



Pain Catastrophizing and Kinesiophobia: Predictors of Chronic Low Back Pain

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By using a population-based cohort of the general Dutch population, the authors studied whether an excessively negative orientation toward pain (pain catastrophizing) and fear of movement/(re)injury (kinesiophobia) are important in the etiology of chronic low back pain and associated disability, as clinical studies have suggested. A total of 1,845 of the 2,338 inhabitants (without severe disease) aged 25–64 years who participated in a 1998 population-based questionnaire survey on musculoskeletal pain were sent a second questionnaire after 6 months; 1,571 (85 percent) participated. For subjects with low back pain at baseline, a high level of pain catastrophizing predicted low back pain at follow-up (odds ratio (OR) = 1.7, 95% confidence interval (CI): 1.0, 2.8) and chronic low back pain (OR = 1.7, 95% CI: 1.0, 2.3), in particular severe low back pain (OR = 3.0, 95% CI: 1.7, 5.2) and low back pain with disability (OR = 3.0, 95% CI: 1.7, 5.4). A high level of kinesiophobia showed similar associations. The significant associations remained after adjustment for pain duration, pain severity, or disability at baseline. For those without low back pain at baseline, a high level of pain catastrophizing or kinesiophobia predicted low back pain with disability during follow-up. These cognitive and emotional factors should be considered when prevention programs are developed for chronic low back pain and related disability.

back pain; cognition disorders; emotions; pain; population; questionnaires

Abbreviations: CI, confidence interval; DMC₃, Dutch population-based Musculoskeletal Complaints and Consequences Cohort; OR, odds ratio; TSK, Tampa Scale of Kinesiophobia.

In the search for factors associated with development of chronic low back pain or other musculoskeletal pain, as well as related disability, patients' attitudes and beliefs about pain are increasingly being studied (1–3). Clinical studies suggest that an excessively negative orientation toward pain (pain catastrophizing) and fear of movement/(re)injury (kinesiophobia) are important in the etiology of chronic low back pain and associated disability (3, 4). These findings are consistent with a cognitive-behavioral perspective that underscores the importance of maladaptive interpretations of bodily sensations (5, 6). The mechanism can be described as follows: persons who catastrophically misinterpret innocuous bodily sensations, including pain, are likely to become fearful of pain, which results in at least two processes. First, pain-related fear is associated with avoidance behaviors and the avoidance of movement and physical activity in partic-

ular. Avoidance also means withdrawal from rewarding activities such as work, leisure, and family. Second, pain-related fear is associated with increased bodily awareness and pain hypervigilance. Hypervigilance, depression, and disuse are known to be associated with increased pain levels and hence might exacerbate the painful experience. This model is used to develop successful treatments (7), and the first trials for treatments based on this model in primary care are promising (8). Unknown is whether fear avoidance beliefs and kinesiophobia are relevant factors regarding chronic pain complaints in the general population. This information is needed before effective prevention strategies can be developed. For low back pain, these prevention initiatives could target beliefs about low back pain (9).

In this paper, we present analyses of a prospective population-based cohort to explore the role of pain catastrophizing

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and kinesiophobia in low back pain, chronic low back pain, and related disability.

MATERIALS AND METHODS

We used data from the Dutch population-based Musculoskeletal Complaints and Consequences Cohort (DMC₃) study (1998–1999) (10). A full-color questionnaire (and a maximum of two reminders) was mailed to 8,000 noninstitutionalized Dutch inhabitants (aged 25 years or older) randomly sampled from the population register of 1998, stratified by 10-year age groups and sex (groups of equal size per age-sex band). A summary of the study profile is shown in figure 1. The sample was identical to general surveys of Statistics Netherlands (11). The questionnaire was completed and returned by 3,664 respondents; 182 who received the questionnaire were identified as not living at the address or having died. Therefore, the net response was 46.9 percent. For the analyses presented in this paper, we excluded those subjects aged 65 years or older and those with severe disease, that is, severe heart disease, cancer, stroke, fibromyalgia, and rheumatoid arthritis, leaving 2,338

persons. Of these, 1,845 gave informed consent and were sent a follow-up questionnaire (and a maximum of two reminders) after 6 months; 1,571 (85 percent) subjects participated in the follow-up.

