A principal components analysis of negative affect-related constructs relevant to pain: Evidence for a three component structure

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Abstract

A number of negative affect-related constructs are important in pain. Some are general, such as anxiety, depression and negative affectivity, whereas others are more specifically pain-related (e.g., fear of pain, pain anxiety and pain catastrophizing). In addition, some more specific fear-related constructs, such as anxiety sensitivity, illness/injury sensitivity, and fear of negative evaluation, have emerged as important to pain. Although these various constructs are considered conceptually separate, there is likely to be overlap between them. Since the extent of this overlap is unknown, the aim of the current study was to investigate these constructs in one sample in order to identify their common and unique features. Frequently used psychological measures were completed by 508 pain free participants. Principal components analysis resulted in the extraction of three components: 'General distress', 'Fear of pain from injury/insult', and 'Cognitive intrusion of pain'. The results presented here suggests that there is indeed commonality between constructs, which may be due to either an overlap between items within measures or due to close conceptual relatedness. The implications of these core dimensions are discussed with reference to future research and theory.

Perspective

This article explores the relationships between various negative-affect pain-related measures and discusses the results from a principal components analysis. The findings show that some questionnaires may measure the same latent construct. A measure could be developed to measure these three core components more concisely for both clinical and research purposes.

Introduction

Pain and negative affect often co-occur [5,16] in both clinical and non-clinical presentations of pain. For example, Conrad et al.[10] found that compared with pain free matched controls, chronic pain patients have significantly greater depression and anxiety. This relationship also appears to occur in experimentally induced pain, with depressed mood related to reduced pain tolerance [48] and higher anxiety to increased pain intensity[41].

Alongside these more general constructs, there are a number of specific anxiety and fear-related dimensions that relate to pain. For example, the pain-related dimensions fear of pain and pain catastrophizing have both been related to pain sensitivity, and both play a role in the development and maintenance of pain-related disability [3,15,20,27,39,45]. There has also been interest in the fear of anxiety-related sensations (i.e., anxiety sensitivity; AS) and the closely related construct of illness/injury sensitivity (IS)[14,18,36,43]. Finally, it is becoming increasingly recognised that pain and its associated expression occur within a social context, and so fears related to negative evaluation (FNE; fear of negative evaluation by others) may also be important[24].

Although this research indicates that there are both general and specific anxiety-related constructs related to pain, we know less about how they are related to one another. In one of the few studies to examine some of these constructs together, Vancleef et al.[44] found that IS and AS, but not FNE, were significant predictors of fear of pain and pain-related catastrophizing. However, it remains unclear the degree to which these anxiety-related constructs are distinct from one another, and what the degree of overlap is between them. If there is overlap between these measures, then some constructs may be redundant or less important. Similar observations have been

expressed more generally in the conceptualisation of anxiety and depression, where it has been shown that the scales used to measure these constructs not only need to share a set of similar symptoms, but can be differentiated by examining condition specific characteristics[46]. This possibility has yet to be examined in the context of pain-related anxiety. However, it seems likely that this group of questionnaires measuring constructs relating to negative affect, anxiety, and fear, may have underlying common themes. Indeed, previous research has shown there to be significant correlations between a number of these constructs (e.g. anxiety sensitivity, fear of pain, and pain anxiety[50]).

Our interest here is in the experience of pain and affect in a sample unaffected by a clinical pain state; as such groups are likely to also suffer from co-existing anxiety and depression. Although a non-clinical sample will allow us to examine the naturally occurring relationships between such constructs, our longer term goal is to develop optimal measurement methods of affect in different pain populations. Thus we view the examination of the interrelationship of constructs in a large non-clinical sample as an important and necessary first step, especially given our focus on the function and fidelity of affect constructs and their inter-relatedness. We hypothesized that when these commonly used measures were examined concurrently, in the same population, that significant conceptual overlap would be found, and a higher order affective system would emerge that cuts across independently developed instruments.

Materials and Methods

Participants

The inclusion criteria for participation in this study included self reported good general health and English as a first language. Those reporting chronic pain

(over 3 months) were excluded. An opportunity and snowballing sampling approach was used. For example, students were recruited during lectures, University employees through invitation etc. A total of 508 healthy adults completed the study. Table 1 presents full demographic information for the sample.

