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Pain Catastrophizing predicts Pain Intensity during a Neurodynamic Test for the Median Nerve in Healthy Participants

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Abstract

Psychological factors within the Fear-Avoidance Model of Musculoskeletal Pain (FAM) predict clinical and experimental pain in both symptomatic and asymptomatic individuals. Clinicians routinely examine individuals with provocative testing procedures that evoke symptoms. The purpose of this study was to investigate which FAM factors were associated with evoked pain intensity, non-painful symptom intensity, and range of motion during an upper-limb neurodynamic test. Healthy participants (n = 62) completed psychological questionnaires for pain catastrophizing, fear of pain, kinesiophobia, and anxiety prior to neurodynamic testing. Pain intensity, non-painful sensation intensity, and elbow range of motion (ROM) were collected during testing and served as dependent variables in separate simultaneous regression models. All the psychological predictors in the model accounted for 18% of the variance in evoked pain intensity ($p = .02$), with only pain catastrophizing ($\beta = .442$, $p < .01$) contributing uniquely to the model. Psychological predictors did not explain significant amounts of variance for the non-painful sensation intensity and ROM models. These findings suggest that pain catastrophizing contributed specifically to evoked pain intensity ratings during neurodynamic testing for healthy subjects. Although these findings cannot be directly translated to clinical practice, the influence of pain catastrophizing on evoked pain responses should be considered during neurodynamic testing.

Keywords

neurodynamic testing; Fear-Avoidance Model of Musculoskeletal Pain; pain catastrophizing

Introduction

Musculoskeletal pain is one of the most common symptoms for patients seeking medical care (Hardt et al., 2008; Woodwell & Cherry, 2004). Clinicians utilize provocative examination procedures which assist in establishing a realistic diagnosis, prognosis, and implementing

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appropriate interventions. 'Neurodynamic testing' is a routinely performed examination procedure for patients experiencing cervical, shoulder, and/or arm pain (Butler, 2000; Shacklock, 2005). The evocation of patient symptoms is one of multiple factors assessed during neurodynamic testing (Butler, 2000; Butler & Gifford, 1989; Shacklock, 2005).

The Fear-Avoidance Model of Musculoskeletal Pain (FAM) describes specific pain cognitions involved in the development and maintenance of chronic pain and disability following injury (Asmundson et al., 2004; Leeuw et al., 2007; Vlaeyen & Linton, 2000). Pain catastrophizing, pain related fear, kinesiophobia, and anxiety are related but separate psychological factors within the FAM. Pain catastrophizing is an exaggerated negative cognition of actual or expected pain that is interpreted as a heightened threat value of pain (Sullivan et al., 2001). Pain related fear describes the fear of pain for specific events (Roelofs et al., 2003), while kinesiophobia is specific to pain-related fear of movement or (re)injury (Kori et al., 1990). In contrast to fear, anxiety is an avoidant emotional and motivational state that occurs in threatening situations (Eysenck et al., 2007).

Psychological factors have been identified as predictors of clinical and experimental pain in both symptomatic and asymptomatic individuals (George et al., 2006a; George et al., 2007a; Hirsh et al., 2008; Picavet et al., 2002; Sullivan et al., 2005). An area that has not been extensively investigated is the influence that psychological factors have on commonly used musculoskeletal examination procedures and if that influence is specific to reports of pain intensity. For example, clinicians commonly use neurodynamic testing procedures to assess the integrity of the nervous system with the reproduction of patient symptoms serving as one criterion for a positive test (Butler, 2000; Butler & Gifford, 1989; Shacklock, 2005). Patients often use a variety of sensory descriptors during neurodynamic testing which may or may not include 'pain' (e.g., pain, stinging, tingling, tightness, sharpness, and numbness) (Coppieters et al., 2001a; Van Hoof et al., 2008; Walsh et al., 2007). Additionally, clinicians will often document the range of motion (ROM) obtained at a particular joint with symptom evocation during neurodynamic testing. Psychological factors have been suggested to be associated with neurodynamic testing outcomes (e.g., straight-leg-raise restrictions) and pain ratings in patients experiencing low back pain (Deyo & Diehl, 1983; McCracken et al., 1993; Pope et al., 1980). In contrast to this study, previous studies have not investigated the relationship between psychological factors and the pain intensity elicited during an upper-limb neurodynamic test. If psychological factors related to the FAM influence responses to neurodynamic testing procedures, there could be potential implications for clinical practice. For example, pain intensity reported during neurodynamic testing could be linked to nervous system pathology and a reflection of psychological influence.

