Illness behavior in patients with musculoskeletal disease
Bot, A.G.J.

Citation for published version (APA):
Bot, A. G. J. (2013). Illness behavior in patients with musculoskeletal disease

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: http://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
CHAPTER 10

Creation of the abbreviated measures of the PCS and SHAI: the PCS-4 and SHAI-5

Arjan G.J. Bot, Stéphanie J.E. Becker, Hanneke Bruijnzeel, Marjolein A.M. Mulders, David C. Ring and Ana-Maria Vranceanu

In print: J Musculoskel Pain
Abstract

Introduction: In patients with arm and upper extremity illness, pain catastrophizing and health anxiety are important factors in disability, pain and patient satisfaction. The aim of this study was to develop a shorter version of the 13-item Pain Catastrophizing Scale [PCS] and 18-item Short Health Anxiety Inventory [SHAI].

Methods: One hundred and sixty-four patients [54% women, mean age of 51 years] with a variety of upper extremity diagnoses enrolled in this study. Patients completed the PCS, the SHAI, the Disabilities of Arm Shoulder and Hand questionnaire [DASH] for disability, Patient Health Questionnaire- 9 [PHQ-9] for depressive symptoms and a scale to measure pain. Intercorrelation analyses were conducted on each of the subscales of the PCS and the SHAI and questions were selected based on the magnitude of their inter-item correlation.

Results: Questions 3, 6, 8 and 11 remained in the PCS-4 and showed good internal consistency [α=0.86] and correlated highly with the original PCS [r=0.96]. Questions 2, 3, 12, 15 and 17 were chosen for the SHAI-5. The SHAI-5 had α=0.67 and had a correlation or r=0.87 with the SHAI-18. Both the SHAI-5 and PCS-4 had equal correlations with DASH, PHQ and pain as the original questionnaires.

Conclusions: We found that the PCS-4 and SHAI-5 were comparable to the original questionnaires but further studies should be conducted in order to confirm our findings. This study provides preliminary evidence that the PCS-4 and SHAI-5 could be used to screen for health anxiety and pain catastrophizing in busy orthopedic settings.
Introduction

Pain catastrophizing (the tendency to ruminate on the pain experience, feel hopeless and helpless when in pain) and health anxiety (the tendency to be overly concerned about health) are important factors associated with pain and disability across many acute and chronic pain conditions. In patients with arm and upper extremity illness, pain catastrophizing and health anxiety are significant predictors of disability, pain intensity and satisfaction in patients with both discrete and nonspecific conditions.

The Pain Catastrophizing Scale (PCS; Sullivan, 1995) is a reliable and valid measure with three interrelated factors: rumination, magnification and helplessness. The PCS has good internal consistency, Crohnbach’s α 0.87 for the entire scale, α=0.60 for the magnification scale and α=0.79 for the helplessness scale. The PCS significantly correlates with depression [r=0.26], trait anxiety [r=0.32], negative affectivity [r=0.32], fear of pain [r=0.80], disability and pain intensity.

The Health Anxiety Inventory (HAI; Warwick, 1989) is a reliable and valid measure of preoccupation and worry about health. Health anxiety is encountered frequently in medical clinics, a study found that 19.8% of the studied patients in 5 different specialties had health anxiety; the highest percentage [24.7%] was found in the neurology clinic. Health anxiety is a significant predictor of pain and disability in patients with chronic pain. In patients with hand and upper extremity illness, health anxiety is a mediator for development of non specific arm pain.

The HAI has excellent internal consistency [Crohnbach’s α=0.95] and sensitivity to detect clinical improvement. The short version of the HAI [SHAI; 19], which has 14-general items and 4 negative consequence items from the original HAI, also showed good internal consistency [Crohnbach’s α=0.89]. Patients with high scores on the SHAI [hypochondriac and anxious patients] also have high scores on depression, the Avoidance scale, the Reassurance scale, the Beck Anxiety Inventory, the Spielberger State-Anxiety Inventory and the Spielberger Trait-Anxiety Inventory. The short version of the HAI was designed specifically for the screening of patients in a medical setting.

Given the aforementioned evidence, it becomes pivotal to assess health anxiety and pain catastrophizing in patients with arm and upper extremity illness presenting to a hand surgical practice. By addressing these factors via efficacious Cognitive Behavioral Therapy we can improve disability and pain as well as the efficacy of medical procedures. However, the PCS and SHAI are fairly long and cumbersome to use in a busy surgical practice. Hence, the purpose of this study is to develop shorter, reliable and valid versions for both questionnaires. Our null-hypothesis is that there will be no difference in the magnitude of the correlation of the shorter version of the SHAI and PCS with disability as measured with the DASH-questionnaire when compared to the long version. Secondary hypotheses are that there will be no differences in the magnitude of the correlation of the shorter version of the SHAI and PCS with depression and pain.

