

Clinical pain research

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Interpersonal problems as a predictor of pain catastrophizing in patients with chronic pain

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Abstract

Background and aims: Pain catastrophizing has consistently been related to a variety of negative outcomes within chronic pain conditions, but competing models exist explaining the role of catastrophizing. According to the fear-avoidance model (FAM), catastrophizing is primarily related to the appraisal of pain (i.e. “intrapersonal”), whereas the communal coping model (CCM) suggests that catastrophizing is a strategy to elicit support (i.e. “interpersonal”). In order to examine the interpersonal nature of catastrophizing, this cross-sectional study examined interpersonal problems as a predictor of pain catastrophizing in a sample of patients ($n=97$) with chronic pain.

Methods: Self-report data was taken from patients entering a multidisciplinary, inpatient rehabilitation program. The four quadrants of the Inventory of Interpersonal Problems circumplex model (Hostile-Dominant, Hostile-Submissive, Friendly-Submissive, Friendly-Dominant) were

used as predictors of pain catastrophizing in a series of separate, hierarchical regression analyses.

Results: After controlling for relevant confounding variables such as demographics (gender, age), pain severity, psychiatric symptoms (anxiety/depression, fatigue, insomnia), adverse life experiences and perceived social support, higher levels of Hostile-Dominant interpersonal problems predicted higher levels of pain catastrophizing ($p \leq 0.01$, $d = 0.56$).

Conclusions: The results add support to the notion that pain catastrophizing may serve a communicative functioning, as predicted by the CCM, with cold, dominant and controlling behaviors as a maladaptive interpersonal strategy to elicit support. It may thus be useful to consider the broader interpersonal context of the individual, and not only the patient’s appraisal of pain, when conceptualizing the role of pain catastrophizing in patients with chronic pain.

Implications: Future psychosocial research and treatment of chronic pain could be informed by including interpersonal theory as a useful theoretical framework, which may help shed more light on how interpersonal problems relates to pain catastrophizing.

Keywords: interpersonal problems; fatigue; pain; catastrophizing; fear-avoidance.

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1 Introduction

Pain catastrophizing may be defined as an exaggerated negative orientation to actual or anticipated pain [1], and has been found to be a robust predictor of adverse outcomes with chronic pain conditions [2, 3]. Whereas the concept of catastrophizing, originating within a cognitive-behavioral framework, has increased our understanding of chronic pain as in the fear-avoidance model (FAM) [4, 5], it has nonetheless been criticized for being overly simplistic, ignoring interpersonal factors [1, 6]. According to this perspective, pain catastrophizing may be a strategy to elicit social support from others. While there is abundant research demonstrating psychosocial factors (negative

affect, childhood trauma, social support, etc.) to be related to the development and maintenance of chronic pain [7], data *specifically* supporting the notion of pain catastrophizing as a strategy to elicit support has been more mixed (e.g. [8–10]). This may reflect differences in research design, measurements as well as lack of control of confounding factors. Hence, the aim of the present study was to examine interpersonal problems as a predictor of pain catastrophizing in a sample of patients with chronic pain, while controlling for relevant confounding variables such as gender, age, pain severity, psychiatric symptoms, fatigue, insomnia, adverse life experiences and social support.

Essentially, the communal coping model (CCM) suggests that pain catastrophizing may be a coping strategy to “maximize proximity or to solicit assistance or empathic responses from others” [1], and serve a strategic purpose similar to other communicative, pain-related behaviors such as vocalizations or facial displays of pain. However, whereas some studies have found support for a positive association between catastrophizing and solicitousness from significant others [11–13], other studies have been negative [9, 14, 15]. This mixed support may reflect a fundamental misconception in relying too heavily on principles from operant conditioning, where the presence or absence of pain catastrophizing is predicted to be contingent upon reward or punishment from the environment (e.g. attention, support) [8]. Research on anxiety disorders, for example, illustrates how avoidance may be an ineffective coping strategy that maintain or even increase anxiety symptoms over time, although commonly used and believed to be effective [16]. In a similar way, maladaptive coping behaviors of a more interpersonal nature may also persist even in the absence of any positive reinforcement from the environment. Pain catastrophizing may elicit attention and support from significant others in the short term, but the long-term outcomes may be reduced support or even punishing responses from significant others, especially if expressed in aversive, demanding and controlling ways causing others to react negatively [17, 18].