Therefore, the purpose of the current study was to investigate whether FAM factors with known influence on pain sensitivity in experimental settings and outcomes in clinical settings also have an influence on a commonly used neurodynamic testing procedure. We hypothesized that FAM factors would influence subject response to the neurodynamic test used in this study, specific to pain intensity as opposed to non-painful sensation intensity response. Additionally, we speculated that movement avoidance behavior related to these factors might also influence the magnitude of elbow extension ROM.

Methods

Participants

Healthy individuals who responded to advertisements posted throughout a Health Science Center of a large research university were screened for eligibility. Inclusion criteria were ages 18 to 50 years. Individuals were not eligible to participate in this study if they were currently experiencing any neck or dominant upper-extremity symptoms, had a history significant for a

chronic painful condition, or using pain-relieving medication. Eligible participants were also required to speak and comprehend English in order to respond to verbal questions, comprehend questionnaires, and understand instructions during the procedures of the study.

Self-Report Psychological Questionnaires

Psychological questionnaires were selected based on their theoretical relevance to the FAM and having appropriate items for healthy individuals (i.e. not contingent on currently experiencing pain to complete).

Pain Catastrophizing Scale (PCS)—The PCS utilizes a 13-item, 5-point Likert scale with higher scores indicating elevated levels of catastrophizing (Osman et al., 1997; Sullivan et al., 1995; Van Damme et al., 2002).

Fear of Pain Questionnaire (FPQ-9)—The FPQ-9 utilizes a 9-item, 5-point Likert scale with higher scores indicating elevated levels of fear (McNeil & Rainwater, 1998; Osman et al., 2002; Roelofs et al., 2005; van Wijk & Hoogstraten, 2006).

Tampa Scale of Kinesiophobia – General Population (TSK-G)—The TSK-G utilizes a 12-item, 4-point Likert scale with higher scores indicating elevated levels of fear of movement/(re)injury in the general population (Houben et al., 2005; Kori et al., 1990; Vlaeyen & Crombez, 1998).

State-Trait Anxiety Questionnaire – (STAI)—The trait portion of the STAI utilizes a 20-item, 4-point Likert scale with higher scores indicating elevated levels of anxiety (Barnes et al., 2002; Spielberger et al., 1983).

Neurodynamic testing

A neurodynamic test for the median nerve was performed using anatomical positions previously reported in the literature (Butler, 1991; Coppieters et al., 1999; Coppieters et al., 2001b; Elvey, 1994; Shacklock, 2005). Prior to testing, participants were informed that their arm would be exposed to various degrees of stretching and that they would be asked to describe how they feel during the stretching. The participant was positioned in supine and their cervical spine was positioned in approximately 25° of contralateral lateral-flexion or when the investigator perceived the first sense of increased resistance; whichever occurred first. This option was provided to account for participants where a first sense of resistance was perceived by the investigator prior to achieving 25° of contralateral lateral-flexion of the cervical spine. Then, the following consecutive positioning procedures were performed; *step 1*) passive scapular depression until a sense of resistance was perceived by the investigator; *step 2*) 90° of combined shoulder abduction and external rotation; combined forearm supination, wrist extension, finger extension until a sense of resistance was perceived by the investigator; *step 3*) elbow extension was then applied until a sense of resistance was perceived by the investigator or when shoulder girdle elevation was noted. At this step, a research assistant recorded elbow extension ROM with a universal goniometer. ROM was documented as the deficit from full elbow extension (i.e., zero degrees indicating full elbow extension). Participants also rated sensory descriptors via a 10 cm VAS. The sensory descriptors include those previously reported in the literature for various neurodynamic tests and included pain, stinging, tingling, tightness, sharpness, and numbness (Coppieters et al., 2001a; Van Hoof et al., 2008; Walsh et al., 2007). A factor analysis indicated that stinging, tingling, tightness, sharpness, and numbness loaded on to a single latent variable. Therefore, we reduced these data by averaging the variables to create a single sensory description variable (i.e., average of VAS scores for stinging, tingling, tightness, sharpness, and numbness). Therefore, "*pain*" and "*non-painful sensation*" were used as two separate dependent variables in our subsequent analyses.

