Anxiety and functional disability in a large sample of children and adolescents with chronic pain

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BACKGROUND: Anxiety is the most common psychiatric condition in children and adolescents, and is linked to significant disruptions across domains of function. Due to the avoidant nature of anxiety and pain-related disability, studying anxiety symptoms in children with chronic and recurrent pain conditions is important.

OBJECTIVES: To examine anxiety symptoms in a large cohort of children and adolescents evaluated for complex chronic and recurrent pain conditions.

METHODS: Through retrospective chart review, data on anxiety, pain and functional disability were collected from 655 children evaluated at a multidisciplinary pain clinic over a three-year period.

RESULTS: Approximately 11% of children and adolescents reported clinically elevated anxiety symptoms, with elevated levels across dimensions of anxiety ranging from 14% (social anxiety, worry) to 27% (physiological). In addition, a notable 31% of the sample potentially minimized their anxiety by responding in a socially desirable manner. Anxiety was linearly associated with greater pain-related functional disability, but was not directly correlated with pain. Moderation analyses revealed that at low levels of worry, higher levels of pain were associated with greater functional disability, whereas at high levels of worry, pain no longer predicted the level of functional disability.

CONCLUSIONS: These findings document the prevalence of anxiety in children and adolescents with chronic pain, and also extend recent studies examining the complex relationships among pain, anxiety and pain-related disability.

Key Words: Adolescents; Anxiety; Chronic pain; Functional disability; Psychosocial functioning

Anxiety is the most common psychiatric condition in youth. The combined one-year prevalence rate of anxiety disorders among children and adolescents is 13% (1). Children and adolescents with anxiety often struggle with typical developmental tasks such as socializing with friends, attending school and participating in family activities. They often choose to avoid these tasks, resulting in significant disruptions across social, academic and family domains (2). Pediatric patients with chronic pain often exhibit similar patterns of activity avoidance, and anxiety and pain are highly prevalent comorbid conditions in some patient groups.

Clinically elevated levels of anxiety vary widely across pain conditions, with high rates found among children with noncardiac chest pain (56% to 81%) (3,4), abdominal pain (45%) (5) and fibromyalgia (58%) (6), while more moderate to low rates have been found among children with complex regional pain syndrome (20%) (7), unexplained pain (18%) (8) and headache (6%) (9). Studies examining anxiety symptoms in tertiary care chronic pain clinics that serve a broad range of patients have found that overall these patients report higher levels of anxiety symptoms than nonclinical samples of children, but as a group, these patients do not report levels equivalent to youth with anxiety disorders (10,11). Although anxiety and pain have been identified as comorbidities among subgroups of pediatric pain patients and, as a whole, these patients suffer from higher levels of anxiety symptoms compared with well peers, the prevalence rates of clinically elevated anxiety symptoms in a sample of patients with diverse pediatric chronic pain conditions have not been previously reported. In addition, a more focused evaluation across complex pain conditions is needed to more fully understand the prevalence and impact of anxiety in pediatric chronic pain.

It is unclear whether psychological distress is a precursor to (12) or consequence of (11) living with chronic pain; however, psychological distress has generally been found to be associated with increased functional disability (13,14). Specifically, previous studies have found a linear relationship between heightened anxiety and functional disability (11,15). A recent study conducted by Cohen et al (16) examined the moderating impact of anxiety on the relationship between pain and disability. They found that in the context of high levels of anxiety, pain was unrelated to physical functioning, school attendance and physician visits, whereas when anxiety was low, pain consistently predicted disability. This unique and interesting finding suggests that anxiety may play a key role in maintaining disability by driving avoidant behaviors, thus perpetuating a vicious cycle of avoidance, which in turn may further heighten anxiety. Research involving adults also provides support for this hypothesis wherein anxiety predicted physical complaints.
beyond the impact of pain (17), and led to avoidance of activities and worsening of disability in chronic pain patients (18). Furthermore, specific treatments that target anxiety and pain-related fears have resulted in reductions in both anxiety and functional disability (19).

