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Type D personality in patients with upper extremity musculoskeletal illness: Internal consistency, structural validity and relationship to pain interference

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ABSTRACT

Objective: Type D personality – the joint tendency toward negative affectivity (NA) and social inhibition (SI) – is associated with greater symptom perception and negative health outcomes among various patient populations. We investigated Type D personality among patients with upper extremity musculoskeletal illness.
Method: In cross-sectional design, we estimated the prevalence of Type D personality in this population and explored the associations of two different Type D conceptualizations (i.e., categorical and dimensional as the NA × SI interaction) and the individual NA and SI traits with pain interference as well as structural-internal validity of DS14.
Results: The categorical Type D personality and greater NA and SI were associated with pain interference above and beyond descriptive variables, but the interaction term between NA and SI was not. NA explained a larger proportion of the variance in pain interference than SI. DS14 showed a two-factor structure and high internal consistency in this sample.
Conclusions: The categorical Type D allows for identifying individuals who struggle with recovery from musculoskeletal injury. Although the dimensional conceptualization didn't prove to be associated with pain interference, NA and SI appear to have individual effects on pain interference, with most variance being accounted for by NA. Implications for clinical care are discussed.

1. Introduction

Type D (distress) personality is a joint tendency toward negative emotions and interpretation of self and situation (i.e., negative affectivity) along with reticence in social interactions due to fear of rejection or disapproval by others (i.e., social inhibition) [1]. Prior research has shown that higher levels of both negative affectivity (NA) and social inhibition (SI) are individually associated with greater symptoms of depression and anxiety, and lower quality of life [2,3] and both are independently associated with somatic symptoms [4].

However, Type D theory [1,5,6] ascertains that the effect of these two distinct, negative and stable personality traits has heightened negative consequences that spread across a variety of mental and physical conditions. Indeed, Type D has been associated with negative outcomes across a variety of conditions including coronary heart disease [7–9], sleep disturbance [10], multiple sclerosis [11], periodontal diseases [12], vestibular and auditory problems [13,14], diabetes [15,16], cancer [17], migraine [18], ulcerative colitis [19] and chronic pain [20]. Type D personality predisposes an individual to detrimental health-related behaviors [21–23] including maladaptive avoidance coping strategies [24]. Avoidance of activities due to pain (e.g., pain interference) is one of the most important factors associated with negative outcomes in patients with musculoskeletal illness [25]. In fact, in fibromyalgia–a condition characterized by widespread musculoskeletal pain–more than half of the patients screened in for Type D [26]. Type D personality has also been depicted as a risk factor for musculoskeletal pain with 2-fold increased odds among adolescents [4]. Given the evidence that Type D increases susceptibility to avoidant maladaptive health related behaviors [21–24], it may be an important transdiagnostic personality factor [27] associated with pain interference, a construct assessing the impact of pain on diverse aspects of life and daily activities [28]. Yet, the association of Type D with the interference of pain in activities of daily living (i.e., pain interference) has not been studied in adult patients with musculoskeletal illness presenting to

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Type D has been traditionally conceptualized as either a dichotomous or dimensional construct. The dichotomous conceptualization allows for the classification of Type D personality based on scores above median split on *both* the NA and SI subscales [1] and has support from research [29]. The dimensional conceptualization is based on the interaction between the NA and SI subscales [30]. Nonetheless, recent research has proposed that NA and SI are important predictors of health outcomes that operate as *main effects* rather than an interaction, as traditionally thought, suggesting that the categorical (i.e., dichotomous) and dimensional (i.e., NA × SI interaction term) conceptualizations may not be necessary within predictive models of health behaviors [31].

This study builds on prior research by assessing the relationship of Type D personality with pain interference in patients with upper extremity musculoskeletal illness presenting to an orthopedic surgeon. First we report on the prevalence of Type D personality in this population. Next, we report results of the factor analysis of the Type D scale. Finally, we hypothesize that 1) the categorical Type D conceptualization will not be associated with pain interference when accounting for the relevant descriptive variables (i.e., primary null hypothesis) and 2) the Type D dimensional conceptualization as well as the individual NA and SI subscales will not be associated with pain interference after controlling for the relevant descriptive variables (i.e., secondary null hypotheses). These findings will provide insight and recommendations for the optimal modality for the assessment of Type D personality and future research directions in this population.

2. Methods

2.1. Participants

One hundred and two patients with upper extremity musculoskeletal illness were recruited from an upper extremity surgical practice at a multispecialty urban teaching hospital. On average, patients were middle aged (Mean (M) = 54, Standard Deviation (SD) = 15) with 15 years of education. They were in majority male (51%), White (78%), working (63%) and living with a partner (51%). Most patients had been previously seen in the clinic (61%), had non-trauma related musculoskeletal illness (57%), and had no prior injury (63%).

