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Pain Catastrophizing, Self-Reported Disability and Temporal Summation of Pain Predict Self-reported Pain in Low Back Pain Patients 12 Weeks after General Practitioner Consultation – A Prospective Cohort Study

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Abstract

Objectives: Patients with low back pain (LBP) often demonstrate pain sensitization, high degree of pain catastrophizing, and psychological distress. This study investigated if pain sensitization mechanisms, the pain catastrophizing scale (PCS), and Start Back Screening Tool (SBST) were associated with pain in recurrent LBP patients 12-weeks after consulting their general practitioner (GP).

Methods: In 45 LBP patients, pressure pain thresholds, temporal summation of pain (TSP), conditioned pain modulation, the Roland Morris Disability Questionnaire (RMDQ) and the PCS were assessed before consultation. Patients were classified into low-to-medium or high risk of poor prognosis based on the SBST. Worst pain within the last 24-hours was assessed on a visual analogue scale (VAS) at inclusion and 12-weeks after GP consultation.

Results: VAS-scores were reduced after 12-weeks in the low-to-medium ($N=30$, $P<0.05$) but not the high risk group ($N=15$, $P=0.40$). RMDQ was reduced after 12-weeks ($P<0.001$) but with no difference between the groups. PCS was reduced in the low-to-medium and the high risk group ($P<0.05$). TSP was significantly higher at follow-up in the high risk group compared with the low-to-medium risk group ($P<0.05$). A Linear regression model explained 54.9% of the variance in VAS-scores at follow-up with utilizing baseline assessments of TSP, RMDQ, and PCS.

Discussion: The current study indicates that, patients with LBP and high self-reported disability, high pain catastrophizing and facilitated temporal summation of pain assessed when consulting the GP might predictive poor pain progression 12-weeks after the consultation.

Key words: recurrent low back pain, pain catastrophizing, temporal summation of pain, start back screening tool, self-reported pain

Introduction

Low back pain (LBP) is the leading cause of disability in the world [1]. Back pain affects 70–85% of individuals during their life, but 90% of the affected individuals typically recover within 12 weeks [2]. The Start Back Screening Tool (SBST) was developed to subgroup patients with LBP and to assist general practitioners (GPs) in identifying patients at high, medium, or low risk of persistent long-term pain [3]. The SBST is widely used within LBP research but limited research exist identifying associations to other risk factors for prolong LBP and how these in combination might strengthen the prediction of future LBP.

Spinal imaging studies suggest that structural changes in the low back cannot explain the nature of LBP [4–6]. Further, other factors such as psychological features [7], social status [8], and sensory functions [9] might explain some of the underlying mechanisms in LBP. Mechanistic pain profiling using quantitative sensory testing (QST) aims to assess the underlying pain mechanisms. In musculoskeletal pain, these mechanisms often include pressure pain thresholds (PPTs), temporal summation of pain (TSP), and conditioned pain modulation (CPM). PPTs assessed at a local painful site reflect primarily localized hyperalgesia whereas PPTs assessed at a distal site generally reflect widespread hyperalgesia, believed to be a component of sensitized central pain amplification [9,10]. TSP is the increase in pain following repeated painful stimulation and TSP is facilitated in many chronic pain conditions [9]. CPM is the human surrogate model for the estimate of the net effect of the pain facilitatory and inhibitory systems [11] and is often impaired in chronic pain conditions [9]. QST finding in LBP are inconsistent[12] but a recent study found that TSP was facilitated in painful recurrent LBP periods but not in pain-free periods whereas CPM seemed to be impaired in both painful and pain-free periods when compared with healthy subjects[13]. Currently, no studies have investigated if these sensory profiles in the painful recurrent LBP periods are important for pain progression. Recently, pain catastrophizing and

widespread pain sensitivity have been found inter-related and associated with clinical pain intensity in a cross-sectional study of chronic LBP [14]. Mechanistic pain profiling has been utilized in chronic pain patients to, e.g., identify subgroups of patients at high risk of developing chronic postoperative pain [15–19] and to predict pharmacological efficacy [20–23] and these studies suggest that measures such as widespread hyperalgesia, TSP and CPM might prognostic value for development or inhibition of pain after interventions. For LBP, pressure stimuli have been suggested to have high discriminating ability [24].

