Relations Between Anxiety Sensitivity, Somatization, and Health-Related Quality of Life in Children With Chronic Pain

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Received May 26, 2011; revisions received February 26, 2012; accepted March 3, 2012

Objective To further understand the influence of psychological variables on pain and functioning in children with chronic pain by examining the relations between pain, anxiety sensitivity (AS), somatization, and health-related quality of life (HRQOL), and whether they vary as a function of age and gender.

Methods 66 children (8–12 years) and adolescents (13–18 years) with chronic pain completed measures assessing pain intensity, AS (Childhood Anxiety Sensitivity Index), somatization (Child Somatization Inventory), and HRQOL (Pediatric Quality of Life Inventory 4.0).

Results Somatization was significantly related to higher pain intensity. Somatization significantly predicted HRQOL over and above pain. AS was a significant predictor of impaired HRQOL for children and females in the sample, but not for adolescents or males.

Conclusion Somatization and AS may be better predictors of HRQOL impairment than pain intensity in children with chronic pain. This may differ as a function of age and gender.

Key words adolescents; anxiety; children; chronic and recurrent pain; quality of life; somatization.

Introduction

Approximately 7.5–32.1% of the children and the adolescents experience chronic pain, including but not limited to headaches, abdominal pain, and musculoskeletal pain (Palermo, 2000; Perquin et al., 2000). Eight percent experience more severe, disabling chronic pain, including primary pain disorders like fibromyalgia and complex regional pain syndrome. In addition to the often debilitating pain experienced by individuals with this diagnosis, children with chronic pain are vulnerable to a number of other adverse outcomes including risks for continued chronic pain in adulthood (Fearon & Hotopf, 2001; Walker, Dengler-Crish, Ripple, & Bruehl, 2010), reduced ability to engage in typical childhood activities (Palermo & Chambers, 2005), sleep disturbances (Konijnenberg et al., 2005), and poor quality of life (Gold, Mahrer, Yee, & Palermo, 2009; Gold, Yetwin, et al., 2009). Health-related quality of life (HRQOL), a measure of perceived psychosocial and physical health, is a construct often used to measure how chronic illness interferes with overall functioning (Varni, Burwinkle, Seid, & Skarr, 2003). Although the association between chronic pain and reduced HRQOL is well documented (e.g., Dhanani, Quenneville, Perron, Abdolell, & Feldman, 2002; Gold, Mahrer, et al., 2009; Hunfeld et al., 2001), pain intensity has only partially explained the adverse effect on functioning, suggesting that there are other factors contributing to impairment in this population.

Currently, pediatric chronic pain is theorized to be the result of the interplay between biological (i.e., nociception process), psychological (i.e., depression, anxiety), and social (i.e., life stressors, interpersonal relationships) factors (Engle, 1977; Gatchel, Peng, Peters, Fuchs, & Turk, 2007). According to the model, the physical experience of chronic pain causes emotional reactions, cognitions make meaning of these emotions, which in turn result in additional emotional reactions, intensifying the experience of pain and increasing disability. The relation between physical and psychological symptoms is further exacerbated by...
the presence of social stressors (Gatchel et al., 2007). Though social and biological factors play important roles, studies have shown psychological factors contributing to disability in this pediatric population (Cohen, Vowels, & Eccleston, 2010).

Anxiety sensitivity (AS), the fear of anxiety sensations and their believed negative consequences, is one psychological factor that may contribute to the maintenance of chronic pain and disability (Asmundson, Wright, & Hadjistavropoulos, 2000; Reiss, Peterson, Gursky, & McNally, 1986). A meta-analysis looking at the relation between AS and pain found that higher levels of AS are associated with greater fear of pain in both clinical and nonclinical samples (Ocanez, Kathryn McHugh, & Otto, 2010). Martin McGrath, Brown, and Katz (2007), studying a sample of 21 children with chronic pain, found that though AS was not related to pain intensity, it did predict fear of pain, which in turn predicted pain-related disability. A separate study examining a larger sample of 87 children with chronic pain, found AS to be significantly related to poorer psychological well-being and social functioning (Tsao, Meldrum, Kim, Jacob, & Zeltzer, 2007). Older children in the sample reported more impaired social and emotional functioning. Therefore AS may be one of many psychological factors contributing to additional adversity in children with chronic pain.

