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Pain-related fear at the start of a new low back pain episode

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Abstract

Previous research supports the fear-avoidance model in explaining chronic low back pain (LBP) disability. The aims of the present study were to determine: (1) whether fear-avoidance model variables are associated already during acute stages of LBP and (2) whether (increases in) pain-related fear are associated with other patient characteristics routinely assessed by the General Practitioner (GP).

General practice patients consulting because of a new episode of LBP completed questionnaires on pain-related fear, avoidance, pain and disability. A sample of 247 acute LBP patients (median duration of current episode was 5 days) was collected. Significant associations were found between pain intensity, pain-related fear, avoidance behaviour and disability, but correlations were generally modest. A strong association was found between pain and disability. Pain-related fear was slightly higher in patients reporting low job satisfaction and in those taking bedrest.

These results suggest that the fear-avoidance model as it was developed and tested in chronic LBP, might not entirely apply to acute LBP patients. Future research should focus on the transition from acute to chronic LBP and the shifts that take place between fear-avoidance model associations.

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Keywords: Acute low back pain; Pain-related fear; Kinesiophobia; Fear-avoidance model; General practice

1. Introduction

Non-specific low back pain (LBP) by its nature appears to be a benign and self-limiting condition. Many patients recover within a few weeks, but residual symptoms and recurrences are common (Waddell, 1987; Von Korff and Saunders, 1996). Chronic LBP accounts for important personal problems (Dionne, 1999) and medical and socio-economic costs (Waddell, 1996).

During the last decade, a cognitive-behavioural fear-avoidance model explaining disability in chronic back

pain has been formulated (Vlaeyen and Linton, 2000). The basic tenet of this model is, that if back pain is being (mis)interpreted as a signal of (re)injury and/or tissue damage, fear emerges and movements that typically increase pain are systematically avoided. Persisting avoidance behaviour will then lead to increasing disability, physical deconditioning and lower pain thresholds. The fearful patient is likely to end up in a cycle of fear, inactivity, disability, depression and pain.

Accumulating evidence has been found supporting this fear-avoidance model. Pain-related fear appeared to be associated with impaired physical performance (Vlaeyen et al., 1995a; Crombez et al., 1999; Al-Obaidi et al., 2000; van den Hout et al., 2001) and increased

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self-reported disability (Vlaeyen et al., 1995b; Asmundson et al., 1997; Crombez et al., 1999). Furthermore, it has been shown that educational interventions aimed at reducing negative attitudes and beliefs that mediate avoidance behaviour result in lower LBP related absence from work (Symonds et al., 1995; Moore et al., 2000; Buchbinder et al., 2001). The reduction of pain-related fear as a result of cognitive-behavioural treatment is associated with increased activity tolerance and improved functional abilities (Vlaeyen et al., 2001; Boersma et al., 2004).

Although most research on pain-related fear is performed in patients with chronic LBP, a small number of recent studies showed that pain-related fear can be identified in acute back pain patients as well. For example, Fritz et al. (2001) focussed on subjects with work-related LBP of less than three weeks duration. Patterns of correlations between fear-avoidance beliefs and other concurrently measured variables (a.o. disability) were similar to those found in chronic LBP patients. Another study by our group (Sieben et al., 2002), using daily measures during the first two weeks of a new LBP episode, identified subgroups of patients with descending, stable and rising levels of pain-related fear. These groups with different acute stage courses of pain-related fear differed on levels of disability at baseline and follow-up (patients with rising pain-related fear levels were more disabled after one year). Furthermore, Buer and Linton (2002) demonstrated pain-related fear to be detectable even in pain-free individuals. Linton et al. (2000) showed fear-avoidance beliefs to be related to the inception of new LBP episodes.

If fearful patients can be identified in clinical practice at an early stage, they become eligible for (secondary) preventive intervention. In the Netherlands, acute LBP patients will initially consult a General Practitioner (GP) for treatment, advice and, if needed, referral to other specialists. Therefore, the general practice context seems to provide an ideal opportunity for early screening (Von Korff and Moore, 2001). Usually, a number of pain characteristics are routinely assessed by the GP, including type of pain onset, radiating symptoms, LBP history (previous episodes), taking bedrest, perceived causes of back pain and job satisfaction. If high-risk patients could be (even roughly) identified by these characteristics, this would facilitate efficient early screening.

