



Predictive capacity of pain beliefs and catastrophizing in Whiplash Associated Disorder

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ABSTRACT

Introduction: Beliefs about pain are known to be important factors in recovery, most notably in LBP. Relatively less is known about the role of pain beliefs in Whiplash Associated Disorder (WAD). The widely advocated cognitive-behavioural approach to pain management necessitates cognitive factors such as pain beliefs be examined, even early after injury. The primary purpose of this study was to explore the predictive capacity of early post-injury pain beliefs and catastrophizing in patients with WAD.

Methods: Patients ($n = 72$) undergoing treatment for acute WAD in physical therapy and chiropractic clinics were invited to participate in the study. Research participants were asked to complete measures of beliefs (Survey of Pain Attitudes (SOPA) and Pain Beliefs and Perception Inventory (PBPI)) and catastrophizing (Pain Catastrophizing Scale) at baseline (within 6 weeks of injury), and 3 and 6 months post-injury. In addition, pain severity and self-reported disability using the Whiplash Disability Questionnaire (WDQ) were recorded at each measurement occasion. Baseline belief and catastrophizing scores were examined for their relationship with future pain and disability using multiple linear regression.

Results: Expectancy beliefs (PBPI Permanence and SOPA Medical Cure) were negatively correlated with pain intensity at 6-months and uniquely accounted for 16% and 14% of explained variance, respectively, after controlling for baseline pain intensity, age, sex and history of WAD. Consistent with previous research, catastrophizing was also found to be predictive of future pain. The amount of unique variance explained by beliefs in the prediction of future disability was modest after controlling for baseline disability, age, sex and history of WAD.

Discussion: These results suggest that expectancy beliefs are potentially important constructs to include in future explanatory prognosis studies. The Medical Cure and Permanence subscales of the SOPA and PBPI are tools that could be used to measure these expectancy constructs.

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Introduction

The prevalence of persistent neck pain after a motor vehicle collision (MVC), also known as Whiplash Associated Disorder (WAD), is high and a significant burden to healthcare.^{1,2} Prognostic research suggests WAD outcomes are largely determined by initial pain intensity. However, psychological factors such as catastrophizing and distress have also been shown to be important.^{1,3,4} The important role of psychological factors has increased attention

toward cognitive-behavioural approaches to understanding pain.⁵ Understanding idiosyncratic beliefs underlying the experience of pain represents a central component of the cognitive-behavioural approach and has been deemed critical for optimal treatment.⁶

Useful models such as the fear-avoidance model⁷ have developed in low back pain, and synthesised literature has identified specific beliefs that influence low back pain outcomes.⁸ The study of WAD-related pain beliefs are less understood, especially outside the context of chronic pain. Evidence suggests that beliefs related to causation, catastrophizing, fear-avoidance, and self-efficacy are associated with WAD pain and disability.^{9–13} However, prognostic evidence regarding specific beliefs is inconsistent in WAD and requires further clarification.¹⁴ Interventions falling under the umbrella of cognitive-behavioural theory propose that beliefs influence pain perception and adjustment to pain.¹⁵

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Thus, beliefs deemed maladaptive are expected to relate with outcomes such as increased pain and disability.^{16–20}

Belief is a broad construct necessitating a broad range of measurement tools to capture the diversity of the construct. Measures such as the Survey of Pain Attitudes (SOPA) and Pain Beliefs and Perceptions Inventory (PBPI) are broad in scope and are potentially well-suited for examining beliefs in a condition such as WAD that is lacking a thorough critique of pain beliefs. The SOPA and PBPI have proven useful in chronic pain settings^{17–19,21} but their prognostic utility is not clear outside this context. Another related construct, catastrophizing, has also emerged as an important contributor to poor outcome after WAD,^{12,16} but requires confirmation in varied settings.

Considering proxy measures suggestive of a chronic pain state can be observed early after injury,^{22,23} as well as calls for psychologically-informed practice,²⁴ exploration of patient beliefs and their relation with outcome early after WAD is important. Based on the incomplete knowledge of the capacity of beliefs to predict future WAD-related pain and disability, we examined the extent beliefs and catastrophizing predict future pain and disability. Based on previous literature cited above, we broadly hypothesised that baseline maladaptive beliefs and cognitions (e.g. catastrophizing, disability beliefs and negative expectations) would positively associate with future WAD-related pain and disability, while adaptive beliefs (e.g. control) would demonstrate negative associations. Specific hypotheses were not made since there is a lack of guiding literature (with the exception of catastrophizing) specific to WAD using the SOPA and PBPI measures. Thus, this study was intended to be exploratory in nature. The University of Alberta Health Research Ethics Board approved this study.

