School Functioning in Adolescents With Chronic Pain: The Role of Depressive Symptoms in School Impairment

Deirdre E. Logan, PhD, Laura E. Simons, PhD, and Karen J. Kaczynski, PhD
Children’s Hospital Boston, Harvard University Medical School

Objective  To explore associations between depressive symptoms and school functioning, including school attendance, academic performance, self-perceived academic competence, and teacher-rated school adjustment among predominantly Caucasian and female adolescent chronic pain patients. Methods  A total of 217 clinically referred adolescents (aged 12–17 years) and their parents completed measures of pain characteristics, depression, and school functioning. Additional data were collected from school records and teacher reports. Results  Depressive symptoms strongly correlated with school functioning indicators. In linear regression analyses, higher levels of depressive symptoms predicted more school impairment. A model testing whether depressive symptoms mediated the association between current pain intensity and parent perceptions of the interference of pain on school functioning was supported by the data. Conclusions  Depressive symptoms play a key role in influencing the extent of school impairment in adolescents with chronic pain. Interventions to alleviate depressive symptoms may enhance treatments designed to improve school functioning in this population.

Key words  adolescents; depression; pain; school functioning.

Pediatric chronic pain is a pervasive problem, affecting an estimated 15–20% of children (APS, 2001; Goodman & McGrath, 1991). A subset of these children experience pain-related functional disability that can severely decrease quality of life in many areas (Gauntlett-Gilbert & Eccleston, 2007; Perquin et al., 2000). In a recent large community-based study of school-age children in Germany, 30% of children in the age group of 4–18 years reported pain lasting 6 months or longer, with half of these children endorsing significant functional impairment due to pain (Roth-Isigkeit, Thyen, Stoven, Schwarzenberger, & Schmucker, 2005). Other recent studies have shown that pain characteristics, such as duration and intensity, cannot fully explain the functional outcomes of chronic pain conditions in children and adolescents (Eccleston et al., 2004; Kashikar-Zuck, Goldschneider, Powers, Vaught, & Hershey, 2001; Logan & Scharff, 2005).

Given the vast individual differences in subjective pain experiences and functional outcomes, a driving question in pain research is why some individuals with chronic pain function adequately, whereas others with comparable subjective pain are significantly disabled by it. In accordance with the biopsychosocial model of pain (Engel, 1977; Gatchel, Peng, Peters, Fuchs, & Turk, 2007), a number of factors that appear to account in part for individual differences in functional disability in the face of chronic pain have been studied, including child coping styles (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001; Simons, Claar, & Logan, 2008), psychological distress (Campo, Comer, Jansen-Mcwilliams, Gardner, & Kelleher, 2002; Kashikar-Zuck et al., 2001), family pain history (Schanberg et al., 2001), and parental responses to pain (Claar, Simons, & Logan, 2008; Peterson & Palermo, 2004). Depressive symptomatology has emerged as a particularly powerful contributor to pain-related functional disability.

The frequent co-occurrence of chronic pain and psychological distress—particularly depression—has been established in both adults (Bair, Robinson, Katon, & Kroenke, 2003; Campbell, Clauw, & Keefe, 2003) and children (Campo et al., 2002; Hoff, Palermo, Schuchter, Zebracki, & Drotar, 2006; Hunfeld et al., 2001;
Kashikar-Zuck et al., 2001). Although a relatively small proportion of pediatric chronic pain patients meet full diagnostic criteria for a depressive disorder, subclinical depressive symptomatology is common in this population. Youth whose pain is comorbid with depression exhibit more functional impairment than those without comorbid psychological distress (e.g., Palermo, 2000). In a pediatric musculoskeletal pain sample, Kashikar-Zuck and colleagues (2001) found levels of depressive symptoms to be strongly associated with global functional disability, accounting for 45% of the variance in disability (compared to 13% accounted for by pain ratings). A similar pattern of findings was reported among children with chronic or recurrent abdominal pain (Claar & Walker, 2006). Although prospective studies are rare, some recent work shows depression to be an important influence on disability in children—particularly girls—over time (El-Metwally, Salminen, Auvinen, Kautiainen, & Mikkelsson, 2004; Hoff et al., 2006; Mulvany, Lambert, Garber, & Walker, 2006). Taken together, existing research supports the view that youth with comorbid pain and depressive symptoms are at elevated risk for global functional disability and that depression may magnify the detrimental effects of pain on functioning.