The aim of the present study is twofold. First we will examine whether association between pain, (increases in) pain-related fear, avoidance and disability at the start of a new LBP episode are comparable to those reported in chronic LBP patients. Secondly, we want to further explore associations between (increases in) pain-related fear and other LBP characteristics easily assessed by the GP.

2. Methods

2.1. Participants

Participants were recruited between January 2001 and April 2003 from 35 general practices located in the southern part of the Netherlands. Patients who consulted their GP with a new episode of non-specific LBP were invited to participate in the study. A new episode of LBP was defined as: (1) pain localised below the scapulae and above the gluteal folds (following IASP taxonomy (Merskey and Bogduk, 1994)), (2) duration since time of pain onset no longer than three weeks, (3) after a period of at least three months without significant activity limitations due to back trouble. Additional selection criteria were (4) 18–60 years of age, (5) no specific cause or strong suspicion of specific cause (such as a tumor, inflammation or vertebral fracture), (6) no pregnancy, (7) sufficient knowledge of Dutch language. Selection criteria were checked by the GPs.

Eligible patients received full written information about the study to read at home; the invitation involved participation in a longitudinal study (the prospective part of which is beyond the scope of this paper). The next day a phone call was made by one of the researchers. Any questions about the study were answered, the patient was requested to verbally consent on participation and selection criteria were checked again. Consenting patients were instructed to return the baseline questionnaire together with their written informed consent. The study protocol was approved by the medical ethics review committees of Maastricht University Hospital & Maastricht University (Maastricht, the Netherlands) and the Institute for Rehabilitation Research (Hoensbroek, the Netherlands).

2.2. Measures

Following the GP visit patients completed a questionnaire on (a) a set of descriptives: back pain history, characteristics of the current episode, work status, and (b) variables concerning the fear-avoidance model: pain-related fear, back pain disability and (avoidance of) physical activity.

Back pain history: Information was gathered about previous back pain episodes (number of episodes in the past, age at which first episode occurred) and history of back pain treatment.

Current episode: The current episode was characterised by (a) pain intensity as measured by a 10 cm. Visual Analogue Scale (VAS) anchored with extremes of 0 ('no pain') and 100 ('unbearable pain'), (b) type of pain onset (sudden or gradual) and (c) radiating symptoms (yes/no). These items were derived from the McGill Pain Questionnaire, Dutch Version (Verkes et al., 1989).

Additionally, acute pain duration (number of days since pain onset) was recorded.

Work status: To explore the occupational context, information was gathered about occupation, employment status, sick leave and job satisfaction.

Pain-related fear: The Dutch version of the Tampa Scale for Kinesiophobia (TSK) (Miller et al., 1991; Vlaeyen et al., 1995b) measures cognitions concerning somatic focus and activity avoidance. The TSK consists of 17 statements with answers on a 4-point scale (1 = 'strongly disagree' to 4 = 'strongly agree'). Reliability and validity of the TSK Dutch version are well established (Vlaeyen et al., 1995b; Roelofs et al., 2004). In this study participants completed the TSK once at the GP practice (consultation) and again a few days later as a part of the baseline questionnaire set. Changes between both measurements were calculated (TSK-score baseline minus TSK-score consultation; positive change values reflect increasing TSK-scores).

Back pain disability: LBP disability was assessed using the Quebec Back Pain Disability Scale (QBPDS) (Kopeck et al., 1996). This questionnaire is specifically developed for use in LBP populations. Patients rate on a 6-point Likert scale (0 = 'no difficulty' to 5 = 'not able to do') to what extent they experience difficulty in performing 20 daily life activities. Both the original English QBPDS scale and the Dutch Version are reliable and valid (Schoppink et al., 1996).

(Avoidance of) physical activity: The Physical Activity Rating Scale (PARS) was used to determine the extent to which patients engage in a selection of 20 specific daily activities (e.g. one hour walking, climbing two stairs, shopping). Patients were asked to indicate on a 5-point scale ('never' to 'very often') whether they had performed each activity over the last 2 weeks. The PARS was initially developed for use in chronic fatigue syndrome and was found to be an acceptable alternative for assessment of physical activity with an accelerometer (Vercoulen et al., 1997). The PARS was previously applied in LBP research by Verbunt et al. (in press).

