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Screening for Pain-Persistence and Pain-Avoidance Patterns in Fibromyalgia

S. van Koulil, F. W. Kraaimaat, W. van Lankveld, T. van Helmond, A. Vedder, H. van Hoorn, H. Cats, P. L. C. M. van Riel, and A. W. M. Evers

Background: *The heterogeneity of patients regarding pain-related cognitive-behavioral mechanisms, such as pain-avoidance and pain-persistence patterns, has been proposed to underlie varying treatment outcomes in patients with fibromyalgia (FM).* ***Purpose:*** *To investigate the validity of a screening instrument to discriminate between pain-persistence and pain-avoidance patterns in FM.* ***Method:*** *In a three-part study, a self-reported screening instrument that assesses pain-avoidance behavior was used to distinguish patients with pain-persistence and pain-avoidance patterns. The resultant groups were compared with regard to several pain-related cognitive-behavioral factors, performance on a physical fitness test, and with regard to the judgments of trained therapists based on a semi-structured interview.* ***Results:*** *The validity of the screening instrument to distinguish between pain-avoidance and pain-persistence patterns was supported by other validated self-report questionnaires for pain-related cognitive-behavioral factors, physical exercise tests, as well as by a high correspondence with blinded therapist judgment after intake assessments.* ***Conclusion:*** *These findings suggest that a short self-report screening instrument can be used to distinguish between pain-avoidance and pain-persistence patterns within the heterogeneous population of FM patients, which offers promising possibilities to improve treatment efficacy by tailoring treatment to specific patient patterns.*

Key words: fibromyalgia, screening, cognitive-behavioral, pain-avoidance, pain-persistence

Introduction

In the frequently studied fear-avoidance models of chronic pain, cognitive, behavioral, physiological, and social processes are proposed to account for the maintenance and exacerbation of pain and disability. Fear of pain is postulated to contribute to chronic pain and long-term disability through perpetuating mechanisms such as avoidance of activities, catastrophizing, heightened attention for pain (hypervigilance), and social reinforcement (Lethem, Slade, Troup, & Bentley, 1983; Philips, 1987; Vlaeyen, Kole-Snijders, Boeren, & van Eek, 1995; Vlaeyen & Linton, 2000). Long-term avoidance of activities can finally lead to physical deconditioning, also called the "disuse syndrome" (Bortz, 1984). Although in various chronic-pain conditions, broad support was found for the fear-avoidance models, they seem less applicable for patients presenting pain-persistence mechanisms (Hasenbring, 2000; Hasenbring, Plaas, Fischbein, & Willburger, 2006; van Houdenhove & Egle, 2004; van Houdenhove, Neerinckx, Onghena, Lysens, & Vertommen, 2001; Vlaeyen & Morley 2004). Phenomena of pain-persistence are often described in patients with fibromyalgia (FM), a chronic musculoskeletal pain disorder characterized by widespread pain, symptoms of fatigue, functional disability, and a heightened level of psychological distress (Schleicher et al., 2005; Wolfe et al., 1990). Recent studies suggest the existence of distinctive cognitive-behavioral patterns in FM and

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other chronic symptoms. One group of patients is characterized by fear of pain and pain-avoidance behavior as specified in the fear-avoidance models. In contrast, there is also preliminary evidence of FM patients and patients with other chronic symptoms that are distinguished by overactivity and task persistence, i.e., patients that try to ignore pain sensations, suppress pain-related thoughts, and tend to persist in their activities in spite of the pain (Bazelmans, Prins, & Bleijenberg, 2006; Hasenbring, 2000; Hasenbring et al., 2006; van Houdenhove & Egle, 2004; van Houdenhove et al., 2001; Prins et al., 2001; Shapiro, 2006; Vlaeyen & Morley, 2004; see Figure 1). Preliminary evidence shows that these pain-persistence mechanisms could be risk factors for the development and maintenance of chronic pain (Hasenbring, 2000; Hasenbring, Marienfeld, Kuhlendahl, & Soyka, 1994; van Houdenhove & Egle, 2004; van Houdenhove et al., 2001; Thieme, Turk, & Flor, 2007). These cognitive-behavioral patterns are specifically a problem in dysfunctional patients with heightened levels of distress, and offering those patients tailored interventions could improve treatment outcomes.