Somatization, the experience of physical symptoms in response to psychosocial stress, is another factor that may contribute to and/or exacerbate the effects of chronic pain (Lipowski, 1988). Though not clearly a psychological factor (Walker & Garber, 2003), somatization is also not conclusively an organic symptom because the sensations tend to be experienced in the absence of a discernible medical cause (Escobar, Rubio-Stipec, Canino, & Karmo, 1989; Muris & Meesters, 2004). In fact, Walker and colleagues found evidence for a general trait-like component of somatization that remains stable across development (Walker, Beck, Garber, & Lambert, 2009). Chronic pain is frequently associated with a high degree of somatization (Fishbain, Lewis, Gao, Cole, & Steele Rosomoff, 2009; McBeth, Macfarlane, Benjamin, & Silman, 2001). For example, children with recurrent abdominal pain are more likely to report somatic symptoms compared to healthy patients and patients with organically based pain (Walker, Garber, & Greene, 1991). Research suggests that somatization is also associated with higher levels of functional disability (Campo, Jansen-McWilliams, Comer, & Kelleher, 1999; Harris, Orav, Bates, & Barsky, 2009; Hyphantis et al., 2009; Walker, Garber, Van Slyke, & Greene, 1995). For example, Campo and colleagues (1999), examining the effects of somatization on functional disability in a nonclinical sample of children of ages 4–15 years, showed that children with somatization had poorer health, greater health limitations, and poorer school performance and attendance than controls. In a study validating the Functional Disability Inventory, Claar and Walker (2006) found that in 596 pediatric patients with chronic abdominal pain, somatization was significantly related to higher disability. Though replication is needed, somatization may also exacerbate impairment in this pediatric population.

The relations between pain, psychological factors and functioning may vary as a function of the age and gender of the child experiencing chronic pain. Campo et al. (1999) found participants classified as somatizers were more likely to be older and female. In nonclinical samples, females are generally found to have higher AS compared to males (Stewart, Taylor, & Baker, 1997; Walsh, Stewart, McLaughling, & Comeau, 2004). Recently, Tsao et al. (2009), looking at the relation between AS, pain catastrophizing, somatization, and pain in a nonclinical sample of 240 children of ages 8–18 years, showed that AS significantly predicted pain and somatization. Participants with current pain problems were more likely to report symptoms of AS and adolescents tended to have higher levels of AS compared to children. However, it is unclear whether similar age and gender differences exist in levels of AS and somatization in children and adolescents with chronic pain.

The present investigation examines the relations between pain, AS, somatization, and HRQOL in a clinical sample of children and adolescents with chronic pain. Specifically, the study examines the relations between AS, somatization, and pain, and how these variables predict HRQOL. Additionally, the study assesses how the relations between pain, AS, somatization, and HRQOL differ as a function of age and gender. We hypothesized that both AS and somatization would be significantly related to pain and that AS and somatization would predict impaired HRQOL over and above current pain levels. Furthermore, we hypothesized that these relations would differ as a function of age and gender, with stronger associations for adolescents and females as compared to children and males.

**Materials and Methods**

Patients seeking pain management services for chronic pain complaints at a multidisciplinary outpatient clinic in an urban children’s hospital were screened for participation. Chronic pain was defined as pain lasting longer than 3 months. Participants were enrolled from January 2003 to November 2007 and data were collected after the initial evaluation at the clinic. Eligible participants were (a) English-speaking, (b) between 8 and 18 years old, and...
(c) experiencing some form of chronic pain. Informed consent and/or assent (children ages 8–13 years) was obtained from child and caregiver participants at the time of recruitment. Exclusion criteria included (a) meeting criteria for a developmental disability or having a cognitive or neurological deficit that would prevent comprehension or completion of the self-report assessment; (b) alcohol or drug dependency; or (c) presenting acute psychiatric distress, indicated by suicidal/homicidal thoughts, or psychosis. The hospital’s institutional review board approved all study procedures. Studies assessing chronic pain and HRQOL (Gold, Yetwin, et al., 2009) and pain, HRQOL, and fatigue (Gold, Mahrer, et al., 2009) have been published with this dataset. Findings indicated that the sample of children and adolescents with chronic pain reported significantly lower HRQOL scores, specifically physical, emotional, and school functioning, compared to population-based normative data and data from children with other chronic illnesses. Lower levels of pain were associated with higher HRQOL scores (Gold, Yetwin, et al., 2009). In addition, the study sample scored in the at-risk range on all measures of fatigue including general fatigue, sleep/rest fatigue, cognitive fatigue, and total fatigue. Fatigue mediated the relation between pain and overall HRQOL on the basis of both self and caregiver proxy reports and mediated the relation between pain and school functioning on the basis of the caregiver proxy report (Gold, Mahrer, et al., 2009). The relations between AS, somatization, and pain, and how these variables influence HRQOL have not yet been examined with this sample.