In this regard, interpersonal theory [19, 20] provides a useful paradigm for examining the role of maladaptive interpersonal behaviours in relation to catastrophizing. According to the interpersonal circumplex model (IIP; [21, 22]), interpersonal behaviors may be organized along two orthogonal dimensions labelled *affiliation* (horizontal axis, ranging from hostile to friendly behavior) and *dominance* (vertical axis, ranging from submissive to dominating behaviors). Four specific types of interpersonal problems may be derived by combining the two axes, representing ways of relating to others that may be either over- or underdeveloped: *Hostile-Dominant*, *Hostile-Submissive*,

Friendly-Submissive and *Friendly-Dominant*. This allows for an examination of how specific *types* of interpersonal problems relates to pain catastrophizing, and some studies suggests a possible association between dominant, needy and controlling behaviors (i.e. Hostile-Dominant and/or Friendly-Dominant) and pain catastrophizing [10, 17, 18].

Chronic pain patients, however, in general typically report high levels of Hostile-Submissive and Friendly-Submissive interpersonal problems [23], associated with being overly submissive, exploitable and avoidant. This implies that patients with chronic pain generally score low on the IIP axis “dominance”, and one previous study using the IIP reported self-sacrificing interpersonal problems to predict pain catastrophizing even when controlling for general distress [8]. Although informative, the study utilized a sample of patients with irritable bowel syndrome, and a subscale from the coping strategies questionnaire (CSQ) [24] to measure pain catastrophizing. It did thus not target the broader population of chronic pain patients, and the CSQ taps mostly into pessimism whereas a broader conceptualization of catastrophizing is found in the pain catastrophizing scale (PCS) [25]. Furthermore, a more rigorous test of the CCM of pain catastrophizing should control for a larger number of potentially confounding variables, as pain catastrophizing is positively correlated with numerous variables such as pain intensity, general psychological distress and traumatic experience [7], as well as fatigue [26].

Utilizing a sample of patients with chronic pain entering a cognitive-behavioral rehabilitation program, we were thus interested in examining the unique influence of interpersonal problems (Hostile-Dominant, Hostile-Submissive, Friendly-Submissive, Friendly-Dominant) on pain catastrophizing in a cross-sectional study. After controlling for confounding variables such as demographics (age, gender), pain severity, comorbid symptoms (anxiety/depression, fatigue, insomnia), adverse life experiences and perceived social support, we hypothesized that higher levels of interpersonal problems would predict higher levels of pain catastrophizing in this patient sample.

2 Methods

2.1 Participants

The patient sample in the present study was taken from a larger clinical trial [27], testing the effects of an intensive, cognitive-behavioral rehabilitation program for patients on long-term sick leave with the goal of returning to work.

Patients who were referred by general practitioners (GPs) or other medical specialists to this 3½-week intensive, inpatient rehabilitation from January 2012 to June 2013, were invited to participate in a study. Prior to admission, the participants were thoroughly assessed by an interdisciplinary team at the pain clinic at the University Hospital St. Olav in Trondheim, consisting of a physician, a psychologist and a physical therapist. Participants filled out a comprehensive survey forming their baseline data before being assessed by this team. At the examination, all patients gave written consent to participate in the study. Inclusion criteria were age between 18 and 60 years, and sick leave for at least 8 weeks prior to inclusion due to musculoskeletal disorders, pain, fatigue and/or common mental disorders. All patients had to be adequately assessed and treated beforehand for any other specific health problem, to be able to attend a rehabilitation program from 08:30 to 15:00 all weekdays, and to have a self-defined goal of increasing labor participation. Exclusion criteria were severe mental illness (ongoing mania, psychosis or suicidal ideation), substance abuse and addiction, pregnancy, unexpressed difficulty functioning in a group, non-fluency in Norwegian and in need of 24-h personal assistance.

Two hundred and twelve patients were included in the original trial [28]. Patients in the present study had to have a confirmed diagnosis of chronic pain with a duration of at least 6 months given by the physician at the pain clinic after the assessments by the whole interdisciplinary team were completed. Ninety-nine patients fulfilled the diagnostic criteria for chronic pain of a duration of at least 6 months, and were eligible for inclusion in the present study. Due to missing data ($n=2$), the final sample consisted of $n=97$ patients.

