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Conceptual overlap of psychological constructs in low back pain

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ABSTRACT

The biopsychosocial model is increasingly accepted in low back pain (LBP) research and clinical practice. In order to assess the role of psychological factors in the development and persistence of pain, a wide array of measures has been developed. Yet there is likely to be considerable conceptual overlap between such measures, and consequently, a lack of clarity about the importance of psychological factors. The aims of this study were to investigate the extent of any such overlap. An observational cohort study of 1591 LBP patients consulting in primary care completed data on a range of psychological instruments. Exploratory and confirmatory factor analyses (EFA and CFA, respectively) were carried out at the subscale level (n = 20) to investigate factor structure. The influences of the derived factors on clinical outcomes (pain intensity and self-reported disability) were then tested using linear regression. EFA yielded 4 factors, termed "Pain-related distress," "Cognitive coping," "Causal beliefs," and "Perceptions of the future," which accounted for 65.5% of the variance. CFA confirmed the validity of these factors models. The pain-related distress factor was found to have the strongest association to LBP patients' outcomes, accounting for 34.6% of the variance in pain intensity, and 51.1% of the variance in disability. Results confirmed that considerable overlap exists in psychological measures commonly used in LBP research. Most measures tap into patients' emotional distress. These findings help us to understand how psychological constructs relate together; implications for future research and clinical practice are discussed.

1. Introduction

Clear evidence exists that psychological constructs such as low mood, anxiety, fear-avoidance beliefs, coping strategies, and poor self-efficacy are significant predictors of outcomes such as pain, disability, and work retention in those who have low back pain (LBP) [18,42,53,54]. An extensive array of measures is currently available, specifically designed to assess these psychological constructs [18,45]. However, there may be considerable conceptual overlap [27], and as a consequence, their distinct value as predictors of pain and associated outcomes is unclear. This standpoint is further supported in a commentary on current disputes over the relative importance of individual psychological constructs in their relation to back pain (eg, fear avoidance), where it is suggested interaction is more likely [42]. Furthermore, clinical interventions now commonly incorporate approaches that specifically attempt to elicit and address unhelpful psychological obstacles to recovery in LBP patients [24,29,32]. Greater clarity on information about the relatedness of psychological constructs has the potential not only to clarify the influences of psychological processes on pain perception and pain-related disability from a theoretical point of view, but also to provide a foundation for the design of more effective interventions [27,42,48].

One way to examine this issue is to search for an underlying common concept, or concepts, that are shared by various psychological factors. An accepted way to undertake such an examination is factor analysis. A number of previous studies have used factor analysis to investigate the relationship between psychological constructs and pain [7,8,35,37,50]. However, 3 of the previous studies included pain and disability variables within their factor analyses models [7,8,35], and although useful in understanding the overview of the overlap of all factors (pain, disability, and psychological), the analyses therefore did not focus solely on psychological factors. Moreover, other than the study by De Gagne et al. [8], none of the previous studies have conducted confirmatory factor analyses (CFA) to confirm the external validity of their findings [3]. Additionally, in the 2 most recent factor analyses, Mounce et al. [37] carried out a factor analysis in a nonpain population, which is not necessarily relevant to understanding of people with pain, and Rooij et al. [50] considered measures of cognitive processes related to pain (eg, fear-avoidance beliefs, coping cognitions, general self-efficacy expectations), but did not include any affective measures (eg, depression, stress, or anxiety). In addition, both Mounce

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et al. [37] and Rooij et al. [50] performed principal components analysis, a data reduction technique commonly used to derive the smallest number of factors, but which can produce inflated values of variance [33], and is not best suited for the exploration of factor structure [4,6].

The aims of this study were to quantify the degree of conceptual overlap in psychological constructs related to LBP, identify the underlying factors, and investigate their clinical validity (in relationship to pain and self-reported disability).

2. Method

2.1. Design and setting

A cohort of consulters with LBP (aged between 18 and 60 years) in 8 general practices within the North Staffordshire and Cheshire area in England completed postal questionnaires about their back pain (for full details see Foster et al. [16]). Briefly, participants who consulted their doctor for LBP were identified via computerised primary care records using Read Codes (the standard method of coding and recording reasons for contact in UK general practice). Read Codes relating to LBP were used, with exclusions for "red flag" diagnoses (eg, cauda equina syndrome, significant trauma, ankylosing spondylitis, cancers). The quality and validity of the Read Code system, within these practices, is assessed annually through continual training and feedback to ensure high-level reporting of read codes during patient consultation [47]. The cohort for the present study comprised 1591 adults who had consulted for LBP and responded to the questionnaire. They included practices with a range of deprivation levels, and, given that over 96% of the UK population is registered with a primary care practice [39], they are representative of the local population.