TABLE 1

Measures & Procedure

Following Ethics Committee approval from the University of Bath, participants were provided with information about the study. The 508 who provided informed consent to participate were then asked to complete nine questionnaires. The constructs we sought to measure were based upon the constructs found in two models. Firstly, the latest fear avoidance model of chronic pain[30] which includes the constructs anxiety sensitivity, negative affectivity, pain catastrophizing, fear of pain, and depression, which are all thought to contribute to the development of chronic pain. Secondly, the hierarchical model of the relationship between negative emotionality, and lower-order constructs[22] which has been expanded to include pain relevant constructs[17], which includes negative emotionality (NA), anxiety, illness/injury sensitivity, social evaluation sensitivity (fear of negative evaluation), anxiety sensitivity, pain catastrophizing, and fear of pain. In addition a measure of pain anxiety has been included due to the extensive research in pain on this construct as well as many of the others. The questionnaires were chosen based on theoretical grounds; they are generally viewed as good measures of the underlying constructs under consideration and are judged to be valid and reliable measures[17]. Although

some of the measures were developed for use in a chronic pain population, all have been validated and used in a normal population. The constructs sampled (and measures administered) were completed in the following order:

Negative Affect

The Positive and Negative Affect Schedule (PANAS[47]) consists of items relating to ten negative states (e.g. 'distressed', 'upset') and ten positive states (e.g. 'inspired', 'active'). Participants rate the extent to which they feel each affective state on a five point Likert scale (1= very slightly or not at all, 5 = extremely). The participants were asked to answer each item in terms of how they 'generally feel' in order to obtain a trait measure. The 'negative affect' (NA) subscale was used as a measure of negative affectivity. Although a preliminary exploration of the data found that the 'positive affect' subscale formed its own component (as expected), it was not included in the main analyses as the study was more concerned with negative constructs. The NA scale has been found to be highly internally consistent (α = .84 to .87), have temporal stability over an eight week period (.71), and have evidence of convergent (.81 to .92) and discriminant validity (.06 to -.21)[47].

General Trait Anxiety

The Spielberger State/Trait Anxiety Inventory (STAI-t[37]) was used to measure trait anxiety. The trait form consists of 20 items to which participants indicate the extent these statements apply to them on a four point Likert scale (1 = almost never, 4 = almost always). This scale has been found to have high test-retest coefficients (.73 to .86 in college students) and internal consistency (α = .90), and shows evidence of concurrent validity (.73 to .85) [37].

Depression, Anxiety, and Stress

The short form of the Depression Anxiety and Stress Scale (DASS-21[23]) was used as a measure of mood. There are seven items in the subscales relating to depression, anxiety, and stress. The questionnaire is rated on a four point Likert scale (0 = did not apply to me at all, 3 = applied to me very much, or most of the time). Internal consistency (α = .87 to .91) and concurrent validity (.55 to .85) was found to be in the acceptable to excellent ranges [2]. All three subscales were used in the current study.

Fear of illness and injury

The Illness/Injury Sensitivity Index (ISI[42]) is an 11-item self report which measures fear of illness and injury. Participants are asked how much they agree with each item on a five point Likert scale (1 = very little, 5 = very much). This questionnaire has acceptable internal consistency (α >.80)[42]. Factor analysis has revealed two factors, fear of injury and fear of illness[7]. In the present study these two factors were used as subscales.

Catastrophic thinking about pain

The Pain Catastrophizing Scale (PCS[38]) a 13 item scale, was developed to measure the tendency to catastrophize during painful situations. The items are rated on a five point Likert scale (0 = not at all, 4 = all the time), which serve to form three dimensions: rumination, magnification, and helplessness. The scale has been found to have acceptable test-retest reliability (.75), internal consistency (α = .93 to .95) and predictive validity[31,32,38].