2.2 Treatment setting

The treatment took place at Hysnes Occupational Rehabilitation Center at St. Olav's University Hospital in Trondheim, Norway. The rehabilitation program was designed to increase return-to-work, and consistent of a multidisciplinary inpatient intervention with Acceptance and Commitment Therapy (ACT) as the overarching treatment model. Details concerning the rehabilitation program have been published elsewhere [27].

2.3 Measures

Pain catastrophizing was assessed with the Pain Catastrophizing Scale (PCS; [25]), which consists of 13-items.

Patients are asked to indicate to what extent they experience certain thoughts or feelings during pain on a five-point rating scale from 0 ("not at all") to 4 ("always"). The PCS has been found to have good psychometric properties [29, 30]. Higher scores reflect higher levels of pain catastrophizing.

Pain was measured with three items from the Brief Pain Inventory (BPI; [31]), averaging worst, least and average pain during the last 24 h. Each item is rated on a numerical scale from 0 ("no pain") to 10 ("pain as bad as you can imagine"). Psychometric properties of the measure has been reported as good [32].

Interpersonal problems were measured with the Inventory of Interpersonal Problems circumplex model [22, 33]. This is a 64-items self-report scale where patients are asked to rate interpersonal behavior that is "hard for you to do" or "you do too much". Each item is rated on a five-point Likert scale ranging from 0 ("Not at all") to 4 ("Extremely"). Eight subscales (or octants) are organized in a circumplex manner according to two main axes (affiliation and domination), labeled as follows: Domineering, Vindictive, Cold, Socially Avoidant, Nonassertive, Exploitable, Overly Nurturant and Intrusive. A global score (IIP Global) may be calculated, representing the average (or non-specific) level of interpersonal problems.

Since the main aim of the present study was to examine the relationship between specific types of interpersonal problems and pain catastrophizing, scores for each of the four main quadrants (Hostile-Dominant, Hostile-Submissive, Friendly-Submissive, Friendly-Dominant) were computed according to the formula given in Ryum and colleagues [34]. The four quadrants may briefly be summarized as follows: Hostile-Dominant reflects aggressive, controlling and manipulative behaviors, as well as distrust and suspicion; Hostile-Submissive reflects difficulties with expressing feelings toward others, and with initiating social contact; Friendly-Dominant is associated with overinvolvement, inappropriate self-disclosure and need for attention from others; Friendly-Submissive is characterized by difficulties in experiencing or expressing anger, and setting limits and expressing personal needs. Internal consistency of the circumplex model has been reported as good in an American sample [22] as well as a Norwegian sample [35].

Anxiety and Depression was measured with the Hospital Anxiety and Depression Scale (HADS; [36]). This is a 14-items self-report scale which assesses symptoms of anxiety and depression, and the total score was used in this study. Each item is rated on a Likert scale ranging from 0 ("not at all") to 3 ("most of the time"). Psychometric properties of the scale has been reported as good [37].

Fatigue was measured with Chalder Fatigue Scale (CFS; [38]). This is an 11-items self-report questionnaire which assesses symptoms of fatigue during the last week. Each item is rated on a Likert-scale ranging from 0 (“Less than usual”) to 3 (“Much more than usual”). Psychometric properties of the scale has been reported as good [39].

Insomnia was measured with the Insomnia Severity Index (ISI; [40]), which is a seven-item scale ranging from 0 (“none/not at all”) to 4 (“very severe/very much”). The ISI has been found to be both a reliable and valid measure to detect insomnia [41].

Adverse life experiences (ALE) was measured with three items comprising experience of death in close family, traumatic experiences, or divorce during the last 12 months. Each item was answered in a fixed “yes” or “no” format, and a global score was calculated adding the three items.

Social support (SS) was measured with four items tapping into relationships with (a) friends, (b) parents/siblings, (c) husband/wife/partner and (d) children. Each item was rated on a six-point Likert scale ranging from 1 (“very unsatisfying”) to 6 (“very satisfying”).

2.4 Psychological and medical examination

A licensed clinical psychologist assessed the presence of comorbid mental disorders using the Structured Clinical Interview for DSM-IV (SCID-I; [42]). A physician reviewed the participants’ medical records and assessed current medication.

2.5 Ethics

Data to this study was derived from a previous trial approved by the Regional Committee for Medical and Health Research Ethics in Central Norway (No: 2010/2404).

2.6 Data analyses

Only patients with complete datasets were included in the analyses. Descriptive statistics were used to characterize participants on demographics and other study variables. Bivariate analyses were employed between the independent variable (PCS) and predictor variables (IIP Quadrants). Stepwise hierarchical regression analyses were utilized to examine the unique predictive power of levels of interpersonal problems (IIP Quadrants) on PCS, after controlling for confounding variables.