Participants

Ninety-three children (8- to 12-years old) and adolescents (13- to 18-years old) with chronic pain were approached to participate in the study. A total of 19 participants did not return the study’s measures, 4 returned incomplete batteries, 2 withdrew from the study, and 2 declined due to scheduling conflicts. Participants did not differ significantly in age, gender, or ethnicity from those who did not participate.

Sixty-six children (n = 21) and adolescents (n = 45) with chronic pain participated in the study. The mean age of the participants was 13.6 (SD = 2.7) years. Seventy-seven percent (n = 51) of the participants were female, consistent with the ratio of 4:1 female: male seen in children with chronic pain (Eccleston, Bruce, & Carter, 2006). Twenty-nine percent reported pain in at least three sites, including: head, arm/leg, abdomen, back, and chest. In addition to experiencing chronic pain symptoms, approximately 20% of the participants were diagnosed with an additional chronic illness that is characterized by pain symptomatology, such as rheumatologic disease, cystic fibrosis, and cancer. These conditions were confirmed by medical chart review and medical history during the initial interview with the attending pain physician and psychologist. Fifty-one percent of the participants were Caucasian, 23% Hispanic, 5% Black, 2% Asian, and 18% “Other.” Most of the participant caregivers were married (67.6%, n = 46) and had completed some post high school education (78%, n = 53).

Measures

Pain

Participants completed a pain questionnaire to assess their pain intensity and location during the past month. Pain intensity was measured using a 10-cm Visual Analog Scale ranging from 0 indicating “no pain” to 10 indicating “worst pain imaginable.” Participants rated least pain, average pain, and worst pain. The rating of worst pain was used in analyses because it had the most variability in the sample. Location of pain was recorded by markings on a validated body outline displaying an anterior and posterior view of the body (adapted from Varni, Thompson, & Hanson, 1987).

Anxiety Sensitivity

AS was measured using the Childhood Anxiety Sensitivity Index (CASI; Silverman, Fleisig, Rabian, & Peterson, 1991; α = .87), a modified version of the AS Index. The 18-item measure asks participants to rate how negatively they view anxiety symptoms (e.g., “Unusual feelings in my body scare me”; “It scares me when my heart beats fast”). Each item is rated as none (1), some (2), or a lot (3). The AS score is the sum of all items (range = 0–54), with higher scores indicating greater AS. The CASI has demonstrated good internal consistency (α = .87), strong test–retest reliability (α range = .62–.78) (Silverman et al., 1991), and has been shown to correlate with measures of trait anxiety (Muris, Schmidt, Merckelbach, & Schouten, 2001; Weems, Hammond-Laurence, Silverman, & Ginsburg, 1998). Though the CASI does not have clinical ranges, a score of 28.1 or greater has been correlated with the presence of generalized anxiety disorder (Silverman et al., 1991).

1Twenty percent of the children and the adolescents in the sample had a chronic illness characterized by pain. Some participants had more than one illness. The chronic illnesses were head injury (n = 9), cancer (n = 4), meningitis (n = 2), heart disease (n = 2), lung disease (n = 2), blood disorder (n = 2), cystic fibrosis (n = 1), bronchopulmonary dysplasia (n = 1), liver disease (n = 1), muscular dystrophy (n = 1), diabetes (n = 1), and rheumatologic disease (n = 1).
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Somatization

Somatization was assessed using the Child Somatization Inventory (CSI; Walker et al., 1991; α = .90), a 35-item questionnaire that measures somatic symptoms not related to any particular illness or disorder in children (e.g., “sore muscles,” “faintness or dizziness”). Participants are asked to report how often they have experienced each symptom during the past 2 weeks (not at all = 0, a little = 1, some = 2, a lot = 3, a whole lot = 4). The CSI has demonstrated good internal consistency (α = .92) (Garber, Walker, & Zeman, 1991) and adequate test–retest reliability (α = .66) (Walker et al., 1991).

