Psychometric properties of the Pain Self-Efficacy Questionnaire (PSEQ): Validation, prediction, and discrimination quality of the Dutch version

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Psychometric Properties of the Pain Self-Efficacy Questionnaire (PSEQ)

Validation, Prediction, and Discrimination Quality of the Dutch Version

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Abstract. Self-efficacy beliefs are an important psychosocial determinant of pain behavior and predict the outcome of pain management programs. Participants in these programs are challenged to live a life as normal as possible despite the pain. In view of the continuous presence of pain, self-efficacy measurement should take this into account. The Pain Self-Efficacy Questionnaire (PSEQ) asks participants to take the pain into account when rating their self-efficacy beliefs. In the present study, this questionnaire is examined on its psychometric qualities. The study also examines self-efficacy as an independent predictor of outcome measures after controlling for pain intensity. 278 chronic pain patients participate in this study, divided into two samples. Exploratory and confirmatory factor analysis supported a 1-factor solution. Internal consistency was excellent, and test-retest reliability was adequate. Regression analysis showed that pain self-efficacy was an independent predictor of disability and quality of life after controlling for pain intensity. Furthermore, the PSEQ discriminated between workers and nonworkers, and between patients who used medication and those who did not.

Keywords: pain self-efficacy, chronic pain, psychometric properties, discriminative validity

Introduction

Self-efficacy beliefs are defined as convictions that one can successfully execute behaviors required to produce outcomes (Bandura, 1977). Efficacy beliefs determine whether coping behavior is initiated, how much effort is expended, and how long this behavior is sustained in the face of obstacles and aversive experiences.

Self-efficacy beliefs play an important role in functioning and coping with chronic pain. Converging lines of evidence support the importance of self-efficacy beliefs in the use of coping strategies (Jensen, Turner, & Romano, 1991), in reducing avoidance behavior (Asghari & Nicholas, 2001), and in predicting pain-induced fear (Károlyi, Okun, Ruehlman, & Pugliese, 2008). Moreover, self-efficacy is a more important determinant of disability than pain intensity, pain duration, and anxiety (Denison-Åsenlöf, & Linberg,

2004; Meredith, Strong, & Feeney, 2006), and Woby, Roach, Urmston, and Watson (2008) showed that increases in functional self-efficacy are strongly related to positive treatment outcome. Self-efficacy beliefs are therefore an important psychosocial determinant of pain behavior and treatment outcomes.

Several questionnaires have been employed to measure self-efficacy in chronic pain patients. Although many patients experience continuous pain, only two questionnaires specifically ask them to assess their confidence in performing general and/or more specific tasks *in view of the presence of their pain*. Altmaier, Russell, Kao, Lehmann, and Weinstein (1993) constructed a measure to assess participants' confidence in their ability to perform activities of daily living despite the pain, such as carrying out the trash, shoveling snow, raking leaves, etc.. However, some of these items are too specific to be relevant for all individ-

uals. Therefore, Nicholas (2007) developed a more general Pain Self-Efficacy Questionnaire (PSEQ) that also asks the participants to take the pain into account when rating their self-efficacy beliefs. Satisfactory reliability and validity have been demonstrated in different languages.

The present study presents detailed information about the reliability and validity of the Dutch version of the PSEQ. Moreover, it improves upon existing psychometric studies of the PSEQ by providing several additional analyses. First, we assess test-retest stability by the intraclass correlation coefficient agreement, which takes into account the absolute level of agreement. Second, we examine reliability by calculating changes in the mean values between test and retest. Furthermore, because of possible response bias, construct validity will be determined not only on the basis of correlations with other self-report instruments, but also by examining the relationship between the PSEQ and objective outcomes. Finally, we examine the association between PSEQ and other pain-related measures to show the independence of the responses on the PSEQ in relation to pain intensity.

Method

Participants

Two independent samples were used in this study. Sample 1 ($n = 164$) consisted of patients with nonspecific musculoskeletal pain from three tertiary care centers in the Netherlands who were on a waiting list for treatment. Sample 2 ($n = 114$) consisted of patients with nonspecific low back pain who participated in a randomized controlled trial in a primary care setting (Van der Roer et al., 2008).