Pain Specific Anxiety

The 20-item version of the Pain Anxiety Symptoms Scale (PASS[26]) was used to measure pain-related anxiety. While it was developed for use with a chronic pain population, it has been used within non-clinical samples, and is considered valid and

reliable in a normal population [1]. Items are rated on a 6 point Likert scale (0 = Never, 5 = Always), which are used to form four subscales: fear of pain, escape-avoidance behaviours, physiological symptoms, and cognitive symptoms of anxiety. The PASS-20 has satisfactory internal consistency (α = .81 to .83) and test-retest reliability (.74 to .87), and has good construct and predictive validity[11,26,35].

Fear of Pain

The Fear of Pain Questionnaire III (FPQ[28]) is a 30-item questionnaire in which participants are asked to rate the fear they associate with each item on a five point Likert scale (1 = not at all, 5 = extreme). There are three subscales relating to the fear of minor pain, medical pain, and severe pain. The FPQ has good internal consistency (α = .87 to .88), test-retest reliability (.69 to .76), and predictive validity with high fear of pain individuals as measured by the FPQ having greater avoidance/escape from a behavioural test, compared with low fear of pain individuals[28].

Fear of Negative Evaluation

The Brief Fear of Negative Evaluation Scale is a 12 item scale which measures the fear of negative evaluation by others (FNES[19]). Items are rated on a five point Likert scale (1 = not at all characteristic of me, 5 = extremely characteristic of me). Individuals who score highly on this questionnaire are more fearful of being negatively evaluated by others. The scale has been found to have good internal consistency (α = .90) and test-retest reliability (.75)[19].

Anxiety Sensitivity

The Anxiety Sensitivity Index (ASI[34]) measures a person's fear associated with the consequences of anxiety-related symptoms. It has 16-items that are rated on a five point Likert scale (1 = very little, 5 = very much). The measure has been found to have good internal consistency (α = .88), test-retest reliability (.75) and has been

shown to be a valid measure of the fear of anxiety[25,33,34]. The ASI is believed to measure three first order factors related to physical concerns, mental incapacitation concerns, and social concerns, which in turn load on to a second order general AS factor[49]. The three subscales were used here.

Statistical approach

The data were analyzed using principal components analyses (PCA) in order to determine whether a smaller number of core components underlie the larger number of psychological constructs related to pain. PCA, like factor analysis, is an exploratory statistical technique used to reduce a large number of variables into a smaller number of subsets. Highly correlated variables which are largely independent of other subsets are combined into components[40]. For more information on this technique see Tabachnick and Fidell[40]. Oblique (oblimin) rotation was used in this case due to the predicted theoretical relationships between these negative constructs. Comrey and Lee[9] give a guideline for sample size for PCA and suggest 500 to be a "very good" size. Therefore, our sample was perceived to be more than adequate.

Results

Descriptive statistics and correlations

Table 2 presents descriptive statistics for the various measures. Table 3 reports the correlations between total scores, which reveals that they were all positively correlated, and so suitable for principal components analysis. Larger correlations were found within the general mood-related measures (i.e., PANAS-NA, DASS, and STAI-t, FNES), and within the measures related to pain (i.e., PASS, PCS, FPQ, ASI, ISI). This pattern of correlations suggest at least two clusters, one related to mood, the other more specific to pain.

TABLES 2 & 3

Principal Components Analysis

A principal components analysis was carried out on the subscale totals (or the total for those measures without subscales) of the questionnaires using oblique (oblimin) rotation due to potential for correlations between components. In addition, an item analysis was carried out in order to investigate whether the items of subscales load together on the same component. However, primarily the subscale analysis will be reported with reference to the item analysis where necessary. The subscale analysis produced four components with an eigenvalue greater than 1 (factor 1 = 8.2, factor 2 = 2.6, factor 3 = 1.6, factor 4 = 1.1, factor 5 = 0.9), while inspection of the scree plot suggested a three or four component solution. Since the third factor only added a fairly small amount to the variance (12.5%) a two factor solution was also considered. Therefore, two, three, and four components solutions were examined. The two component solution consisted of one component with high loadings from the pain related measured and one with high loadings from general negative mood measures. However, an inspection of the residual correlation matrix showed that a large number of the residuals had values greater than 0.05 suggesting the presence of another factor[40]. This, together with the results of the scree test and eigenvalues resulted in a rejection of a two component solution. Examination of the three and four component solution revealed that the three component solution provided the clearest solution and was therefore selected. The four component solution was very similar with the exception of the two subscales of the ISI forming their own component. In addition it only had an eigenvalue of 1.1. The three component structure is presented in Table 4, and accounted for 59.3% of the total variance. The item PCA closely resembled those