Both the baseline and follow-up questionnaires contained items on low back pain. The following indicators were analyzed: current low back pain (the presence of low back pain when the research was conducted), low back pain with limitation (current low back pain with limitation in daily activities), chronic low back pain (current low back pain lasting longer than 3 months), severe low back pain (current low back pain with a pain severity of 5 or more on a scale of 1–10), and low back pain with disability (current low back pain and disability according to the Quebec Back Pain Disability Questionnaire). This questionnaire (12) and the Dutch version (13) consist of 20 activities such as walking, turning in bed, making the bed, and carrying a heavy suitcase with, for each activity, a 6-point scale for rating level of difficulty. A (arbitrary) total score of 45 or more is defined as indicating low back pain with disability.

Pain catastrophizing was measured by using a Dutch version of the Pain Catastrophizing Scale (14) consisting of 13 descriptions of pain experience in the following form, for example: “If I am in pain, I am afraid the pain will get worse.” Respondents were asked to indicate whether they

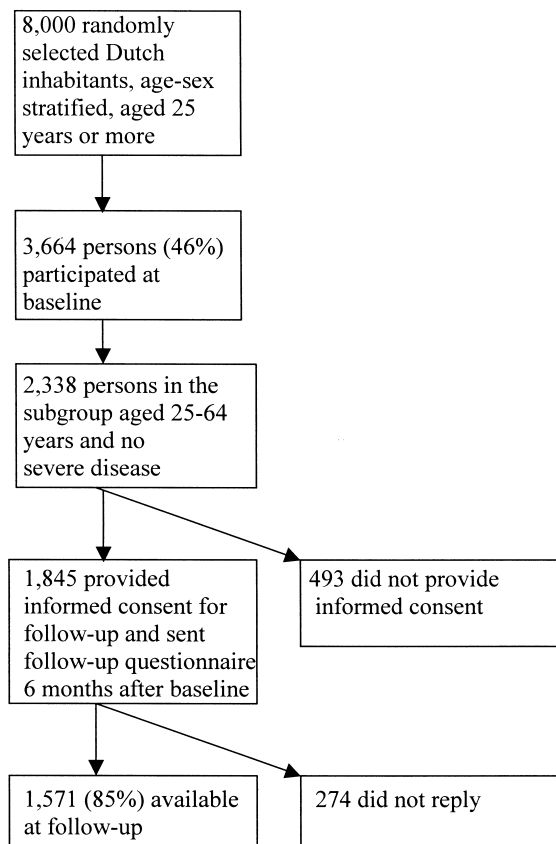


FIGURE 1. Profile of the Dutch population-based Musculoskeletal Complaints and Consequences Cohort study, 1998–1999, and selection of the subgroup for analysis of pain catastrophizing and kinesiophobia as predictors of low back pain.

TABLE 1. Description of the study population, Dutch population-based Musculoskeletal Complaints and Consequences Cohort study, 1998–1999

	Respondents	
	No.	%
Total	1,571	100
Men	671	42.7
Women	900	57.3
Age group (years)		
25–34	347	22.1
35–44	403	25.7
45–54	406	25.8
55–64	415	26.4
Marital status		
Unmarried	248	15.8
Married	1,176	74.9
Widowed	31	2.0
Divorced	116	7.4
Educational level		
Primary school	134	8.6
Junior (vocational)	537	34.4
Secondary (vocational)	468	30.0
Vocational	327	21.0
University	94	6.0
Low back pain at baseline		
Yes	411	26.2
No	1,160	73.8

agreed with these statements by using a 5-point rating scale. A Pain Catastrophizing Scale sum score was calculated from all items (range, 13–65), with a high score indicating a high level of pain catastrophizing.

Kinesiophobia was measured by using a modified version of the Tampa Scale of Kinesiophobia (TSK) (unpublished report). The TSK consists of 17 statements capturing the idea that pain is a signal for (re)injury because of physical activity or certain movements. Respondents are asked to indicate their level of agreement on a 4-point rating scale. The original TSK was developed for patients with musculoskeletal pain and included statements such as, "It's really not safe for a person with a condition like mine to be physically active." The modification included a slight change in wording so that persons without musculoskeletal pain could also complete the questionnaire. An example of a modified statement is, "It's really not safe for a person with low back pain to be physically active." A modified TSK sum score was calculated by using all items (range, 17–68); a high score indicated a high level of kinesiophobia.

Tertiles of scores on the Pain Catastrophizing Scale and the modified TSK from the total population were used to

identify their contribution to low back problems after 6 months, as calculated with logistic regression analyses. Analyses were carried out separately for those subjects with and those without low back pain at baseline. All data analyses were performed by using SAS software (Statistical Analysis System, version 8.1; SAS Institute, Inc., Cary, North Carolina).