Procedure

Questionnaires, informed consent, and an information letter were sent by mail to the patients of the different rehabilitation centers to be completed at home. Sample 1 received this package the moment they were officially placed on the waiting list for treatment; Sample 2 received this package before treatment in a primary physiotherapy care setting from a research assistant. Patients from Sample 1 who completed the questionnaires and were still not in treatment received the PSEQ a second time (retest).

Instruments

Pain Self-Efficacy Questionnaire (PSEQ) (Nicholas, 2007)

The PSEQ consists of 10 items. Each item is scored on a 7-point scale ranging from 0 *not at all confident* to 6 *completely confident*. Higher scores reflect stronger self-efficacy

beliefs. The PSEQ was translated according to the back-translation technique (Sperber, 2004).

Pain Disability Index (PDI) (Pollard, 1984)

The Dutch Version of the PDI was prepared in 1999 at the Pain Management and Research Centre, University Hospital Maastricht. The PDI is a 7-item self-report measure of pain-related disability. Ratings are made on an 11-point scale ranging from 0 *no disability* to 10 *total disability*. Higher scores reflect more pain disability.

Roland Morris Disability Questionnaire (RDQ) (Gommans, Koes, & Van Tulder, 1997; Roland & Morris, 1983)

The RDQ consists of 24 questions related to activities of daily living measuring self-reported functional status. Each item is scored either 0 (*disagree*) or 1 (*agree*) and the total score ranges from 0 (*no dysfunction*) to 24 (*maximum dysfunction*).

Tampa Scale of Kinesiophobia (TSK) (Vlaeyen, Kole-Snijders, Boeren, & van Eek, 1995)

The TSK was developed as a measure of fear of movement/(re)injury. The scale consists of 17 items (Vlaeyen et al., 1995) or, in an abbreviated version, of only 11 items (Woby, Roach, Urmston, & Watson, 2005). The present study used the 11-item version. Each item is provided with a 4-point Likert scale ranging from *strongly disagree* to *strongly agree*. A high score indicates a high level of fear of movement/(re)injury.

McGill Pain Questionnaire (MPQ) (Melzack, 1975; Van der Kloot, Oostendorp, Van der Meij, & Van den Heuvel, 1995)

The present study used only the Pain Rating Index (PRI) of the MPQ. The PRI measures three dimensions of pain experience in 20 groups of words. Higher scores reflect a more intense experience of pain.

Rand-36 Item Health Survey (Rand-36) (RAND Health Sciences Program, 1992) (Van der Zee, Sanderman, Heyink, & de Haes, 1996)

Two dimensions of the RAND-36 (physical functioning and social functioning) were employed in this study: The dimension of physical functioning consists of 10 items about daily activities; the dimension of social functioning consists of 2 items about social activities. The scores are

transformed to a 0–100 scale. A higher score reflects a better quality of life on that domain.

Patients were asked to score pain intensity as the average pain felt in the last week on an 11-point numeric rating scale. They were asked whether they take pain medication (*yes/no*), either prescribed or over-the-counter, and if they have paid work (*yes/no*).

Statistical Analysis

The factorial structure of the Dutch version of the PSEQ was examined using a principal component analysis (PCA) and re-examined with a confirmatory factor analysis (CFA). For this purpose two groups of 139 subjects were randomly selected based on all subjects in this study. To obtain the CFA a maximum likelihood method was used (Lisrel version 8.30). Goodness-of-fit for the factor solution was evaluated by the comparative fit index (CFI) and the standardized root mean square residual (SRMR). For studies with a sample size smaller than 250, a good fit is presented only if the CFI value is ≥ 0.95 and the SRMR value is ≤ 0.09 (Hu & Bentler, 1999). Internal consistency was evaluated by calculating Cronbach's α .

Test-retest reliability was examined with intraclass correlation ($ICC_{\text{agreement}}$). Previously Pearson correlations were often used as an indicator of test-retest stability, but this does not take into account potential systematic or absolute differences between the two successive measurements. The test-retest stability was examined by the Bland and Altman method. The mean of differences between the test and retest and the 95% confidence interval of the mean difference ($CI = \text{mean of the difference} \pm 2 \times \text{standard error of the mean}$) give an indication of the systematic changes. If zero is included in the 95% CI of the mean difference, no significant systematic change in the mean is present. The Bland-Altman 95% limits of agreement ($LOA = \text{mean of the difference} \pm 1.96 \times \text{standard deviation of the difference}$) give an indication of the magnitude of the random changes caused by natural variation within-patient variation and random measurement errors. Smaller limits of agreement indicate more stability.