HRQOL

HRQOL was measured using the Pediatric Quality of Life Inventory 4.0 (PedsQL) 4.0 (Varni et al., 2003; α = .93). The 23-item PedsQL, validated for use with children (8–12 years) and adolescents (13–18 years), yields a total score and four subscale scores: physical (α = .90), emotional (α = .82), social (α = .75), and school functioning (α = .85). Participants are asked to indicate the degree to which the item has been a problem for them over the past week (never a problem = 0, almost never a problem = 1, sometimes a problem = 2, often a problem = 3, and almost always a problem = 4). The scores range from 0 to 100 with higher scores indicating better HRQOL. Varni et al. (2003) determined at-risk cut-off scores for the full-scale HRQOL score and four subscales ranging from 59.57 to 72.98. All scales demonstrate high internal consistency (α range = .80–.91).

Statistical Analyses

Descriptive Analyses

Descriptive statistics and outlier analyses were conducted to identify any nonnormally distributed variables or errant data points. Bivariate correlations were used to examine the relations among all study variables. Demographic variables (i.e., age, gender, ethnicity, or comorbid chronic illness) found to significantly relate to AS or somatization were included as covariates. Pain intensity was entered into all models as a covariate.

Regression Analyses

First, multiple regression analyses were used to examine whether AS and somatization predict pain intensity. Next, multiple regression analyses were used to examine the influence of AS and somatization on HRQOL, controlling for pain intensity. Both AS and somatization were included in all models to partial out the overlapping variance. If gender or age were found to significantly relate to study variables, separate models were run for males and females, or children and adolescents to see if effects varied as a function of gender and/or age. MPlus (Muthén & Muthén, 2006), with full-maximum likelihood estimation for missing data, was used for the analyses. Power calculations were conducted at an α-level of p = .05 using G*Power (Faul and Erdfelder, 1992) for each model.

Results

Preliminary Analyses

Table I shows descriptive statistics for all study measures. The skewness and kurtosis of all study variables fell within the acceptable range (skewness cut-off −2.0 and kurtosis cut-off −7.0) (West, Finch, & Curran, 1995). Post hoc analyses revealed that with a moderate effect size of .16 (Cohen, 1992), the statistical power for the pain intensity model was .66, whereas with a large effect size of .75 the statistical power for the HRQOL model was .99. Participants in the study were at risk for poor total HRQOL, specifically physical, emotional, and school functioning. AS and somatization were higher (t = 2.53, p < .05; t = 14.09, p < .001, respectively) than scores in a nonclinical sample (Tsao et al., 2009).