RESULTS

General characteristics of the study population are presented in table 1. The response rate was slightly higher among women than men. However, there were no differences by age group. To obtain an idea of the percentages of the general population indicating pain catastrophizing or kinesiophobia, refer to table 2 for some of the most prevalent and least prevalent items. The thoughts presented are not rare, and no striking differences were found between subjects with pain and those without pain, with the exception of the following item: "I can't do all the things normal people do because it's too easy for me to injure my back," a thought that was more prevalent among those with low back

TABLE 2. Prevalence of dichotomized items measuring pain catastrophizing* and kinesiophobia† in the Dutch population-based Musculoskeletal Complaints and Consequences Cohort study (1998–1999) at baseline, the three most and least prevalent items: the percentages of participants agreeing or strongly agreeing with the statements

	Total study population (n = 1,571)	Current low back pain (n = 411)	No low back pain (n = 1,160)
<i>Pain catastrophizing‡</i>			
When I am in pain . . .			
I anxiously want the pain to go away.	29.4	32.7	28.3
I keep thinking about how badly I want the pain to stop.	19.6	18.8	15.9
There is nothing I can do to reduce the pain.	9.8	8.7	10.3
It's terrible and I think it's never going to get any better.	2.2	6.0	2.3
I feel that I can't stand it any more.	2.4	3.4	2.1
I think of other painful experiences.	2.0	2.9	1.6
<i>Kinesiophobia§,¶</i>			
People would not have much back pain if there weren't something wrong with the back.	73.0	76.1	72.0
Simply being careful not to make unnecessary movements is the safest thing I can do to prevent back pain.	61.7	68.5	59.3
Back pain always means that the body is injured.	44.0	47.8	42.6
I would not have to exercise when I suffer back pain.	14.4	14.8	14.2
I can't do all the things normal people do because it's too easy for me to injure my back.	13.0	27.1	7.9
It's really not safe for a person with low back pain to be physically active.	12.3	9.5	13.4

* An excessively negative orientation toward pain.

† A fear of movement/(re)injury.

‡ A 5-point rating scale of the Pain Catastrophizing Scale was used.

§ The most and least prevalent items, excluding the four that were worded positively.

¶ A 4-point rating scale of the modified Tampa Scale of Kinesiophobia was used.

TABLE 3. Pain catastrophizing* and kinesiophobia† as predictors of low back pain and associated disability after 6 months, Dutch population-based Musculoskeletal Complaints and Consequences Cohort study, 1998–1999

	No.	Low back pain at 6 months' follow-up									
		Current low back pain (n = 253)		Low back pain limitation (n = 104)		Severe low back pain (n = 138)		Chronic low back pain (n = 216)		Low back pain and disability (n = 124)	
		OR‡	95% CI‡	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<i>Low back pain at baseline (n = 411)</i>											
Pain catastrophizing											
Lowest tertile	106	1§		1§		1§		1§		1§	
Middle tertile	134	1.3	0.8, 2.1	2.2	1.1, 4.4	1.3	0.7, 2.3	1.3	0.7, 2.2	1.5	0.8, 2.7
Highest tertile	146	1.7	1.0, 2.8	3.7	1.9, 7.3	3.0	1.7, 5.2	1.7	1.0, 2.8	3.0	1.7, 5.4
Data missing	25										
Kinesiophobia											
Lowest tertile	118	1§		1§		1§		1§		1§	
Middle tertile	124	0.8	0.5, 1.3	1.5	0.8, 3.1	1.2	0.7, 2.2	0.8	0.5, 1.3	1.5	0.8, 2.9
Highest tertile	161	1.6	1.0, 2.7	3.6	1.9, 6.7	3.0	1.8, 5.1	1.6	1.0, 2.7	4.4	2.5, 7.9
Data missing	8										
<i>No low back pain at baseline (n = 1,160)</i>											
Catastrophizing											
Lowest tertile	373	1§		1§		1§		1§		1§	
Middle tertile	380	0.9	0.6, 1.5	0.7	0.3, 1.8	1.0	0.4, 2.5	1.3	0.7, 2.5	1.9	0.7, 5.9
Highest tertile	345	1.2	0.8, 1.9	1.4	0.6, 3.7	2.2	1.0, 5.0	2.1	1.1, 3.9	3.1	1.1, 8.7
Data missing	62										
Kinesiophobia											
Lowest tertile	375	1§		1§		1§		1§		1§	
Middle tertile	387	0.8	0.5, 1.3	1.5	0.6, 4.0	0.7	0.3, 1.8	0.6	0.3, 1.2	0.8	0.2, 2.7
Highest tertile	361	1.2	0.8, 1.9	1.7	0.6, 4.3	1.6	0.8, 3.5	1.3	0.8, 2.4	3.4	1.6, 8.7
Data missing	37										

* An excessively negative orientation toward pain. Pain Catastrophizing Scale scores: <18 (lowest tertile), 18–24 (middle tertile), ≥24 (highest tertile).

