**Title: Exploring the stability of the CSQ24 factor structure: a longitudinal survey of adults with chronic low back pain**

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**Introduction**

Assessment of coping strategies in chronic low back pain is important in both clinical practice and research. The Coping Strategies Questionnaire (CSQ) [11], is arguably the most commonly used and studied measure of pain coping strategies, with reference to this assertion dating back as far as 1994 [12]. The need to have a more clinically utilitarian method of assessing coping strategies led to the development of the CSQ24, which features a reduced number of items from the original and a simplified scoring protocol [4]. The CSQ24 is in use in both clinical and research situations internationally and has been recommended over other versions such as the CSQ-R [9] by the New Zealand Government Accident Compensation Corporation as a measure of coping [1]. The CSQ24 consists of 23 items about coping with a 7-point Likert scale anchored with “Never Do That” and “Always Do That”, and one item measuring perceived control over pain with a 7-point Likert scale anchored with “No Control” and “Complete Control”.

The CSQ24 is designed to comprise four factors: Catastrophising, Diverting Attention, Reinterpreting and Cognitive Coping. This structure has one less factor than the generally accepted, though often debated, five-factor structure of the CSQ [1,3,4,6,10,11,12,14,15]. The missing factor, Praying and Hoping, is postulated to be absent in the UK validation of the tool secondary to sociocultural and religious differences between the American and UK populations sampled in the different versions [5].

The stability over time of a tool’s factor structure is an important issue when the questionnaire of interest is part of an on-going clinical evaluation or a longitudinal research design. This property is rarely if ever tested in scales used in the pain field. Although various studies have used the original CSQ in a longitudinal methodology, such as [14], the emphasis of these studies has been clinical and excludes repeated analysis of the tool itself. While it has been argued that the CSQ has a relatively stable structure with repeated cross sectional studies finding similar results [1,4] this has not been tested empirically in a clinical pain population over a longitudinal period.

Therefore, the aim of this study was to explore the constitution and behaviour of the factor structure of the CSQ24 in adults with chronic low back pain over an extended period of time, incorporating initial assessment, discharge from physiotherapy, and 6 and 12 month follow up assessment.

**Methods**

**Design**

This study was a prospective longitudinal survey. Data were collected from each participant on four occasions: before and after physiotherapy treatment, and at six and twelve months following discharge. Ethical approval was granted by Teesside University and the NHS, and all participants gave their written informed consent to take part.

**Participants**

A consecutive sample of patients referred from a specialist chronic low back pain assessment clinic to a UK physiotherapy outpatient department was obtained over a 24 month period. The exclusion criteria were determined by those of the spinal assessment unit in question to ensure results remained clinically relevant. Patients were excluded if they were under 16 years of age or if there was any serious spinal pathology such as infection or fracture. Patients were also excluded if they did not understand English or were unable to understand basic concepts such as coping as described by the questionnaire. All other patients with a primary complaint of low back pain, with or without associated leg pain, were included.

194 cases who completed treatment after assessment and referral from the spinal unit were available for analysis. Their mean age was 52 years (SD 14.59) ranging from 16 to 83 years of age. 42% of the participants were male and the population was almost exclusively white. 46% of the sample was employed, 28% were retired and 15% were either on sick leave or claiming incapacity benefit. The majority, 53%, had had low back pain for over 5 years with only 10% having suffered for less than 6 months. 2.5% were undertaking litigation regarding their back pain.

Of the initial n=196 cases 70% n=137 satisfactorily completed and returned the 6 month questionnaire and of these 70% n=96 satisfactorily completed and returned the12 month longitudinal follow up. Table 1 shows that the demographic make-up of respondents at discharge, 6 months and 1 year is very similar, indicating a lack of selection bias between respondents who did and did not return follow up questionnaires.

**Measures**

Coping was measured using the Coping Strategies Questionnaire 24 (CSQ24) [4]. In addition pain was measured using a 100mm horizontal visual analogue scale [7]; back specific function using the Roland-Morris Disability Scale, 18-item version [13]; anxiety and depression using the Hospital and Anxiety and Depression Scale [16]; and Global Subjective Outcome Score using a 6-point Likert scale with anchors of “I feel worse” and “I am completely better”.

**Procedures**

Participants were given a composite questionnaire comprising the measures noted to be completed unsupervised at the clinic on attendance for assessment and also upon discharge after their last physiotherapy treatment session. They were then sent, by post with a stamped addressed return envelope, the composite questionnaire at six and twelve months after discharge to be completed at home. Those not initially returning the postal questionnaire were sent a further questionnaire two weeks later.