Procedures

Participants read and signed an informed consent form that had been approved by the University's Institutional Review Board prior to participating in any study-related procedures. Potential participants were verbally screened for current painful conditions involving their neck or dominant upper-extremity and for chronic pain conditions (i.e. Fibromyalgia) or current use of pain relievers. Participants completed a demographic questionnaire and psychological factors were measured via several self-report questionnaires. The investigator was blinded to the results of the psychological questionnaires when performing the neurodynamic test. Pain intensity, sensation ratings and elbow extension ROM measures were collected during the previously described *step 3* of neurodynamic testing.

Data analysis

All data analyses were performed on SPSS for windows, Version 16.0 (SPSS Inc, Chicago, IL) at an alpha level of .05. Descriptive statistics were generated for the demographic, psychological, and neurodynamic testing measures (i.e., pain intensity, non-painful sensation intensity, and elbow ROM). Several preliminary analyses were calculated to ensure that regression assumptions were not violated. Pearson correlations determined the relationship between pain intensity, non-painful sensation intensity, and elbow ROM. Pearson correlations were calculated between psychological factors to investigate if collinearity (i.e., close relationship between factors) would be an issue in subsequent regression analyses. Separate simultaneous regression was used, with pain intensity, non-painful sensation intensity, and elbow ROM serving as the dependent variables in their respective models. Pain catastrophizing (PCS), fear of pain (FPQ-9), kinesiophobia (TSK-G), and anxiety (STAI) served as independent variables in each regression equation. In addition to standard regression statistics, variance inflation factor (VIF) coefficients were reported to assess the extent of multicollinearity among the independent variables.

Results

Sixty-two healthy volunteers responded to advertisements and were included in this study (46 females; mean ± SD age, 23.7 ± 3.9). Descriptive data for the neurodynamic testing outcomes and psychological variables are presented in Table 1. Comparison to a clinical sample of patients with low back pain indicate our sample had lower scores for FPQ-9 ($p < .01$), but not for PCS and STAI ($p > .05$) (George et al., 2010).

Table 2 contains the results of correlation analyses examining the bivariate relationships among pain intensity, non-painful sensation intensity, elbow ROM, and psychological factors. Pain intensity was positively associated with non-painful sensation intensity during neurodynamic testing ($r = .54$, $p < .01$). Elbow ROM was not strongly associated with pain intensity ($r = -.13$, $p > .05$) or non-painful sensation intensity ($r = -.01$, $p > .05$). As expected, pain catastrophizing and fear of pain had a positive association ($r = .46$, $p < .01$). Kinesiophobia had a positive association with fear of pain ($r = .26$, $p = .04$) and anxiety ($r = .28$, $p = .03$). The associations between psychological factors were not so strong that excessive collinearity was expected in the planned regression models.

Regression analyses for pain intensity

The regression model for pain intensity is summarized in Table 3. In this model, all of the psychological factors explained 18.2% ($p = .02$) of variance, with only pain catastrophizing contributing uniquely ($\beta = .44$, $p < .01$). Fear of pain ($\beta = -.09$, $p > .05$), kinesiophobia ($\beta = -.07$, $p > .05$), and anxiety ($\beta = .14$, $p > .05$) were not significant predictors of pain intensity. We chose to include all of these variables so that we had a complete model allowing us account each of the factors. These results suggest that when specific psychological components of FAM

were considered together, pain catastrophizing was the only predictor of pain intensity during neurodynamic testing.

In multiple regression analyses, standardized beta (β) coefficients represent a unit which allow for direct comparisons between other variables entered in the regression model and the dependent variable of interest. Specific to the results of this study, (β = .44) indicates a one unit increase in pain catastrophizing would be expected to result in a .44 unit increase in pain intensity.

A reduced regression model containing only pain catastrophizing as the independent variable was created to determine the amount of variance contributed directly to this construct. In this model, pain catastrophizing explained 15.3% ($p < .01$) of the variance, suggesting a large majority of variance in the preceding model can be explained by pain catastrophizing.