A new question designed for this study was added to the PARS scale. After having rated activity frequencies, patients were asked for each item whether they would have performed the activity more often if they would not have taken their back pain into account. The sum of all 20 dichotomous answers (yes = 1/no = 0) was used as a measure of avoidance, with higher scores depicting more avoidance behaviour.

2.3. Analysis

SPSS 11.0 was used for all statistical analyses. Because variables showed non-normal distributions, non-parametric statistics were used. Unless reported otherwise, statistical tests are two-sided and *p*-values ≤ 0.05 were judged significant.

Bivariate associations between variables within the fear-avoidance model (pain-related fear, pain intensity, avoidance and disability) were examined by Spearman rank correlation coefficients. Furthermore, in a circular model each variable serves both as a predictor and an outcome. By regarding the variables in the model as mediators in between two other variables, roles are shifted from effects to causes. The theoretical model is supported if each variable is a mediator of the association between the variables immediately preceding and following it. Partial (rank) correlations were used as a non-parametric alternative for the regression analyses as proposed by Baron and Kenny (1986) to test for mediation. Given significant bivariate correlations between independent variable *A* and mediator variable *B* and between independent variable *A* and dependent variable *C*, variable *B* is an essential mediator of the *AC*-relation, if the partial correlation of *AC* corrected for *B* is low.

To explore the association between pain-related fear and other LBP characteristics, subgroups of patients were created based on several dichotomous episode characteristics, LBP history and behavioural factors. Mann-Whitney *U* tests were then performed to test for differences in (increases in) pain-related fear between these subgroups.

3. Results

3.1. Participant characteristics

The GPs invited 464 patients to participate in the study. Of this total, 71 patients reported LBP for more than 3 weeks and were invited to participate in another study focussing on physical consequences of LBP (excluded from present analyses). Another 146 did not meet the selection criteria (*N* = 52) or refused participation (*N* = 94) after reading the information package. Ultimately, selection criteria were met and questionnaires were returned by 247 patients (144 male and 103 female). Mean age of this sample was 42.9 years (*SD* = 10.3). Baseline levels of pain intensity, LBP disability and pain-related fear are shown in Table 1a. For these variables no differences were found between men and women. In Table 1b characteristics of the current episode and LBP history are presented. Median duration of the current pain episode at consultation was 5 days (range 0–21), which suggests that this is an acute back pain sample. Of all participants 75.7% were employed in a paid job. Eight individuals were on long-term sick leave (>12 weeks) and another 13 were receiving disability benefits at the time of consultation (both not necessarily due to LBP, because other illness and associated sick leave were no exclusion criteria). There were no significant differences (age, sex) between

Table 1

Baseline characteristics: acute low back pain in general practice, $N = 247$

Median (Q1–Q3)	
(a)	
Pain intensity (VAS; score 0–100)	47.0 (25–64)
LBP disability (QBPDs; score 0–100)	42.0 (29–55)
Pain-related fear (TSK; score 17–68)	37.0 (32–41)
N (%)	
(b)	
Previous episodes	186 (75.3)
1–2 previous episodes	71 (28.7)
3–5 previous episodes	42 (17.0)
>5 previous episodes	73 (29.6)
Onset of pain	
Sudden	161 (65.2)
Gradual	81 (32.8)
Radiating symptoms	
Yes	156 (63.2)
No	86 (34.8)

Q1–Q3 = interquartile range.

participants and non-participants (excluded/refusal categories; data available from $N = 89$).

3.2. Associations between fear-avoidance model variables

Spearman rank correlation coefficients of relevant associations within the fear-avoidance model are presented in Fig. 1 (solid arrows). Although fear-avoidance theory implies unidirectional arrows between variables, two-sided arrows are displayed because no inferences concerning causality can be made based on cross-sectional data. Bivariate correlations for all links showed to be significant. The strongest association was found between disability and pain intensity. Correlations between variables adjacent in the model were about as

strong as the more distant correlations. Acute stage increase in pain-related fear was only weakly associated with increased disability ($\rho = 0.198$, $p = 0.002$) and pain intensity ($\rho = 0.160$, $p = 0.014$).