found in the subscale analysis, with the same measures generally loading together in a similar way in both analyses. The only exception to this involved the ISI, which loaded onto 'Fear of pain from injury/insult' on the subscale analysis but in the item analysis they load onto the 'Cognitive intrusion of pain' component. Excluding this, the item analysis and subscale analysis yield very similar solutions. The solution for the subscale PCA accounted for 59.3% of the total variance compared with only 33.9% for the item PCA. It seems likely that this is due to the subscale PCA having a greatly reduced number of variables and more parsimonious solution.

The first component included the subscales from the PASS and the PCS. The PASS and PCS are concerned with cognitions experienced during the experience of pain. Subscales of the PCS are magnification, rumination, and helplessness, all associated with thoughts about pain, specifically catastrophizing about pain. The PASS differs in that it has a subscale devoted to avoidance behaviour and one measuring physiological response to pain, but the other two subscales, fearful thinking and cognitive anxiety, are both concerned with thoughts in response to pain. The highest loading subscales were PASS cognitive anxiety, PCS rumination and PCS helplessness. We also looked at the top loading items from the item-based PCA in order to guide the labelling of the component. This revealed that most of the top-loading items were related to cognitions about pain dominating thoughts. Therefore, this component was named 'cognitive intrusion of pain'. This accounted for 39.2% of the variance.

The second component consisted of the STAI-t total, subscales from the DASS, the FNES total, the PANAS-NA subscale, and the mental concerns subscale of the ASI. The items from these measures are generally related to anxiety, depression, negative affectivity, and fear of negative evaluations from others. Although an

association between depression, negative affectivity, and anxiety has previously been found[46], the FNES also loaded onto this component suggesting a relationship between these constructs and a concern with what others think. The mental concerns subscale of the ASI also loaded onto this component. The highest loading (sub)scales were STAI-t, DASS depression, and DASS stress. Since the items of the highest loading (sub)scales were related to a mixture of depression, anxiety and stress it seemed that this component was comprised of items measuring general distress and therefore this is the name it was given. This component accounted for 12.5% of the variance.

The third component had the highest loadings from the FPQ subscales, the ASI physical concerns subscales and the ISI subscales. These subscales are principally concerned with the fear of pain that could result from certain circumstances, fear of physical sensations related to anxiety, and fear of illness and injury. The highest loading subscales on this component were the FPQ subscales, the ASI physical concerns subscale and the ISI injury subscale. Examination of the top loading items on the item analysis revealed they related more generally to the fear of various injuries, procedures and physical sensations. This component was named 'fear of pain from injury/insult'. This component accounted for a further 7.6% of the variance. In order to further evaluate the stability of this three component solution, the sample was split into two groups of 254 data sets and a PCA as described above was conducted. Again, the three component solution was selected for each sample due to inspection of eigenvalues, scree plots, and meaningfulness. For the first half of the sample the three components explained 60.8% of the variance and the eigenvalues of these were as follows: factor 1 = 8.8, factor 2 = 2.4, factor 3 = 1.5. For the second half of the sample the three components explained 58.6% of the variance and the eigenvalues were: factor 1 = 7.6, factor 2 = 2.9, factor 3 = 1.8. The three component

solutions for each group closely resemble the solution of the whole sample. The same measures loaded together on the components, with a slight variation of order of component loadings in some places. This finding adds support for the three component solution.

TABLE 4

Component correlations

As previously discussed, the three components were found to be correlated. The largest relationship was found between the two pain related components 'fear of pain from injury/insult' and 'cognitive intrusion of pain' (r = .43). 'general distress' was also correlated with these two (r = .24, r = .31 respectively).