Recognizing the important role of anxiety as it relates to pain-related outcomes in children and adolescents, the current investigation assessed anxiety symptoms within a large tertiary care pain clinic sample to examine the prevalence rates of anxiety across complex chronic pain conditions; the dimensions of anxiety and their relation to functional disability; and whether dimensions of anxiety moderate the relation between pain and functional disability. Based on previous research, we hypothesized that children and adolescents with abdominal pain (20) and diffuse pain (6) would report higher levels of anxiety than patients with other chronic pain conditions. We also predicted that anxiety would be linearly associated with functional disability. Finally, based on the Cohen et al (16) findings, we anticipated that high levels of anxiety, not pain, would predict high levels of functional disability, whereas at low levels of anxiety, pain would be associated with greater disability.

METHODS

Participants
All patients eight to 17 years of age, with at least three months' duration of chronic pain who underwent a multidisciplinary pain evaluation at a tertiary pain clinic in a large, American pediatric hospital between February 2003 and October 2006 were included in the present retrospective chart review. The total sample included 653 patients who were primarily Caucasian (91.9%) and female (75.1%), reflective of the population of children seen in this tertiary care clinic setting. The mean (± SD) age was 13.9±2.38 years. Primary pain diagnoses included headache (29.1%; including migraine, tension-type headache, combined and daily chronic headache), neuropathic pain (21.3%; including complex regional pain syndrome and neuralgia), musculoskeletal pain (23.9%; including juvenile rheumatoid arthritis and hypermobility syndromes), abdominal pain (11.2%; including functional abdominal pain and inflammatory bowel disease), diffuse pain (8.1%; including fibromyalgia or description of pain in three or more areas without a clear etiology) and other pain (6.3%; eg, chest, ear, bladder). At the time of the evaluation, patients' mean duration of pain was greater than two years (28.71±30.42 months, range three to 178 months).

Family socioeconomic status based on the factor index of social status (21) ranged from 21 (semi-skilled workers) to 66 (business owner, professional), with a mean of 48.1±10.01 (minor professional, technical). The majority of mothers (74.1%) and fathers (71.5%) were college graduates.

Measures

Functional Disability Inventory: The Functional Disability Inventory (FDI) (22,23) assesses children’s self-reported difficulty in physical and psychosocial functioning due to their physical health. The instrument consists of 15 items concerning perceptions of activity limitations during the previous two weeks; total scores are computed by summing the items. Higher scores indicate greater disability. The FDI has demonstrated reliability and validity (22,23); alpha reliability for the current sample was 0.89.

Revised Children's Manifest Anxiety Scale: The Revised Children’s Manifest Anxiety Scale (24,25) is a 37-item questionnaire that assesses symptoms of anxiety. Total anxiety scores are calculated by summing all items with the exception of the lie scale items. Subscales consist of physiological anxiety, worry, social anxiety and a lie scale, which assesses underreporting of symptoms as a result of social desirability. The Revised Children’s Manifest Anxiety Scale is a well-validated and reliable measure of anxiety (24,25). Alpha reliability for the total score in the current sample was 0.88.

Pain rating: As part of the semistructured interview with the clinical psychologist, children were asked to provide their current pain rating on a standard 11-point numerical rating scale (26) from 0 (no pain) to 10 (most pain possible).

Basic demographic information: Parents provided basic demographic information (eg, child’s age and sex, parents’ occupations, education, and marital status) on the Pain Treatment Service Demographic Information form.

Procedure

Approval from the hospital’s Institutional Review Board was obtained before conducting the retrospective chart review. All measures completed in the present study were part of standard clinical care. All of the questionnaires were mailed to families before the child’s multidisciplinary pain clinic evaluation. Parents and children were asked to complete the questionnaires individually and return them on the date of the evaluation. If parents and children had not completed the questionnaires before the appointment, they were asked to do so when they arrived for their evaluation. Children then underwent evaluation by a physician, physical therapist and clinical psychologist. All questionnaires were reviewed by the psychologist before the clinical interview. Patients’ pain diagnoses, assigned by a pain management physician during the multidisciplinary evaluation, were obtained from a medical record review.