3.3. Mediation within the fear-avoidance model

Results with respect to the mediating contribution of each variable within the model are shown in Fig. 1 (dashed arrows). Bivariate correlations and partial correlations involving sets of three variables are presented. Differences between correlations and partial correlations are mostly modest. Results show disability to be a mediator in between pain intensity and avoidance, because the correlation between pain intensity and avoidance drops considerably (from 0.208 to 0.062) and even loses significance when controlling for disability. As the partial correlation between pain-related fear and avoidance controlled for pain intensity is only slightly lower than the simple correlation between pain-related fear and avoidance (0.298 compared to 0.327; not shown in Fig. 1), pain-related fear seems to be an independent predictor of avoidance rather than a mediator of the pain-avoidance relation. Similarly, disability and pain intensity are strongly related to each other apart from the influence of pain-related fear and avoidance (simple correlation between disability and pain = 0.565; controlled for fear = 0.552; controlled for avoidance = 0.542).

3.4. Associations between pain-related fear and other back pain related variables

Results of Mann-Whitney U tests for differences on pain-related fear between groups divided by several LBP characteristics are presented in Table 2. Patients with low scores on job satisfaction reported higher

Fig. 1. Associations and mediation within the fear avoidance model.

Explanation: The chain in this illustration represents the fear-avoidance model. By starting at the lower left side and by following the solid arrows, one can navigate through the subsequent steps of the model (pain intensity, pain-related fear, avoidance, disability). **Solid arrows:** Spearman's rank correlation coefficients for associations between two variables. **Dashed arrows:** ranked partial correlation coefficients for associations between two variables corrected for mediating influence of third variable. p -values ≤ 0.05 are marked *.

Table 2

Differences on pain-related fear between groups based on episode characteristics, LBP history and behavioural factors

Groups (N)	TSK median (Q1–Q3)	MW-U <i>p</i> -value
Onset of pain		
Sudden (161)	36 (32–40)	0.393
Gradual (81)	37 (32–42)	
Radiating symptoms		
Yes (156)	36 (32–41)	0.763
No (86)	37 (32–41)	
Number prev. episodes		
1–2 (71)	36 (31–40)	0.197
>5 (73)	37 (32–42)	
Bedrest because LBP		
Yes (77)	38 (33–44)	0.015*
No (164)	36 (32–40)	
Attribution cause LBP		
Muscular (71)	36 (31–41)	0.644
Other (149)	37 (32–41)	
Job satisfaction		
0–6 = low (73)	38 (34–44)	0.004*
7–10 = high (138)	35 (31–40)	

TSK = Tampa Scale of Kinesiophobia score as measured at consultation (score 17–68).

Q1–Q3 = Interquartile range.

MW-U = Mann-Whitney *U* test.* *p*-values ≤ 0.05.

pain-related fear than patients who were satisfied with their jobs. Participants who took bedrest because of their LBP also showed higher levels of pain-related fear than those who did not. Although these differences are significant, they are not very large (2–3 TSK points). No differences were found on changes in TSK-scores (increase or decrease) for any of the LBP-related variables. However, it should be noted that changes in TSK-scores during the few days in between measurements are small in general (overall median = −1; interquartile range −6 to +2).

4. Discussion

During the last decade a number of studies have focussed on the role of pain-related fear in LBP. Its importance as a perpetuating factor in chronic LBP has been well established (Vlaeyen and Linton, 2000), but the role of pain-related fear and avoidance during the acute stage of a LBP episode is still unclear.

The sample of general practice acute LBP patients in this study was characterised by considerable pain, high acute LBP disability and pain-related fear levels comparable to those in chronic patients. Associations among fear-avoidance model variables were significant but rather modest. The strongest association was found

between pain intensity and disability; these two variables appeared to be independently related and not mediated by pain-related fear. Slightly higher levels of pain-related fear at consultation were found in patients with low job satisfaction and those who took bedrest; no clear differences were found for other LBP characteristics.

4.1. The fear-avoidance model in acute LBP

These results provide some, but rather weak, support for the fear-avoidance model in acute stages of LBP. The strong association found between pain intensity and disability replicates findings by van den Hout et al. (2001) and seems to reflect obvious differences between acute and chronic LBP.