Pain catastrophizing is characterized by the tendency to magnify the threat of a pain stimulus, to feel helpless in the context of pain, and by a relative inability to inhibit pain-related thoughts in anticipation of, during, or following a painful encounter [25]. The pain catastrophizing scale (PCS) has been developed and validated for LBP [26]. High levels of pain catastrophizing have been associated with a high risk of developing severe pain, if untreated [27], and pain after surgery [28–30]. This indicates that the PCS might hold prognostic value.

The aims of the current study were: 1) to utilize QST, PCS, and SBST to profile patients with recurrent LBP; and: 2) to determine which of those parameters would predict pain at a 12-week follow-up visit. The hypothesis of the study was that the combination of the three features would yield a more robust definition of patients at high risk of poor progression than each individual parameter alone.

Materials and Methods

Patients

This prospective cohort study was conducted in accordance with the Declaration of Helsinki and approved by The North Denmark Region Committee on Health Research Ethics (N-20160086) and pre-

registered at ClinicalTrials.gov (NCT03109548). Patients were recruited between April 11 2017 and November 6 2018 from general practice. Written informed consent was obtained before inclusion.

Two large general practices in the North Jutland Region of Denmark participated. If a patient consulted the clinic due to recurrent LBP and the GP diagnosed him/her with recurrent low back pain, the patient was invited to participate. If the patient agreed, a research assistant would phone to screen the patient for exclusion criteria. If a patient had a self-reported addiction, had surgery to the spine or displayed a lack of cooperation, he/she was excluded. Patients who passed the phone screening were invited for the testing. The patients were treated according to the Danish national clinical guidelines for non-surgical treatment of LBP, which include information about prognosis, warning signs, advice to remain active, patient education, supervised exercise, and manual therapy [31]. Patients were assessed using questionnaires and mechanistic pain profiling in the days after the GP visit.

Outcomes and self-report questionnaires

The primary outcome was self-reported pain measured as the worst pain intensity within the last 24 hours (visual analog scale (VAS), 0 - 10). This was collected at both baseline and at the 12-week follow-up. Further, the Roland Morris Disability Questionnaire (RMDQ), PCS and QST were also assessed at baseline and follow-up. The SBST was assessed at baseline only.

The Start Back Screening Tool

The SBST is a nine-item self-reporting questionnaire validated for triage of non-specific LBP patients in primary care[3,32]. The SBST identifies modifiable prognostic factors from the health domains of pain, activity limitation, and psychosocial factors, which are established risk factors for persistent non-specific LBP. The SBST overall score ranges from 0 to 9 and is determined by summing up all positive responses and SBST psychosocial subscale scores (ranging from 0 to 5) by determining the sum of

items related to bothersomeness, fear, catastrophizing, anxiety, and depression. Based on the patient responses, the SBST categorizes patients as: 'high-risk' (psychosocial subscale scores ≥4) in which high levels of psychosocial prognostic factors are present with or without physical factors; 'medium-risk' (overall score >3; psychosocial subscale score <4) in which physical and psychosocial factors are present, but not a high level of psychosocial factors; or 'low-risk' (overall score 0-3) in which few prognostic factors are present [3]. In the current study, the low and medium risk groups were merged into a low-to-medium risk group as only eight patients were classified into the low risk group.

Roland Morris Disability Questionnaire

The RMDQ is a self-administered disability questionnaire consisting of 24 questions and is one of the most widely used questionnaires for back pain [33–35]. The questions are related specifically to physical functions likely to be affected by low back pain. Each item is qualified with the phrase "because of my back pain" to distinguish back pain disability from disability due to other causes. When completing the RMDQ, the respondents are asked to tick a statement if it applies to them on that particular day.

The Pain Catastrophizing Scale

The PCS consists of 13 items focusing on thoughts and feelings in connection with pain[26]. The questions are rated on a 4-point Likert scale ranging from 0 (not at all) to 4 (very much). The PCS has been validated for patients with LBP [26].

Mechanistic pain profiling

Deep tissue pain sensitivity was evaluated by cuff pressure stimuli using a computer-controlled cuff algometer (Cortex Technology and Aalborg University, Denmark) including a 13-cm wide tourniquet cuff (VBM, Sulz, Germany) and an electronic VAS (Aalborg University, Denmark) for recording of the pain intensity. The cuff was placed at the level of the head of the gastrocnemius muscle of the

dominant leg. The electronic continuous VAS (sliding resistor) was 10 cm long and sampled at 10 Hz; 0 cm indicated "no pain" and 10 cm indicated "maximum pain". The order of assessment was cuff pain detection and tolerance thresholds, TSP and CPM, which have consistently been used in similar studies on patients musculoskeletal pain[13,20,36,37].