Regression analyses for non-painful sensation intensity and elbow ROM

The regression models for predicting non-painful sensation intensity and elbow ROM are summarized in Tables 4 and 5 respectively. The psychological factors were not significant predictors of non-painful sensation intensity or elbow ROM, explaining only 4.1% ($p > .05$) and 5.3% ($p > .05$) of variance respectively. These results suggest that psychological components of the FAM were not predictors of general non-painful sensation intensity and elbow ROM during neurodynamic testing.

Discussion

The purpose of this study was to investigate the influence of psychological factors central to the FAM on pain intensity, non-painful sensation intensity, and elbow ROM during an upper-limb neurodynamic test. Previous studies involving neurodynamic testing evoked symptoms have primarily focused on pain as a sensory descriptor (Coppieters et al., 2002; Sterling et al., 2002; van der Heide et al., 2001). Several studies have identified other sensation descriptors commonly reported by patients during neurodynamic testing, such as stinging, tingling, tightness, sharpness, and numbness (Coppieters et al., 2001a; Reisch et al., 2005; Van Hoof et al., 2008; Walsh et al., 2007). Our findings suggest that in healthy subjects pain intensity is positively associated with non-painful sensation intensity, but not elbow ROM during a neurodynamic test for the median nerve. Furthermore, pain catastrophizing was a unique predictor of pain intensity, while FAM factors were not predictors of non-painful sensation intensity or elbow ROM.

Pain intensity

The results indicating pain catastrophizing as the only predictor for evoked pain intensity was not surprising, as previous studies have established a positive relationship between pain catastrophizing and pain perception in healthy individuals (Sullivan et al., 1995; 2002; 1997) and others have found psychological influence on neurodynamic testing outcomes (Deyo & Diehl, 1983; McCracken et al., 1993; Pope et al., 1980). In our study, pain was elicited during a neurodynamic test, which is different from clinical pain experienced by patients but similar to experimental situations that evoke pain in healthy subjects. As a psychological construct, pain catastrophizing is a cognitive element of the fear network in which pain is perceived as excessively threatening (Crombez et al., 1998; Leeuw et al., 2007). A potential explanation as to why pain catastrophizing was related to pain intensity reports may be that individuals demonstrating elevated levels of pain catastrophizing perceived the neurodynamic testing procedure as threatening. In addition, pain catastrophizing is a multifactorial construct comprised of magnification, rumination, and pessimism (Sullivan et al., 1995) and any (or all) of those factors could account for positive association with pain intensity observed in this study.

An unexpected finding was that other FAM factors were not strong predictors of pain intensity during neurodynamic testing. Specifically, we expected pain-related fear to be a predictor based on previous studies that suggested pain-related fear was a stronger predictor of evoked pain compared to pain catastrophizing in healthy individuals (George et al., 2006a; Hirsh et al., 2008). A potential rationale for why pain-related fear was not a strong predictor of pain intensity in our study may be because we used neurodynamic testing to elicit pain. Previous studies utilized a cold-pressor test to elicit pain (George et al., 2006a; Hirsh et al., 2008), which may have had a higher threat level as compared to the neurodynamic testing procedure used in this study. Additionally, the influence of fear may not have been as strong for neurodynamic testing because it was being applied by a professional, and the subject may have perceived it very unlikely that tissue damage would occur. Our results indicated the importance of pain catastrophizing when eliciting pain intensity response via neurodynamic testing. We cannot directly generalize these findings to clinical settings but these results suggest that, reports of pain intensity during neurodynamic testing may be accentuated by pain catastrophizing.

Non-painful sensation intensity and elbow ROM

FAM factors did not predict evoked non-painful sensation intensity, which was expected given that the majority of work on FAM has reported associations with pain intensity and not other sensation descriptors. This finding suggests that psychological factors associated with the FAM have a specific influence on pain and are not an influence on general sensation reports. Therefore, it should not be assumed that elevated FAM psychological factors would also influence reports of numbness, tightness, stinging, etc. This finding is inconsistent with ‘perceptual amplification’, a theory that suggests amplification can occur in response to both noxious and non-noxious stimuli (Hollins et al., 2009; Rollman, 2009). Psychological risk factors, like pain catastrophizing, have been hypothesized to play a role in perceptual amplification (Rollman, 2009), but our data do not support such a link in healthy subjects exposed to evoked pain during neurodynamic testing. Additional research in patient populations is required to determine whether psychological distress is associated with amplification of non-noxious stimuli.