Convergent validity was evaluated by calculating Pearson correlations. It was expected that PSEQ would be negatively moderately to highly related to disability (PDI and RDQ), lowly to moderately related to pain intensity (NRS) and all three subscales of pain experience (MPQ), and moderately related to fear of movement (TSK). A positive moderate relation was expected with the two dimensions of the RAND36 (physical functioning and social functioning), because of the content similarity of these dimensions with the disability questionnaires.

Discriminative validity was examined performing *t*-tests between patients with or without pain medication, and between patients with or without paid work. It was expected

that patients without pain medication and those with paid work would show better self-efficacy beliefs.

Subsequent to establishing the magnitude of the correlations between self-efficacy beliefs and disability, two dimensions of quality of life (physical and social functioning), paid work, and medication use were examined as to whether these relations were independent of the intensity of pain experienced by the subjects. To this end, we performed two linear regression analyses with disability and the two dimensions of quality of life as the respective dependent variables. Furthermore, two logistic regression analyses were performed with paid work and medication use as the respective dependent variables.

Results

Descriptive Statistics

Demographic characteristics of the participants are shown in Table 1. Table 2 presents descriptive information about the questionnaires in the two samples. Different numbers of subjects for each outcome are due to missing data and the use of different samples per questionnaire. No signifi-

Table 1. Sample characteristics

Variable	Sample 1 (<i>N</i> = 164)	Sample 2 (<i>N</i> = 114)
Age in years (Mean, <i>SD</i>)	43.1 (10.5)	41.8 (9.3)
Women (%)	75	52.6
Paid work (%)	29.9	63.2
Educational level* (%)		
– 8–12 years	50.6	50.0
– 13–16 years	22.6	28.9
– > 17 years	26.2	21.1
– Unknown	0.6	
Marital status (%)		
– Married/living together	56.7	64.1
– Single	23.2	28.9
– Divorced	13.4	6.1
– Other	6.1	0.9
– Unknown	0.6	
Pain sites (%)		
– (Lower) back	17.1	100
– Neck, shoulders	20.7	
– Multiple sites	44	
– Other	9.1	
– Unknown	9.1	
Use of pain medication (% yes)	59.1	37.7

Notes. Sample 1 = tertiary care patients, sample 2 = primary-care patients from Van der Roer et al. (2008). *In years of formal education.

Table 2. Descriptive statistics

Measures	Sample 1 Mean (SD)	Sample 2 Mean (SD)
PSEQ	29.1 (11.0)	36.3 (12.4)
PDI	40.5 (10.5)	
RDQ		13.1 (5.6)
TSK-11	23.8 (6.2)	25.9 (5.9)
Pain intensity	6.6 (1.7)	6.5 (2.0)
MPQ		
– Sensory scale	11.9 (6.2)	
– Affective scale	5.4 (3.4)	
– Evaluative scale	6.2 (2.8)	
RAND-36		
– Physical functioning	45.3 (21.0)	
– Social functioning	43.6 (21.2)	

Notes. Sample 1: tertiary care patients, sample 2: primary-care patients from the study by Van der Roer et al. (2008). PSEQ: Pain Self-efficacy Questionnaire, PDI: Pain Disability Index, RDQ: Roland Disability Questionnaire, MPQ: McGill Pain Questionnaire, TSK: Tampa Scale of Kinesiophobia.

cant difference was found on the PSEQ between men and women, and no significant correlation was found between age and the PSEQ. However, patients from Sample 1 (tertiary care centers) did have significantly lower PSEQ scores than patients from Sample 2 ($t = -5.12, p < .001$).