3 Results

3.1 Descriptive statistics

Mean scores, standard deviations, and correlations of the primary study variables are presented in Table 1.

As expected, most study variables correlated positively at statistically significant levels, except for pain severity (BPI), Gender and Age, which had mostly non-significant correlations with other variables. Moreover, all four IIP Quadrants correlated non-significantly with pain intensity (BPI), but positively with psychiatric symptoms (HADS), fatigue (CFS) and insomnia (ISI). Social Support correlated negatively with most other variables. Whereas scores for Adverse Life Experiences were generally low, scores on other variables were within the clinical range. The correlations between the IIP Quadrants were high, as expected, as the measure (and subscales) is sensitive to respondents’ response style and general distress [22, 33].

3.2 Main analyses

In order to examine the study hypothesis regarding interpersonal problems as predictors of pain catastrophizing, four stepwise hierarchical regression analyses were computed with PCS as the dependent variable and each of the four IIP Quadrants as predictors in separate analyses. After controlling for confounding variables in steps 1–8, levels of Hostile-Dominant, Hostile, Submissive, Friendly-Submissive and Friendly-Dominant interpersonal problems were entered in step 9. Neither levels of Friendly-Dominant, Friendly-Submissive or Hostile-Submissive interpersonal problems were found to predict levels of pain catastrophizing (p -values 0.81–0.43), but levels of Hostile-Dominant interpersonal problems emerged as a significant predictor, as presented in Table 2.

After controlling for the effects of gender, age, pain severity, comorbid symptoms (anxiety/depression, fatigue, insomnia), adverse life experiences, and social support, higher levels of Hostile-Dominant interpersonal problems predicted higher levels of pain catastrophizing, explaining 6% of the unique variance. In the final model (step 9), pain severity (BPI) also remained a statistically significant predictor.

4 Discussion

The aim of the present study was to examine interpersonal problems as a predictor of pain catastrophizing in

Table 1: Descriptive statistics and Pearson's correlations for study variables ($n = 97$).

	Mean (SD)	BPI	HADS	CFS	ISI	Adv. Exp.	Friendly/Dom	Friendly/Sub	Hostile/Sub	Hostile/Dom	Gender (1, -1)	Age	Social support
PCS	16.55 (10.79)	0.27 ^b	0.27 ^b	0.12	0.28 ^b	0.12	0.24 ^a	0.11	0.23 ^a	0.40 ^c	0.01	-0.03	-0.22 ^a
BPI	5.47 (1.31)		0.01	0.00	0.21 ^a	-0.04	0.03	0.05	0.12	0.08	-0.04	-0.12	-0.02
HADS	13.32 (7.28)			0.48 ^b	0.38 ^b	-0.04	0.55 ^b	0.53 ^b	0.61 ^b	0.60 ^b	-0.02	0.10	-0.29 ^b
CFS	21.40 (5.05)				0.43 ^b	-0.03	0.38 ^b	0.38 ^b	0.39 ^b	0.35 ^b	0.06	0.10	-0.17
ISI	12.91 (6.02)					-0.05	0.35 ^b	0.30 ^b	0.36 ^b	0.35 ^b	-0.08	0.14	-0.20 ^a
Adv. Exp.	0.14 (0.35)						-0.02	-0.11	-0.10	-0.07	0.06	-0.09	0.21 ^a
Friendly/Dom	1.79 (1.12)							0.77 ^c	0.67 ^c	0.67 ^c	0.17	0.16	-0.23 ^a
Friendly/Sub	3.16 (1.77)								0.83 ^c	0.44 ^b	0.21 ^a	0.08	-0.13
Hostile/Sub	2.16 (1.58)									0.71 ^b	0.14	-0.03	-0.21 ^a
Hostile/Dom	1.10 (1.00)										0.00	-0.05	-0.30 ^a
Gender (1, -1)	78 (80.4%)												0.00
Age	44.00 (9.13)												0.00
Social support	4.66 (1.13)												-0.17

PCS = pain catastrophizing scale; BPI = brief pain inventory; HADS = hospital anxiety and depression scale; CFS = Chalder fatigue scale; ISI = insomnia severity index; Adv. Exp. = adverse life experiences; Friendly/Dom = IIP friendly-dominant quadrant; Friendly/Sub = IIP friendly-submissive quadrant; Hostile/Sub = IIP hostile-submissive quadrant; Hostile/Dom = IIP hostile-dominant quadrant; Gender = n and % females; Social support = satisfaction with friends and parents (and wife/husband/partner and/or own children, when relevant).