Studies involving symptomatic individuals have suggested that psychological factors are associated with activity-related pain (George et al., 2007b; Sullivan et al., 2009; Swinkels-Meewisse et al., 2006) and clinical examination findings (Fritz & George, 2002; Fritz et al., 2001). Similar findings have been reported in healthy individuals where pain-related fear was a strong predictor of exercise induced clinical pain (George et al., 2007b). Findings from studies of symptomatic individuals in which relationships between psychological factors and ROM were investigated suggest a negative correlation. Consequently, we had speculated that elbow ROM measures (i.e., ROM deficits from full elbow extension) obtained during neurodynamic testing might have been related to psychological factors in a similar manner. This speculation was not supported, as kinesiophobia was only weakly correlated with elbow ROM (Table 2) and did not uniquely contribute to the multivariate model (Table 5). This finding could be because our study differed from others that have examined this construct for two reasons. First and most importantly, we did not test this hypothesis in patients experiencing reports of clinical pain. Second, we were testing ROM at the elbow whereas other studies have examined patients with low back pain. For example, when controlling for pain intensity, pain-related fear was consistently associated with reduced lumbar flexion ROM (Geisser et al., 2004). In similar studies, inverse relationships between fear-avoidance beliefs (George et al., 2006b) and pain-related fear (Thomas & France, 2007; 2008) with lumbar ROM have been reported. Additionally, it has been suggested that there is a strong trend for psychological influence in conditions associated with low back pain (Leeuw et al., 2007), as compared to other anatomical regions.

Limitations

The primary limitation of the present study is that we tested the ability of psychological factors to predict evoked symptoms in healthy individuals; therefore, our results cannot be directly corroborated to clinical scenarios. Nevertheless, these findings of psychological influence on pain responses during diagnostic procedures provide insight to a topic that has been previously investigated in low back pain (Deyo & Diehl, 1983; McCracken et al., 1993; Pope et al., 1980), but has not been extensively investigated in upper-extremity pain models. Another potential limitation is that psychological factors such as “hypervigilance” (i.e., excessive attention to pain) were not considered in this analysis. These factors have been hypothesized to play a role in the FAM, but are not considered primary factors (Leeuw et al., 2007). Additionally, although participants were informed that their arm would be exposed to various degrees of stretching, they were not physically exposed to these procedures prior to actual testing. This may be viewed as a limitation because physical exposure prior to testing may have lessened the participant's level of threat associated with neurodynamic testing and potentially resulted in a more accurate response (McCracken et al., 1993).

Future study

Future studies in this area should investigate these relationships in patients with upper extremity clinical pain conditions. Considering psychological influence on neurodynamic testing responses has not been extensively investigated, investigators should consider incorporating other neurodynamic tests (e.g., slump test) to determine if findings are similar. Moreover, future studies should investigate if exposure to testing procedures prior to actual testing decreases the association between testing responses and psychological factors. From a clinical perspective, the clinical decision-making process may be improved if psychological factors are considered when neurodynamic testing involves the reproduction of pain.

Conclusion

The results of this study suggest that pain catastrophizing may be an important factor to consider when evaluating evoked pain intensity reports during upper-extremity neurodynamic testing. Before this finding has direct impact on clinical practice, however, it needs to be replicated in symptomatic individuals. Variables consistent with the FAM were not predictive of non-painful sensation rating or elbow ROM, suggesting a specific influence on reports of pain intensity.

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Table 1

Demographic, Psychological, and Evoked Symptom Summary of Sample (n = 62)

Variable	Value
Sex (#, female, %)	46, 74.2%
Age (years)	23.8 (3.9)
Race (#, Caucasian, %)	42, 67.7%
(#, African American, %)	6, 9.7%
(#, Asian, %)	8, 12.9%
(#, Other, %)	6, 9.7%
Ethnicity (#, Hispanic, %)	10, 16.1%
Pain Catastrophizing (PCS, 0-52) †	15.1 (7.6)
Fear of Pain (FPQ-9, 0-36) †	13.5 (5.8)
Kinesiophobia (TSK-G, 12-48) †	23.2 (4.5)
Anxiety (STAI-trait, 20-80) †	33.9 (6.5)
Pain intensity (VAS, 0-100)*	23.2 (17.3)
Non-painful sensation intensity (VAS, 0-100)*	20.9 (14.3)
Elbow ROM*‡	42.7 (14.6)

† indicates potential range of score;

* recorded during neurodynamic test;

‡ represents ROM deficit from full elbow extension (i.e., zero degrees)

PCS – Pain Catastrophizing Scale; FPQ-9 – Fear of Pain Questionnaire; TSK-G – Tampa Scale of Kinesiophobia; STAI – State-Trait Anxiety Questionnaire; VAS – visual analog scale

Table 2

Zero-Order Correlations for Variables Included in Regression Analyses.