Cuff pain detection and tolerance threshold

The pressure was increased by 1 kPa/s and the patient was instructed to rate the pain intensity continuously on the electronic VAS until the tolerance level was reached. The patients were instructed to press a stop button at this point. The pressure pain detection threshold (cPDT) was defined as the pressure at which the VAS score exceeded 1 cm[37]. The pain tolerance threshold (cPTT) was defined when the patient pressed the stop button. The measurements were performed on both the dominant and non-dominant leg.

Temporal summation of pain

Ten short-lasting stimuli (1 s each) at the level of the cPTT were given with a 1 s break between stimuli. The participants were instructed to continuously rate the pain intensity of the sequential stimuli using the electronic VAS and not to return to zero during the breaks. For each cuff stimulus, a VAS score was extracted. For analysis of TSP, the average VAS score was calculated in the interval from the first to the third VAS score (VAS-I) and for the final three VAS scores (VAS-II). The TSP-effect was defined as the difference between VAS-I and VAS-II (i.e. VAS-II minus VAS-I), which has previously been used to define TSP [16,37,38].

Conditioned pain modulation

The CPM magnitude was assessed as the absolute changes in cPDT with and without a cuff conditioning stimulus (i.e., cPDT_conditioned – cPDT_unconditioned). The conditioning stimulus was applied to the non-dominant lower leg and the cPDT was assessed as described above. The conditioning stimulus was applied as a constant stimulus with an intensity of 70% of the pain tolerance level on the dominant leg, which is a reliable combination [39,40]. The CPM effect was calculated as the absolute difference in cPDT with and without a conditioned stimulus.

Statistics

The data are presented as means and standard error of the mean (SEM) if not otherwise stated. The sample size was estimated based on Riis et al., 2017[41], with a power of 80% and a significant level of 0.05, which estimated that 80 patients were needed for the study.

The differences between patients included in the analysis and patients lost to follow-up were calculated using t-tests for continuous data and chi-square tests for categorical data.

Repeated measures analyses of variance (ANOVAs) with factors time[baseline;follow-up] and group[low-to-medium risk;high risk] were applied to assess the differences in self-reported pain, PCS, and mechanistic pain profiling comparing baseline and follow-up assessment. The SBST was applied to assess differences at baseline and follow-up in patients classified as low-to-medium or high risk of poor progression. The post hoc analysis was adjusted for multiple comparisons using the Bonferroni correction.

Initially, Pearson correlations on baseline assessments were conducted to investigate intercorrelations between parameters. Following this, Pearson correlation analysis was conducted to find baseline parameters associated with self-reported pain at follow-up. Baseline parameters associated with self-reported pain at follow-up was included in linear regression model was used to predict self-reported

pain at follow-up using cut-offs for inclusion of 0.05 and exclusion of 0.157 according to Akaike's Information Criterion for prognostic models [42]. Finally, backwards selection models were applied to identify independent baseline parameters for baseline self-reported pain VAS scores with cut-offs for inclusion of 0.05 and exclusion of 0.157 for the final model [42].

The statistical analyses were performed using SPSS (version 23, IBM Corporation, New York, USA). P-values < 0.05 were considered significant.

Results

Eighty recurrent LBP patients were screened, 58 patients were recruited, and 45 patients had complete data and were included in the statistical analysis. The patients included in the analysis were not significantly different from the patients without complete data before GP consultation with regard to age (t-test: P > 0.8), body mass index (t-test: P > 0.4), self-reported pain VAS scores (t-test: P > 0.6), SBST classification (Chi-square: P > 0.5), PCS (t-test: P > 0.3), and RMDQ (t-test: P > 0.8). However, the group without full data comprised significantly more men compared with the group with full data (Chi-square: P = 0.033).

For the patients included, self-reported pain VAS scores (t-test: P = 0.002) and PCS (t-test: P < 0.001) significantly decreased at follow-up compared with baseline, table 1.

Start Back Screening Tool classifications

Thirty patients (43% females) were classified as low-to-medium risk and 15 patients (67% females) were classified as high risk of poor progression based on the SBST. The two groups were not significantly different with regard to age (t-test: P = 0.471), Body Mass Index (t-test: P = 0.254), and gender distribution (chi-square: P = 0.140).