Table I. Descriptive Statistics of Somatization, Anxiety Sensitivity, and HRQOL

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total, n = 66, M (SD)</th>
<th>Female, n = 51, M (SD)</th>
<th>Male, n = 15, M (SD)</th>
<th>Ages 8–12, n = 21, M (SD)</th>
<th>Ages 13–18, n = 45, M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Least</td>
<td>3.0 (2.4)</td>
<td>3.1 (2.5)</td>
<td>2.7 (2.1)</td>
<td>2.7 (2.6)</td>
<td>3.2 (2.3)</td>
</tr>
<tr>
<td>Average</td>
<td>6.1 (1.9)</td>
<td>6.3 (1.6)</td>
<td>5.6 (2.6)</td>
<td>5.6 (2.3)</td>
<td>6.4 (1.7)</td>
</tr>
<tr>
<td>Most</td>
<td>8.8 (1.5)</td>
<td>8.9 (1.4)</td>
<td>8.4 (1.9)</td>
<td>8.9 (1.6)</td>
<td>8.7 (1.5)</td>
</tr>
<tr>
<td>CSI</td>
<td>38.9 (19.6)</td>
<td>41.4 (17.7)</td>
<td>31 (24)</td>
<td>34.3 (22.9)</td>
<td>41.1 (17.9)</td>
</tr>
<tr>
<td>CASI</td>
<td>29.5 (6.9)</td>
<td>30.8 (6.4)</td>
<td>26.4 (7.8)</td>
<td>27.6 (6.0)</td>
<td>30.8 (7.2)</td>
</tr>
<tr>
<td>Total HRQOL</td>
<td>59.5 (20.0)</td>
<td>58.7 (19.2)</td>
<td>62.3 (23)</td>
<td>66.6 (17.1)</td>
<td>56.1 (20.6)</td>
</tr>
<tr>
<td>Physical</td>
<td>52.5 (25.8)</td>
<td>58.7 (19.2)</td>
<td>52.8 (29.6)</td>
<td>61.5 (24.9)</td>
<td>48.3 (25.4)</td>
</tr>
<tr>
<td>Emotional</td>
<td>53.9 (23.0)</td>
<td>52.5 (24.9)</td>
<td>60.3 (26.8)</td>
<td>63.3 (17)</td>
<td>49.4 (24.2)</td>
</tr>
<tr>
<td>Social</td>
<td>76.3 (19.4)</td>
<td>75.5 (19.8)</td>
<td>78.8 (18.4)</td>
<td>76.9 (20.5)</td>
<td>76 (19.1)</td>
</tr>
<tr>
<td>School</td>
<td>59.1 (25.4)</td>
<td>58.2 (24.1)</td>
<td>63.3 (28.8)</td>
<td>67.6 (21)</td>
<td>55.3 (26.2)</td>
</tr>
</tbody>
</table>
Participant age was negatively correlated with HRQOL ($r = -0.27$, $p < 0.05$) and participant age and female gender were positively correlated with AS ($r = 0.24$, $p < 0.05$; $r = 0.27$, $p < 0.05$). Additionally, AS was negatively correlated with HRQOL ($r = -0.53$, $p < 0.01$) and positively related to somatization ($r = 0.66$, $p < 0.001$). Somatization was positively correlated with worst pain experienced ($r = 0.34$, $p < 0.01$) and negatively correlated with HRQOL ($r = -0.61$, $p < 0.01$). See Table II for correlations among all study variables.

**Multiple Regression Analyses**

Results of the regression analyses are presented in Tables III and IV. Somatization, controlling for age, gender, and AS, significantly predicted pain intensity ($b = 0.029$; $p < 0.05$). The model explained 14% of the variance in pain intensity ($p < 0.10$). Controlling for age and gender, somatization ($b = -0.466$; $p < 0.01$) significantly predicted HRQOL over and above pain, but AS only approached significance ($b = -0.682$; $p = 0.068$). The model explained 43% of the variance ($p < 0.001$). Because age was significantly related to AS and HRQOL, separate models were run for children and adolescents (Table V). Results showed that for children (age 8–12 years), both somatization ($b = -0.482$; $p < 0.001$) and AS ($b = -1.32$; $p < 0.01$) significantly predicted HRQOL. However, for adolescents (age 13–18 years), only somatization ($b = -0.571$; $p < 0.01$) was a significant predictor. The model explained 65% of the variance in children ($p < 0.001$) and 39% ($p < 0.01$) of the variance for adolescents. Because gender was significantly related to AS, separate models were run for females and males (Table VI). Results showed that for females both somatization ($b = -0.372$; $p < 0.05$) and AS ($b = -1.05$; $p < 0.01$) significantly predicted HRQOL, but for males only somatization ($b = -1.23$; $p < 0.001$) was a significant predictor. For females, the model explained 42% of the variance ($p < 0.001$), and for males, the model explained 66% of the variance ($p < 0.001$).

### Table II. Correlations among Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Gender</td>
<td>0.23</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ethnicity</td>
<td>0.00</td>
<td>0.09</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Chronic illness</td>
<td>-0.11</td>
<td>0.03</td>
<td>-0.076</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Pain</td>
<td>0.01</td>
<td>0.14</td>
<td>0.05</td>
<td>-0.06</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. CSI</td>
<td>0.20</td>
<td>0.22</td>
<td>-0.06</td>
<td>0.05</td>
<td>0.39**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. CASI</td>
<td>0.24*</td>
<td>0.27*</td>
<td>-0.08</td>
<td>-0.07</td>
<td>0.24</td>
<td>0.66**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8. HRQOL</td>
<td>-0.27*</td>
<td>-0.08</td>
<td>-0.08</td>
<td>-0.11</td>
<td>-0.21</td>
<td>-0.61**</td>
<td>-0.53**</td>
<td>1</td>
</tr>
</tbody>
</table>