† A fear of movement/(re)injury. Modified Tampa Scale of Kinesiophobia scores: <29 (lowest tertile), 29–35 (middle tertile), ≥35 (highest tertile).

‡ OR, odds ratio; CI, confidence interval.

§ Reference category.

pain (27.1 percent) than among those without low back pain (7.9 percent).

Although the measures of pain catastrophizing and kinesiophobia were slightly correlated (Pearson correlation, 0.35), both factors were viewed as different and were analyzed separately. No significant interaction between kinesiophobia and pain catastrophizing was found for any of the models.

For those respondents with low back pain at baseline, a high level of pain catastrophizing predicted current low back pain at follow-up (odds ratio (OR) = 1.7, 95 percent confidence interval (CI): 1.0, 2.8) and chronic low back pain (OR = 1.7, 95 percent CI: 1.0, 2.8), but in particular low back pain limitation (OR = 3.7, 95 percent CI: 1.9, 7.3), severe low back pain (OR = 3.0, 95 percent CI: 1.7, 5.2), and low back pain with disability (OR = 3.0, 95 percent CI: 1.7, 5.4) (table 3). A high level of kinesiophobia showed similar associations.

For those without low back pain at baseline, a high level of pain catastrophizing predicted severe low back pain (OR = 2.2, 95 percent CI: 1.0, 5.0), chronic low back pain (OR = 2.1, 95 percent CI: 1.1, 3.9), and low back pain with disability (OR = 3.1, 95 percent CI: 1.1, 8.7). In this group, kinesiophobia did predict only low back pain with disability at follow-up (OR = 3.4, 95 percent CI: 1.3, 8.7).

For those with low back pain, the significant associations remained, although they were weaker, after adjustment for pain duration at baseline (for chronic low back pain), for pain severity at baseline (for severe low back pain), or for disability at baseline (for low back pain disability) (table 4).

The associations we observed were all in the same direction for men and women, different age groups, and different socioeconomic groups based on level of education.

TABLE 4. Pain catastrophizing* and kinesiophobia† as predictors of low back pain and associated disability after 6 months, corrected for severity and disability at baseline, among those with low back pain at baseline (n = 411), Dutch population-based Musculoskeletal Complaints and Consequences Cohort study, 1998–1999

	Low back pain at 6 months' follow-up							
	Low back pain limitation (n = 104)		Chronic low back pain (n = 188)		Severe low back pain (n = 128)		Low back pain with disability (n = 124)	
	OR‡	95% CI‡	OR	95% CI	OR	95% CI	OR	95% CI
Pain catastrophizing								
Lowest tertile	1§		1§		1§		1§	
Middle tertile	1.6	0.8, 3.5	1.4	0.8, 2.5	1.1	0.6, 2.1	1.4	0.7, 2.9
Highest tertile	2.3	1.1, 4.9	1.7	1.1, 3.0	2.4	1.3, 4.4	1.5	0.7, 2.9
Back pain limitation	8.9	5.1, 15.4						
Chronic back pain			4.7	2.5, 9.1				
Severe back pain					6.7	4.1, 11.0		
Back pain disability							11.7	6.8, 20.1
Kinesiophobia								
Lowest tertile	1§		1§		1§		1§	
Middle tertile	1.2	0.6, 2.6	0.8	0.5, 1.4	1.0	0.6, 2.0	1.3	0.6, 2.7
Highest tertile	2.0	1.0, 3.9	1.7	1.0, 2.9	2.3	1.3, 4.2	2.6	1.4, 5.0
Back pain limitation	9.9	5.7, 17.1						
Chronic back pain			4.8	2.5, 9.3				
Severe back pain					6.7	4.1, 10.9		
Back pain disability							10.0	6.0, 16.7

* An excessively negative orientation toward pain.

† A fear of movement/(re)injury.

‡ OR, odds ratio; CI, confidence interval.