Statistical analyses

Analyses were conducted using SPSS version 19 (IBM Corporation, USA). Descriptive statistics were used to calculate means, SDs and frequencies. Correlation analyses were conducted to examine the patterns of relationships among the variables of interest. ANOVAs were conducted to examine differences across pain diagnostic groups. First, a series of hierarchical multiple regression analyses were conducted to examine the extent to which children’s anxiety symptoms moderated the relationships between children’s current pain and functional disability. Tests of moderation used the data analytic technique described by Baron and Kenny (27), and Holmbeck (28). Scores on the FDI constituted the dependent variable for each analysis. In the first step, current pain and anxiety symptomatology (total anxiety, physiological anxiety, worrying or social anxiety) were entered. In the second step, the two-way interactions between current pain and children’s anxiety were entered. Evidence of children’s anxiety moderating the relationships between current pain and functional disability was obtained when significant interactions between children’s pain and anxiety predicted children’s functional disability.

RESULTS

Descriptive data

Regarding overall anxiety symptoms, 11% of the total sample reported clinically significant anxiety levels, with T-scores >65. Elevated levels of anxiety for each subscale (subscale score >13) were also examined: 26.6% of participants reported clinically significant physiological anxiety, 14.7% reported clinically significant worrying and 14% reported clinically significant social anxiety. Notably, 31.1% of the sample reported clinically elevated lie scale scores, suggesting that one-third of the sample was likely underreporting symptoms to prevent favorably. Table 1 details the frequency of clinically elevated anxiety symptoms across pain groups and dimensions of anxiety. The ‘other pain’ group was not examined because they represented several different pain diagnoses with too few in any category to be examined independently.

As expected, total anxiety was associated with functional disability (r=0.25; P<0.001), but was not associated with pain (r=0.04, P not significant). However, pain was associated with functional disability (r=0.33; P<0.0001). As indicated in Table 2, each dimension of anxiety (eg, physiological, worry and social anxiety) was significantly correlated with functional disability. In addition, patients’ lie subscale scores were significantly negatively correlated with each dimension of anxiety, indicating that patients who reported greater social desirability concerns reported lower levels of each type of anxiety.
Anxiety according to pain diagnosis

Beyond prevalence of clinically significant anxiety, dimensions of anxiety (eg, worrying, physiological, social) were examined to determine whether they varied among primary pain diagnoses using one-way ANOVAs and Bonferroni post hoc t tests.

**Total anxiety**: A one-way ANOVA indicated that there were significant differences in total anxiety according to pain diagnosis, F(4, 607)=4.22, P<0.01. Post hoc tests indicated that children with diffuse pain reported significantly higher levels of total anxiety (33.4±13.7) than children with musculoskeletal pain (47.3±11.5, P<0.05), neuropathic pain (47.7±12.3, P<0.05) and headache pain (48.2±12.7, P<0.05).

**Physiological anxiety**: A one-way ANOVA indicated that there were significant differences in patients' reports of physiological anxiety according to pain diagnosis, F(4, 607)=5.22, P<0.001. Post hoc tests indicated that children with diffuse pain (11.8±3.13) and abdominal pain (11.6±3.24) reported significantly more physiological anxiety than children with musculoskeletal pain (10.1±3.37, P<0.05), children with headaches (10.2±3.53, P<0.05) and children with neuropathic pain (10.1±3.37, P<0.05).

**Worrying**: A one-way ANOVA indicated that there were significant differences in patients' worrying according to pain diagnosis, F(4, 607)=2.36, P=0.05. Although none of the post hoc analyses revealed significant differences by diagnosis, it appears that the diffuse pain (9.4±4.07) and abdominal pain (9.3±3.23) groups reported higher worry than the other diagnostic groups (headache, 8.7±3.70; neurological, 8.3±3.56; and musculoskeletal, 8.1±3.36), likely driving this omnibus finding.

**Social anxiety**: A one-way ANOVA indicated that there were significant differences in patients' social anxiety symptoms according to pain diagnosis, F(4, 607)=2.56, P<0.05. Although none of the post hoc analyses revealed significant differences according to diagnosis, it appears that the diffuse pain (10.1±3.55) and abdominal pain (9.6±2.78) groups reported higher social anxiety symptoms than the other diagnostic groups (headache, 8.8±3.17; neurological, 8.9±3.02; and musculoskeletal, 8.9±3.04), likely driving this omnibus finding.

**Lie scale**: A one-way ANOVA indicated that there were no significant differences in patients' lie scale scores according to pain diagnosis, F(4, 607)=1.16, P=0.33.

Does children’s anxiety moderate the relation between pain and functional disability?