Self-reported pain

A significant time effect was found for the self-reported pain VAS scores (ANOVA: $F = 11.030$, $P = 0.002$; figure 1) with the post-hoc analysis showing a significantly decreased self-reported pain VAS score at follow-up compared with baseline in the low-to-medium (Bonferroni: $P < 0.001$) but not in the high risk group (Bonferroni: $P = 0.40$). In addition, the high risk group displayed significantly higher self-reported pain VAS scores at follow-up compared with the low-to-medium risk group (Bonferroni: $P = 0.001$).

Self-reported disability

A significant time effect was found for the self-reported RMDQ (ANOVA: $F = 21.900$, $P < 0.001$) showing higher RMDQ values at baseline compared with follow-up. No significant group difference was found (ANOVA: $F = 0.070$, $P = 0.792$).

Pain Catastrophizing Scale

A significant time effect was found for PCS (ANOVA: $F = 17.784$, $P < 0.001$) with the post hoc analysis showing decreased PCS scores at follow-up compared with baseline in the low-to-medium (Bonferroni: $P = 0.005$) and in the high risk group (Bonferroni: $P = 0.004$). In addition, the post hoc analysis showed that the low-to-medium risk group displayed significantly lower PCS scores at baseline (Bonferroni: $P < 0.001$) and follow-up (Bonferroni: $P < 0.001$) compared with the high risk group (figure 2).

Mechanistic pain profiling

No significant time effects were observed for cPDT (ANOVA: $F = 1.937$, $P = 0.171$), cPTT (ANOVA: $F = 0.903$, $P = 0.347$), or CPM effect (ANOVA: $F = 0.670$, $P = 0.418$). A significant time effect was seen for the TSP effect (ANOVA: $F = 5.430$, $P = 0.025$) with the post hoc analysis showing significantly higher TSP effect at follow-up compared with baseline in the high risk group (Bonferroni: $P = 0.024$) but not in the low-to-medium risk group (Bonferroni: $P = 0.505$). See figure 3.

Predicting self-reported pain at follow-up

Baseline Pearson intercorrelations for self-reported pain, RMDQ, PCS, and TSP are found in table 2. Pearson correlation analysis revealed that baseline self-reported pain ($R = 0.489$, $P < 0.001$), RMDQ ($R = 0.640$, $P < 0.001$) SBST ($R = 0.574$, $P < 0.001$), PCS ($R = 0.682$, $P < 0.001$) and a trend for TSP ($R = 0.255$, $P = 0.051$) were associated with self-reported pain at follow-up. These parameters were included in a linear regression model to investigate the predictive value of these baseline parameters on self-reported pain at follow-up. Model 1 consisted of all baseline assessments and yielded a predictive value of 52.9% (Table 3). Using backward selection, the PCS ($P = 0.001$) and RMDQ ($P = 0.027$) were identified as the only independent predictive factor but TSP at baseline was a contributing factor for the predictive model with a predictive value of 54.9% (Table 3).

Discussion

The current study ~~is the first to show~~ found that poor self-reported disability, facilitated temporal summation of pain, and increased pain catastrophizing thoughts in patients with recurrent LBP are associated with increased pain intensity 12 weeks after the baseline visit. The current study was unable to demonstrate that assessing the Start Back Screening Tool ~~prior to GP consultation~~ added predictive value to self-reported disability, temporal summation of pain, and pain catastrophizing thoughts with regard to the pain intensity outcome.

Mechanistic pain profiling in chronic low back pain

The underlying mechanisms for LBP are still largely unknown. Pain sensitization has been suggested to contribute to the development and the maintenance of chronic LBP [43] and many other musculoskeletal disorders [10,44]. The association between chronic LBP and sensitization is still debated [12,45] and it is not as clear as in other chronic pain disorders [9,10]. Notably, Neziri et al., 2012 [46] ranked the ability to discriminate stimuli between chronic LBP patients and healthy subjects and found that pressure stimuli