Cognitive-behavioral therapy (CBT) in FM and chronic pain is usually aimed at the dysfunctional mechanisms specified in fear-avoidance models, but its effectiveness in FM appears to be limited (Hadhazy, Ezzo, Creamer, Berman, & McCain, 2000; van Koulil et al., 2007; Rossy et al., 1999; Sim & Adams, 2002). Nevertheless, there is increasing evidence that the efficacy of interventions improves when treatments are matched to the patient's main cognitive-behavioral mechanisms (Evers, Kraaimaat, van Riel, & de Jong, 2002; van Koulil et al., 2007; Thieme, Flor, & Turk, 2006; Thieme et al., 2007; Turk, 2005; Vlaeyen & Morley, 2005). Specifically, patients characterized by high-level pain-avoidance behavior and fear of pain are likely to benefit most from treatment aimed at changing their avoidance behavior, whereas cognitive restructuring of high self-demands and acceptance-based approaches could be more beneficial for patients distinguished by task persistence (Thieme et al., 2006, 2007; Vlaeyen & Morley, 2005). Consequently, screening FM patients to establish their specific patterns followed by tailored interventions might be a promising strategy to enhance treatment outcomes. However, for the tailored treatment to be successful requires a reliable, valid screening procedure and in-depth knowledge of the patient's underlying cognitive-behavioral mechanisms and level of physical fitness. In addition, it needs to be demonstrated that the screening instrument that is founded on self-reported measures is consistent with therapist judgments.

The main aim of the three studies presented below was to distinguish between pain-persistence and pain-avoidance patterns in a cohort of FM patients by means of a screening instrument consisting of a short self-report questionnaire assessing pain-avoidance behavior. In the first study, we evaluated the tool's validity by comparing the pain-avoidance and pain-persistence patterns with regard to several cognitive-behavioral factors that have shown to be pain-perpetuating factors in FM and chronic pain, and in the second study with measures of physical fitness. In the third study, we evaluated the level of correspondence between two screening methods, one based on our self-report questionnaire and one based on the judgments of a blinded therapist following a semi-structured interview. We hypothesized that pain-avoidance patterns would highly correspond to pain-related retreating, worrying about pain, fear of pain, hypervigilance, social reinforcement, and a diminished level of physical fitness as proposed by fear-avoidance models, in contrast to pain-persistence patterns that would be strongly correlated to ignoring pain sensations, persistence statements, and a higher level of physical fitness, since fear-avoidance models seem less applicable. A high level of correspondence was expected between the two screening methods in the third study.

Study 1: Relating Patient Patterns to Pain-Related Cognitive-Behavioral Factors

The objective of our first study was to investigate the pain-persistence and pain-avoidance patterns of FM patients, as assessed by a relatively low and high level of pain-avoidance behavior, respectively, with respect to several pain-related cognitive-behavioral factors. We hypothesized that patients with pain-avoidance patterns would score higher on the pain-avoidance factors of pain-related retreating, worrying about pain, hypervigilance, fear of pain, and social reinforcement, and that pain-persistence patients would score higher on the pain-persistence factors of persistence statements and ignoring pain.

Pain-Avoidance Pattern	Pain-Persistence Pattern
- High level of pain-avoidance behavior	- Low level of pain-avoidance behavior
- Preoccupation with or high attention to pain stimuli	- Active despite pain
- Pain-related worrying	- Ignoring pain and (physical) limits
- Fear of pain and movement	- Non-accepting and demanding cognitions about limitations

Figure 1. Overview of the proposed perpetuating factors for the two patient patterns in fibromyalgia.

Methods

Participants and Procedure

A total of 359 adult FM patients was randomly recruited through the Netherlands association for FM patients. Inclusion criteria were a diagnosis of FM as confirmed by a rheumatologist based on the diagnostic criteria of the American College of Rheumatology (ACR; Wolfe et al., 1990) and age above 18 years. Exclusion criteria were severe physical and psychological comorbidity assessed by a standardized self-report questionnaire on comorbidity and a diagnostic interview as well as by regular clinical and laboratory assessments by the rheumatologist, FM secondary to another rheumatic condition, illiteracy and inability to communicate in Dutch. Patients completed a set of validated self-report questionnaires measuring sociodemographic variables, physical and psychological functioning, and a number of pain-related cognitive-behavioral factors, including the screening instrument of pain-avoidance behavior.