Methodology

Design

A prospective cohort survey design was used. We measured WAD-related beliefs in a clinical setting at an acute stage (<6 weeks post-MVC) and 3 and 6 months post-MVC.

Participants

From December 2008 to May 2010, we recruited patients with acute WAD using a convenience sampling strategy. Eighteen physical therapy and chiropractic clinics in Alberta and Saskatchewan, Canada, were approached to distribute study invitations. The 18 clinics were distributed in urban (15 clinics) and rural (3 clinics) areas of Alberta (15 clinics) and in Saskatchewan (3 clinics). Fifteen were physical therapy clinics and 3 were chiropractic. Study packages that included the survey were distributed by clinic administrative staff to patients attending the clinics with complaints of neck pain of less than 6 weeks duration as a result of a MVC. Other exclusion factors included age < 18 years and inability to speak or read English.

Sample size was based on suggestions for multiple linear regression. A commonly used rule of thumb suggests 10 subjects per variable entered in the model.²⁵ Therefore, a minimum of 50 participants would be required to examine 5 baseline variables in predicting self-reported pain and disability.

Measures

The survey included the following demographic variables: age, sex, previous history of WAD, vehicle insurance (tort or no fault) and whether or not the injury resulted in an overnight hospital

stay. In addition, the number of painful body parts was measured as another indicator of injury severity.

Pain beliefs

Three tools were used to measure a wide range of WAD-related pain beliefs. These included the Survey of Pain Attitudes (SOPA-35), Pain Beliefs and Perceptions Inventory (PBPI) and the Pain Catastrophizing Scale (PCS). Each will be described in detail.

SOPA-35^{17–19,26}: The SOPA-35 includes 7 subscales with items scored on a 5-point Likert agreement scale. The subscales include control, disability, harm, emotion, medication, solicitude, and medical cure. The higher the score the more the belief is endorsed. Higher scores on the subscales control and emotion are considered adaptive beliefs, and the remainder maladaptive. Internal consistency coefficients for the 7 subscales have been reported to range from 0.66 to 0.84 with only the harm scale having a marginal coefficient value.¹⁷ Test-retest reliability for the SOPA-35 factors was also acceptable (0.71–0.82).¹⁷ In chronic pain settings, there is evidence supportive of construct validity for the SOPA demonstrating expected associations with pain, disability, depression and coping.^{19,26}

PBPI²⁰: The PBPI is a 16-item questionnaire designed to evaluate patient beliefs about pain, with items rated on a 4-point Likert agreement scale. It was originally found to be comprised of 3 factors²⁰ with subsequent studies demonstrating a 4-factor structure.^{21,27–29} The subscales are labelled mystery, self-blame, pain permanence, and pain constancy. Negative scores on the subscales indicate disagreement with the belief, while positive scores indicate endorsement. Agreement on these four sub-scales would be considered maladaptive. The PBPI has been shown to have adequate internal consistency (Cronbach's $\alpha = 0.65–0.80$).²⁰ The construct validity evidence for the PBPI is primarily in chronic pain settings. Subscales on the PBPI have demonstrated expected relationships with measures of pain quality and intensity, depression, anxiety, physical functioning, and coping strategies.^{17,19,21,27–30} The constancy scale was not considered in this analysis since it measures a description of pain rather than a time-related pain belief as originally described.²⁰ Qualitative interviews with a sub-group of our participants were conducted and will be discussed elsewhere, but confirmed that the constancy scale was interpreted as a description of pain (Bostick, unpublished data).

PCS³¹: The PCS is a 13-item instrument that measures the extent of exaggerated negative mental thoughts during actual or anticipated painful experiences, with each item scored on a 5-point Likert scale.^{31,32} It is reported to have three correlated subscales: rumination, magnification, and helplessness. This 3-factor structure was not reproduced in an exploratory factor analysis performed on this data set. Thus, only the overall PCS score is used in this study. Higher scores indicate higher levels of catastrophizing. Each factor has shown acceptable levels of internal consistency (Cronbach's $\alpha = 0.66–0.87$).³² The PCS has been found to correlate with outcomes such as pain intensity in a variety of conditions including WAD.^{31,33} In addition, catastrophizing is associated with pain and illness behaviours¹² and disability after WAD at, 1- and 3-years post-MVC.³⁴ The PCS has a considerable amount of validity evidence in both acute and chronic pain populations^{32,33} and is an important prognostic factor in the WAD injury context.¹²

Outcome variables

Pain intensity and disability were the key outcomes of interest and were measured at each measurement occasion. Pain and self-reported disability at 3 and 6 months post-MVC were the dependent variables used in the examination of predictive capacity. Pain intensity was measured on an 11-point numerical rating scale. Disability was measured using the Whiplash Disability

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