Discussion

The measures used in this study are commonly used in pain research and previous research has examined relationships between some of these constructs. Inspection of correlations found in this study between measures replicates previous findings. For example, measures of anxiety, depression, and negative affectivity had moderate to high correlations (r = .55 to .72) which is in line with earlier findings[8]. Additionally, moderate correlations were found between trait anxiety and anxiety sensitivity, illness/injury sensitivity, and fear of negative evaluation (r = .26 to .60) similar to previous research[42]. Finally, correlations found between pain-related constructs fear of pain, anxiety sensitivity, pain catastrophizing, and pain anxiety substantiate previous findings (r = .46 to .71) ([44, 50, 4, 38, 12]). Although other studies

have examined relationships between some of these constructs, as far as we are aware, this is the first attempt to consider these measures together. The measures have been developed by different researchers with the aim of measuring a particular aspect of negative mood or fear about pain and conceptually they are thought to reflect different constructs. However, it is likely that there is overlap in what the questionnaires are measuring because they focus on a similar area. Therefore, the aim of this study was to investigate whether anxiety-related constructs, often measured in the context of pain, using instruments with general and overlapping item content, can be reduced to a smaller number of underlying components. When analysed together, three core anxiety constructs emerged: a general affective component 'general distress' and two pain-related anxiety/fear components, 'cognitive intrusion of pain' and 'fear of pain from injury/insult'.

With respect to the general distress component, items that loaded on it were related to anxiety, depression, negative affectivity and fear of negative evaluation. It was perhaps unsurprising that these constructs loaded onto the same component as they are conceptually closely related, especially depression, anxiety, and negative affectivity[46]. The other two components were more specifically related to pain. The fear of pain from injury/insult component included items concerned with fear about pain or physical sensations from injury/insult, illness and anxiety, whereas the cognitive intrusion of pain component contained items concerned with cognitive reactions to pain, especially in terms of being unable to take ones thoughts away from the pain.

Closer inspection of the fear of pain from injury/insult and cognitive intrusion of pain components suggests two main differences. The fear of pain from injury/insult component appears to be anticipatory, imagining how one would feel about certain

circumstances, whereas cognitive intrusion of pain is linked to how one reacts to pain. The second difference is that fear of pain from injury/insult is concerned with fear while cognitive intrusion of pain is concerned with anxious thoughts about pain. Although fear and anxiety consist of cognitive, physiological, and behavioural dimensions, fear tends to have a more short-term arousal-like quality associated with it, whereas anxiety has a greater cognitive component, and is less physiologically focused[3,6]. Therefore, fear of pain from injury/insult may be measuring a more emotional and physiological fear factor, while cognitive intrusion of pain has a more cognitive focus, especially given that the top-loading items tended to relate to intrusive thoughts about pain. Interestingly, other anxiety-related constructs have also made a distinction between emotional and cognitive components (e.g. test anxiety[21,29]), and so in the same sense the pain questionnaires used here could also be accessing different emotional (fear of pain from injury/insult) and cognitive components (cognitive intrusion of pain).

A second point is that examination of the content of the PASS and PCS reveals that some of it is comparable. This suggests that both measures may be accessing the same (latent) construct that we have labelled 'cognitive intrusion of pain'. If two questionnaires are being used to measure essentially the same latent construct, then this may have implications in terms of research and for clinical studies, although recognizing that this solution has yet to be replicated with clinical samples. Likewise, inspection of the measures found in fear of pain from injury/insult, the FPQ, ASI, and ISI demonstrates that although the three constructs being measured are related to a different fear: fear of pain from injury, fear of sensations from anxiety symptoms, and a fear of illness/injury, they are also conceptually related, and generally concerned with fear of bodily harm. Therefore, the three questionnaires may

be measuring the same underlying construct 'fear of pain from injury/insult'. However, since the questionnaires do appear to be measuring different fears, 'fear of pain from injury/insult' may be a higher order factor, with 'fear of pain', 'fear of injury/illness', and 'anxiety sensitivity' being lower order factors in a hierarchical structure. This may be of interest to those researchers who have suggested a hierarchical model of negative emotional[22] and pain-related constructs[17].

