

## Relationship of neuroticism and laboratory pain in healthy children: Does anxiety sensitivity play a role?

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### ABSTRACT

Both neuroticism, a higher-order, stable personality trait, and anxiety sensitivity (AS), a lower-order pain-related construct, have been associated with pain, although no research exists examining the relationship of both these constructs to acute pain in children. In the current study, 99 healthy children (53 girls) completed self-report measures of neuroticism and AS before undergoing pain tasks involving cold and pressure pain. We hypothesized that both neuroticism and AS would be correlated with acute pain responses, but that AS would at least partially mediate the relationship between neuroticism and pain responses. Results indicated significant correlations between neuroticism, AS, and anticipatory anxiety, pain intensity and pain bother. Mediation models revealed that AS partially mediated relationships between neuroticism and pain intensity/bother, and fully mediated relationships between neuroticism and anticipatory anxiety. These data suggest that, at least in children, neuroticism may be best understood as a vulnerability factor for elevated pain responses, especially when coupled with a fear of bodily sensations.

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### 1. Introduction

Neuroticism is a stable personality trait reflecting a tendency to experience negative emotional responses, including symptoms such as irritability, sadness, and anxiety [7], and has been linked with negative physical health outcomes [21,28]. There is now renewed interest in the relationship of neuroticism to pain, particularly in pediatric populations [13,17,24]. Although neuroticism is considered a higher-order personality trait (a broad construct describing a general characteristic, made up of specific and unique facets, known as lower-order factors), some have hypothesized that neuroticism may impact pain responses through its effects on lower-order factors, such as pain-related cognitive and behavioral processes [2,21]. One of these factors, pain catastrophizing, has been shown to mediate relationships between negative affect (ie, neuroticism) and somatic complaints and functional disability [36]. These data suggest that pain-specific factors, in addition to higher-order personality traits, are both critical to helping understand pain and disability.

In particular, anxiety sensitivity (AS), or the tendency to fear the physical sensations of anxiety, has been established as a predictor of both acute [18,19,30,33–35] and chronic pain [31]. AS has been found to be more predictive of acute pain responses than

higher-order traits such as neuroticism in adults [22]. Among children, we previously found strong relationships between AS and acute pain responses [33–35], although the relationships among neuroticism, AS, and pain responses have not been tested in children. Furthermore, evidence suggests that AS seems to be a distinct construct from other cognitive, pain-related constructs such as pain catastrophizing or pain anxiety [25] and therefore may help explain the relationships of negative affect and pain responses beyond those already previously reported [36].

Understanding these relationships may have profound implications for treatment. The treatment of neuroticism has primarily been addressed through psychopharmacological approaches [9,20], with one study in adults with major depressive disorder finding that levels of neuroticism were significantly lower after a trial of paroxetine, even after controlling for improvements in depression [29], whereas cognitive therapy did not produce changes in neuroticism, when depression levels were controlled. On the other hand, AS has been demonstrated to be responsive to cognitive behavioral interventions [19,39], and reductions in AS may lead to reductions in pain through cognitive mechanisms, such as pain-related anxiety. Taken together, these findings suggest that lower-order factors may be more amenable to behavioral approaches than higher-order factors such as neuroticism. Among children, concerns regarding medication side effects on the developing neurobiological system underscore the need to delineate pathways for effective treatment.

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The current study aimed to examine the relationship between neuroticism, AS, and acute pain responses (anticipatory anxiety, pain intensity, and pain bother) to a series of standardized laboratory pain tasks involving cold and pressure pain in a sample of self-reported healthy children by testing whether AS mediates the neuroticism-pain relationship (Fig. 1). We hypothesized that neuroticism and AS would be correlated with acute pain responses, but AS would at least partially mediate the relationship between neuroticism and pain responses.

## 2. Methods

### 2.1. Participants

The data for the current study were drawn from a larger investigation examining the influences of sex and puberty on acute pain responses in children and adolescents with and without chronic pain. The present study only included children without chronic pain. At least one parent of each participating child also took part in a laboratory session at the same time as their child, but the parent data are not reported herein. Participants for the current study were 99 healthy children and adolescents (53 girls, 53.5%), with a mean age of 13.5 years (SD 2.8 years, range 8–17 years) (Table 1). The broad age range was designed to include youth at various stages of puberty, from prepubescence through adolescence. Demographic statistics, including race/ethnicity, are reported in Table 1.