§ Reference category.

DISCUSSION

Our results showed that, in a population-based cohort, a high level of pain catastrophizing or a high level of kinesiophobia increases the risk of future chronic low back pain and disability. This finding was true for those subjects with and those without low back pain at baseline and still existed after correction for severity of back pain at baseline.

This is the first known population-based study on the identification of these fear-avoidance beliefs as risk factors for low back pain, severe low back pain, chronic low back pain, and low back pain with disability. The results are consistent with those from clinical studies (3, 5–7). They are also consistent with those from a previous population-based study of 415 subjects who were pain free at baseline. Persons whose scores on fear-avoidance beliefs at the pretest were above the median had twice the risk of suffering an episode of back pain and a 1.7-times higher risk of lower physical functioning at the follow-up. Pain catastrophizing was somewhat less salient, increasing the risk of pain or lower physical functioning by 1.5 times but with confidence intervals falling below unity (15).

The consistency of these findings in clinical and population-based studies provides confidence that these factors are causal and therefore provides insight into a prevention strategy. However, an alternative explanation is that pain

catastrophizing and pain-related fear are markers for other variables that have not (adequately) been measured, such as type or history of low back pain at baseline, that increase the risk of chronic low back pain. The success of treatments based on these factors (7–9) will provide further evidence regarding whether pain catastrophizing and fear avoidance are causal.

When the results of the DMC₃ study are interpreted, some limitations concerning nonresponse and item nonresponse should be taken into account. Similar to other population-based studies in the Netherlands, this study also had a relatively high nonresponse rate (16). However, on the basis of general characteristics from the population register, respondents and nonrespondents did not differ. In addition, the characteristics of respondents in the mail-based DMC₃ study were similar to those of subjects in a national health survey based on interviews (11). Nevertheless, the DMC₃ study probably slightly overestimated the period prevalence based on information from nonrespondents who returned a “nonresponse” card that included questions on nonparticipation and pain prevalences (17). It is unlikely that this overestimation distorted the analyses presented in this paper, however. The extent of item nonresponse on the Pain Catastrophizing Scale (6 percent of respondents) and the modified TSK (3 percent of respondents) is acceptable from a research point of view but should be taken into account if such instruments

will routinely be used for screening purposes in primary care. Item response can probably be increased if the number of items is reduced.

Low back pain, in particular chronic low back pain, is an important public health problem because of its high impact on disability (18, 19), absence due to sickness, and work-related disability (20, 21) and health care costs (22). Despite increasing research, low back pain is still poorly understood. Many potential risk factors—lifestyle, physical, psychosocial, and both work-related and non-work-related—have been studied. Some physical factors such as lifting and carrying loads, whole-body vibration, and frequent bending and twisting have already been established, but the evidence for all other factors is mixed or lacking, and the associations are often weak (23, 24). Not only are patients' attitudes and beliefs about pain increasingly found to be risk factors, but the associations are also much stronger than those for other risk factors studied.

Aspects of cognitive treatments focusing on these attitudes and beliefs are now commonly used in the behavioral treatment of chronic (disabling) low back pain (6), and significant effects are particularly found in patients reporting high levels of pain-related fear (25). In a primary care setting, use of a booklet with information and advice on fear-avoidance beliefs also showed an effect on patients' beliefs and clinical outcomes (9). In addition, a public health prevention program could help reduce the burden of chronic (disabling) back pain, especially because many patients do not consult their general practitioners (17). Furthermore, even if patients do so, most do not recover from back pain episodes within a few weeks or months although they do not consult their general practitioners again (26). Such low back pain prevention programs should include educational messages focusing on this excessively negative orientation toward pain (pain catastrophizing) and fear of movement/(re)injury (kinesiophobia). Besides reaching (future) back patients, a public health prevention program could also affect the attitudes and beliefs of health care providers about disability and back pain (27).

A population-based public health prevention program was carried out in Victoria, Australia (28). It consisted of a large media campaign using television and radio commercials, printed advertisements, outdoor billboards, seminars, workplace visits, and publicity articles with positive messages about back pain based on fear-avoidance beliefs (9). Positive results for this unique project were found regarding back pain beliefs both for patients and physicians, as well as a decline in the number of insurance claims for back pain, number of days compensated, and medical payments for claims regarding back pain. This public health prevention campaign could be an example for countries with a high public health burden of low back pain, especially when fear-avoidance beliefs are highly associated with the risk of chronic (disabling) low back pain, as shown in our study.

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