Interestingly, the three components found here appear in one form or another within the fear avoidance model[45] which suggests that negative affectivity, pain catastrophizing, and pain-related fear are integral in contributing to the development and maintenance of chronic pain. Amended versions have included anxiety sensitivity[30] and pain-related anxiety, although it appears to be portrayed as separate to pain catastrophizing[3]. The results of the current study suggest that there may be overlap between questionnaires that are used to measure pain-related anxiety and pain catastrophizing (the PASS and PCS), and so the fear avoidance model may need to take this into consideration. Indeed, although fear of pain has been suggested to be critical in the development of chronic pain and pain-related disability[20], less is known about whether illness/injury sensitivity and anxiety sensitivity contribute to the development and maintenance of pain and disability. The results of this study suggest that the three constructs are closely related and so may also serve as vulnerability factors for the development of chronic pain. Therefore, a fear of anxiety symptoms and illness/injury may need to also be considered with respect to the fear-avoidance model and may also be an important area of focus in a clinical setting.

In another study to consider a number of self-report measures relevant to pain, Davidson et al (2008)[13] carried out an exploratory factor analysis (EFA) on a number of questionnaires including those measuring sensory pain, functioning, coping with

pain, and pain disability in patients with chronic pain. Seven factors were extracted. Measures of anxiety and depression loaded together, but the Pain Catastrophizing Scale also loaded onto this factor. However, since this study was examining a wide range of constructs measuring the different aspects of pain experience, it seems likely that when loaded into an EFA the Pain Catastrophizing Scale may load with depression and anxiety as other measures of negative emotions and cognitions. Since the present study only examined negative emotions and cognitions related to pain, this allowed a more detailed understanding of how these constructs related to each other.

Implications of this study are that some questionnaires used in pain measurement often have overlapping content and therefore one or more may be redundant. In addition, the findings contribute to the theory of the hierarchical model of negative and pain-related constructs[22,17]. Further, the relationships found between the constructs may be of interest in terms of adding additional constructs or deleting certain constructs from the fear-avoidance model[3,20]. Finally, the findings of this study can be used in the development of a brief questionnaire to reduce the number of measures necessary.

The study has some relevant limitations. First, we were interested in how the various constructs under consideration were related within a healthy sample i.e., in absence of chronic pain. It is entirely possible that an alternative structure may be found within chronic pain patients and extrapolation to clinical samples should be done with caution. Related to this is the idea that more specific constructs (e.g., worry about pain) may only become relevant in a chronic pain context as it is largely defined by the existence of repetitive threat. Additionally, although we excluded those with chronic pain, the experiences of pain of the sample in this study are likely to vary widely and include some participants who are familiar with pain. However, since

chronic pain was an exclusion criterion and 70 percent of the sample was under the age of 35, this is likely to be restricted. However, this needs to be taken into consideration when interpreting the results. Second, although we included nine instruments, others were not selected and could offer different solutions. We cannot, therefore, definitively state that we have sampled all relevant content. Third, PCA itself can be criticized as it has no available criteria against which to test the solution, and since following extraction there is an infinite number of rotations available. The final decision and labelling depends upon expert decision and interpretation[40].

Future research could focus on further analysis of the stability of this factor structure with other healthy samples, and samples of patients with chronic pain. If this tripartite solution is robustly replicated a stronger argument can be made for the development of a brief questionnaire to directly measure these three core components economically, increasing accuracy and reducing demand on participants.

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Table 1. Demographic details of the sample.

	Mean or Proportion
Age	
Male	34.9 (SD 12.3)
Female	34.7 (SD 14.3)
Sex	
Male	38.6%
Female	59.3%
Missing	2.2%
Occupation	
Students	17.7%
Non-manual	65.5%
Manual (skilled and unskilled)	12.0%
Missing	4.7%
Ethnic group	
White European	92.7%
Other ethnicities	4.6%
Missing	2.8%

Table 2. Descriptive statistics for the various questionnaire totals and subscales.