The patients' mean age was 48.4 years ($SD = 9.0$). The greater majority was female (92.7%), and more than 80% was married or co-habiting. Of this sample, 5.5%, 79.7%, and 14.8% had respectively a primary, secondary, or tertiary educational level, representing on average 7, 12, and 17 years of formal education. The mean duration of FM symptoms was 15.8 years ($SD = 9.3$). Based on sociodemographic variables and measures of physical and psychological functioning, our sample was comparable to other representative samples of the FM population (Burckhardt, 1991; Burckhardt, Clark, & Bennett, 1993; Burckhardt, Clark, O'Reilly, & Bennett, 1997; Cedraschi et al., 2004; Zijlstra et al., 2005).

Measures

All measures have been shown to be reliable and valid in previous FM studies, with a Cronbach's α of at least 0.74 in the present study.

Screening Instrument

A distinction was made between pain-avoidance and pain-persistence patterns based on their level of pain-avoidance behavior as the main component of fear-avoidance models. Pain-avoidance behavior was assessed with the 5-item scale "resting when in pain" of the Pain Coping Inventory (PCI; Kraaimaat & Evers, 2003; Kraaimaat, Bakker, & Evers, 1997), which reflects the level of pain-avoidance behavior when coping with pain in daily life (item examples: "I stop my activities," "I do not exert myself physically," "I rest sitting or lying down"). The Cronbach's α was .74 in this study. The mean score on this scale "resting when in pain" for several chronic-pain populations (including patients with rheumatoid arthritis, chronic headache, and pain clinic patients; Kraaimaat & Evers, 2003) was used as the cut-off score to distinguish between pain-persistence (below the mean) and pain-avoidance patterns (above the mean). In addition, this specific cut-off score was supported by a median-split procedure as well as the mean on this scale in Study 1.

Demographic Variables

Sociodemographic variables were assessed with a general checklist, assessing patient's gender, age, marital status, educational level, and medical history.

Physical and Psychological Functioning

Functional disability within the past week was assessed on a subscale of the Fibromyalgia Impact Questionnaire (FIQ; Bennett, 2005; Burckhardt, 1991; Iversen, 2003; Zijlstra, Taal, van de Laar, & Rasker, 2007). The 11 items reflecting physical functioning in daily life are rated on a 4-point Likert scale ranging from "always" to "never" with a Cronbach's α of .87 in this study.

Pain was assessed using the 6-item pain scale of the Impact Rheumatic Diseases on General Health and Lifestyle (IRGL; Huiskes, Kraaimaat, & Bijlsma, 1990; Evers et al., 1998b), which assesses physical, psychological, and social health in patients with rheumatic diseases. Patients indicate the severity and frequency of painful episodes and the duration of morning stiffness within the last month. The Cronbach's α was .76 in this study.

Fatigue for the previous two weeks was assessed with the 8-item fatigue scale of the Checklist Individual Strength (CIS; Bultmann, 2000; Vercoulen et al., 1996), with a Cronbach's α of .82 in this study.

Psychological functioning was assessed with the anxiety and negative mood scales of the IRGL (Huiskes et al., 1990; Evers et al., 1998b). The 10-item anxiety scale assesses the respondent's anxiety levels in the last month and the 6-item negative mood scale the various negative mood states over the previous week. The Cronbach's α for the anxiety scale was .88 and for the negative mood scale .92.

Pain-Avoidance Factors

Pain-related retreating was assessed with the 7-item scale "retreating" of the PCI (Kraaimaat & Evers, 2003; Kraaimaat et al., 1997), reflecting behavioral tendencies to avoid environmental stimuli on a 4-point Likert scale, ranging from "rarely or never" to "very frequently" with a Cronbach's α of .75 in this study.

Worrying about pain was assessed with the 9-item scale "worrying" of the PCI (Kraaimaat & Evers, 2003; Kraaimaat et al., 1997) measuring catastrophic cognitions about pain. The Cronbach's α was .82 in

this study. Hypervigilance was assessed with the Dutch version of the Pain Vigilance and Awareness Questionnaire (PVAQ; McCracken, 1997; Roelofs, Peters, McCracken, & Vlaeyen, 2003; Roelofs, Peters, Muris, & Vlaeyen, 2002), a 16-item measure of attention to pain in chronic pain patients. The Cronbach's α was .82 in this study.