^a $p < 0.05$; ^b $p < 0.01$; ^c $p < 0.001$.

a sample of patients with chronic pain, controlling for confounding variables such as demographics (gender, age) pain severity (BPI), comorbid symptoms (anxiety/depression, fatigue, insomnia), adverse life experiences (ALE) and social support. A series of separate hierarchical regression analyses with each of the IIP Quadrants as predictors revealed that only levels of Hostile-Dominant interpersonal problems predicted levels of pain catastrophizing (PCS). That is, patients who reported more cold, vindictive, controlling and demanding interpersonal problems, also reported higher levels of pain catastrophizing. Hostile-Dominant interpersonal problems explained 6% of the unique variance in pain catastrophizing ($d = 0.59$), not better accounted for by patient's overall level of psychological distress (anxiety, depression, fatigue or insomnia), the severity of pain or social risk- or protective factors.

The results add support for a central tenet in the CCM, namely that pain catastrophizing may serve a communicative purpose aimed at maximizing the probability that distress is being managed (or attempted to be managed) within a social/interpersonal context [1, 43]. A Hostile-Dominant style, characterized by dominant, vindictive, self-centered and controlling behaviors, may be helpful in eliciting attention and support in the short-term, but is likely to backfire over time [15]. This may also help explain why research on the role of solicitousness, such as the display of pain behaviors and caregiving responses from the environment, has been mixed (e.g. [9, 11]). Indeed, as noted by Lackner and Gurtman [8], the CCM may draw too heavily on principles from operant conditioning [44], linking pain processes such as catastrophizing to reinforcing environmental variables such as attention, support, assistance or care.

In comparison, interpersonal theory suggests that people interact with their environment in a more transactional manner [33], and is theoretically more akin to attachment theory [45]. Both theories aim to describe and explain individual's more enduring patterns of relating to others, such as the regulation of autonomy and attachment, and how interpersonal strategies aimed to meet these needs may be over- or underdeveloped. In this light, it is perhaps not surprising that the results from the present study are also in accordance with previous studies demonstrating pain catastrophizing to be associated with a support- and caretaking-demanding interpersonal style [8, 13], as well as with insecure- and/or anxious attachment styles [46–48]. Taken together, the results indicate that the interpersonal context of the individual is of importance and may help shed light on the functional role of pain catastrophizing amongst chronic pain patients.

Table 2: Stepwise hierarchical regression analysis with PCS as dependent variable ($n = 97$).