Existing studies view functional disability broadly, typically defined by scores on the Functional Disability Index (FDI; Walker & Greene, 1991) or similar checklists that do not explore specific domains of functioning in depth. Although few studies to date conceptualize different domains of functional disability in pediatric pain patients, there is some evidence to suggest that functional disability is a complex construct, with different domains of functioning influenced by different variables (Gauntlett-Gilbert & Eccleston, 2007). Because school is the primary venue for success or failure in the developmental tasks of childhood and adolescence, this specific domain of functioning merits more detailed scrutiny (Eccleston, Crombez, Scotford, Clinch, & Connell, 2004; Walker & Johnson, 2004). Of particular interest is how pain and depressive symptoms may combine to influence school functioning.

Frequent school absence is well documented among adolescents with chronic pain (Chan, Piira, & Betts, 2005; Eccleston et al., 2004; Walker & Johnson, 2004). Studies of laboratory-induced pain show that lower pain thresholds in healthy children predict school absence (Tsao, Glover, Bursch, Ifekwunigwe, & Zeltzer, 2002; Tsao & Zeltzer, 2003), suggesting links between pain perception and school attendance. Beyond elevated absence rates, adolescents with chronic pain identify many other school difficulties, including declines in academic performance, more school-related stress and poor academic competence (Chan et al., 2005; Claar, Walker, & Smith, 1999; Logan, Simons, Stein, & Chastain, 2008; Torsheim & Wold, 2001). Yet these domains of functioning have been less well studied in the chronic pain population despite their demonstrated links to school success and positive adjustment in the developmental and school psychology literatures (Cole et al., 2001; Eccles et al., 2006).

Building on previous work that expanded the scope of school functioning beyond attendance data and revealed significant school impairment among adolescents with chronic pain (Logan et al., 2008), the current study focuses specifically on the influence of depressive symptoms on the pathway from chronic pain to school impairment. Specific hypotheses are that (1) higher levels of depressive symptoms will be associated with greater impairment in school functioning, as measured by a range of indicators (school absences, academic performance, self-perceived academic competence, and teacher ratings of academic adjustment); and (2) depressive symptoms will mediate the relation between pain characteristics and school functioning.

Methods

Participants

Participants are consecutively recruited adolescents (aged 12–17 years) who presented for initial evaluation of chronic or recurrent functional pain symptoms at a tertiary pediatric chronic pain outpatient clinic within a large urban children’s hospital, between October 2005 and June 2007. As part of this clinic visit they received medical, psychological, and physical therapy evaluations. Study inclusion criteria were minimum pain duration of 3 months at time of enrollment, pain frequency of at least once per week or 5 days per month, and current enrollment in middle school or high school. Patients were excluded from study participation if they had (1) specific organic etiology of pain (e.g., cancer pain, juvenile rheumatoid arthritis), (2) severe cognitive impairment by history, or (3) inability to speak sufficient English to complete questionnaire measures.

Of 289 eligible participants, 217 participants made up the final sample (7.6% declined, 14.6% signed consents but failed to fully complete or return questionnaire packets, and 1.8% were deleted from analyses due to substantial missing data). The final sample was primarily female (80.2%) and Caucasian (92.9%), reflecting the characteristics of the patients seen in this clinic setting and similar to sample characteristics reported in other studies based in tertiary-care pediatric chronic pain clinics.
(Eccleston et al., 2004; Guite, Logan, Sherry, & Rose, 2007). Participants had a mean age of 14.7 years (SD = 1.6). The responding parent was the adolescent’s mother for 92% of the sample. Overall, parents in the sample were highly educated, with a median education level of college graduate for both mothers (education level ranged from “some high school” to “professional/graduate school”) and fathers (education level ranged from “first grade to eighth grade” to “professional/graduate school”). Approximately 30% of the sample presented with neuropathic pain complaints; another 30% had musculoskeletal or joint pain problems; about 25% complained of headaches; and approximately 10% had abdominal pain, gynecologic, or genitourinary complaints. A more detailed description of participants’ primary pain complaints, along with additional characteristics of the sample and differences between participants and nonparticipants, is reported elsewhere (Logan et al., 2008).