*p < 0.05, **p < 0.01
Discussion

The current study extends the literature and supports a biopsychosocial model of chronic pain by increasing the understanding of how psychological constructs may exacerbate the negative outcomes affecting children and adolescents with chronic pain. Although many clinicians and scientists agree that a biopsychosocial model of chronic pain best accounts for and supports the unique and integrated effects of biological, psychological, and social parameters, the current study scientifically demonstrates the paired and unique contribution of AS and somatization in chronic pain and its impact on HRQOL. Children with chronic pain in the current sample have higher levels of AS and much higher levels of somatic symptoms compared to previously studied nonclinical youth samples (Tsao et al., 2009). Furthermore, the current data supports previous studies (e.g., Dhanani et al., 2002; Gold, Yetwin, et al., 2009; Hunfeld et al., 2001; Varni et al., 2003) demonstrating that children with chronic pain are at risk for poor total HRQOL, specifically physical, emotional, and school functioning. Consistent with previous research with nonclinical populations, age and gender had a significant relation with AS, with adolescents and females reporting greater AS symptoms (Stewart et al., 1998; Tsao et al., 2009; Walsh et al., 2004). Additionally, age was negatively related to HRQOL, demonstrating that adolescent patients experience greater impairment in HRQOL compared to younger patients. It is unclear why adolescents, particularly females, report greater symptomatology and lower HRQOL. However, it could be theorized that these AS symptoms create difficulties in other critical areas of physical, emotional, and academic development that are more salient in females during adolescence (Tsao et al., 2007). Further research is needed to understand the role of age and gender effects on AS, HRQOL, and other health outcomes within a biopsychosocial model in children with chronic pain.

The first hypothesis of the current study was partially supported. Somatization was a significant predictor of pain intensity, whereas AS was not. Though a previous study has found that AS predicts pain in a nonclinical sample of children (Tsao et al., 2009), the current study suggests that this relation may not apply to children with chronic pain. Consistent with previous research in a pediatric population, it may be that AS is associated with fear of pain rather than pain intensity (Martin et al., 2007). This finding also supports the biopsychosocial model, which states that pain influences negative emotion rather than the reverse (Gatchel et al., 2007). Furthermore, in the current sample somatization predicted impaired functioning, over and above current pain levels, but AS only approached significance. This finding is consistent with previous studies that have found that somatic symptoms are related to impaired functioning (Campo et al., 1999; Claar & Walker, 2006). Despite only reaching marginal significance, AS was negatively associated with HRQOL and positively correlated with somatization, suggesting that AS is associated with poorer functioning in children and adolescents with chronic pain. Pain intensity did not have a direct effect on HRQOL in the current sample. These results support the idea that pain intensity alone may not be the primary influence on poor functioning in children and adolescents with chronic pain, but rather the affiliated psychological variables may have a greater impact on disability (e.g., Martin et al., 2007). In line with the biopsychosocial model, feelings of somatization and AS may exacerbate the effects of the chronic pain, thus creating additional impairment.

The second hypothesis was supported showing that the relations between pain, somatization, AS, and HRQOL, differed as a function of age and gender. Interestingly, though AS was not a significant predictor of HRQOL for the entire sample, AS predicted impaired HRQOL, over and above pain, for females and children (ages 8–12 years) in the sample. These findings suggest that although AS may not be a good predictor of functioning in adolescents or males, it may play a unique role in the complex processes that impair functioning in children and females with chronic pain. Females in the sample have higher levels of AS compared to males, implying that they are more likely than males to interpret anxiety sensations as dangerous, which in turn appears to impair their daily function. This fear of anxiety may create a pattern of rumination, which may further impair other critical areas of functioning, including physical, emotional, and academic. In general, the relation between AS and HRQOL for children is less clear as they do not tend to have higher levels of AS. However, children with higher