The most common, suddenly emerging acute back pain may be related to mechanical strain or dysfunction with minor muscular tissue damage and physiological responses (Waddell, 1998). Therefore acute back injury can be quite painful and disabling during the first few days. This is in contrast with the situation in chronic patients, where the initial injury has long been resolved and disability is no longer related to pain intensity (Crombez et al., 1999).

Subsequently, as a strong association between pain and disability apparently makes sense, it is not surprising that acute LBP patients are fearful of the pain and tend to avoid activities during the very early stages of a LBP episode. This avoidance behaviour may often be temporary; because many patients will be aware of the self-limiting nature of LBP, (possibly) painful or impaired activities will just be postponed. After a few days, pain-related fear and disability will resolve naturally along with the pain in most patients. This might explain why a mediating role of pain-related fear was not found as expected.

This argumentation casts doubt on the value of measuring pain-related fear at a very early stage of an episode. As we showed in our previous study (Sieben et al., 2002), changes in pain-related fear over a longer period (for instance 2 weeks) may instead better predict disability at follow-up. Those patients who do not show a spontaneous decrease of pain-related fear as described above, should be made eligible for targeted intervention. From this study we could not derive an easy to apply alternative for the existing screening instrument (TSK) to do so.

The current paper is based on cross-sectional data, which impairs the ability to draw causal inferences. Preliminary analyses of our follow-up data both support and contradict fear-avoidance theory (details beyond the scope of this paper). More thorough analysis is warranted to further clarify the role of pain-related fear in the transition from acute to chronic LBP.

4.2. Methodological considerations

Some critical remarks can be made with regard to the methods used in this study. Testing early processes within a circular model involves design problems. Choosing a cross-sectional design limits the options for analysing causal relationships within the model. However, a longitudinal study design does not solve this problem, since in a circular model both causal factors and consequences may exist simultaneously. It can be hypothesized that causal relations between pain, pain-related fear and disability can only be demonstrated during the first few times a patient passes through the fear-avoidance cycle. Later, all variables present at the same time as an invariable complex, in which details of the chain and mutual processes can no longer be isolated.

This issue might be further confounded by the recurrent nature of LBP. Even if a new episode can properly be defined by its occurrence in time (when clearly linked to an event or acute injury), the accompanying cognitions and expectations will not be uniquely related to this particular episode. In recurrent cases the patient's ideas will inevitably be influenced by previous LBP experiences. For these methodological reasons it could be recommended to only recruit patients with "first-time ever episodes", but such patients are very difficult to find. Besides, because LBP is very common, even patients without LBP history will have cognitions based on information from media and relevant others.

The number of patients in this study is also a reason for concern. Based on incidence rates and data on prevalence in primary care, the number of participants was expected to be higher. Recruiting acute patients for research appeared to highly interfere with daily practice. Furthermore, implementation of a new Dutch general practice guideline on treatment of LBP in recent years might have influenced the number of patients consulting with acute LBP. According to this new guideline, acute LBP patients can be initially advised to await natural recovery before seeing a doctor. The number of patients eligible for this study may have been reduced for this reason.

Finally, another issue involves the interval in between TSK measurements. We used a short time interval (a few days) to calculate changes in TSK-scores compared to the 2-week interval used in the previous study (Sieben et al., 2002). This might explain why we found only small changes and weak associations. A longer period of time will reflect a tendency (rising, stable, decreasing) more accurately.

4.3. Conclusion

Despite limitations, the present study reveals new information about pain-related fear in very acute LBP

that may add to the knowledge already gained by research in chronic patient populations. The fear-avoidance model is often presented as a causal model of the development of chronic LBP, while research in chronic LBP patients can only prove its worth as a perpetuating factor once chronicity is established. Our findings suggest that already in acute stages of LBP, significant associations between pain-related fear, avoidance, pain and disability exist. On the other hand, the fear-avoidance model as developed in chronic patients may not completely apply to acute low back pain conditions. Longitudinal research can show what changes take place during the transition from acute to chronic LBP, and in which subgroups of patients pain-related fear is relevant to treat.

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