Procedure

Human subjects’ approval was granted by the hospital IRB (institutional review board) prior to commencing data collection. Data were collected during the school year only, so that current-year school data could be obtained for all participants. Potentially eligible families were identified in advance of clinic appointments, and letters were mailed to their homes to explain the purpose of the study. Families wishing not to be approached about the study during their clinic visit were invited to send back a stamped postcard indicating this. At the time of clinic visit, the study coordinator met with the family to explain the study in detail and obtain informed consent from both adolescent and parent participants. A separate consent form was used for families to grant permission for the research team to contact the adolescent’s school to obtain study information. Consenting families then completed self-report measures.

Measures

Pain characteristics

Time since pain onset was recorded in months since onset of current pain problem, by parent report. Pain intensity over the past week was measured at a single time point on a standard 11-point numeric rating scale with anchors of 0 = “no pain” and 10 = “worst pain possible.” Adolescents provided ratings for both their current and average pain.

Depressive symptoms

The Children’s Depression Inventory (CDI; Kovacs, 1985) self-report form was used to obtain adolescents’ ratings of current depressive symptomatology (expressed continuously). The CDI contains 27 self-report items rated on a 3-point scale from 0 to 2, summed to obtain a total score. Higher scores indicate higher levels of depressive symptoms. The CDI has been found to have adequate reliability and validity (Kovacs, 1985). Alpha reliability in this sample was .85.

School functioning

To yield a comprehensive view of school functioning, multiple indicators of school functioning were obtained from multiple reporters. These included the following:

1. School attendance: Official attendance records were collected from schools to track school attendance for the month prior to the date on which families completed questionnaires. This information was used to create a variable indicating percentage of days on which the adolescent was absent, arrived late, and/or was dismissed early. Parents and adolescents also provided subjective ratings of the perceived effects of pain on school attendance. This was measured with a single item worded, “How much has pain interfered with your attendance at school?” Responses were recorded on 10-cm visual analogue scale (VAS) lines with anchors of 0 = “did not interfere at all” to 10 = “interfered extremely.”

2. Academic performance: Parents reported the average grades their adolescent received in the year prior to onset of the pain problem and grades currently received, using a multiple-choice format with options including “mostly A’s,” “A’s and B’s,” “mostly B’s,” “B’s and C’s,” “mostly C’s,” “C’s and D’s,” “mostly D’s,” “D’s and F’s,” and “mostly F’s.” Responses were used to derive an indicator of change in grades since onset of pain based on the extent of decline or improvement (i.e., the number of categories that performance fell or improved from prior to pain onset to current time, coded so that higher scores indicate larger declines in performance since pain onset). Despite possible subjectivity, parent report was considered the best source of information on grades because current teachers were not necessarily aware of students’ grades in previous school years. Parents and adolescents also provided subjective ratings of the perceived effects of pain on school performance by responding to the question, “How much has pain interfered with your performance at school?” Responses were recorded on a 10-cm VAS with anchor points identical to the item assessing effects of pain on school attendance.
3. Self-perceived academic competence: The six-item Scholastic subscale from the Harter Self-Perception Profile for Adolescents (SPPA; Harter, 1988) was used to assess adolescents’ perceptions of their own academic competence. Most participants were administered the measure in its traditional format, wherein adolescents first determine which of two statements is more like them and then rate how true the statement is (i.e., “sort of true for me” vs. “really true for me”). Participants recruited in the final 9 months of the study (N = 84) received the measure in an alternative format that has been shown to be equivalent to the original but easier to complete (Wichstrom, 1995). In this format, participants were given the initial statement from each of the items and asked to rate how true that statement is for them (from “not at all true” to “really true”). Difference in scores between those who completed the traditional or alternative formats in this sample was nonsignificant, F(1, 179) = 0.04, p = .85. Both formats use a 4-point scale with item scores averaged to yield the subscale score. Higher scores indicate higher self-perceived competence (i.e., less impairment). Cronbach’s alpha scores for the current sample are .79 for the original version and .82 for the revised format version.