<table>
<thead>
<tr>
<th>Variable</th>
<th>b (95% CI)</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRQOL—Females (n = 51)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>−1.0 (−1.8 to −0.26)</td>
<td>.40</td>
<td>−2.6</td>
<td>.009</td>
</tr>
<tr>
<td>Somatization</td>
<td>−0.37 (−0.68 to −0.06)</td>
<td>.16</td>
<td>−2.4</td>
<td>.017</td>
</tr>
<tr>
<td>Age</td>
<td>−1.1 (−2.8 to 0.72)</td>
<td>.91</td>
<td>−1.2</td>
<td>.25</td>
</tr>
<tr>
<td>Pain</td>
<td>.21 (−3.3 to 2.9)</td>
<td>1.6</td>
<td>−1.3</td>
<td>.19</td>
</tr>
<tr>
<td>HRQOL—Males (n = 15)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>1.4 (−0.17 to 3.0)</td>
<td>.85</td>
<td>1.8</td>
<td>.08</td>
</tr>
<tr>
<td>Somatization</td>
<td>−1.2 (−1.9 to −0.59)</td>
<td>.33</td>
<td>−3.8</td>
<td>&lt;.000</td>
</tr>
<tr>
<td>Age</td>
<td>0.36 (−2.1 to 2.8)</td>
<td>1.3</td>
<td>.28</td>
<td>.78</td>
</tr>
<tr>
<td>Pain</td>
<td>0.31 (−4.4 to 5.0)</td>
<td>2.4</td>
<td>13</td>
<td>.90</td>
</tr>
</tbody>
</table>

Note: Bold values indicate significant p-values/significant findings.
levels of AS may not have the ability to cope with and understand their fearful sensations, in addition to their medical condition. Within a biopsychosocial model, AS may exacerbate the effects of chronic pain by impairing physical, psychological, and social function. Adolescents may be less affected by these fearful sensations as they may have developed a broader repertoire of coping strategies including support seeking from peers, problem solving, and cognitive strategies including positive self-talk and cognitive reframing (Skinner & Zimmer-Genbeck, 2007) to cope with AS. There may be additional variables that better explain the impairment seen in males and adolescents in this pediatric population. Additional research is needed to identify these other psychological, biological, or social variables and to further explore why AS may be more detrimental for females and for children.

Several limitations of this study need to be addressed. First, the cross-sectional design of this study makes directional associations between chronic pain, AS, somatization, and HRQOL unclear. Additionally, a small sample size may have limited our ability to detect other findings. Furthermore, though somatization was conceptualized to be a psychological variable, it is difficult to determine if the reports of somatization were truly psychological or related to an organic cause. To address this we examined the presence of a comorbid chronic illness as a possible covariate but found that it was not related to any of the constructs measured in this study. However, the possibility remains that somatization was not entirely a psychological variable. We also did not assess duration of pain in the sample. Though all participants had pain complaints lasting longer than 3 months, it may be that the relations between pain, AS, somatization, and HRQOL differed as a function of pain duration. As this field is still in its infancy, future longitudinal research, with larger samples, is needed to better interpret the relations found between these psychological constructs and HRQOL in patients with pediatric chronic pain.

The results of this study continue to support a biopsychosocial paradigm that considers the total person’s unique biological, psychological, and social factors in understanding the effects of pediatric chronic pain. The current study extends our multifaceted understanding of child and adolescent chronic pain to include the assessment of AS and somatization as vital predictors of HRQOL. The findings also show that developmental and gender effects may exist between and among children/adolescents with chronic pain. Furthermore, the current findings highlight the insignificant role of pain intensity alone. While many researchers examine pain intensity and clinicians rely on reports of pain intensity to assess patients with acute and chronic pain, it may not be a vital factor in understanding the impact of chronic pain on function and disability. While chronic pain has been shown to put youths at risk for poor quality of life (Gold, Mahrer, et al., 2009; Gold, Yetwin, et al., 2009; Konijnenberg et al., 2005; Palermo & Chambers, 2005), this study highlights the continued importance of looking beyond the physical symptoms alone and considering the concomitant psychological contributors. These findings, along with further confirmatory research, will have important implications in the establishment of developmentally sensitive assessments and treatment for children and adolescents with chronic pain.

Conflicts of interest: None declared.

References


epidemiological correlates in two large community samples. *The Journal of Nervous and Mental Disease, 177*(3), 140–146.