2.2. Measures

Psychological measures included within this study were chosen based on previous research that has shown associations of these concepts with pain outcomes [16,19,27,30,37,40,42,45,53,54].

2.2.1. Psychological measures

The Hospital Anxiety and Depression Scale was used to measure depressive and anxiety symptoms [57]. The measure consists of 7 questions on depressive symptoms and 7 questions on anxiety symptoms; each item is scored on a 4-point scale (0 to 3), leading to scale score ranges of 0 to 21.

Fear avoidance was measured by the Tampa Scale for Kinesiophobia, which contains 17 items about a person's fear of movement due to pain; higher scores indicate a higher level of fear avoidance [28].

Participant coping styles were assessed using the Coping Strategies Questionnaire 24 (CSQ-24) [21]. Twenty-three items are divided into 4 scales in the questionnaire (catastrophising, diversion, re-interpretation, cognitive-coping), with higher scores indicating a higher frequency of use of the coping style.

The Pain Self Efficacy Questionnaire was used to measure the participants' beliefs and confidence in their ability to accomplish activities and engage in activities (eg, doing household chores, being active, getting enjoyment out of things, leading a normal life) despite their level of pain [40,41]. The measure consists of 10 items, each scored by a 6-point Likert scale, with a higher score indicating greater self-efficacy.

Illness perceptions were measured using the Illness Perception Questionnaire-Revised (IPQ-R) [36]. The IPQ-R has 12 subscales, 7 for illness perceptions (Timeline – Acute/Chronic, Consequences, Timeline – Cyclical, Emotional Representations, Illness Coherence, Personal Control, Treatment Control) and 4 on the causes of LBP (Psychological Attributions, Risk Factors, Immunity, Accident/Chance), and a final scale that accounts for the perception of the number of symptoms (IPQ-R Symptoms) that are associated with LBP. Higher scores on each subscale of the IPQ-R indicate stronger illness perceptions, with some inter-subscale items being reverse-scored.

2.2.2. Pain and disability measures

Pain intensity was measured by calculating the mean of 3 numerical rating scales (0–10) for the participant's least and usual pain intensity (in the previous 2 weeks) and current pain intensity (at the time of filling in the questionnaire). A higher score indicates a higher level of reported pain intensity [12,56].

Disability was assessed using the 24-item Roland-Morris Disability Questionnaire [49]; it asks questions on the level of disability associated with LBP on the day of questioning and gives a score from 0 to 24 (a higher score indicates a higher level of disability).

2.2.3. Additional factors

Additional factors shown to be associated with pain and disability were included [10,13,19]. Information was collected on age, gender, employment status (employed vs not working due to ill health or back pain, retired, unemployed, housekeeping, other), pain duration (<1 month, 1–6 months, and 7 or more months of pain duration before time of questioning), and radiating symptoms (presence of spreading pain in the legs).

2.3. Data analysis

To address the aims of the study, the respondents (n = 1591) were randomly allocated to 3 groups corresponding to the proposed analyses: (1) exploratory factor analysis group (n = 530); (2) confirmatory factor analysis group (n = 530); and (3) linear regression analysis group (n = 531). The random splitting of this cohort was tested for significant differences in the factors described above using analysis of variance and χ^2 tests as appropriate. Convention related to sample sizes for factor analysis and linear regression suggests that a ratio of 5:1 to 10:1 (cases per variable or item) is acceptable [6,26], indicating adequate sample size within these subgroups for each analysis.

2.3.1. Factor analysis

It is recommended that a number of preparatory stages are completed prior to factor analysis in order to yield the best results from the data [6]. Data preparation involved missing data analysis of the scale scores, and used Missing Completely At Random (MCAR) testing (Little's MCAR test [55]) to ascertain potential bias in data from missing responses. CFA, using AMOS version 19 (SPSS, Inc., Chicago, IL, USA), utilises "Full Information Maximum Likelihood," and so missing data were imputed using Estimation Maximisation for the factor analysis data [3,51,52]. Sensitivity analysis was carried out to determine differences between nonimputed and imputed datasets. Normal data distribution was checked (Kolmogorov-Smirnov test, visual inspection of Q-Q plots, histograms), as severe nonnormally distributed data can be problematic for Maximum Likelihood factor analysis [6], though less so in large sample sizes [26]. As this study investigated conceptual overlap at a scale level, it was important to check on the reliability structures of individual items, within each scale, as imprecise results can be obtained when consideration is not given to scale structure [7]. To achieve this, Cronbach alpha values were calculated on all items, within each individual scale, to ensure internal consistency of this cohort population in comparison to the original estimates from source publications. Within factor analysis, items (in this case, scales) should correlate within the proposed factor, but not