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Observational study

The association between pain characteristics, pain catastrophizing and health care use – Baseline results from the SWEPAIN cohort

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HIGHLIGHTS

- Pain intensity and pain catastrophizing influence the decision to consult healthcare.
- The importance of pain catastrophizing believes differ with pain duration.
- Rehabilitation strategies must incorporate this to meet the individual's needs.

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ABSTRACT

Background and aim: Pain is common and adds to the global burden of disease. However, individuals suffering from pain are a heterogeneous group in terms of pain spreading, intensity and duration. While pain influences overall health care consultation not everyone with pain consult health care. To be able to provide health care matching the patients' needs increased knowledge about what factors determines the decision to consult health care is essential. The aim of this study was to explore the combined importance of pain spreading, intensity, duration and pain catastrophizing for consulting health care.
Methods: In this cross-sectional study we used population based survey data from southeast Sweden (SWEPAIN) including 7792 individuals' aged 16–85 reporting pain. We used Modified Poisson regressions to analyse factors of importance related to the decision to consult health care.
Results: High and moderate pain intensity, as compared to low, increases the probability of consulting health care (High PR = 1.7 [95% CI 1.51–1.88], moderate PR = 1.2 [1.15–1.41]). Having widespread pain, as compared to localised pain, increased the probability of consulting health (PR = 1.2 [1.03–1.36). Pain duration was not associated with increased probability of consulting health care (PR = 1.0 CI0.88–1.07). However an interaction ($p = 0.05$) between pain duration and pain catastrophizing beliefs was seen indicating a combined importance of the two when consulting health care.
Conclusion: Our result suggests that pain intensity, pain spreading and pain catastrophizing independently influence the decision to consult health care while there is an interaction effect between pain duration and pain catastrophizing beliefs where the importance of pain catastrophizing believes differ with pain duration; the importance of pain catastrophizing believes differ with pain duration.
Implications: Treatment and rehabilitation strategies should incorporate this finding in order to meet the individual's needs focusing on the biopsychosocial model within health care focusing not only on actual pain reliefs but also on for example acceptance and behavioural changes.

1. Introduction

Pain is a common condition that adds to the global burden of disease [1]. However since individuals suffering from pain are a heterogeneous group in terms of pain spreading, intensity and duration, daily life can be affected to different extent. Moreover pain influences overall health care consultation partly due to related comorbidities [2,3], sick leave and productivity loss [1] as well as individual suffering [4]. Still, not everyone with pain consult health care [5–7]. The decision to consult has been suggested to be linked with e.g. severe and prolonged pain, specific pain locations, sociodemographic features and life time adverse events [5,7–13].

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Pain is a subjective phenomenon embracing not only structural and biochemical changes or damage but more so a complex mix of sensory, emotional and cognitive variability. Therefore psychological factors such as cognitive reassurance, personality, behavioural adaptation, and social support are important determinants for pain trajectories [14–16]. As such, pain catastrophizing particularly is one of the most important factors and determinant for pain behaviour and believes. The concept originates from catastrophizing in the context of mental ill health i.e., depressive and anxiety disorders, in which the individual use a mal-adaptive cognitive style to cope [17–19]. To have a pain catastrophizing strategy imply a mental set during pain, both present and anticipated pain [19] which magnifies the severity and impact of the pain [20] and eventually influencing the decision to consult health care [19,21,22].

Health care options for patients with pain is increasingly based on the biopsychosocial model embracing biological (medical), psychological, social and contextual factors. Still, only few effective treatment options for individuals with different types of long lasting pain are available and fully implemented [23–25]. For proper management, it is crucial to identify the combined importance of pain characteristics and psychological factors such as pain catastrophizing on the decision to consult health care. Given this complexity in decision making it is important to further increase knowledge on why and which individuals with pain that consult health care. Such information is both important when designing the assignment strategies and for the content of the treatment and rehabilitation interventions offered to the patients.

A majority of the studies focusing on identifying factors, pain related and others, that explain why an individual with pain consult health care have not hitherto fully reported pain characteristics such as pain spreading on the body, intensity and duration of pain in depths in relation to pain catastrophizing [5,7–13].

Therefore the aim of this study was to explore the combined importance of pain spreading, intensity, duration, and pain catastrophizing for consulting health care.

We explicitly tested the following three hypotheses:

- that pain spreading, high pain intensity, and long pain duration increases the likelihood of consulting health care
- that having high pain catastrophizing increases the likelihood of consulting health care
- that pain spreading, pain intensity, and pain duration affect the likelihood of consulting health care differently depending on level of pain catastrophizing.