Factorial Structure

The interitem correlations of the PSEQ ranged from 0.40 to 0.79, with a mean value of 0.55. The level of this mean value in combination with the homogeneous clustering of the interitem correlations around it suggests that the PSEQ taps a narrow construct (Clark & Watson, 1995). The determinant of the correlation matrix was larger than 0.00001, which suggests no multicollinearity in the data (Field, 2009). The KMO statistic (Kaiser-Meyer-Olkin measure of sampling adequacy) was 0.91, and all KMO values for individual items were > 0.89 , indicating that the sample size was adequate for factor analysis (Field, 2009). A principal component analysis yielded one factor with an eigenvalue exceeding 1, explaining 59.4% of the variance. Communalities ranged between 0.70 and 0.85, with a mean of 0.77. All items loaded 0.68 or higher on this factor (Table 3).

The factor structure obtained by the exploratory factor analysis was tested by means of a confirmatory factor analysis. CFI (.96) and SRMR (.05) showed a good fit of the 1-factor model.

Internal consistency of the PSEQ was good for both random samples used in the factorial analyses (Cronbach's $\alpha = .92$ and $.90$ for the explorative and the confirmative sample).

Table 3. Factor loadings of PSEQ items as obtained by exploratory factor analysis

Item	Description	Factor loadings
1	I can enjoy things	.687
2	I can do most of the household chores	.719
3	I can socialize with my friends or family members as often as I used to do	.760
4	I can cope with my pain in most situations	.763
5	I can do some form of work	.805
6	I can still do many things I enjoy doing	.819
7	I can cope with my pain without medication	.712
8	I can accomplish most of my goals in life	.831
9	I can live a normal lifestyle	.850
10	I can gradually become more active	.741

Reliability

For test-retest analysis 65 patients from Sample 1 were available. The test-retest period was on average 13 days with a range of 6 days to 28 days. The mean scores for the two assessments were 27.2 ($SD = 10.5$) and 28.5 ($SD = 10.6$), respectively. There was no significant difference between the mean test and retest scores.

Intraclass correlation coefficient for agreement was 0.76. Because of the relatively long test-retest period, the group was divided in a short test-retest period (6–14 days, $N = 51$) and a long test-retest period (15–28 days, $N = 14$). No large differences were found between these two groups on the PSEQ.

The mean difference, 95% CI of the mean difference, and the 95% LOA are graphically shown in Figure 1. The mean difference was close to zero (-1.26), and the 95% CI of the mean difference contained zero (-3.07 to 0.55). The 95% limits of agreement were -15.56 to 13.03 . Further-

Table 4. Correlations between PSEQ and other self-report measures

Measure	N	PSEQ
Pain intensity	274	-.310
PDI	145	-.518
RDQ	111	-.649
TSK11	167	-.472
MPQ		
– Sensory scale	160	-.166
– Affective scale	160	-.409
– Evaluative scale	160	-.239
RAND-36		
– Physical functioning	153	.315
– Social functioning	158	.489

Notes. PSEQ: Pain Self-Efficacy Questionnaire, MPQ: McGill Pain Questionnaire, PDI: Pain Disability Index, RDQ: Roland Disability Questionnaire, TSK11: Tampa Scale of Kinesiophobia 11 items.

Figure 1. Bland-Altman plot of agreement between test and retest scores of the PSEQ. A solid line represents the mean of the difference, the bold dashed lines represent the 95% limits of agreement (LOA), and the normal dashed lines represent the 95% confidence interval (CI) of the mean of the difference.

Table 5. Regression models for disability, quality of life, paid work, and medication use

Linear regression	Step 1			Step 2		
	<i>B</i> (SE)	β	R^2	<i>B</i> (SE)	β	R^2
PDI						
Pain intensity	2.69 (.51)	.40 ^c	.16	2.06 (.46)	.31 ^c	
PSEQ				-.43 (.07)	-.45 ^c	.36 ^c
RDQ						
Pain intensity	1.36 (.23)	.49 ^c	.24	.79 (.21)	.29 ^c	
PSEQ				-.24 (.03)	-.54 ^c	.49 ^c
RAND physical functioning						
Pain intensity	-3.53 (.99)	-.28 ^c	.08	-2.72 (.98)	-.22 ^b	
PSEQ				.50 (.15)	.26 ^c	.14 ^c
RAND social functioning						
Pain intensity	-3.13 (1.0)	-.24 ^b	.06	-1.74 (.91)	-.14 ^{ns}	
PSEQ				.89 (.14)	.46 ^c	.26 ^c
Logistic regression	<i>B</i> (SE)	OR (95% CI)	R^2	<i>B</i> (SE)	OR (95% CI)	R^2
Paid work						
Pain intensity	-.14 ^{ns} (.07)	0.87 (.75–1.00)	.02	-.05 ^{ns} (.08)	0.96 (.82–1.12)	
PSEQ				.05 ^c (.01)	1.05 (1.03–1.08)	.11
Medication use						
Pain intensity	.16 ^a (.07)	1.18 (1.02–1.35)	.03	.13 ^{ns} (.07)	1.13 (.98–1.31)	
PSEQ				-.02 ^{ns} (.01)	0.98 (.96–1.00)	.05

