helplessness attitude reported more pain and also suffered more psychological distress, than those who did not [32]. A study in patients with osteoarthritis of the knee showed similar results - helplessness was found to be an important factor in determining self-reported pain severity [6]. Similar results also suggest that in healthy individuals subjective helplessness has an independent impact in pain perception [34]. Among the three catastrophizing subscales (e.g. rumination, magnification, helplessness) helplessness was found to best predict pain experience [35].

In their article on the development of the Pain Catastrophizing Scale, Sullivan and his colleagues [30] tried also to explain the connection between helplessness and pain intensity; what they suggest is that the three different subscales of catastrophizing are linked to different appraisal processes. Helplessness may be associated with secondary processes, whereby the capacity of dealing adequately with pain is negatively appraised by individuals. In their review on the relationship between catastrophizing and pain, Sullivan et al. (2005), assert that helplessness may be the result of years of suffering from pain [35].

In our study we found no differences between patients and control subjects in levels of catastrophizing. Such a finding reflects the Sullivan et al. (2001) proposition that catastrophizing is a general phenomenon than a pain-related outcome [2]. Taking into account our finding of the significant correlation between catastrophizing and depression, and the way cognitive-behavioral model describes catastrophizing as a cognitive distortion of depression [1], one would suggest that individuals who catastrophize when in pain may also catastrophize in pain free situations.

Furthermore, we didn't find any gender differences in pain intensity or catastrophizing. Earlier studies have yielded that women score higher on measures of catastrophizing in many different conditions and report more intense pain [36, 37]. Other studies have argued that the differences in pain intensity between genders were no longer significant when controlling for catastrophizing [38, 39]. Nevertheless, concerning catastrophizing, our findings are in line with more recent studies which found no gender differences related to catastrophizing [40, 41].

When we analyzed separately male and female subjects, we found that age did not correlate with catastrophizing. Nevertheless, when we examined the relationship between age and catastrophizing in the total sample, age was found to positively correlate with the helplessness subscale of catastrophizing. This result is not in line with findings of previous studies which have suggested that catastrophizing may indeed change as a function of age but in an adverse way; higher levels of catastrophizing are associated with younger age [2]. This finding was evident in patients following breast cancer surgery [11], junior high school students [42] and patients attending a dental clinic [43]. Nevertheless, other studies report no relationship between level of pain catastrophizing and age [40, 44].

A limitation of the study may be our small sample of patients, therefore we cannot generalize our results in other populations other than individuals with orthopedic conditions. This could provide directions for future study with a larger sample in the same or different pain conditions. Moreover, we only used self-report measures to assess the variables that we studied, which may raise the probability of biases. A future study using an interview with each individual in addition to self report measures might be useful.

Table 1: Pearson's r correlation coefficients among pain severity, the three catastrophizing subscales and depression

	Depression	Rumination	Magnification	Helplessness
Pain Intensity	,39**	,41**	,42**	,54**
Depression		,52**	,51**	,46**
PCS Rumination			,70**	,78**
PCS Magnification				,71**

** . Correlation is significant at the 0.01 level (2-tailed).

Table 2: Results of the stepwise multiple linear regression analysis including age, depression scores and the three PCS subscales scores as independent variables; dependent variable was pain intensity.

Model	R	R ²	Adjust. R ²	SE of Estimate	ANOVA			Coefficients		
					F	MSe	p<	b	t	p<
Helplessness	.51	.26	.25	2.20	31.38	4.85	.0005	.51	5.60	.0005
Helplessness	.54	.29	.27	2.17	18.25	4.70	.0005	.47	5.209	.0005
Age								.18	2.016	.05
Helplessness	.57	.33	.30	2.12	14.40	4.49	0.0005	.36	3.560	.005
Age								.20	2.279	.05
Depression								.22	2.249	.05

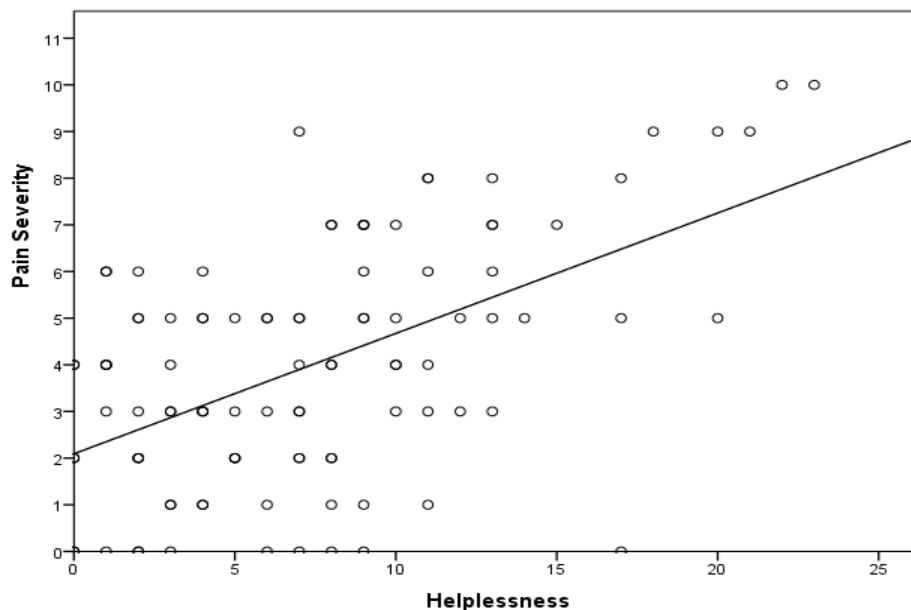


Figure 1: Positive correlation between pain severity and scores in the helplessness subscale of the Greek version of the Pain Catastrophizing

III. CONCLUSION

Our findings highlight the aspect of helplessness as a predictor of pain intensity, and its possible significance in planning appropriate therapeutic interventions for patients with pain. We found no gender differences in pain intensity, and a positive correlation between age and helplessness, findings that are not so commonly found in relevant literature. Thus, one could suggest that it may also be important to scrutinize the role of any possible cultural discrepancies on the relationship between age and pain-coping strategies, as well as on the way gender may influence pain intensity. Cognitive behavioral therapy for pain is the psychological treatment of choice for many different pain conditions [3], while relevant research suggests that dealing with the pain catastrophizing cognitive distortions plays an important role in the interruption of the fear avoidance cycle of pain [45]. Our findings that show a significant role of catastrophizing and depression in the prediction of pain, suggest that it may be useful to also plan a cognitive behavioral therapy intervention in pain patients, an intervention targeting both catastrophic and depressiogenic thinking in order for us to treat in a more meaningful way pain severity.

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