Fear of pain was assessed with the recently adjusted Tampa Scale of Kinesophobia (TSK; Kori, Miller, & Todd, 1990; Roelofs, Goubert, Peters, Vlaeyen, & Crombez, 2004; Goubert et al., 2004), which determines fear of increasing pain and (re)injury by physical activity. Its 13 items are scored on a 4-point Likert scale, ranging from "totally disagree" to "totally agree." The Cronbach's α was .81 in this study.

Social reinforcement was assessed with the scale "solicitous responses" of the Multidimensional Pain Inventory (MPI; Kerns, Turk, & Rudy, 1985; Lousberg et al., 1999; Thieme, Spies, Sinha, Turk, & Flor, 2005), which measures concerned reactions of significant others when in pain. The 6 items are rated on a 7-point Likert scale ranging from "never" to "very often." The Cronbach's α was .77 in this study.

Pain-Persistence Factors

Ignoring pain was assessed by the 6-item scale "ignoring pain sensations" of the Dutch version of the Coping Strategies Questionnaire (CSQ; Robinson et al., 1997; Rosenstiel & Keefe, 1983) that is used to establish the cognitive coping strategy of denying that the pain hurts or affects oneself. The Cronbach's α was .79 in this study.

Persistence statements were assessed by the 6-item scale "coping self-statements" of the CSQ (Robinson et al., 1997; Rosenstiel & Keefe, 1983) that measures the coping style in which patients use self-statements to tell themselves to cope with the disease and to continue activities despite the pain (item example: "Although it hurts, I just keep on going"). The Cronbach's α was .80 in this study.

To facilitate comparison to the pain-coping strategies of the PCI, response categories of the CSQ were slightly adjusted (4-point Likert scales ranging from "rarely or never" to "very frequently").

Statistical Analysis

The screening instrument described above was used to distinguish between patients with pain-persistence (low-level pain-avoidance behavior) and pain-avoidance patterns (high-level pain-avoidance behavior). Differences between the two groups of patients were tested with chi-square analyses for categorical data and student's t-test for continuous variables with a threshold of $p < 0.05$ (two-tailed). To determine the specific factors that discriminated patients with pain-persistence and pain-avoidance patterns best, an analysis of groups was undertaken using a stepwise discriminant function procedure in SPSS (Statistical Package for the Social Sciences, SPSS, Chicago, IL). Low-level and high-level pain-avoidance behavior were used as outcome variables, the variables that yielded significant differences in the initial t-test analyses were entered in the analysis as predictor variables to produce a model and the percentage patients correctly classified by this solution. In the stepwise procedure, variables are entered in successive steps, minimizing the overall Wilks' lambda until no variables fulfill this criterion, thereby producing an optimal model.

Results

Based on the screening criterion of pain-avoidance behavior, 214 patients (59.6%) had a pain-persistence (low-level of pain-avoidance behavior) and 145 patients (40.4%) a pain-avoidance pattern (high-level pain-avoidance behavior). Means and standard deviations of sociodemographic variables and indicators of physical and psychological functioning are presented for the pain-avoidance and pain-persistence patterns in Table 1. No significant differences on sociodemographic variables (e.g., gender, age, marital status, educational level) were found between these groups. With regard to the level of physical and psychological functioning, the patients with pain-avoidance patterns had significant higher levels of functional disability ($t = -6.94$, $p < .001$), pain ($t = -3.40$, $p < .001$) and more (severe) symptoms of fatigue ($t = -3.06$, $p < .001$) relative to the patients with pain-persistence patterns, but no differences were found for anxiety

Table 1. *Means and Standard Deviations (between parentheses) or Percentages of Sociodemographic Variables and Indicators of Physical and Psychological Functioning for the Two Patient Patterns in Fibromyalgia (Study 1)*

	Pain-Persistence Pattern (n = 214)	Pain-Avoidance Pattern (n = 145)
Sociodemographic variables		
Age (years)	48.1 (8.8)	48.8 (9.3)
Sex	93%	92%
Married/co-habiting	80%	85%
Educational level		
Primary	4%	6%
Secondary	80%	79%
Tertiary	16%	15%
Physical and psychological functioning		
Fatigue	43.4 (8.5)	46.1 (7.9)
Disability	1.1 (0.6)	1.5 (0.5)
Pain	18.7 (3.7)	20.0 (3.4)
Anxiety	21.3 (6.3)	21.4 (6.1)
Depression	5.1 (4.3)	5.7 (4.8)