were ranked higher compared with, e.g., thermal stimuli in LBP. This could interfere with the general pain sensitivity landscape in chronic LBP since the methodological in LBP literature uses both thermal and pressure stimuli. The evidence supporting sensitization of central mechanisms in chronic LPB is mixed but studies have found that patients with chronic LBP display widespread pressure hyperalgesia [47,48] and facilitated TSP [46]. Further, a subgroup of chronic LBP patients demonstrate impaired CPM [49] when compared with healthy subjects. Subgroups of patients with chronic pain due to osteoarthritis exist [50], and the pain intensity and duration have been suggested to be driving factors for sensitization of central pain mechanisms in osteoarthritis [10,50,51]. This has rarely been assessed in chronic LBP and might explain the mixed results. Studies using psychological and physical pathologic factors have predicted 20-25% of the variance [52,53] when predicting LBP in cross-sectional studies, which is similar to the results from the current study. It seems evident that a single modality of pain is less predictive of pain outcomes than the combination of different pain modalities [54]. This has also been demonstrated in patients with osteoarthritis in relation to pain outcomes following exercise programs [55], pharmaceutical treatment with three weeks of nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen [20], and for pain 12 months after total joint replacement [15,16].

Pain catastrophizing has been related to increased pain sensitivity in chronic LBP [56], and pre-treatment interventions targeting pain catastrophizing (specifically targeting pain helplessness) have been suggested to affect the long-term outcome of treatment of LBP [57]. In addition, high pain catastrophizing scores are widely associated with poor progression following numerous treatments in chronic pain patients [25,29,52,58–61]. Recently, Meints et al., 2019 [14] demonstrated that pain sensitivity and pain catastrophizing were associated with high self-reported pain in patients with LBP in a cross-sectional study. The current study supports that pain catastrophizing thoughts, self-reported disability, and TSP

might be predictive parameters of pain progression in recurrent LPB. Of note, the PCS has often been found to be a predictor of poor pain progression following, e.g., joint replacement surgery [62], and studies have speculated if a reduction in PCS scores would decrease the risk of chronic postoperative pain [63]. Recently, Riddle et al., 2019 [64] demonstrated that a reduction of the PCS scores does not improve pain at 2, 6 or 12 months following total knee replacement in a multi-center study of more than 400 patients, which questions if modifying the PCS scores improves the long-term clinical pain outcome.

Start Back Screening Tool classifications

The SBST was developed for use in the primary care by providing a risk stratification and targeted treatment for improved disability outcomes [65] and has been shown to lower the healthcare utilization when compared with usual care [66]. Interestingly, Katzan et al., [67] recently investigated more than 1,000 LBP patients and found that SBST identified patients who were less likely to improve in functional disability following approx. 45 days of physiotherapy. In combination with recent studies [32,68], this broadens the use of the SBST tool to more than primary care. The current study found that high SBST classification is associated with high self-reported pain and pain catastrophizing level at baseline and that high risk classification is associated with high self-reported pain intensities at the 12-week follow-up, which is in line with previous research [66,69–71].

The SBST includes factors associated with cognitive beliefs of pain[70] similar to the PCS[26]. This explains why the SBST subgroups were different with regard to PCS in the current study and since these are inter-correlated, this might also describe why PCS and not SBST was found as an independent predictor for pain intensity 12 months after GP consultation. The association between SBST and sensitization of central pain mechanisms has not been well studied, but recently Rabey et al.

[72] assessed 290 chronic LBP patients and found no difference in pressure, cold and heat pain thresholds, TSP, and CPM when comparing the different SBST classifications. Interestingly, the current study reported that the different SBST classifications were not associated with differences in cPDT, cPTT, or CPM effect and that the TSP effect was only significantly worst sat follow-up in the high risk compared with the low-to-medium risk group. Future studies should aim to evaluate the associations between the SBST classifications and the mechanistic pain profiling to further improve the prognostic value for LBP patients, which could thus provide a platform for new pain treatment options.

Limitations

The current study is limited by the sample of patients classified into the group with low risk of poor progression according to the SBST classification. This sample is lower compared with previous studies within this field [70,72]. It has previously been demonstrated that the number of LBP patients classified in the low risk category is lower in Denmark compared with the UK [71], and therefore the international generalizability of the findings in relation to the SBST should be interpreted with care.

In addition, the current study did not control for pharmaceutical or non-pharmaceutical treatments in between the baseline and follow-up sessions.

The current study did not include a control for treatment advice provided by the GP nor include a control group, which limits the interpretation of the findings.

In conclusion, the current study found that assessment of self-reported disability, pain catastrophizing and temporal summation of pain during the GP consultation are predictors of pain 12 weeks after GP consulting in patients with recurrent low back pain.