Step	Variable	β	S.E	b	95% Confidence interval of B		T	ΔR^2	R ²	d	Dependent variable
					Low	High					
PCS											
1	Gender (1, -1)	0.11	1.39	0.01	-2.64	2.87	0.08	0.00	0.00	0.02	
2	Gender	0.16	1.41	0.01	-2.63	2.95	0.11				
	Age	-0.03	0.12	-0.03	-0.27	0.21	-0.27	0.00	0.00	0.06	
3	Gender	0.25	1.36	0.02	-2.46	2.96	0.18				
	Age	0.00	0.12	0.00	-0.24	0.24	0.02				
	BPI	2.22	0.83	0.27	0.58	3.87	2.68 ^a	0.07	0.07	0.55	
4	Gender	0.36	1.32	0.03	-2.25	2.98	0.28				
	Age	-0.03	0.12	-0.03	-0.26	0.20	-0.26				
	BPI	2.19	0.80	0.27	0.60	3.78	2.73 ^a				
	HADS	0.40	0.14	0.27	0.12	0.69	2.80 ^a	0.07	0.14	0.58	
5	Gender	0.37	1.33	0.03	-2.26	3.01	0.28				
	Age	-0.03	0.12	-0.02	-0.26	0.20	-0.25				
	BPI	2.19	0.80	0.27	0.59	3.79	2.72 ^a				
	HADS	0.41	0.16	0.28	0.09	0.74	2.51 ^b				
	CFS	-0.03	0.24	-0.01	-0.50	0.44	-0.12	0.00	0.14	0.03	
6	Gender	0.62	1.32	0.05	-2.00	3.25	0.47				
	Age	-0.06	0.12	-0.05	-0.29	0.18	-0.49				
	BPI	1.85	0.82	0.22	0.21	3.48	2.24 ^b				
	HADS	0.36	0.17	0.24	0.03	0.69	2.14 ^b				
	CFS	-0.16	0.25	-0.07	-0.65	0.33	-0.64				
	ISI	0.34	0.20	0.19	-0.07	0.74	1.65	0.03	0.17	0.35	
7	Gender	0.50	1.32	0.04	-2.12	3.12	0.38				
	Age	-0.04	0.12	-0.03	-0.27	0.19	-0.34				
	BPI	1.91	0.82	0.23	0.28	3.54	2.33 ^b				
	HADS	0.36	0.17	0.24	0.03	0.69	2.18 ^b				
	CFS	-0.16	0.25	-0.07	-0.65	0.33	-0.64				
	ISI	0.34	0.20	0.19	-0.07	0.74	1.66				
	Adv. Exp.	4.30	2.94	0.14	-1.54	10.15	1.46	0.02	0.19	0.31	
8	Gender	0.48	1.30	0.04	-2.11	3.07	0.71				
	Age	-0.06	0.12	-0.05	-0.30	0.17	-0.54				
	BPI	1.90	0.81	0.23	0.29	3.51	2.34 ^b				
	HADS	0.30	0.17	0.20	-0.04	0.63	1.77				
	CFS	-0.16	0.24	-0.07	-0.64	0.33	-0.64				
	ISI	0.31	0.20	0.17	-0.09	0.71	1.54				
	Adv. Exp.	5.29	2.96	0.17	-0.60	11.18	1.79				
	Social support	-1.68	0.98	-0.18	-3.62	0.26	-1.72	0.03	0.22	0.36	
9	Gender	0.31	1.26	0.02	-2.20	2.82	0.25				
	Age	-0.01	0.12	-0.01	-0.24	0.22	-0.09				
	BPI	1.81	0.79	0.22	0.25	3.37	2.31 ^b				
	HADS	0.07	0.19	0.05	-0.30	0.43	0.36				
	CFS	-0.19	0.24	-0.09	-0.66	0.28	-0.80				
	ISI	0.24	0.20	0.13	-0.15	0.63	1.22				
	Adv. Exp.	5.52	2.87	0.18	-0.18	11.23	1.92 ^c				
	Social support	-1.26	0.96	-0.13	-3.16	0.65	-1.31				
	IIP Hostile/Dom	3.38	1.29	0.31	0.82	5.94	2.63 ^a	0.06	0.28	0.56	

PCS = pain catastrophizing scale; BPI = brief pain inventory; HADS = hospital anxiety and depression scale; CFS = chalde fatigue scale; ISI = insomnia severity index; Adv. Exp. = adverse life experiences; Social support = satisfaction with friends and parents (and wife/husband/partner and/or own children, when relevant); IIP Hostile/Dom = inventory of interpersonal problems, hostile-dominant quadrant; ΔR^2 = square change; R^2 = R square; d = Cohen's effect size ($d = 2t/\sqrt{df}$); $d > 0.5$ = medium effect size.

^a $p \leq 0.01$; ^b $p < 0.05$; ^c $p < 0.06$.

The results from this study may be somewhat at odds with an earlier study [8], which found interpersonal problems in the Friendly-Submissive quadrant to predict pain catastrophizing. Bearing in mind that the two studies utilized different diagnostic groups (chronic pain vs. irritable bowel syndrome) and controlled for an unequal number of variables (8 vs. 1), a possible explanation for this discrepancy is that the studies utilized different measures of pain catastrophizing. The subscale from the CSQ taps primarily into the dimensions of helplessness and pessimism in the context of pain, which may be associated with a more passive, submissive and dependent interpersonal style. In comparison, the PCS is a broader measure of pain catastrophizing, tapping into dimensions of rumination and magnification (and not only helplessness), which may be more closely associated with an interpersonal “pull” for attention and support. Adding to this, of the four IIP quadrants, only the Friendly-Submissive quadrants did *not* demonstrate a significant zero-order correlation with the PCS (see Table 1).