Table 2. *Means, Standard Deviations (between parentheses), and Results of the t-tests of the Pain-Related Cognitive-Behavioral Factors for the Two Patient Patterns in Fibromyalgia (Study 1)*

	Pain-Persistence Pattern ($n = 214$)	Pain-Avoidance Pattern ($n = 145$)	t-test	p
Pain-avoidance factors				
Pain-related retreating	1.7 (0.5)	2.2 (0.6)	−7.98	.000
Worrying about pain	1.8 (0.5)	2.0 (0.6)	−3.12	.002
Hypervigilance	35.1 (11.1)	39.2 (10.8)	−3.49	.001
Fear of pain	25.7 (6.4)	27.9 (6.5)	−3.20	.002
Social reinforcement	3.0 (1.1)	3.6 (1.1)	−4.72	.000
Pain persistence factors				
Persistence statements	2.5 (0.6)	2.2 (0.5)	4.04	.000
Ignoring pain sensations	2.1 (0.6)	1.9 (0.5)	2.03	.043

and depressive symptoms. Results for the pain-related cognitive-behavioral factors are presented in Table 2 and demonstrated that patients with a pain-avoidance pattern had significantly higher scores on the behavioral component of pain-related retreating, cognitive aspects of worrying when in pain, heightened attention of pain stimuli (hypervigilance), fear of pain, and social aspect of reinforcement. In contrast, the pain-persistence group had significantly higher scores on the pain-coping strategies of persistence statements and ignoring pain. Furthermore, after controlling for multiple testing by means of the Bonferroni correction, the differences on all the cognitive-behavioral factors remained significant, except for ignoring pain.

Subsequently, stepwise discriminant analyses were performed to determine distinguishing pain-related cognitive-behavioral variables for the two groups. The predictor variables entered into the discriminant analysis were the cognitive-behavioral factors that yielded significant differences between the two groups in the former t-tests. The discriminant analysis was significant (Wilks' lambda = 0.770, $p < 0.000$), and 71.9% of the patients were correctly classified, compared to a chance level of 50%. The discriminant analysis showed that the variables (1) pain-related retreating, (2) social reinforcement, and (3) persistence statements discriminated the pain-persistence and pain-avoidance patterns best.

Study 2: Relating Patient Patterns to Physical Fitness

This goal of this study was to investigate whether the patients with pain-persistence and those with pain-avoidance patterns, as assessed by a relatively low and high level of pain-avoidance behavior, respectively, differed on the level of physical fitness, measured by a shuttle walking test. We hypothesized that patients with pain-persistence patterns would have a higher level of physical fitness than patients with pain-avoidance patterns.

Methods

Participants and Procedure

Patients with FM, who had been referred by their rheumatologists for a randomized, controlled trial, testing the effect of a tailored cognitive-behavioral intervention, were invited to participate in our second study. The same inclusion and exclusion criteria were used as in Study 1, although here the patients' diagnoses of FM needed to have been made no longer than five years prior to the study to ensure a relative early intervention for the trial. In addition, only patients with a risk profile of heightened distress were selected for the trial and thus included in this study to indicate the maladaptive function of the cognitive-behavioral patterns (Evers et al., 2002). Patients filled out several questions to establish sociodemographic variables and the screening instrument of pain-avoidance behavior. Before their inclusion in the tailored treatment program, patients took part in an intake procedure conducted by a physical therapist who was blind to the patients' scores on the screening instrument, during which they performed a shuttle walking test to establish their level of physical fitness.

The study sample comprised 112 FM patients with a mean age of 41.2 years ($SD = 10.9$, range 18–71). Participants were predominantly female (93.8%) and 76% was married or co-habited. Of the total sample, 2%, 85%, and 13% had, respectively, a primary, secondary, or tertiary educational level. In comparison to the sample of Study 1, the group's mean age was slightly younger ($t = 6.31$, $p < .001$).