	Mean total score	Standard deviation	Range
FNES	34.87	10.05	12-60
PANAS-NA	17.06	5.67	10-50
STAI-t	38.66	9.13	20-80
DASS total	10.15	8.15	0-63
DASS depression	2.83	3.16	0-21
DASS anxiety	1.99	2.54	0-21
DASS stress	5.34	3.97	0-21
ISI total	23.61	8.77	11-55
ISI illness	16.01	5.74	6-30
ISI injury	7.60	3.59	5-25
PCS total	12.00	9.09	0-52
PCS rumination	5.07	3.82	0-16
PCS magnification	2.29	2.07	0-12
PCS helplessness	4.64	4.17	0-24
PASS total	22.22	15.65	0-100
PASS fearful appraisal	3.55	3.86	0-25
PASS cognitive anxiety	7.55	5.14	0-25
PASS physiological anxiety	3.87	3.96	0-25
PASS escape and avoidance behaviour	7.25	5.19	0-25
FPQ total	66.96	19.95	30-150

FPQ minor	15.73	5.83	10-50
FPQ severe	29.73	9.66	10-50
FPQ medical	21.50	7.85	10-50
ASI total	29.81	8.41	16-80
ASI physical concerns	14.42	5.26	8-40
ASI mental concerns	5.61	2.17	4-20
ASI social concerns	9.79	2.74	4-20

FNES = Fear of Negative Evaluation Scale, PANAS-NA = Positive and Negative Affectivity Scale – negative affect subscale, STAI-t = Spielberger State-Trait Anxiety Inventory – Trait version, DASS = Depression, Anxiety, Stress Scale, ISI = Injury/Illness Sensitivity Index, PCS = Pain Catastrophizing Scale, PASS = Pain Anxiety Symptoms Scale, FPQ = Fear of Pain Questionnaire, ASI = Anxiety Sensitivity Index.

Table 3: Correlations between total scores of each questionnaire

	NA	STAI-t	DASS	ISI	PCS	PASS	FPQ	ASI
FNES	.39	.60	.49	.24	.26	.28	.30	.40
NA		.64	.55	.29	.32	.31	.24	.36
STAI-t			.72	.26	.29	.31	.26	.41
DASS				.23	.30	.33	.21	.42
ISI					.48	.46	.49	.48
PCS						.71	.46	.51
PASS							.49	.54
FPQ								.59

Note. All correlations are significant at the $p < 0.01$ level. FNES = Fear of Negative Evaluation Scale, NA = negative affect subscale of the Positive and Negative Affectivity Scale, STAI-t = Spielberger State-Trait Anxiety Inventory – trait version, DASS = Depression, Anxiety, Stress Scale, ISI = Injury/Illness Sensitivity Index, PCS = Pain Catastrophizing Scale, PASS = Pain Anxiety Symptoms Scale, FPQ = Fear of Pain Questionnaire, ASI = Anxiety Sensitivity Index.

Table 4. Factor loadings of subscale totals.

Subscales	Cognitive intrusion of pain	General distress	Fear of pain from injury/insult
PASS cognitive anxiety	**.91**	.01	-.04
PCS rumination	**.82**	-.04	.02
PCS helplessness	**.79**	.01	.05
PASS escape and avoidance behaviors	**.79**	-.06	-.06
PASS fearful appraisal of pain	**.76**	.08	.09
PCS magnification	**.75**	.08	.06
PASS physiological anxiety	**.71**	.11	.06
STAI-t	-.01	**.87**	.02
DASS depression	.06	**.82**	-.19
DASS stress	.04	**.81**	-.08
DASS anxiety	.03	**.75**	.02
PANAS – NA	.09	**.67**	.01
FNES	-.07	**.62**	.19
ASI mental concerns	.05	**.46**	**.31**
FPQ severe pain	.05	-.10	**.80**
FPQ minor pain	-.03	-.02	**.79**
FPQ medical pain	-.03	.01	**.78**
ASI physical concerns	.20	.13	**.60**
ISI injury	.16	-.10	**.59**

ISI illness	.23	.04	**.56**
ASI social concerns	-.07	.27	**.52**

Note. FNES = Fear of Negative Evaluation Scale, NA = negative affect subscale of the Positive and Negative Affectivity Scale, STAI-t = Spielberger State-Trait Anxiety Inventory - trait version, DASS = Depression, Anxiety, Stress Scale, ISI = Injury/Illness Sensitivity Index, PCS = Pain Catastrophizing Scale, PASS = Pain Anxiety Symptoms Scale, FPQ = Fear of Pain Questionnaire, ASI = Anxiety Sensitivity Index. Salient loadings (=>.3) appear in **bold**.