4. Teacher perceptions of school adjustment: Adolescents were asked to designate a current teacher who knows them well. This teacher completed the Walker–McConnell scales of social competence and school adjustment, adolescent version (WMS; Walker & McConnell, 1995). The WMS is a 53-item scale assessing teacher perceptions of how frequently students display various academic and social skills in the classroom setting. It includes the domains of self-control (e.g., “copes effectively with being upset”), peer relations (e.g., “interacts with a number of different peers”), school adjustment, (e.g., “is personally well organized”), and empathy (e.g., “is sensitive to the needs of others”). Items are answered on a 5-point scale from 1 = “never” to 5 = “frequently,” with higher scores indicating better adjustment. Total scale score is used for data analyses. For the current sample, Cronbach’s alpha for the total scale score = .95.

Data Analyses

For purposes of data reduction and streamlining of analyses, composite scores were generated by averaging the two pain interference questions (i.e., school attendance, academic performance) for each respondent. These scores are referred to as perceptions of pain interference, adolescent, and parent report. Higher scores indicate greater interference from pain. All other school functioning indicators were examined separately. Data were analyzed using SPSS (Version 14.0 for Windows). For preliminary analyses, means and standard deviations for variables of interest were examined along with bivariate associations among participant and family demographics, pain characteristics, and depressive symptoms via Pearson product moment correlations. Subsequent analyses entailed multivariate hierarchical linear regression analyses. All analyses were run on the available sample with pairwise deletions for missing data.

Results

Descriptive and Preliminary Analyses

The means and standard deviations for key variables are presented in Table I. Regarding depressive symptoms, the majority of the sample scored within the normal range on the CDI, whereas 12.6% of the sample scored in the “at-risk” range (i.e., CDI total T score = 60–69) and 7.4% scored in the “clinically significant” range (i.e., CDI total T score ≥ 70). Level of depressive symptoms was associated with participant age, with older adolescents reporting higher levels of symptoms (r = .16, p < .05); age was, therefore, included in subsequent multivariate analyses. Associations between demographic and pain characteristics and school functioning indicators have been reported elsewhere (Logan et al., 2008); parental education levels were significantly associated with several parent-reported indicators and one teacher-reported indicator of school functioning (i.e., lower education levels were associated...
with reports of poorer functioning). Due to a strong inter-
correlation between paternal and maternal levels of edu-
cation, only paternal education—which correlated with
more outcomes of interest than maternal education—was
included as a covariate in the relevant multivariate anal-
yses. Associations between gender and depressive symp-
toms and pain characteristics were explored but found to
be nonsignificant.

Bivariate Pearson correlation analyses were conducted
to examine associations among the primary constructs of
interest, namely, level of depressive symptoms, pain char-
acteristics, and the various indicators of school functioning
(see Table II). Higher levels of depressive symptoms were
strongly associated with most school impairment indica-
tors, including school absences, adolescent and parent
perceptions of the interference of pain on attendance and
performance, and adolescent reports of lower scholastic
competence. The correlation between depressive symp-
toms and teacher reports of poorer school adjustment
was in the expected direction but not statistically signifi-
cant. Notably, ratings of average pain intensity and time
of pain onset were not significantly correlated with depres-
sive symptoms nor with any school impairment variables.
Current pain intensity was only weakly correlated (p < .05)
with depressive symptoms and parent perceptions of pain
interference scores.