2. Materials and methods

2.1. Data collection SWEPAIN

In this cross sectional study we used data from the SWEPAIN cohort. The SWEPAIN study and cohort has previously been described in detailed elsewhere, and the overall aim of the SWEPAIN study was to identify factors associated with transition from local to spread pain [26]. The individuals in the SWEPAIN cohort were selected from a sampling frame based on the total population of the three included regions. The total sample frame consisted of 404,661 (2012) and 410,001 (2013) individuals, 16–85 years old living in south-eastern Sweden. The samples in 2012 and 2013 were both stratified according to municipality and sex to reach individuals living in urban and rural areas and to balance the gender distribution. The 2012 sample was additionally stratified on sick leave status (Yes/no in 2009).

Important for this specific study was that the data was collected by two different baseline surveys on pain and pain symptoms that were sent out in 2012 (February 27-June 15) and in 2013 (October 2-December 10). The questionnaires used within the two surveys were identical on the items reported in this paper, and were only administered at two different time point due to administrative reasons. The postal included different questions on pain, physical and psychological overall health and comorbidities and also sociodemographic factors, and health care utilisations. The 2012 survey was further split into two questionnaires (for more detail see under study sample) sent out on two different occasions with a 9 week period between. The first questionnaire (17 questions) was returned either by post or electronically while the second questionnaire was administrated in paper format only. This second questionnaire was sent only to those reporting pain (*Question: Have you suffered from any pain during the last 7 days?)* in the first questionnaire. In the second questionnaire the participants where again asked if they *Have you suffered from any pain during the last 7 days.* Thereafter they were asked if they usually suffered from pain. Finally they were also asked to mark pain sites on a body manikin. In the 2013 survey, all questions was included in the same one questionnaire and a reminder was sent to non-responders after two weeks and, if necessary, after another two weeks, see under study sample for detailed information. In total, the questionnaire in 2012 was sent to 8982 individuals and the questionnaire in 2013 to 33,915 individuals. A total of 20,470 responded (48% overall response rate).

2.2. Study sample

The study sample was selected through different steps, described below, and the inclusion is further explained in Fig. 1. In the final sample we included responders that in the final step fulfilled the following three inclusion criteria:

- -usually suffered from pain *(Question: Do you usually suffer from pain?)*
- had experienced pain the last 7 days (Question: Have you suffered from any pain during the last 7 days?) and
- -marked pain sites on a body manikin.

Descriptive data from the 2012 survey including comparative analysis of patients with local pain, regional pain and widespread pain in relation to the proportion consulting and not consulting health care the previous 12 month period have been reported previously [26].

2.3. Outcome

The outcome health care use, was assessed through the question 'Have you consulted health care or complementary or alternative medicine in relation to your pain during the last 3 months?' (No/Yes health care e.g. physician, physiotherapist, psychologist/Yes complementary care e.g., acupuncture, homoeopathy, zone therapy, herbal medicine or any equivalent type of consultations). Individuals reporting 'Yes health care e.g. physician, physiotherapist, psychologist' was coded as the group consulting health care and used in the analyses of the present study while individuals only consulting complementary medicine was defined as not consulting health care.

2.4. Independent variables

Pain spreading was defined based on the responder's markings of pain on a standardized anatomical model of a human, a body manikin. The body manikin was divided into 22 sections on the front and 22 sections on the back. From the responses on the manikin three different pain spreading groups were constructed:

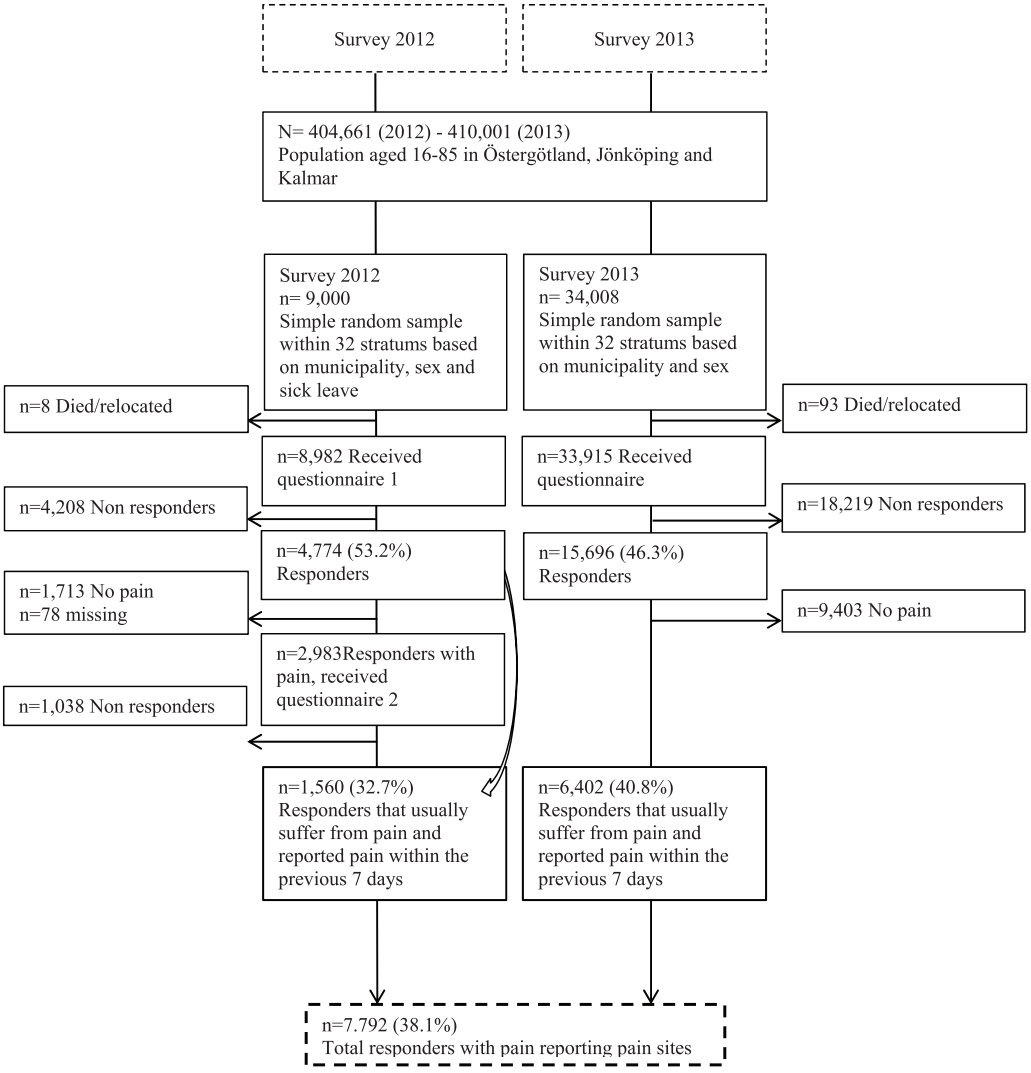

Fig. 1. Flowchart of inclusion survey 2012 and 2013.

local pain (LP), regional pain (RP) and widespread pain (WSP) [27]. The definition of WSP was pain marked in at least two sections in two contralateral limbs and the axial skeleton and marked equally on the front and on the back of the body manikin. This definition of widespread pain is a stricter version of the modified definition of the ACR criteria used by MacFarlane and co-workers [28]. MacFarlane et al. define widespread pain in limbs to be present "if there are at least two painful sections (in two contralateral limbs)", a definition that does not require pain to be marked equally on the front and back of the body. When marked on just one section (or two sections when sections were equally marked on the front and back of the manikin, e.g., hip, knee, shoulder, or arm), pain was defined as local pain (LP). Regional pain (RP) was defined as pain shaded on the manikin that did not meet the criteria for WSP or LP.

Pain intensity was defined as the intensity of the pain the previous seven days (eleven-grade numeric rating scale (NRS) ranging from 0 = not at all to 10 = worst imaginable pain). Pain intensity was in the analysis divided into three groups: no/mild (0–3), moderate (4–6) or severe (7–10) pain. *Pain duration* was assessed by the question '*Do you usually suffer from pain?*' (No/Yes, less than 3 months/yes, more than 3 months). Individuals marking yes, more than 3 months were considered having a long lasting pain condition.

Pain catastrophizing were measured by the Pain catastrophizing scale (PCS). The PCS measures three dimensions of catastrophizing: rumination, magnification, and helplessness [29,30] based on 13 items (with five alternatives [*Not at all*, *to a slight degree*, *to a moderate degree*, *to a great degree* and *all the time*]). In the present study we used the total PCS (PCS-total). The PCS total score range typically from 0 to 52 – the maximum score according to the original scale; a high score represents the worse outcome. However, due to a technical failure the most negative alternative ("all the time") was not printed in the questionnaire so the most negative alternative was "to a great degree". In the present study PCS-total hence had possible scores between 0–39 instead of 0–52. We categorize the PCS-total score into tertiles based on the distribution within the study population. Sex was included as an independent variable, categorised as women or men.