Methods

Study Design

One hundred and seventy adult patients [18 years and older] visiting one of four hand surgeons for a new or return visit were invited to enroll in this Institutional Review Board approved study and provided informed consent. Patients were enrolled between December 2009 and June 2011. A total of 6 patients were excluded: 1 patient did not feel comfortable completing the questionnaires and withdrew from the study and 5 patients did not have a valid DASH...
questionnaire, which was used to compare short and long questionnaires, which left a cohort of 164 patients.

**Patient Characteristics [Table 1]**

There were 89 women [54%] and 75 men [46%], with a mean age of 51 years [range, 18 to 89 years] and 41% of the patients were new patients. Sixty-six percent did not have previous surgery and symptoms were present for an average of 18 months. There were multiple diagnoses: a fracture in 56 patients, carpal tunnel syndrome in 19 patients, osteoarthritis in 17 patients, trigger finger in 10 patients, non-specific arm pain in 7 patients and other diagnoses in 55 patients.

Twelve percent of the patients smoked, 30% of the patients were single, 3% were living with partner, 45% were married, 16% divorced and 6% were widowed. The working status was as follows: full-time 49%, part-time 14%, homemaker 3.7%, retired 18%, unemployed 14% and workers compensation 1.8%. The patients had a mean of 15 years of schooling. [Table 1]

<table>
<thead>
<tr>
<th>Table 1 Patient demographics</th>
<th>n=164</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter</strong></td>
<td><strong>Mean ± SD</strong></td>
</tr>
<tr>
<td>Age (years)</td>
<td>51 ± 15</td>
</tr>
<tr>
<td>Presence of symptoms in months</td>
<td>18 ± 39</td>
</tr>
<tr>
<td>Years of schooling</td>
<td>15 ± 2.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>75</td>
</tr>
<tr>
<td>Female</td>
<td>89</td>
</tr>
<tr>
<td>Visit type</td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>67</td>
</tr>
<tr>
<td>Follow-up</td>
<td>97</td>
</tr>
<tr>
<td>Previous surgery</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>54</td>
</tr>
<tr>
<td>No</td>
<td>110</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19</td>
</tr>
<tr>
<td>No</td>
<td>145</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>49</td>
</tr>
<tr>
<td>Living with partner</td>
<td>5</td>
</tr>
<tr>
<td>Married</td>
<td>74</td>
</tr>
<tr>
<td>Separated/Divorced</td>
<td>26</td>
</tr>
<tr>
<td>Widowed</td>
<td>10</td>
</tr>
<tr>
<td>Working status</td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>80</td>
</tr>
<tr>
<td>Part-time</td>
<td>23</td>
</tr>
<tr>
<td>Homemaker</td>
<td>6</td>
</tr>
<tr>
<td>Retired</td>
<td>29</td>
</tr>
<tr>
<td>Unemployed</td>
<td>23</td>
</tr>
<tr>
<td>Workers compensation</td>
<td>3</td>
</tr>
</tbody>
</table>

**Evaluation**

At enrollment, patients completed demographics and questionnaires. The DASH questionnaire [Disabilities of Arm Shoulder and Hand] was completed to measure arm specific disability, the PHQ-9 questionnaire [Patient Health Questionnaire-9] to measure symptoms of depression, the Pain Catastrophizing Scale [PCS] to assess catastrophic thinking, the Short Health Anxiety Inventory [SHAI] to test for health anxiety, and an 11-point ordinal pain scale to measure pain intensity.

The 13-item PCS was used to measure misconceptions of nociception and a higher score on this scale indicates more catastrophic thinking. There are three subscales in this questionnaire; rumination [questions 1, 7, 9 and 11], magnification [questions 3, 6, 13] and helplessness [questions 2, 4, 5, 8, 10, 12].

The SHAI contains 18 questions which are answered on a scale from 0-3 and total scores...
range between 0 and 54; higher scores correspond to more health anxiety \textsuperscript{19}. The scale consists of a two subscales: 4 negative consequence items [question 15, 16, 17 and 18] and the other 14 questions \textsuperscript{19}.

For missing individual questions in the SHAI and PCS, we imputed the mean of the patient’s other questions.