Notes. ^a $p < .05$, ^b $p < .01$, ^c $p < .001$; ^{ns} $p > .05$. *B* = the gradient; *SE* = standard error; β = standardized version of *B*, the number of standard deviations that the outcome will change as a result of one standard deviation change in the predictor; R^2 = the amount of variance explained by the model; CI = confidence interval.

more, the Bland-Altman plot (Figure 1) shows that, when the average of test and retest scores increase, the difference between test and retest scores do not increase as well, so error measurement was independent of the magnitude of the PSEQ score (homoscedasticity).

Validity

Convergent validity was established by computing Pearson correlations between the PSEQ and conceptually related measures (Table 4). All correlations were significant and in the expected direction. Interestingly, the correlation between the PSEQ and the affective subscale of the MPQ was notably higher than its correlations with the sensory and evaluative subscales of the MPQ.

Discriminative validity was established by performing *t*-tests between patients with or without paid work and between patients with or without pain medication. A significant difference was found on the PSEQ between patients with or without paid work. Patients with paid work scored significantly higher, mean = 35.63, *SD* = 11.7, than the patients without, mean = 29.1, *SD* = 11.2. Patients who used pain medication scored lower on the PSEQ, mean = 30.9, *SD* = 11.4, than the patients who did not, mean = 33.9, *SD* = 13.0. This difference, however, was only borderline significant, $p = .052$.

Table 5 shows the two steps of the hierarchical linear and logistic regression analyses. In the first step only pain intensity was included and in step two pain self-efficacy was added.

In the linear regression with disability (PDI & RDQ) and the two dimensions of quality of life as independent variables the R^2 of the model in step 2 is significant higher than the model in step 1. This means that the second model with pain intensity and pain self-efficacy as predictor variables is a better model for predicting disability and the physical and social functioning of quality of life than one with only pain intensity as a predictor variable. Furthermore, the standardized beta values of pain self-efficacy are higher than the standardized beta values of pain intensity in the second model. Therefore, pain self-efficacy is considered an independent predictor and a stronger predictor than pain intensity.

In the model of the logistic regression with paid work as the dependent variable it is even shown that pain intensity does not contribute significantly to the model whereas the PSEQ does. In the model with medication use as the dependent variable, PSEQ is not a significant predictor after controlling for pain intensity.

Discussion

The first aim of this study was to assess psychometric properties of the Dutch version of the PSEQ. The exploratory

factor analysis demonstrated that the Dutch version of the PSEQ is a unidimensional instrument with adequate internal consistency, which is in accordance with the original English-language version and the subsequent Portuguese version (Nicholas, 2007; Sardà, Nicholas, Pimenta, & Asghari, 2007). The stability of the factor loadings and structure of the PSEQ obtained by this exploratory factor analysis was tested with a confirmatory factor analysis. The goodness-of-fit indices indicated a good fit as was also demonstrated by Vong, Cheing, Chan, Chan, and Leung (2009) in the Chinese version of the PSEQ. This provides strong evidence that the Dutch version of the PSEQ is an internally consistent unidimensional instrument.