Age (five categories: 16–24, 25–39, 40–54, 55–69 and 70 years and over) and education (highest level achieved: nine-year compulsory school, upper secondary school or university education) were considered confounders in the association under study.

2.5. Statistical analysis

All statistical analyses were conducted using the statistical software packages SAS 9.4. Specifically for the prevalence ratio (PR)

calculations under the Poisson regression model the PROC GENMOD procedure was used [31]. To assess the importance of the various independent variables for consulting health care we used Poisson regression with robust variance estimation [32]. This models estimates differences in care seeking as prevalence ratios. A priori four analytical steps were decided. Step 1: all pain variables and sex was run adjusted for the confounders age and education (model 1). Step 2: pain catastrophizing was included in the model from step 1, model 2. Step 3: After this we tested for any interaction between the different pain variables and pain catastrophizing by testing the Type III Sum of squares test. For those, if any, variables where the type III show a statistical significant interaction ($p < 0.05$) in step 4 any potential interaction defined in step 3 are further analyzed through stratified modified poison regressions to assess the interaction effect. Throughout the level of statistical significance was set at $p < 0.05$.

3. Results

Our study sample consisted of 7792 individuals reporting pain (61% women). Overall 31% had consulted health care in relation to their pain during the last 3 months (32% among women and 31% among men). The proportion of individuals that had consulted health care was higher among those with high pain intensity compared to those with lower (Table 1). Of those that had consulted health care, a larger proportion had WSP as compared to those not consulting (Table 1). Similarly a high pain catastrophizing belief was more common among those that had consulted health care than those who did not (Table 1). However pain duration did not differ depending on health consultation during the last 3 months.

From the regression models, having high pain intensity compared to low increased the likelihood of having consulted health care during last 3 months with 100% (95% CI 78–117% increase, Table 2, model 1, high vs. low NRS). Having WSP as compared to LP increased the likelihood with 20% (95% CI 3–36%) as seen from model 1 Table 2. However there were no difference between LP and RP. A high pain catastrophizing belief increased the likelihood of having consulted health care with 51% (95% CI 37–66%) according to model 2 (Table 2).

It is noteworthy that after pain catastrophizing was introduced to the model the associations with the pain variables remained similar as in model 1, however pain intensity was the one variable changing the most (High NRS PR = 2.0 in model 1 vs PR = 1.7 in model 2). Moreover, we did not find any statistically significant interaction between neither pain spreading ($p = 0.11$) nor pain intensity ($p = 0.12$) and pain catastrophizing believes. However an interaction was indicated between pain duration and pain catastrophizing beliefs ($p = 0.05$). Considering the rather homogeneous study sample in terms of duration specifically, we created stratified regression models to tease out whether any underlying interaction in any direction for specific combination existed. The probability of consulting health care was higher among those with high pain catastrophizing beliefs that also had a long pain duration compared to those with high pain catastrophizing belies but with short pain duration (PR 1.6 compared to 1.3), Table 3. Noteworthy, although not within the scope of this paper, the probability of consulting health care in relation to pain spreading differed when we stratified on pain duration, Table 3.

4. Discussion

In this study we found that having high pain intensity was associated with the likelihood of having consulted health care in relation to the pain recently. Pain spreading was significantly associated with consulting health care, though the association did decrease when adjusting for pain catastrophizing. A high pain catastrophizing increased the likelihood of using health care. However our hypothesis that there would be any interaction between pain catastrophizing and pain spreading and intensity was not supported. We did however find an interaction between pain duration and pain catastrophizing believes. This suggest that pain intensity and pain spreading is equally important as a proxy for health care seeking regardless if the individual have low or higher pain catastrophizing beliefs. While the importance of pain duration differs depending on pain catastrophizing believes. The observed association between pain intensity and health care use corroborates with the majority of previous studies that identifies pain intensity as an important characteristic for consulting health care [8,27,33–36].