Measures

Physical fitness was assessed with a shuttle walking test, a standardized, progressive, maximal test of walking speed and endurance. The difference with a conventional treadmill test is that this test is incremental and externally paced (Singh, Morgan, Hardman, Rowe, & Bradsley, 1994; Singh, Morgan, Scott, Walters, & Hardman, 1992). Outcome measures were distance

walked in meters and perceived exertion as measured by the Borg scale rated from 0 (no perceived exertion) to 10 (maximum perceived exertion) (Borg, 1982).

Statistical Analysis

As in Study 1, the screening instrument consisting of pain-avoidance behavior was used to distinguish the patients. Performance differences with regard to the distance walked and the perceived exertion between the patients with pain-persistence (low-level pain-avoidance behavior) and those with pain-avoidance patterns (high-level pain-avoidance behavior) were tested with student's t-test with a threshold of $p < 0.05$ (two-tailed).

Results

Based on the screening criterion of pain-avoidance behavior, 54 patients (49%) had a pain-persistence (low-level of pain-avoidance behavior) and 58 patients (51%) a pain-avoidance pattern (high-level pain-avoidance behavior). The shuttle walking test revealed significant group differences in the total distance walked ($t = 2.64$, $p < .05$) (see Table 3). The patients with a pain-persistence pattern walked longer than those with a pain-avoidance pattern. These results remained significant after controlling for multiple testing by means of the Bonferroni correction. No pattern-related differences were found for the level of perceived exertion (see Table 3).

Study 3: Self-Report-Based Patient Patterns versus Interview-Based Therapist Patterns

The aim of our third study was to investigate the level of correspondence between two screening methods for pain-persistence and pain-avoidance patterns in FM: the first based on our self-reported screening instrument of pain-avoidance behavior and the second founded on the judgment of a therapist following a semi-structured interview. A relatively high level of correspondence was expected between the two screening methods.

Table 3. *Means, Standard Deviations (between parentheses), and Results of the t-tests of the Shuttle Walking Test for the Two Patient Patterns in Fibromyalgia (Study 2)*

Physical Test	Pain-Persistence Pattern ($n = 54$)	Pain-Avoidance Pattern ($n = 58$)	t-test	p
Distance walked (meter)	307.0 (122.6)	239.7 (134.5)	2.77	.007
Perceived exertion (Borg)	4.0 (1.9)	4.2 (1.8)	–0.67	.503

Methods

Participants and Procedure

For this study, a sub-sample of consecutive patients of Study 2 was used consisting of 77 patients. Consequently, the sample consisted of FM patients who had been referred by their rheumatologists for a randomized, controlled trial, and the inclusion and exclusion criteria were the same as in Study 2. Before inclusion in the treatment program, patients filled out a questionnaire on sociodemographic data and the screening instrument of pain-avoidance behavior. As part of the intake procedure for the treatment program, patients were also seen by a trained psychologist who was experienced with the pain-persistence and pain-avoidance patterns. The therapist, blind for the scores on the self-reported screening instrument, conducted a semi-structured, diagnostic interview with the patient with regard to relevant pain-related cognitive-behavioral factors, including pain-avoidance behavior, social reinforcement, hypervigilance, and fear of pain. In addition, the 7-day record of daily activities the patients had been asked to keep prior to the interview was discussed.

The present FM sample consisted of 77 patients with a mean age of 41.7 ($SD = 11.7$). Patients were predominantly female (93.5%) and 76.3% was married or co-habited. Of the total sample, 2.9%, 88.4%, and 8.7% had, respectively, a primary, secondary, or tertiary educational level. Again, the sample was slightly younger ($t = 7.04$, $p < .001$) relative to the sample in Study 1. No sociodemographic differences were found in comparison with the patients of Study 2.

Measures

After the interview, the therapist indicated on two separate 10-point visual analogue scales (VAS) the degree to which they judged the patients to be characterized by pain-persistence patterns and by pain-avoidance patterns. Patients were classified as pain-persistent if the relevant VAS score was ≥ 5 and the difference with the pain-avoidance VAS was ≥ 1, and vice versa for the pain-avoidant group. As the pain-persistence and pain-avoidance VAS scores of six patients were equal, they were subsequently excluded from further analyses.