Author contribution

KKP, MBJ, and MSR contributed to the conceptual development of the study. Data were collected by MBJ and LVH and analyzed by KKP. All authors interpreted and discussed the data. KKP wrote the first draft which was critically revised by MBJ, TGN, LVH, LAN and MSR. All authors approved the final version.

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Figure legends

Figure 1: Mean (+SEM) self-reported pain VAS scores from 45 patients with LBP before and at 12-week follow-up after contacting the general practitioner. Patients were classified into low-to-medium or high risk of poor prognosis based on the Start Back Screening Tool at baseline. * indicates $P < 0.05$ compared with the baseline, # indicates $P < 0.05$ compared with the low-to-medium risk group.

Figure 2: Mean (+SEM) Pain Catastrophizing Scale ratings from 45 patients with LBP before and at 12-week follow-up after contacting the general practitioner. Patients were classified into low-to-medium or high risk of poor prognosis based on the Start Back Screening Tool at baseline. * indicates $P < 0.05$ compared with baseline, # indicates $P < 0.05$ compared with the low-to-medium risk group.

Figure 3: Mean (+SEM) temporal summation of pain ratings from 45 patients with LBP before and at 12-week follow-up after contacting the general practitioner. Patients were classified into low-to-medium or high risk of poor prognosis based on the Start Back Screening Tool at baseline. # indicates $P < 0.05$ compared with the low-to-medium risk group.

Tables

	Baseline	Follow-up	P-value
Age (years)	44.8 ± 16.7		
Body mass index (kg/m^2)	29.1 ± 6.2		
Gender distribution (% females)	51.1%		
SBST classification (low-to-medium/high risk)	30 / 15		
Pain duration (months)†	55.0 ± 10.3		
Self-reported pain VAS (cm)	5.5 ± 2.6	3.9 ± 3.2	P = 0.002
Pain Catastrophizing Scale	23.4 ± 14.3	17.5 ± 15.8	P < 0.001
cPDT (kPa)	21.5 ± 2.0	19.4 ± 1.7	P = 0.205
cPTT (kPa)	46.4 ± 3.2	45.8 ± 3.4	P = 0.446
TSP effect (VAS points)	2.0 ± 0.2	2.5 ± 0.2	P = 0.076
CPM effect (kPa)	3.6 ± 2.1	4.3 ± 1.5	P = 0.780

Table 1: Baseline and 12-week follow-up data from 45 patients with recurrent low back pain consulting their general practitioner. Data are presented as mean ± standard deviation unless otherwise specified. † only for 40 patients. P-value: comparing baseline and follow-up data. Abbreviations: cPDT: cuff Pain Detection Threshold, cPTT: cuff Pain Tolerance Threshold, TSP: Temporal Summation of Pain, CPM: Conditioned Pain Modulation.

	Self-reported pain	RMDQ	PCS	TSP
Self-reported pain				
RMQD	$R^2 = 0.566$ $P < 0.001$			
PCS	$R^2 = 0.430$ $P = 0.004$	$R^2 = 0.591$ $P < 0.001$		
TSP	NS	NS	NS	

Table 2: Baseline Pearson correlations coefficients (R^2) for self-reported pain, Roland Morris Disability Questionnaire (RMDQ), the Pain Catastrophizing Scale (PCS) and Temporal Summation of Pain (TSP) assessed in 45 patients with recurrent low back pain.

Predicting self-reported pain VAS scores at follow-up				
Model	Baseline parameters	Standardized coefficients	P-value	Predictive value
1				0.529
	Self-reported pain VAS scores	0.181	0.166	
	RMDQ	0.275	0.093	
	Start Back Screening Tool	0.068	0.691	
	PCS	0.566	0.002	
	TSP effect	0.164	0.156	
2				0.549
	PCS	0.493	0.001	
	RMDQ	0.313	0.027	
	TSP effect	0.189	0.081	

Table 3: Linear regression models aiming to predict self-reported pain VAS scores at 12-week follow-up (model 1). Backwards selection models were applied with inclusion of $P < 0.05$ and exclusion of $P > 0.1$ to identify independent predictive factors for at 12-week follow-up (model 2). PCS: pain catastrophizing scale, TSP effect: temporal summation of pain effect, RMDQ: Roland Morris Disability Questionnaire.