Our hypothesis around the importance of pain catastrophizing beliefs and health care consultation strived from the definition that pain catastrophizing believes is manifested by a problem solving behaviour related to fear avoidance, that aims to reduce negative emotions triggered by pain [37,38]. Fear avoidance behaviour has been shown to increase the probability to consult health care [35,38,39]. Further pain catastrophizing beliefs are also linked to depression [37,40] which in turn might cause people to consult health care: mental illness is one of the most common causes for health care utilisation apart from various pain conditions. Individuals with high pain catastrophizing believes and pain should receive treatment and rehabilitation that incorporate pain strategies including management of pain catastrophizing [41]. In the regression analyses we included both subjects with acute, subacute and chronic pain and it is important to recognize that catastrophizing in an acute situation may be associated with more appropriate reactions and consequences than in the chronic context. We further hypothesised that the importance of pain intensity would interact with pain catastrophizing believes, however we found no such support. Instead both of this dimensions seems to be of important in the decision making.

Pain duration was not alone identified as being important for consulting health care in this study. However other cross-sectional studies, addressing low back pain, indicate that duration is important in the decision to consult care [42]. Indeed when we analysed the combined importance of duration and pain catastrophizing beliefs the association between pain catastrophizing beliefs and health care seeking was dependent on pain duration.

Sex was not associated with the probability to consult health care in this study and the proportion of individuals with pain consulting health care did not differ between women and men (32% among women and 31% among men, Fischer's exact test $p = 0.341$), although the absolute number of women reporting pain was higher than men reporting pain. This would indicate that pain as such is more common among women although the consultation does not differ between the sex. There is research that identify that women consult health care more than men [43]. However recent studies on overall health care consultations among men and women suffering from the same condition, not pain conditions exclusively, does not support gender differences in consultation [44–46].

A strength of our study is the large population-based design since it enables multiple analyses without losing too much power given the large sample size of almost 8000 individuals. Another strength is the low rate of missing data. However, a limitation is the cross-sectional nature. It could be argued that some people with pain that did report health care use within the prior 3 months was indeed treated in a way that would affect the pain and ultimately the pain spreading and pain intensity. However if in fact this was the case an initial more spread pain and/or more intense pain would, given our results, render an even higher probability had this been taking care of. Also, since people with initial pain, choosing to consult receiving treatment that removed the pain, would not at all

Table 1
Background characteristics stratified on the use of health care.

	Health care consultation last 3 months, *n* = 2448 (31%)	No health care consultation last 3 months, *n* = 5344 (69%)	All, *n* = 7792
Women, % (*n*)	62 (1518)	61 (3252)	61 (4770)
Age, median (Q1;Q3)	58 (44;69)	54 (41;66)	56 (42;67)
Age category (%)			
70+	25 (621)	14 (743)	18 (1364)
55–69	32 (783)	22 (1172)	25 (1955)
40–54	23 (562)	20 (1060)	21 (1622)
25–39	12 (291)	11 (588)	11 (879)
16–24	8.0 (191)	33 (1781)	25 (1972)
Missing	0	0	0
Education, % (*n*)			
University education	29 (710)	31 (1630)	30 (2340)
Upper secondary school	43 (1055)	44 (2368)	44 (3423)
Nine-year compulsory school	26 (647)	24 (1271)	25 (1918)
Missing	2 (36)	1 (75)	1 (111)
Pain spreading			
WSP	7 (180)	5 (272)	6 (452)
RP	79 (1922)	79 (4229)	79 (6151)
LP	14 (346)	16 (843)	15 (1189)
Missing	0	0	0
Pain intensity[a]			
High	31 (767)	19 (1020)	23 (1787)
Moderate	50 (1227)	52 (2762)	51 (3989)
Low	17 (426)	28 (1492)	25 (1918)
Missing	1 (28)	1 (70)	1 (98)
Pain duration, % (*n*)			
>3 months	87 (2134)	87 (4639)	87 (6773)
<3 months	13 (314)	13 (705)	13 (1019)
Missing	0	0	0
PCS[b] % (*n*)			
PCS > 17	38 (836)	23 (1230)	27 (2066)
PCS 10–17	32 (880)	41 (2198)	40 (3078)
PCS < 10	20 (483)	28 (1494)	25(1977)
Missing	10 (249)	8 (422)	8 (671)

[a] Pain intensity = NRS (Numeric pain rating scale).
[b] PCS = Pain Catastrophizing scale (Note here the maximum score is 39), tertiles. All models adjusted for age and education.

Table 2
The association between pain spreading, intensity, duration and frequency and pain catastrophizing and having consulted health care last 3 months, results from modified Poisson regression models.