One hundred forty-five families were screened for eligibility by telephone, but 5 children (3.4% of those screened) were excluded as a result of acute or chronic illness, use of medications that could affect study outcomes, or developmental delay. Of the 140 (96.6%) invited to participate, 34 (24.5%) declined participation mainly because of lack of interest or scheduling difficulties. Six participants had incomplete data and were excluded from the analyses. Written informed consent forms were completed by parents, and children provided written assent. The study was approved by the UCLA institutional review board. Each child received \$50 cash for their participation.

### 2.2. Procedure

Participants were recruited through posted advertisements, community events, and referrals from previous participants. Study advertisements were posted on online forums (eg, Craigslist, local Yahoo groups) as well as at locations where parents and children would be expected to encounter them (eg, libraries, pediatricians' offices). Study staff also attended various community events (eg,

**Table 1**

Demographic information for 99 study participants.

Characteristic	Value
Female, n (%)	53 (53.5)
Age, mean (SD), years	13.5 (2.8)
<i>Ethnicity, n (%)</i>	
Non-Hispanic/Non-Latino	72 (72.7)
Hispanic/Latino	27 (27.3)
<i>Race, n (%)<sup>a</sup></i>	
White	51 (51.5)
African American	20 (20.2)
Asian	2 (2.0)
Multiracial	23 (23.2)

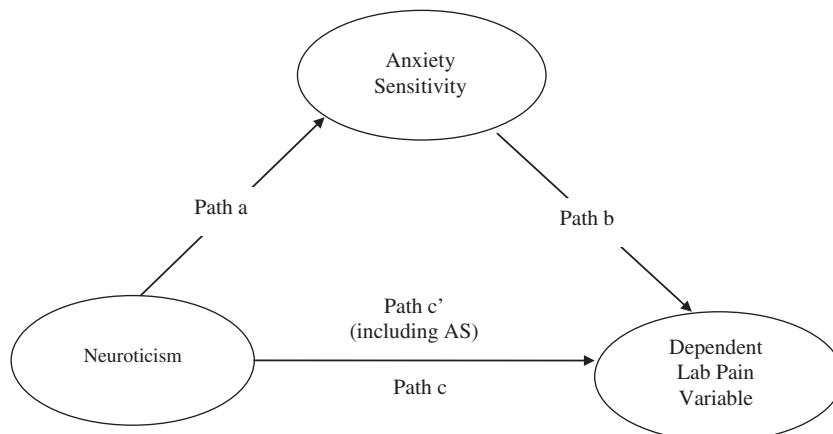
<sup>a</sup> Race was unavailable for 3 participants.

festivals/fairs, farmers' markets, 5K runs) to pass out fliers and get contact information for interested families. Also, previous participants were offered the opportunity to refer their friends/neighbors and earn an additional \$25 for each referred family that completed the study.

Eligibility was confirmed by telephone. A trained research assistant asked parents whether they or their child met any of the following exclusionary criteria: acute illness or injury that may potentially impact laboratory performance (eg, fever, flu symptoms), or that affected sensitivity of the extremities (eg, Raynaud's disease, hand injuries); daily use of opioids at the time of study participation; or developmental delay, autism, or significant anatomic impairment that could preclude understanding of study procedures or participation in pain induction procedures. If the family had more than one child that met the inclusion criteria, only one child per family was enrolled into the study.

Upon arrival at the laboratory, participants were greeted and escorted to separate rooms; there was no contact between parent and child until after the session was completed. Participants provided informed consent/assent and then completed questionnaires via a Web site. Only those questionnaires relevant to the current study are discussed herein. Child participants were interviewed by a research assistant about their recent pain history, and for girls, menstrual history.

Child participants were then escorted into the laboratory where height and weight were recorded, medication use for that day was assessed, and leads for physiological recording were attached. (Physiological data were continuously recorded during the laboratory session but will be presented in a separate report.) Participants were shown the 0 (none) to 10 (worst or most possible) numeric rating scale (NRS, described below) and instructed on its use. These endpoints were identical for all NRS-related questions



**Fig. 1.** Mediation models of neuroticism, anxiety sensitivity, and dependent laboratory pain variables.

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