The participants received treatment that was consistent with the protocol of the specialist physiotherapy rehabilitation unit. While there was room for adapting treatment to the individual needs of the patient treatment consisted almost exclusively of exercise prescription and practice in the context of on-going cognitive behavioural management. As this is not the emphasis of the study no further details are given. Participants received a mean of three treatments after assessment over a period of three months.

**Data Analysis**

Exploratory Factor Analysis using principal components analysis with Varimax rotation was used to examine the factor structure of the CSQ24 at each time point. Item loading tolerances were set at a minimum primary loading of 0.4 with no item loading on another scale within 0.2 of the primary loading [1,4]. Cronbach’s alpha was used to test the internal reliability of each factor at each time point. The relationships between a factor’s scores at each time point were explored using Pearson’ Product Moment Correlation Coefficients. Also for each factor, changes in that factor’s score over time were explored using paired t-tests, which were also used to test changes over time in pain, function, anxiety and depression. In keeping with the exploratory nature of the study we did not use Bonferroni corrections for multiple testing.

**Results**

At each time point a four factor solution was identified that consistently fitted the structure found by Harland & Georgieff [4] including Catastrophising, Cognitive Coping, Diverting, and Reinterpreting. On all four occasions, every item contributed to the factor solution. On only three occasions did any single item load at <0.6. The items that comprised a factor were the same for each factor at each time point. .At assessment, Catastrophising and Reinterpreting explained 23% and 25% of the total variance, while Cognitive Coping and Diverting explained 17% and 15% respectively. At all subsequent time points the relative contribution of each factor was almost equal with no more than 2% of a difference. Table 2 shows full factor loading and variance results. Within each Factor, at every time point, Cronbach’s alpha was > 0.7 (Table 3), indicating high internal reliability.

For each factor, the correlations between the factor scores at each time point were statistically significant. Within Diverting the correlations were predominantly “strong”, defined as ≥0.7 [8] with the exception of the correlation between discharge and 6 months and between assessment and discharge which were “moderate” being ≥ 0.4 but < 0.7 [8]. The correlations regarding Reinterpreting were predominantly moderate except those between discharge and one year and between 6 months and one year which were strong. Within Catastrophising and Cognitive Coping all the correlations were moderate. Table 4 shows factor correlation results.

There were statistically significant improvements between assessment and discharge in all four factor scores (Catastrophising p<0.001; Cognitive Coping p<0.001; Reinventing p=0.004; Diverting p=0.006). That improvement remained significant at 6 and12 months in Catastrophising (both p<0.001)and Cognitive Coping (6m p<0.001, 12m p=0.01). In Reinterpreting there was no significant difference between assessment and 6 months (p=0.159) but by 12 months the difference from assessment was again significant (p=0.018). For Diverting there were no significant differences between assessment and 6 months (p=0.919), and assessment and 12 months (p=0.771).

Compared to pain at assessment, the mean score was statistically significantly lower at discharge, 6 months and 12 months (all p<0.001). Within that period pain increased significantly between discharge and 6 months (p<0.007). There were statistically significant improvements in function at discharge, 6 months and 12 months (all p<0.001). In comparison with scores at assessment, anxiety was statistically significantly improved at discharge (p<0.001), 6 months (p=0.005) and 12 months (p=0.001). Within that period anxiety increased significantly between discharge and 6 months (p=0.025). Depression was lower, compared to assessment, at discharge, 6 months and 12 months (all p<0.001). Within that period depression increased significantly between discharge and 6 months (p<0.001).Mean scores of all factors and of pain, disability, anxiety and depression at each time point are shown in table 5.

**Discussion**

This longitudinal survey of adults with chronic low back pain aimed to explore the factor structure of the CSQ24 at initial assessment, on discharge from physiotherapy, and at 6 month and 12 month follow up. At each time point we found a four factor structure with similar patterns of item and factor loading described as Catastrophising, Cognitive Coping, Diverting and Reinterpreting. Within each factor the factor scores at each time point were significantly correlated. Also, at each time point the factors showed acceptable internal reliability.

Some judgement was required to define the factors. At the first assessment Cognitive Coping was accepted with an eigenvalue of 0.98, which was just below the preset criteria of 1.0. In this analysis Question 3 loaded almost equally on Cognitive Coping and Reinterpreting. It was decided to keep it within Cognitive Coping, with which it was conceptually more aligned, and to which it was allocated statistically at each of the later time points. There was one other ambiguous allocation, which occurred in Cognitive Coping at the 12 month follow up period. In this case Question 10 cross-loaded between Cognitive Coping and Reinterpreting. It was included with Cognitive Coping, again because it fitted their best conceptually, as well as being allocated there statistically at the three previous time points. The requirement to make these marginal judgements may be a function of the relatively small sample size, being just under 100, which is often recommended as a minimum [2].