	Health care[a]	Model 1 pain variables			Model 2 pain and PCS variables		
		PR	95% CI	*p*-value[b]	PR	95% CI	*p*-value[b]
Sex				0.37			0.85
Women		1.0	0.96–1.10		1.0	0.94–1.08	
Men		1			1		
Pain spread				0.04			0.19
WSP	40	1.2	1.03–1.36		1.1	0.97–1.31	
RP	31	1.0	0.93–1.13		1.0	0.91–1.11	
LP	29	1			1		
NRS[c]				<0.0001			<0.0001
High (7–10)	43	2.0	1.78–2.17		1.7	1.51–1.88	
Mod (4–6)	31	1.4	1.26–1.52		1.3	1.15–1.41	
Low (0–3)	22	1	1		1	1	
Duration				0.53			0.54
Duration > 3 months	32	1.0	0.88–1.07		1.0	0.87–1.07	
Duration < 3 months	31	1			1		
PCS[d]							<0.0001
PCS > 17	41				1.5	1.37–1.66	
PCS 10–17	29				1.1	1.04–1.25	
PCS < 10	24				1		

[a] Consulting health care (%).
[b] *p*-value from type 3 sum of squares test.
[c] Pain intensity = NRS (Numeric pain rating scale).
[d] PCS = Pain Catastrophizing scale (Note here the maximum score is 39), tertiles. All models adjusted for age and education.

turn up in the study given the study design requiring pain in the previous seven days. Considering the scope of this study, focusing on symptoms among those actually seen in clinic, we believe this study adds to the current knowledge. Although we acknowledge that our study design limits the interpretation of our result in relation to causality hence longitudinal studies are needed. The overall response rate is considered low around 50% and the difference between those responding and those not responding was that responders were slightly older, more women and somewhat higher educated. However since we can't consider these variables as being colliders between our exposure and our outcome, we won't anticipate this affecting our results.

Table 3
The association between pain spreading, intensity, duration and frequency and pain catastrophizing and having consulted health care last 3 months, results from modified Poisson regression models stratified by duration.

	Short pain duration (<3 months)			Long pain duration (>3 months)		
	PR	95% CI	*p*-value[a]	PR	95% CI	*p*-value[a]
Sex			0.75			0.71
Women	1.0	0.79–1.18		1.0	0.94–1.09	
Men	1			1		
Pain spread			0.22			0.27
WSP	1.6	1.00–2.46		1.1	0.96–1.31	
RP	0.9	0.76–1.16		1.0	0.91–1.14	
LP	1			1		
NRS[b]			<0.0001			<0.0001
High (7–10)	1.5	1.16–2.00		1.7	1.54–1.95	
Mod (4–6)	1.1	0.83–1.33		1.3	1.19–1.48	
Low (0–3)	1			1		
PCS[c]			0.01			<0.0001
PCS > 17	1.3	1.00–1.64		1.6	1.40–1.73	
PCS 10–17	0.9	0.69–1.10		1.2	1.08–1.33	
PCS < 10	1			1		

[a] *p*-value from type 3 test.
[b] Pain intensity = NRS (Numeric pain rating scale).
[c] PCS = Pain Catastrophizing scale (Note here the maximum score is 39), tertiles, All models adjusted for age and education.

A more technical limitation of our study is the interpretation of the PCS scores given the misprints to the questionnaires leaving the worst option (to a great degree and all the time) out. This is a systematic error that rendered a maximum score of 39 instead of the usual 52. A limitation of this was that the actual scores could not be used in relation to previous studies. However, the spreading of PCS allowed us to use the data in tertiles, and despite this error we believe that our study is reliable since there is no reason to believe that only the most extreme should be associated with neither the outcome nor the other independent variables. Although a replication of our results in another setting could help clarify that.

5. Conclusion

In conclusion, our study provides data suggesting that both pain intensity and pain catastrophizing independently influence the decision to consult health care while the importance of pain catastrophizing believes differ with pain duration.

6. Implications

Treatment and rehabilitation strategies should incorporate our findings in order to meet the individual's needs by focusing on the biopsychosocial model. This implies a focus not only on actual pain reliefs but also on for example acceptance and behavioural changes.

Ethical issues

All participants gave their informed consent to take part in the study. Data were collected by Statistics Sweden on behalf of Linköping University. The study was approved by the local ethics committee of Linköping University, Sweden, Dnr 2011 72/31.

Conflicts of interest

The author declares no conflict of interests.

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