\textit{Statistical Analysis}

For this study we used a convenience sample of 164 patients. Crohnbach’s alpha coefficient was calculated for SHAI, PCS and each of the subscales of the questionnaires to measure internal consistency of the questionnaires.

Five sets of intercorrelation analysis were conducted on subscales of the SHAI and PCS in order to create shorter questionnaires of the PCS and SHAI. The items for the short scales were selected based on their corrected inter-item correlation value [highest magnitude]. When the selected item contributed to reduced scale variability we selected the next question based on the magnitude of the inter-item correlation \textsuperscript{44}.

Correlation analysis between subscales of the proposed short version of the PCS [rumination, magnification and helplessness] and SHAI [the first items and the negative consequence items] with the matched subscales of the longer questionnaires was conducted. We also did correlation analysis for the nonmatching subscales of both SHAI and PCS and investigated the correlation of the short and long questionnaires with each other.

Shortening questionnaires may lead to a decreased validity of the questionnaires; therefore we investigated the correlation of both the proposed short questionnaires and the original questionnaires with DASH, PHQ-9 and pain [with Pearson correlation]. The obtained correlation coefficients were compared using Fisher’s Z-transformation.

\textit{Results}

\textit{Outcomes:}

The mean DASH score was 29 ± 19, mean PHQ-9 score was 3.6 ± 4.4 points, mean PCS was 5.3 ± 6.9 and the SHAI was 11 ± 6.6 in this cohort.

\textit{Inter-item correlations [Table 2]:}

We did intercorrelation analysis on the 3 subscales of PCS and the 2 subscales of the SHAI. For the PCS in the rumination subscale, question 11 [“I keep thinking about how badly I want the pain to stop”] was selected; in the magnification subscale question 3 [“It’s terrible and I think it’s never going to get any better”] and question 6 [“I become afraid that the pain may get worse”] and in the helplessness subscale question 8 [“I anxiously want the pain to go away”]. Question 8 did not have the highest value of inter-item correlation of all questions in the subscale, but the questions with higher correlations would lead to a reduced variance of the subscale and were therefore not selected for the short form of the PCS [Table 2].

For the SHAI questions 15 [“If I had a serious illness I would…”] and 17 [“A serious illness would ruin…..aspects of my life”] were selected from the negative consequence items subscale; from the other subscale questions 2 [“I notice aches and pains…”], 3 [“…..aware of bodily sensation or changes”] and 12 [“I …..think I have a serious illness”] were retained in the subscale of the short questionnaire. Questions 2 and 3 did not have the highest corrected inter-item correction but were chosen because the other questions would lead to a reduced scale variability \textsuperscript{44}. [Table 2]
Correlation with the subscales of the long questionnaires [Table 3 and 4]
The short subscales correlated highly with the matching subscales on the longer questionnaires [correlation coefficient ranged from 0.86-0.94 for the subscales of PCS, and 0.82 to 0.89 for the subscales of the SHAI]. Each of the subscales in the short questionnaire correlated significantly with the other nonmatching subscales in the original subscales of the PCS, with a correlation coefficient ranging from 0.60 to 0.82 [Table 3]. There was a moderate correlation between the nonmatching subscales in the short and long questionnaires of the SHAI (the correlation coefficient was 0.30 and 0.44) [Table 4]. The correlation of the PCS-4 and PCS-13 was r= 0.96, the correlation of the SHAI-5 and the SHAI-18 was r= 0.87.

Internal consistency and correlation statistics for the new questionnaires [Table 5 and 6]
Statistical evaluation revealed a Cronbach’s alpha of 0.67 for the 5 question version of the SHAI and 0.86 for the 4-question PCS. The Cronbach’s alpha coefficient was 0.93 for the full PCS and 0.88 for the SHAI-18 [Table 5].

Both the short PCS-4 and PCS-13 correlated significantly with pain, disability as measured with the DASH and depression as assessed with PHQ (correlation ranged between
Both the short and long version of the SHAI correlated significantly with DASH, PHQ-9 and pain (correlation ranged between $r=0.20$ to $r=0.48$). There were no statistical differences in the correlation coefficients of the short and long questionnaires with the DASH, PHQ-9 and pain.

