Indices of Central Sensitisation can predict effective Self-management in Individuals with Chronic Low Back Pain

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Background and aims: Chronic low back pain (CLBP) is one of the most prevalent reasons people seek healthcare assistance worldwide. Guidelines for managing CLBP prioritise the development of self-management strategies, for example through cognitive behavioural therapy (CBT)-based physiotherapy interventions. Levels of central sensitisation (CS) vary between individuals with chronic pain. CS might be associated with increasing psychological distress, pain, fatigue and catastrophization, each of which might be barriers to effective self-management. However, it is currently unknown whether CS might itself be a dominant factor predicting worse self-management. Quantitative sensory testing (QST) may provide reliable and valid indices of CS. Our recent systematic review and meta-analysis showed that baseline QST predicted musculoskeletal pain and disability (Georgopoulos *et al*., *Pain* 2019;160;1920-32). CS has also been associated in people with knee pain with self-report measures of widespread pain distribution (reported by shading a pain manikin) or a self-report Central Mechanisms Trait score, comprising items addressing depression, anxiety, neuropathic-like symptoms, pain distribution, catastrophising, sleep, fatigue and cognitive difficulties (Akin-Akinyosoye *et al., Pain* 2018;159;1035-44). We aimed to determine the reliability of a QST protocol to detect CS, and the ability of CS indices to predict self-management outcomes in a population with CLBP.

Methods: Studies were approved by the Nottingham Research Ethics Committee 1 (18/EM/0049). Reliability of Pressure Pain Detection Threshold (PPT), Temporal Summation (TS) and Conditioned Pain Modulation (CPM) conducted at a site distant from the low back were assessed in healthy participants (n=25) and individuals with CLBP (n=25). QST test site was the dominant forearm and conditioning site the contralateral arm. Receiver operating characteristics (ROC) established the cut-off for the optimal number of painful sites needed to classify low PPT (1^{st} quartile). Confirmatory factor analysis (CFA) assessed model fit and generated a single Central Mechanisms Trait score. The ability of baseline indices of CS (PPT, TS, CPM, number of painful sites on a manikin, and Central Mechanisms Trait score) to predict self-management outcomes at 3-month follow-up was assessed in individuals with CLBP (n=97) participating in a CBT-based group physiotherapy intervention. Self-management was measured in 8 discrete domains; health-directed behaviour, positive engagement in life, self-monitoring and insight, constructive attitudes and approaches, skill and technique acquisition, social integration and support, health services navigation and emotional distress. Pain (Numerical Rating scale), depression/anxiety (Hospital Anxiety-Depression Scale), fatigue (Fatigue Severity Scale) and catastrophizing (Pain Catastrophizing Scale) were also measured.

Results: Test-retest and inter-rater reliability were high for PPT and TS in both normal and CLBP populations (ICC=0.76-0.92) but low for CPM (ICC=0.43-0.46). In people with CLBP (n=97), ROC analysis determined that >9/24 painful sites optimally predicted low PPT at the forearm (AUC=0.67, 95%CI: 0.55-0.80). The single-factor Central Mechanisms Trait model showed a good fit to the data (CFI=0.92, TLI=0.88; RMSEA=0.09; SRMR=0.07; x^2(df)=34.19(20)). Follow-up questionnaires were completed by 87 people with CLBP (67% female, mean age 65y). Low PPT and inefficient CPM measures at baseline predicted worse

social integration and support (r=0.28, p<0.01) and positive engagement in life (r=0.31, p<0.01) at 3 months. More than 9/24 painful sites shaded on the pain manikin at baseline also predicted less positive engagement in life (r=-0.32, p<0.01) at 3 months. Baseline Central Mechanisms Trait score also predicted worse positive engagement in life, constructive attitudes and approaches and emotional distress (r=0.51-0.54, p<0.01) at 3-months. In multivariate regression models adjusted for baseline depression, catastrophization, pain and fatigue, low PPT and inefficient CPM at baseline, remained significantly (p<0.05) predictors of worse social integration and support and less positive engagement in life.

Conclusion: Baseline indices of high CS can predict reduced ability of individuals with CLBP to self-manage their condition 3 months after commencing a CBT-based group physiotherapy intervention. Prediction of self-management by CS was not entirely explained by pain severity, catastrophizing, depression or fatigue. Treatments which directly target CS might help remove barriers to self-management in people with CLBP.

Conflicts of Interest: The authors have no conflicts of interest to declare.

Sources of Financial Support: University of Nottingham, Versus Arthritis and NIHR