**Regression Analyses**

To more fully examine our first hypothesis that higher
levels of depressive symptoms would be associated with
greater impairment in school functioning, multivariate
linear regression analyses were conducted using depressive
symptoms as the primary independent variable and includ-
ing age and paternal education level to control for the
effects of these demographic characteristics. Separate hier-
archical regression equations were generated for the follow-
ing dependent variables representing school impairment:
(1) percent of full and partial school days missed (school
report), (2) teacher ratings of school adjustment, (3) ado-
lescent perceptions of pain interference, (4) adolescent
perceptions of scholastic competence, (5) parent percep-
tions of pain interference, and (6) parent report of grade
changes since pain onset. Age and (when relevant) paternal
education were entered on the first step of the equations,
and CDI score was entered on the second step.

Complete results of these analyses, including effect
sizes and confidence intervals, are presented in
Table III. The regression analyses indicate that levels of
depressive symptoms significantly predicted school-
reported absences, teacher report of school adjustment,
adolescent and parent perceptions of pain interference
with school, adolescents’ perceived scholastic competence,
and parent report of grade changes since pain onset.

**Tests of Mediation**

To test the second hypothesis that depressive symptoms
would mediate the relation between pain characteristics
and school functioning, we followed the procedures out-
lined in Baron and Kenney (1986) and further clarified in
Holmbeck (2002), supplemented with bootstrapping
methods to apply the Sobel test (Preacher & Hayes,
2004) to determine statistical significance of mediation.

### Table II. Bivariate Pearson Correlation Matrix

| Variable                                      | N   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
|-----------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pain characteristics                          |     |     |     |     |     |     |     |     |     |     |     |     |
| 1. Time since pain onset                      | 184 | –   | .04 | .12 | .05 | .14 | .07 | .15 | .02 | .05 | .17 |
| 2. Average pain intensity                     | 197 | –   |     | .36** | .14 | .09 | .13 | .08 | .09 | .08 | .05 |
| 3. Current pain intensity                     | 197 | –   |     |     | .17 | .05 | .19 | .13 | .01 | .02 | .05 |
| Depressive symptoms                           |     |     |     |     |     |     |     |     |     |     |     |     |
| 4. CDI total score                            | 206 | –   |     |     | .23* | .32** | .33** | .19* | –   | .43** | .14 |
| School functioning                            |     |     |     |     |     |     |     |     |     |     |     |     |
| 5. Percentage of full and partial days missed | 160 | –   |     |     |     | .68** | .60** | .22* | .17 | .28* |
| 6. Parent PPI                                 | 187 | –   |     |     |     |     | .81** | .41** | .21* | .34** |
| 7. Adolescent PPI                             | 174 | –   |     |     |     |     |     | .39** | .27** | .36** |
| 8. Parent report of grade change              | 175 | –   |     |     |     |     |     |     | .18 | .47** |
| 9. Adolescent perceived scholastic comp.      | 181 | –   |     |     |     |     |     |     |     | .18 |
| 10. Teacher WMS                               | 120 | –   |     |     |     |     |     |     |     |     |     |

PPI: perception of pain interference score; WMS: Walker McConnell Scales, School Adjustment subscale score. Correlations are two-tailed. To adjust for multiple comparisons, only p values < .01 are indicated as significant.

* p < .01, ** p < .001.
The tested mediation models were guided by the results of the bivariate correlation analyses, although weaker correlations (p < .05 within the context of multiple comparisons) were considered worth further examination. Specifically, because neither average pain ratings nor pain duration correlated significantly with any of the school functioning outcome variables, the tests of mediation focused on examining whether depressive symptoms mediated associations between current pain severity and school impairment. Separate mediational models were tested for each of the school functioning–outcome variables: (1) percent of full and partial school days missed (school report), (2) teacher ratings of school adjustment, (3) adolescent perceptions of pain interference, (4) adolescent perceptions of scholastic competence, (5) parent perceptions of pain interference, and (6) parent report of grade changes since pain onset.