Although the psychometric results were comparable with other research, the mean values of the PSEQ are slightly different between all these studies (our study: Sample 1, $M = 29.1$ and Sample 2, $M = 36.3$; Nicholas (2007), $M = 25.8$; Sardà et al. (2007), $M = 34.08$; Vong et al. (2009), $M = 40.1$). Vong et al. (2009) and Sardà et al. (2007) mentioned possible cultural differences between their samples and Western samples, such as differences in social welfare system. Our samples and the Australian sample of Nicholas (2007) are both Western samples, and cultural differences probably do not play a prominent role here. Another explanation for differences in the mean score is the type of care setting in which patients are recruited. The highest pain self-efficacy scores were found in primary care patients (sample of Vong et al. (2009) and in our Sample 2). All other patients were recruited in secondary care settings. There may be important differences between patients in primary and secondary care setting, such as pain duration, having paid work, and general interference with activities. Having paid work discriminated in self-efficacy beliefs in our study and could also be a possible explanation for the differences in means with the sample of Nicholas (2007). In our Sample 1, 29.9% of patients had paid work compared to 16.3% in the study of Nicholas (2007). Having paid work may indicate to patients that they are still capable of performing their work successfully despite the pain, which in turn stimulates positive self-efficacy beliefs.

This study is the first to provide an ICC to establish test-retest stability. The results in this study ($ICC = 0.76$), which is considered to be satisfactory for group comparisons (Lohr, 2002), showed a good stability over time. Moreover, this study demonstrated that test-retest stability remained stable across a 4-week period. This is clinically relevant since it usually takes some time after intake before treatment starts. Furthermore, no systematic change between the two scores was found as demonstrated by the 95% CI of the mean difference.

The Bland-Altman plot also showed good agreement between test and retest values, and no association between measurement error and the magnitude of the measurement.

Construct validity of the PSEQ was established by showing that correlations with other self-report measures assessing similar constructs were in agreement with previously found correlations. The PSEQ scores were strongly

associated with pain-related disability (PDI, RDQ), pain-related fear of movement and (re)injury (TSK), and the two dimensions of quality of life (physical and social functioning, RAND-36). PSEQ scores were moderately associated with pain intensity and pain experience (MPQ).

More importantly, this study also demonstrated that pain self-efficacy was associated with work status and – although only borderline significant – with use of medication. The use of objective outcome measures avoids the problem of response bias and/or the possibility that associations between the PSEQ and pain-related self-report measures are due to item similarity. Especially associations between measures of pain self-efficacy and disability are prone to this alternative interpretation. Whereas pain self-efficacy measurement tools ask people what they *believe* (how certain they are) they *can still do* despite their pain, disability measurement tools ask people what they *feel* they *cannot do anymore* because of their pain. The finding that pain self-efficacy was also associated with objective outcome measures indicates that the PSEQ may have added value in research into the determinants of functioning in chronic pain patients.

The discrimination on medication use was only borderline significant. However, type and dosage of medication was not taken into account in this study. It would be interesting to examine whether pain self-efficacy beliefs differ between patients who use over-the-counter or prescribed medication, or between chronic and occasional use of medication.

An alternative interpretation of the PSEQ scores and their association with other pain-related outcomes could be that patients' responses to the items of the PSEQ are driven by their pain intensity level. The PSEQ was constructed in such a way that patients are explicitly asked to take their pain into account when answering each of the items. One could imagine that patients find it easier to overcome barriers and remain functional when pain intensity is low, but with increasing pain intensity this becomes more and more difficult. However, the idea behind the PSEQ is that it should be largely independent of pain intensity, because it takes the pain into account. The Pearson correlations between PSEQ and the pain-related outcomes pain intensity as well as the sensory and evaluative components of pain experience in this study are relatively low. Moreover, the hierarchical regression analyses demonstrated that, after controlling for pain, the PSEQ was an independent predictor of disability, two dimensions of quality of life and paid work. These results confirm that associations of the PSEQ with pain-related outcomes are largely independent of the level of pain. Accordingly, the relationship between the sensory component of pain experience and the PSEQ was very weak, whereas the relationship between the affective component of pain experience and the PSEQ was relatively high. Because of the cross-sectional nature of our data, no conclusions regarding causality can be made. Therefore, future research could shed more light on the direction of the relationship between the affective and sensory aspects of pain and self-efficacy beliefs.

In conclusion, the results of this study indicate that the Dutch version of the PSEQ is a unidimensional, reliable, and valid measurement instrument.

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