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The direct and indirect effects of the negative affectivity trait on self reported physical function among patients with upper extremity conditions

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ABSTRACT

Negative affectivity is a personality trait that predisposes people to psychological distress and low life satisfaction. Negative affectivity may also affect pain intensity and physical function in patients with musculoskeletal conditions. We explored the association of negative affectivity to pain intensity and self-reported physical function, and tested whether pain intensity mediates the effect of negative affectivity on physical function. In a cross-sectional study, 102 patients with upper extremity musculoskeletal conditions presenting to an orthopedic surgeon completed self-report measures of negative affectivity, pain intensity, and physical function in addition to demographic and injury information. We used the Preacher and Hayes' bootstrapping approach to quantify the indirect effect of negative affectivity on physical function through pain intensity. Negative affectivity correlated with greater pain intensity and lower self-reported physical function significantly. Also, pain intensity mediated the association of negative affectivity with physical function. The indirect effect accounted for one-third of the total effect. To conclude, negative affectivity is associated with decreased engagement in daily life activities both directly, but also indirectly through increased pain intensity. Treatments targeting negative affectivity may be more economical and efficient for alleviation of pain and limitations associated with musculoskeletal illness than those addressing coping strategies or psychological distress.

1. Introduction

Negative affectivity - the predisposition toward negative thoughts and feelings, including worry, self-criticism, and negative misinterpretations of self, others and the future– is a risk factor for mood disorders (Davey et al., 2015; Gulley et al., 2016), ineffective coping strategies (Watson and Clark, 1984; Wong et al., 2015), and low life satisfaction (Forgas, 2010; Huebner and Dew, 1996). This previously considered stable personality trait, is more malleable than initially thought. The Transdiagnostic Unified Protocol (Boisseau et al., 2010; Bullis et al., 2014; Farchione et al., 2012; Wilamowska et al., 2010) directly targets this underlying trait, which may provide a more economical and feasible approach to psychosocial treatment by addressing the root cause rather than individual symptoms.

The negative affectivity trait may be a key driver explaining the magnitude of pain and disability in patients with orthopedic conditions. Negative affectivity may directly predispose individuals with musculoskeletal conditions to avoid of activities of daily living. Negative affectivity may also prompt individuals to more negative interpretations of nociception, hyper-vigilance to nociception (Watson and Pennebaker, 1989), and increased pain intensity (Conden et al., 2013) thus indirectly decreasing self-reported physical function. However, to our knowledge, the mediation model in which pain intensity mediates the indirect effect of negative affectivity trait on self-reported physical function has not yet been studied in adult patients with musculoskeletal pain presenting to orthopedic surgeon.

If these relationships are identified in patients with musculoskeletal illness, it might transform management by promoting early screening for and amelioration of negative affectivity. The negative affectivity trait may explain why certain patients are predisposed to greater trouble with pain and other persistent symptoms. Negative affectivity might also explain the tendency for patients to have multiple persistent somatic conditions.

This study tests the primary null hypothesis that negative affectivity

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has no direct association with pain intensity and self-reported physical function in patients with upper extremity conditions. Next, we hypothesize that pain intensity partly mediates the effect of negative affectivity on self-reported physical function.

2. Methods

2.1. Participants

One hundred and two adult patients with upper extremity conditions were enrolled from a hand and upper extremity service at a multispecialty teaching urban hospital. The participants' mean of age was 54 years old (range:20–58). Fifty-two of the enrolled patients were male (51%) and 50 were female (49%). The mean of education was 15 years (range:5–24). Majority of the participants were white (78%), married (51%), follow-up patients (61%) and their conditions were non-trauma related (57%). Pain duration was between 0.07 and 183.85 months with the mean of 14.54 months.

2.2. Procedures

The Institutional review board approved this observational cross-sectional study. Patients were enrolled if they were at least 18 years old, fluent in English and able to provide informed consent. Potential patients were excluded from study if they were pregnant or had untreated severe axis I psychopathology by self-report. In practice, no participants who were approached for participation reported severe axis I disorder and as a result no patient was excluded from the study because of this criterion. The researcher approached potential patients before their appointment with the treating surgeon. The study was explained in detail and participants were told that they could withdraw from the study at any time, without any repercussions to their medical care. Those who agreed to participate provided informed consent. Participants completed a demographic and clinical history questionnaire and self-report measures of pain intensity, physical function, and negative affectivity. Enrollment occurred in three months in summer 2015.