	2.	3.	4.	5.	6.	7.
1. Pain intensity‡	.544†	− .138	.392†	.093	.023	.133
2. Non-painful sensation intensity‡		−.012	.199	.088	.073	.016
3. Elbow ROM			.008	.041	.213	−.021
4. PCS				.460†	.174	.022
5. FPQ-9					.259*	−.009
6. TSK-G						.280*
7. STAI						

PCS – Pain Catastrophizing Scale; FPQ-9 – Fear of Pain Questionnaire; TSK-G – Tampa Scale of Kinesiophobia; STAI – State-Trait Anxiety Questionnaire

‡VAS ratings during neurodynamic testing

*p < .05;

†p <.01

Table 3

Pain Catastrophizing Significantly Associated with Evoked Pain Intensity during Neurodynamic Test.

Overall model				
R^2 = .182				
Adjusted R^2 = .125				
$F_{4,57}$ = 3.17				
P = .02				
Variables	**B**	**Standard β†**	**P Value**	**VIF§**
Pain Catastrophizing	.101	.442	<.01	1.27
Fear of Pain	− .027	− .091	.51	1.33
Kinesiophobia	− .026	− .070	.59	1.17
Anxiety	.038	.142	.26	1.09
Evoked Pain Intensity‡ = .505 + .101(PCS) - .027(FPQ) - .026(TSK-G) + .038(STAI)				

PCS – Pain Catastrophizing Scale; FPQ-9 – Fear of Pain Questionnaire; TSK-G – Tampa Scale of Kinesiophobia; STAI – State-Trait Anxiety Questionnaire

†Standardized beta (β) coefficients represent a unit which allow for direct comparisons between other variables entered in the regression model and evoked pain intensity.

(β = .442, p <.01) indicates a one unit increase in pain catastrophizing would be expected to result in a (.44) unit increase in evoked pain intensity.

§VIF – variance inflation factor, representing a measure of multicollinearity

‡VAS ratings during neurodynamic testing.

Table 4

Psychological Factors Predictability with Evoked Non-painful Sensation Intensity during Neurodynamic Test.

Overall model

R^2 = .041

Adjusted R^2 = -.026

$F_{4,57}$ = .613

P = .65

Variables	B	Standard β	P Value	VIF
Pain Catastrophizing	.037	.198	.18	1.27
Fear of Pain	− .004	− .015	.92	1.33
Kinesiophobia	.013	.043	.76	1.17
Anxiety	.000	.000	.99	1.09

Evoked “Other Sensation” Intensity[ǂ] = 1.266 + .037(PCS) - .004(FPQ) + .013(TSK-G) + .000(STAI)

PCS – Pain Catastrophizing Scale; FPQ-9 – Fear of Pain Questionnaire; TSK-G – Tampa Scale of Kinesiophobia; STAI – State-Trait Anxiety Questionnaire

[ǂ]VAS ratings during neurodynamic testing

Table 5

Psychological Factor Predictability with Elbow Extension ROM‡ during Neurodynamic Test.

Overall model				
R^2 = .053				
Adjusted R^2 = -.016				
$F_{4,55}$ = .766				
P = .52				
Variables	**B**	**Standard β**	**P Value**	**VIF**
Pain Catastrophizing	− .067	− .033	.82	1.27
Fear of Pain	− .008	− .003	.98	1.32
Kinesiophobia	.771	.241	.09	1.15
Anxiety	− .192	− .086	.53	1.09
Elbow Extension ROM‡ = 32.348 - .067(PCS) - .008(FPQ) + .771(TSK-G) - .192(STAI)				

PCS – Pain Catastrophizing Scale; FPQ-9 – Fear of Pain Questionnaire; TSK-G – Tampa Scale of Kinesiophobia; STAI – State-Trait Anxiety Questionnaire

‡represents ROM deficit from full elbow extension during neurodynamic testing