### Table 5 Outcomes short and long forms of PCS and SHAI

<table>
<thead>
<tr>
<th>Questionnaires</th>
<th>Score</th>
<th>SD</th>
<th>Range</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>†PCS 13</td>
<td>5.3</td>
<td>6.9</td>
<td>0-32</td>
<td>0.93</td>
</tr>
<tr>
<td>†PCS-4</td>
<td>2.0</td>
<td>2.7</td>
<td>0-12</td>
<td>0.86</td>
</tr>
<tr>
<td>°SHAI-18</td>
<td>11</td>
<td>6.8</td>
<td>1-33</td>
<td>0.88</td>
</tr>
<tr>
<td>°SHAI-5</td>
<td>4.0</td>
<td>2.4</td>
<td>0-12</td>
<td>0.67</td>
</tr>
</tbody>
</table>

†PCS = Pain Catastrophizing Scale
°SHAI = Short Health Anxiety Index
■ Crohnbach’s α: internal consistency coefficient

### Table 6 Correlation of PCS and SHAI with DASH, PHQ-9 and Pain

<table>
<thead>
<tr>
<th>Bivariate analysis</th>
<th>†DASH</th>
<th>°PHQ-9</th>
<th>Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson’s correlation</td>
<td>$r$</td>
<td>$p$</td>
<td>$r$</td>
</tr>
<tr>
<td>†PCS</td>
<td>0.50</td>
<td>$p&lt;0.001$</td>
<td>0.64</td>
</tr>
<tr>
<td>†PCS-4</td>
<td>0.46</td>
<td>$p&lt;0.001$</td>
<td>0.57</td>
</tr>
<tr>
<td>°SHAI-18</td>
<td>0.26</td>
<td>0.001</td>
<td>0.48</td>
</tr>
<tr>
<td>°SHAI-5</td>
<td>0.23</td>
<td>0.004</td>
<td>0.43</td>
</tr>
</tbody>
</table>

†DASH = Disabilities of the Arm, Shoulder and Hand
°PHQ = Patient Health Questionnaire
†PCS = Pain Catastrophizing Scale
°SHAI = Short Health Anxiety Index

### Discussion

This study described the development of a 4-item version of the Pain Catastrophizing Scale and a 5-item version of the Short Health Anxiety Inventory. Both abbreviated questionnaires showed good or acceptable internal consistency [PCS-4: Crohnbach’s α = 0.86; SHAI-5 Crohnbach’s α = 0.67], which were slightly lower than the original scales due to reduction in number of scale items. The short questionnaires correlated highly with the original questionnaire, PCS $r=0.96$ and SHAI $r=0.87$. The matching subscales in the short and long questionnaires correlated highly in both SHAI and PCS, and both the short and long questionnaires had comparable correlation coefficients with measures of depression, disability and pain.

The purpose of this study was to develop shorter questionnaires that could be easily used in a [hand and upper extremity] clinic to screen for catastrophic thinking and health anxiety. The questions were reduced in both questionnaires to one third of the original number of questions, which would make screening for these conditions less time consuming and cumbersome for the patients.

There are several shortcomings in this study which should be considered. This study only described the development of the shorter version of the PCS-4 and SHAI-5, but was not intended to validate the short questionnaires. Validation studies should be conducted to confirm the findings in this study.

Although we used a validated methodology, there are always points of discussion in the method of shortening a questionnaire and selecting questions. We used the corrected inter-
item correlations as a tool to select the questions and chose the next question when the selected item would yield reduced scale variability. Based on this method we did not select 1 question in the PCS and 2 alternative questions in the SHAI with the highest corrected inter-item correlation. A suggestion for having selected the right questions is to compare the correlations of the original and the shortened version of the questionnaire with disability, depression and pain. The correlations with the outcome variables did not significantly differ between the short and long versions in this study, which is an indication that the selected questions measure the same as the original questionnaire, although other studies should confirm these findings.

In the final version of the SHAI we selected 3 questions from the first 14 items and 2 from the negative consequence items, but for the PCS we selected 2 questions of the magnification subscale and only 1 in the 2 other subscales. The decision to select 2 questions from the magnification subscale and 2 from the rumination and helplessness subscale makes it impossible to compare the internal consistency of the 2 subscales with the original subscale. However, the correlation of the short subscale compared to the longer subscale of the PCS was high [correlation coefficient ranged from 0.86 to 0.94].

These shortcomings stress the importance of validating results of this study with a different sample. Confirmation of these results would increase confidence that the abbreviated versions of the PCS and SHAI are reliable and valid, and would foster incorporation of these questionnaires as part of screening for all new patients presenting to hand surgical practices. Both catastrophic thinking and heightened illness concern can be treated with cognitive behavior therapy and the shortened forms of the questionnaires can be used in the setting of screening for these conditions.