2.3. Measurements

2.3.1. Pain intensity

We used an 11-point numeral rating scale (NRS) (range: 0–10) (Farrar et al., 2001) to measure self-reported pain intensity. Participants were asked to rate their average pain intensity in the past 7 days. Previous study has shown that the NRS (range: 0–10) is an appropriate measure of pain intensity in both acute and chronic pain populations (Cook et al., 2013).

2.3.2. Self-reported physical function

We used the Patient Reported Outcomes Measurement Information System (PROMIS), an initiative by National Institute of Health (Fries et al., 2011) to measure self-reported physical function. PROMIS scores are standardized with a mean of 50 and standard deviation (SD) of 10 as the average for samples derived within U.S. population (Cella et al., 2007; Liu et al., 2010). We used Computer Adaptive Testing (CAT) which dynamically selects each item a participant is going to answer next, based on responses to previous items (Cella et al., 2007; Chakravarty et al., 2007), thus decreasing patient burden. PROMIS Bank (v1.2) physical function-upper extremity CAT was used to evaluate physical function. Respondent answered questions about their perception on their own ability to engage in a variety of activities, by selecting an answer from “without any difficulty” to “unable to do”. PROMIS upper extremity is a valid and reliable measure (Doring et al., 2014). Participants filled the PROMIS measure on https://www.assessmentcenter.net on an encrypted laptop.

2.3.3. Negative affectivity trait

We used the negative affectivity (NA) subscale of the Type D Scale (DS14) (Denollet, 2005) to measure the negative affectivity trait. The subscale has 7-items that are scored on a five-point Likert-type scale ranging from 0 “false” to 4 “true”. The subscale showed good test–retest validity and high internal validity with Cronbach's α of 0.88 (Denollet, 2005).

2.4. Statistical analyses

Pearson product-moment zero-order correlations were used to explore the relationships among main study variables and with demographic and clinical continuous variables. Independent-samples *t*-tests and one-way independent ANOVAs were used to explore differences in the study variables by categorical demographic and clinical variables.

2.4.1. Model building

The model was built with negative affectivity as the independent variable, self-reported physical function as the dependent variable, and pain intensity as the candidate mediator. Any demographic and clinical variables that showed significant zero-order correlations with the candidate mediator, the dependent variable or both were inserted into the model as covariates. We performed the mediation analyses first uncontrolled and then controlling for the covariates to isolate and explain the proportions of variation in the outcome not accounted by the direct or indirect effects in the model.

2.4.2. Mediation analysis

Fig. 1 depicts the mediation model. The total effect (c) (i.e., the sum of the direct and indirect effects), the direct effect (c') (i.e., the effect of negative affectivity on physical function that is not carried out through pain intensity) and the indirect effect (i.e., the effect of negative affectivity on physical function that is carried out through pain intensity) were quantified in both models using Hayes' PROCESS macro tool version 2.15, (http://www.processmacro.org), for SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY:IBM Corp.). The causal steps approach was used to explore and interpret the indirect effect path ($a \times b$), that encompasses path a (the effect of negative affectivity on pain intensity), and path b (the effect of pain intensity on physical function) together. Full mediation occurred when path c' became non significant while path a and path b were significant. Partial mediation occurred when path c' stayed significant but smaller than path c, and paths a and b were significant. Finally, mediation was rejected when either path a or b were non-significant.

The PROCESS macro tool was used to infer and quantify the indirect effect based on the Preacher and Hayes' bootstrapping method (Preacher and Hayes, 2004, 2008). Through a 5000-resampling iteration process, we used this method to produce robust bootstrapped Standard Errors (SE) and 95% Bias-Corrected accelerated (BCa)

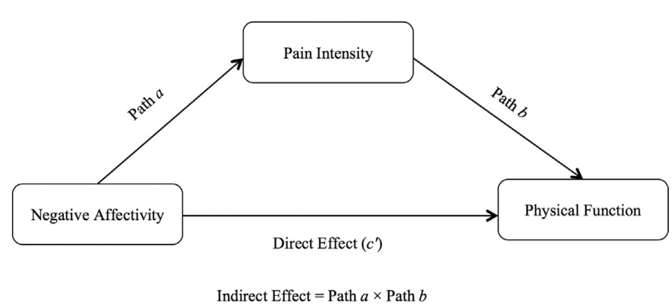

Fig. 1. The proposed mediator model for the effect of negative affectivity on physical function whereas negative affectivity leads to lowered physical function directly and indirectly through pain intensity.