Catastrophising, Cognitive Coping, Diverting and Reinterpreting are also factors that appear in the other versions of the CSQ, thus confirming the validity of the shorter CSQ24 version. The four factor structure is the same as that reported in a previous paper [4], which shows consistency across groups. In this study the factor structure also showed consistency over time: the items for each factor were the same at each time point, there were statistically significant correlations within each factor at the four time points, and there was a similar pattern of variance explained by the factors. That this was observed in a clinical research setting during a period of statistically significant change in the factor scores and pain, function and mood, is further evidence of the stability of the CSQ24. Such longitudinal analysis has not been undertaken with the other versions of the CSQ. Nor indeed has any related psychosocial measure of pain been analysed at this level.

**Limitations**

With the study being exclusively focused on an adult CLBP population caution should be applied to extrapolating results to other diagnostic population. Similarly, assumptions regarding the longitudinal stability of other versions of the CSQ should also be made with caution. This study was exploratory, and did not employ more stringent statistical tests associated with Confirmatory Factor Analysis that are available to establish longitudinal invariance. That was primarily due to the relatively small sample size. However, it is a robust exploratory study that indicates at least configural invariance in the factor structure over time. Future work could recruit a larger sample and employ Confirmatory Factor Analysis and tests of configural and metric invariance to explore the factor structure in more detail.

**Conclusions**

The results provide support for the stability of the factor structure of the CSQ24 in research and clinical practice. In both contexts, issues regarding the ability to measure coping strategies over a period of clinical change have not, until now, been explored or acknowledged. This evidence of longitudinal stability in the CSQ24 factor structure points the way towards its use in future work into investigating coping from within a state/trait context where measurement stability is essential.

Conflict Of Interest Statement – Neither author has any conflict of interest to declare in regard to this research or article.

**References**

[1] Accident Compensation Corporation, New Zealand Government. Persistent Pain Assessment Instruments: A Compendium, 2008.

[2] Comrey, AL, Lee, HB. A first course in factor analysis. Hillsdale, New Jersey: Erlbaum, 1992.

[3] Dozois, DJA, Dobson KS, Wong M, Hughes D, Long A. Predictive utility of the CSQ in low back pain: individual vs. composite measures. Pain 1996; 66: 171-180.

[4] Harland, N, Georgieff, K. Development of the Coping Strategies Questionnaire 24, a clinically utilitarian version of the Coping Strategies Questionnaire. *Rehabil Psychol* 2003;48: 296-300.

[5] Harland, N. Validation of the Coping Strategies Questionnaire 24 (CSQ24).A longitudinal study of state or trait coping strategies in a chronic low back pain population. Unpublished PhD Thesis 2009, Teesside University.

[6] Hastie BA, Riley JL, Fillingham RB. Ethnic differences in pain coping: factor structure of the Coping Strategies Questionnaire and coping strategies Questionnaire-Revised, J Pain 2004; 5: 304-316.

[7] Korff MV, Jensen MP, Karoly P. Assessing global pain severity by self report in clinical and health services research. Spine 2000;25: 3140-3151.

[8] Portney LG, Watkins MP. Foundations of clinical research: applications to practice. New Jersey: Prentice Hall Inc, 2000.

[9] Riley, JL, Robinson ME. CSQ: Five factors or fiction? Clin J Pain 1997; 13: 156-162.

[10] Robinson, ME, Riley, JL, Myers, MS, Cynthia, D, Sadler, IJ, Kvaal, SA, Geisser, ME, Keefe, FJ. The Coping Strategies Questionnaire: A large sample item level factor analysis. Clin J Pain 1997; 13: 43-49.

[11] Rosenstiel, AK, Keefe, FJ. The use of coping strategies in chronic low back pain patients: relationship to patient characteristics and current adjustment. Pain 1983; 17: 33-44.

[12] Swartzman, LC, Gwadry, FG, Shapiro, AP, Teasell, RW. The factor structure of the Coping Strategies Questionnaire. Pain 1994; 57: 311-316.

[13] Stratford PW, Binkley JM. Measurement properties of the RM-18: A modified version of the Roland-Morris Disability Scale. Spine1997;22: 2416-2421.

[14] Turner JA, Clancy S. Strategies for coping with chronic low back pain: relationship to pain and disability. Pain 1986;24: 355-364.

[15] Tuttle, DH, Shutty, MS, DeGood, D. Empirical dimensions of coping in chronic pain patients: A factoral analysis. Rehabil Psychol 1991; 36: 179-188.

[16] Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. Acta Psychiat Scand 1983; 67: 361-370.