Using hierarchical multiple regression analyses, it was examined whether children’s anxious symptoms moderated the relationship between current pain rating and children’s functional disability, illustrated in Table 3. While results indicated significant main effects for multiple types of anxiety and pain on disability, the only significant interaction that emerged was between pain and worrying. The final equation was significant, F(3, 624)=34.47, P<0.001, R²=0.14. To examine the nature of the interaction effect, regression lines were plotted for patients with high (+1 SD) and low (–1 SD) levels of anxiety. This interaction is illustrated in Figure 1. For children and adolescents who reported higher levels of worrying, the level of pain associated with functional disability was higher than for children who reported lower levels of worry, higher levels of pain were associated with higher levels functional disability. However, for children and adolescents who reported higher levels of worrying, the level of pain did not predict functional disability.

**DISCUSSION**

The present study examined the prevalence of anxiety in patients with diverse chronic pain complaints. Results indicated that although only a small percentage of patients reported clinically significant levels of total anxiety, almost one-third of the participants reported clinically significant levels of physiological anxiety, indicating that anxiety about somatic symptoms and physical complaints tends to be high in patients with chronic pain. There was also a consistent pattern among children and adolescents with diffuse and abdominal pain complaints. Overall, a higher percentage of these patients reported clinically elevated anxiety symptoms, and their scores were significantly higher when compared with children and adolescents with headache, musculoskeletal pain and neuropathic pain. However, while statistically significant, the differences in scores were small, thus suggesting that while patients with diffuse pain in particular may be more at risk for clinically significant anxiety, the best course of action is evaluating a patient’s anxiety symptoms regardless of pain diagnosis.

We also found that patients’ level of worrying moderated the relationship between their current pain and functional disability. Specifically, we found that for patients with lower levels of worry, higher levels of pain were associated with greater functional disability. However, for patients who tended to be high in worrying, even low levels of pain were associated with high levels of disability. This
TABLE 3
Child anxiety symptoms and pain on children’s functional disability

<table>
<thead>
<tr>
<th>Variables</th>
<th>β</th>
<th>Beta</th>
<th>t</th>
<th>R²</th>
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<td>0.25</td>
<td>6.78***</td>
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<tr>
<td>Total anxiety × pain</td>
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<tr>
<td>Physiological anxiety</td>
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<td>–1.97*</td>
<td>0.01</td>
<td>0.01</td>
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<td>Worry anxiety × pain</td>
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<td>Social anxiety</td>
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<td>0.07</td>
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<td>0.00</td>
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</tbody>
</table>

Notes: *P<0.05, **P<0.01, ***P<0.001. Effect sizes of 0.02, 0.15, and 0.35 are considered small, medium and large (Cohen J. Statistical Power Analysis for the Behavioral Sciences, 2nd edn. Hillsdale: Lawrence Erlbaum, 1988).

The study findings must be interpreted in light of their limitations. First, the study was retrospective and cross-sectional in design, with data drawn from chart review procedures. The tertiary clinic-based sample may not be fully representative of the larger population of all children who experience chronic pain. Although the high numbers of female and Caucasian patients are similar to demographic patterns reported in other pediatric multidisciplinary chronic pain clinic samples (11,13), and research documents sex and ethnic discrepancies in those who seek treatment for chronic pain (31,32), the predominance of girls in the current sample and the lack of racial heterogeneity limit the generalizability of the findings. Finally, given the large sample size in the present study and its effects on achieving statistical significance, it is important to address the clinical meaningfulness of these results. Although there were some statistically significant differences in
reports of anxiety according to patients’ pain diagnoses, overall, these differences were quite small and perhaps not clinically significant. Despite these limitations, results of the present study suggest that anxiety is an important factor in pediatric chronic pain. Given that anxiety could be a factor in the exacerbation and maintenance of pediatric chronic pain, highlighting these issues in treatment is important. These findings highlight the importance of screening for anxiety among children with chronic pain and underscores that patients often present themselves in a socially desirable manner for evaluation. Discussing the potential benefit of psychological therapies with patients who present for pain evaluation should be a common practice to not only destigmatize psychological treatments for pain, but to ensure that patients receive adequate psychopharmacology regarding the potential psychological impact of living with a chronic pain condition. Finally, the findings of the present study add to the current knowledge base for medical and mental health professionals regarding the prevalence and role of anxiety among children and adolescents with chronic pain.

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