Pain severity (BPI) remained a significant predictor in the final analysis of pain catastrophizing (see step 9 in Table 2), but the lack of a direct relationship between pain severity and each of the four IIP Quadrants (see Table 1) suggests that Hostile-Dominant interpersonal problems may be unrelated to the interpretation or experience of pain. This finding is interesting, and in accordance with the notion that people may primarily catastrophize to convey distress and elicit support from others; that is, to manage and cope with pain within an interpersonal context. Whereas this study did not examine to what extent catastrophizing *de facto* is an effective strategy to elicit support or attention, the negative correlation between social support, on the one hand, and pain catastrophizing ($r = -0.22$) as well as Hostile-Dominant interpersonal problems ($r = -0.30$) on the other hand (see Table 1), suggest that catastrophizing may be an ineffective strategy in this regard. It is also noteworthy that Hostile-Dominant interpersonal problems predicted pain catastrophizing even after controlling for any eventual protective effect of social support (see Table 2).

Whereas the sample consisted of patients with chronic pain, who mostly reported comorbid symptoms in the clinical range (psychiatric symptoms, pain intensity, insomnia, etc.), the level of pain catastrophizing (16.55) was below ≥ 23 which has been proposed as a cut-off differentiating “high” from “low” catastrophizers [49]. However, it is important to bear in mind that this study did not primarily target “high catastrophizers”, and a large proportion of patients with chronic pain are typically not classified as “high catastrophizers” [50]. Moreover, all participants

in the present study were on sick leave with the goal of returning to work, whereas many studies on chronic pain conditions typically include large proportions of patients on disability/state pension.

Although interpersonal theory may add to our understanding of catastrophizing as a strategic coping strategy in chronic pain patients, it is important to note that this does not imply that an intrapersonal conceptualization of pain catastrophizing is without merit. Importantly, this study did not examine the central tenet in the CB model, namely that people catastrophize when they appraise a stressor as posing a threat that exceeds their coping capacity. An intrapersonal- and interpersonal conceptualization of pain catastrophizing are not mutually exclusive [10], and their relative emphasizes may differ between individuals. Moreover, the cumulative empirical evidence suggests that interpersonal problems, such as being demanding and controlling, as well as having an insecure/anxious attachment, may not be uniquely associated with the management of pain. Rather, they may reflect a more pervasive and habitual way of responding to emotional distress. In accordance with this (see Table 1), all IIP Quadrants correlated significantly with general psychiatric symptoms, fatigue and insomnia in the present study. However, it is of both theoretical and clinical importance that the effects of general psychiatric symptoms, fatigue and insomnia, were no longer statistically significant when all variables were entered in the final model (see Table 2), implying that interpersonal factors are perhaps more important than correlated symptoms.

The clinical implication of this study is that a reliance exclusively on an intrapersonal conceptualization of pain catastrophizing, risks missing out on an important piece of information, such as the patients’ way of relating to other people. High catastrophizers may have a controlling, demanding and vindictive style, which at least may be a maintaining factor for pain catastrophizing as well as the experience of pain and daily function. Depending on the particular patient, therapeutic interventions may need to take into account the social context of the individual, including spouse and/or family members, and there is a risk that treatment may be compromised by a controlling, interpersonal style on the part of the patient.

A Hostile-Dominant interpersonal style explained 6% of the variance in pain catastrophizing, whereas all included variables roughly explained 30% of the variance (see Table 2). As such, it is important to be cognizant of the fact that the larger share of the variance in pain catastrophizing was unexplained in the present study.

4.1 Limitations

First, the cross-sectional design prohibits any definitive conclusions regarding causality, and longitudinal studies are needed to address the temporal relationship between interpersonal problems and pain catastrophizing. Second, the majority of participants were females (80%), and the results may not generalize to the male population although gender was controlled for in the statistical analyses. Third, results were obtained from patients with chronic pain entering a cognitive-behavioral rehabilitation program, and may not generalize to other patient populations. Fourth, all statistical analyses were performed on self-reported data only, which may not capture the “true nature” of people's interpersonal functioning.

4.2 Conclusion

The results from the present study suggest that pain catastrophizing may be partly conceptualized as an interpersonal strategy to elicit support from significant others, in accordance with the CCM of pain [1]. This highlights the need to include the interpersonal context of chronic pain patients, as an important additive to the focus on the appraisal of pain.

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Informed consent: Informed consent has been obtained from all individuals included in this study.

Ethical approval: The research related to human use complies with all the relevant national regulations, institutional policies and was performed in accordance with the tenets of the Helsinki Declaration, and approved by the Regional Committee for Medical and Health Research Ethics in Central Norway (No: 2010/2404).

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