Statistical Analysis

As in both previous studies, the screening instrument consisting of pain-avoidance behavior was used to distinguish the patients with a pain-persistence (low-level pain-avoidance behavior) and pain-avoidance pattern (high-level pain-avoidance behavior). Cross-tabs percentages and the Cohen's kappa test (chance-corrected proportional agreement) were computed to

compare the therapists' results and the results based on the self-reported screening instrument.

Results

The comparison of the self-report-based and the therapists-based patient patterns yielded a correspondence of 70.6% for the pain-persistence patterns and 80% for the pain-avoidance patterns (see Table 4) Cohen's kappa was significant ($K = .546$), indicating a moderate to good agreement (Altman, 1991). For 16 of the 71 patients (22.5%) no agreement was found.

Discussion

With our three-part study, we set out to gain a deeper insight into the discriminative value of pain-avoidance behavior to distinguish specific cognitive-behavioral patterns in FM patients. In our first study, we found that pain-avoidant patients retreated more when in pain, worried more about their pain, paid more attention to pain sensations, and were more afraid that movement would cause (more) pain. In addition, their social environment reinforced their avoidance behavior more strongly. These findings are consistent with fear-avoidance models that postulate that factors of pain-avoidance behavior, heightened attention to pain, pain-related fear, and catastrophizing are interrelated (Lethem et al., 1983; Philips, 1987; Vlaeyen & Linton, 2000; Vlaeyen et al., 1995). In contrast, patients characterized by pain-persistence patterns showed higher scores on persistence statements and ignoring pain, providing preliminary support for the recent findings of a distinct group of patients characterized by overuse and demanding cognitions, where fear-avoidance models seem less applicable (Bazelmans et al., 2006; Hasenbring, 2000; Hasenbring et al., 2006; Prins et al., 2001; Shapiro, 2006; Vlaeyen & Morley, 2004). The discriminant factors of these patterns, namely pain-related retreating, persistence statements, and social reinforcement, underscore the relevance of cognitive, behavioral, and social mechanisms in distinguishing patient patterns (Evers, Kraaimaat, van Riel, & Bijlsma, 2001; Flor, Birbaumer, & Turk, 1990; Turk & Flor, 1999). Furthermore, the preliminary findings with regard to the physical fitness test in Study 2 seem to deliver additional support that long-lasting pain-avoidance behavior can seriously compromise the physical condition of FM patients (Bortz, 1984; Crombez, Vlaeyen, Heuts, & Lysens, 1999; Evers, Kraaimaat, Geenen, & Bijlsma, 1998a). Future studies might also clarify whether internal stop-rules and motives play a role in the persistence or avoidance behavior during physical fitness examination (Vlaeyen & Morley, 2004). Finally, the findings of the third study suggest that a screening instrument consisting of only a short self-report can be used as a clinically valid instrument for the discrimination of FM patients with dissimilar cognitive-behavioral patterns.

Table 4. *Percentage Agreement between the Therapists' Interview-Based Patient Patterns and the Patterns as Derived from the Self-Report Screening Instrument (Study 3)*

	Screening Instrument		
	Pain-persistence Pattern	**Pain-avoidance Pattern**	**Total**
Therapist judgment			
Pain-persistence pattern	31 75.6%	10 24.4%	41
Pain-avoidance pattern	6 20%	24 80%	30
Total	37	34	71

As different perpetuating cognitive-behavioral mechanisms for the maintenance of pain and disability appear relevant in these two groups, offering FM patients CBT that is tailored to their specific dysfunctional mechanisms seem to be promising to augment treatment effects and to reduce the number of patients dropping out. Studies on in vivo exposure specifically aimed at diminishing the patient's fear of pain and movement, for example, have reported encouraging results, particularly in chronic pain patients exhibiting high fear-of-pain levels (Vlaeyen, de Jong, Sieben, & Crombez, 2002; de Jong et al., 2005). Thieme and colleagues (2006) have further shown the benefits of specific operant-behavioral and cognitive-behavioral treatment options for FM patients, which offer promising possibilities for tailored interventions. Patients with pain-avoidance patterns are likely to benefit most from operant-behavioral interventions aimed at changing their pain-avoidance patterns and fear of pain, whereas for patients with pain-persistence patterns, cognitive restructuring and acceptance-based approaches might be more appropriate (Vlaeyen & Morley, 2005; McCracken, Vowles, & Eccleston, 2005; Thieme et al., 2006).