2.2. Procedures

The institutional review board (IRB) approved this observational cross-sectional study prior to the commencement of any study related procedures. Inclusion criteria were: 1) being at least 18 years old, 2) being fluent in English and 3) being able to provide informed consent. The exclusion criteria were 1) being pregnant per our IRB requirement or 2) currently having significant axis I psychopathology such as active substance abuse, untreated bipolar disorder, schizophrenia and psychotic symptoms by self-report. Consecutive patients were recruited from the clinic of one surgeon. Recruitment occurred while patients were waiting for their medical visit. Informed consent was obtained from the participants. They were told that participation was voluntary, and they could withdraw at any time without any repercussions to their medical care. After consent, patients who met inclusionary and exclusionary criteria were asked to complete a demographic and clinical survey, as well as measures of pain interference and Type D personality (negative affectivity and social inhibition).

2.3. Measurements

2.3.1. Self reported pain interference

We used Patient-Reported Outcomes Measurement Information System (PROMIS) Bank v1.1 pain interference computerized adaptive test (CAT) to assess the levels of pain interference in patients with musculoskeletal related injuries in the upper extremity. Respondents have 5 choices of answers for each item rating the magnitude of interference of pain from “never” to “always” or “not at all” to “very much” depending on the question. The PROMIS scores are calibrated based on T-score metric standard, in which weighted scores are computed in a way that the 50 ± 10 remains the mean ± SD of United States (U.S.) population for that measure [32,33]. This standardization communicates the interpretation of each respondent's score relative to the general population. PROMIS pain interference item bank was found to be psychometrically reliable (Cronbach's $\alpha = 0.99$) and valid [28]. Its validity was established based on the association with previously validated legacy measures of Brief Pain Inventory (BPI) [34] interference subscale ($rho = 0.90$) and medical outcomes Short Form-36 (SF-36) [35,36] bodily pain subscale ($rho = -0.84$) [28].

2.3.2. Type D personality, negative affectivity and social inhibition

We used DS14 [1] to assess Type D personality. It comprises two 7-item subscales measuring two independent and temporally stable personality traits: negative affectivity (NA) and social inhibition (SI). The DS14 is a valid and reliable measure [1]. Items are answered on a five-point Likert-type scale ranging from 0 “false” to 4 “true”. The NA (e.g., “I often feel unhappy”) and SI (e.g., “I often feel inhibited in social interactions”) subscales can be scored independently as continuous variables with scores ranging from 0 to 28 with high scores representing more of the construct being measured. Patients can also be classified as having Type D personality when scoring 10 or higher on both NA and SI. This cut off is based on the median split of scores of the individual traits in the general population, which has been proposed and validated by the developer of this scale [1]. A Type D interaction term (NA × SI) was also calculated [30]. In the development study of DS14 [1], the DS14 has shown good internal consistency ($\alpha = 0.88$ for NA and 0.86 for SI), and high temporal stability ($r = 0.72$ for NA and 0.82 for SI). NA and SI showed good convergent validity with neuroticism ($r = 0.68$) and extroversion ($r = -0.59$). A factor analysis showed that Type D has a two-factor structure with all of the 7 NA items and 7 SI items demonstrating a loading range of between 0.62 and 0.82 on their corresponding trait factor. This two-factor solution for DS14 corroborates the theory of Type D personality (i.e., structural validity). Also, scores on the NA and SI subscales were not mood state-dependent over a period of three months making these personality traits independent from changes in emotional states and mood and confirming that they measure a trait and not a state [1].

2.4. Statistical analyses

Variables were summarized with descriptive statistics using M ± SD (range) for continuous and number (percentage) for categorical variables. Pearson product-moment zero-order correlations coefficients were used to infer the relationships among continuous main study variables (pain interference, NA, SI and their interaction term) and the correlation between pain interference and continuous descriptive variables. The relations of dichotomous Type D personality typology with pain interference, NA, SI and the NA × SI interaction term were assessed through point biserial correlation coefficients. The relationship between pain interference and categorical descriptive variables as well as the relation of Type D dichotomy to continuous descriptive variables were studied through independent sample *t*-test and one-way independent ANOVA. Fisher's exact test and Chi-Square test were used to explore the differences in the Type D dichotomy by categorical descriptive variables. We used the principal components analysis (Varimax rotation with Kaiser normalization) to assess the structural validity and internal consistency of DS14 and its subscales. All factors with eigenvalue > 1 according to Kaiser criterion were retained. Succeeding factors (eigenvalue ≤ 1) were considered to be representative of negligible amounts of variation in the personality. A scree plot was deployed to illustrate the factors and to determine the