Some limitations of the present study have to be mentioned. As to our choice of participants, we cannot rule out a possible selection bias. Although the results were largely consistent to our expectations in all the different samples, the patients in Study 1 were a random sample recruited through our national FM patient association comparable to other representative FM samples, whereas the samples of Study 2 and Study 3 comprised distressed patients that were specifically interested in CBT and who probably demonstrate maladaptive patterns of pain-avoidance and pain-persistence. Second, although the agreement between the therapist-based and screening-based patient patterns was relatively high, there was still a group with

no concord, which may indicate some overlap between the two patterns. Furthermore, one therapist was involved in the rating of the patient patterns, and future research should aim at investigating the inter-rater reliability of this procedure. Third, the level of physical functioning differed between the patients with pain-persistence or pain-avoidance patterns, and it could be argued that the differences we found on the pain-related cognitive-behavioral factors might also be attributable to the patients' level of functioning. However, also when adding indicators of physical and psychological functioning as covariates in post-hoc analyses, the differences between the pain-avoidance and pain-persistence patterns remained significant or borderline significant. Nevertheless, prospective and experimental studies are clearly needed to investigate this relationship in more detail. Fourth, the factors of ignoring pain and persistence assessed with a slightly adjusted self-report questionnaire were used to explore patterns of pain-persistence. Behavioral methods such as self-observation lists or measures of actual activity levels (actometer) are also important in the assessment of pain-persistence patterns, and factors that could influence physical functioning should be taken into consideration (e.g., age, body mass index). In this study, we found preliminary evidence that patients characterized by pain-persistence patterns had a higher level of physical fitness than pain-avoidance patients, suggesting this group is not just claiming pain-persistence behavior. Future research should aim at developing more self-report and behavioral methods to explore pain-persistence patterns. Finally, the clinical relevance of the two FM patterns should additionally be established, for example, by comparing the efficacy of CBT programs that are tailored to specific patient patterns with the effects of regular CBT interventions.

Taken together, this three-part study suggests that the short self-report screening instrument based on pain-avoidance behavior in FM patients is a valid method to distinguish between two specific cognitive-behavioral patterns supported by physical fitness tests and consistent with interview-based therapist judgments. Furthermore, it supports the notion that pain-avoidance behavior can be used to discriminate between patients characterized by pain-avoidance patterns and those characterized by pain-persistence patterns. Future prospective and experimental research should aim at delineating underlying mechanisms of these patterns further, in particular, the less explored factor of pain-persistence as cognitive-behavioral mechanism in FM patients. Although more prospective and experimental research is clearly needed, preliminary findings suggest that pain-persistence mechanisms can be a risk factor for the development and maintenance of chronic pain (Hasenbring, 2000; Hasenbring et al., 1994; van Houdenhove & Egle, 2004; van Houdenhove et al., 2001; Thieme et al., 2007). However, more research is needed to differentiate between functional active pain coping strategies that are taught in CBT to patients with pain-avoidance patterns and the dysfunctional patterns of pain-persistence and overuse that can lead to exhaustion and more complaints in the long term. For example, in our study, patients with heightened levels of distress were enrolled to ensure the maladaptive function of pain-persistence and pain-avoidance patterns. In addition, overt behavioral methods can be used in addition to self-report measures to ensure the selection of patients with actual pain-persistence patterns (Vercoulen et al., 1997). Furthermore, more research is needed on the possible underlying mechanisms of pain-persistence patterns, e.g., fear of failing to function in daily life as a result of the pain, low self-esteem, or personality characteristics of perfectionism (van Houdenhove, 1986). In addition, the long-term changes of these patient patterns should be further explored, while these patterns could be stages in a learning process. For example, it has been proposed that pain-persistence patterns might be particularly relevant in the phase from acute to chronic pain and could finally lead to exhaustion and pain-avoidance behavior in the long term (van Houdenhove & Egle, 2004; van Houdenhove et al., 2001). Finally, there is also preliminary evidence that these cognitive-behavioral patterns are relevant in other chronic (pain) conditions, for example, in chronic fatigue syndrome (Bazelmans et al., 2006; Shapiro, 2006), and additional research with regard to differences and correspondences to patients with FM is needed to investigate this in greater detail.

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