Following conventional methods of assessing mediation (Baron & Kenny, 1986), it was first established that the independent variable, current pain intensity, significantly predicted CDI scores ($\beta = .17, t = 2.25, p < .05$). The regression analyses reported in Table III demonstrate that CDI scores significantly predicted all six school functioning outcomes, satisfying an additional criteria for establishing depressive symptoms as a mediator of the association between pain intensity and school functioning. Next, current pain intensity had to be established as a significant predictor of the school functioning–outcome variables. Current pain intensity did not significantly predict school attendance, teacher ratings of school adjustment, adolescent perceptions of pain interference, adolescent perceptions of scholastic competence, or parent-reported grade change. Only the regression of parent perceptions of pain interference on current pain

| Table III: Regression Analyses: Relations Between Depressive Symptoms and School Functioning |
|-----------------------------------|----------|---------------|-------------|--------|-----------|-----------|
| Variables                         | $\beta$  | Beta         | 95% CI for beta | $t$    | $r^2$ [CI] change | Cohen's $f$ |
| I. Outcome: Days missed (partial + full) |
| Step 1: Age                       | 0.17     | .01          | -3.14 to 3.47  | 0.10   | -.01      | 0.12       |
| Step 2: Age                       | -0.72    | -.04         | -3.88 to -2.43 | -0.45  | .10***    | 0.12       |
| Depressive symptoms               | 1.48     | .33          | 0.76 to -2.20  | 4.06***|           |            |
| II. Outcome: Teacher WMS score    |
| Step 1: Age                       | 0.00     | .01          | -0.10 to 0.10  | 0.05   | .01       | 0.06       |
| Paternal education                | 0.12     | .17          | -0.02 to 0.25  | 1.67   |           |            |
| Step 2: Age                       | 0.01     | .03          | -0.09 to 0.11  | 0.28   | .04*      | 0.06       |
| Depressive symptoms               | 0.10     | .15          | -0.03 to 0.24  | 1.53   |           |            |
| Paternal education                | -.02     | -.19         | -0.04 to 0.01  | -1.92  |           |            |
| III. Outcome: Adolescent PPI      |
| Step 1: Age                       | 0.10     | .02          | -0.55 to -0.75 | 0.30   | -.01      | 0.11       |
| Step 2: Age                       | -0.07    | -.02         | -0.69 to -0.55 | -0.22  | .10***    | 0.23       |
| Depressive symptoms               | 0.34     | .33          | 0.19 to -0.48  | 4.47***|           |            |
| IV. Outcome: SPPA schol. comp.    |
| Step 1: Age                       | 0.01     | .01          | -0.06 to -0.07 | 0.15   | -.01      | 0.14       |
| Step 2: Age                       | 0.03     | .07          | -0.03 to -0.08 | 0.96   | .18***    | 0.23       |
| Depressive symptoms               | -.04     | -.44         | -0.05 to -0.03 | 9.40***|           |            |
| V. Outcome: Parent PPI            |
| Step 1: Age                       | 0.50     | .11          | -0.18 to -1.18 | 1.45   | .03*      | 0.02       |
| Paternal education                | -.96     | -.16         | -1.89 to -0.04 | -0.02* | 1.11***   | 0.14       |
| Step 2: Age                       | 0.32     | .07          | -0.04 to -0.98 | 0.95   |           |            |
| Paternal education                | -.86     | -.14         | -1.75 to -0.02 | -1.92  |           |            |
| Depressive symptoms               | 0.31     | .30          | 0.16 to -0.46  | 4.05***|           |            |
| VI. Outcome: gGrade change (parent rep.) |
| Step 1: Age                       | -0.04    | -.04         | -0.17 to -0.10 | -0.52  | -.001     |            |
| Step 2: Age                       | -0.06    | -.07         | -0.20 to -0.07 | -0.93  | .03**     | .04        |
| Depressive symptoms               | 0.04     | .20          | 0.01 to -0.08  | 2.64** |           |            |

SPPA Schol. Comp: Scholastic Competence Subscale of Self-Perception Profile for Adolescents; PPI: Perception of Pain Interference Score. Cohen's $f^2$ effect sizes of 0.02, 0.15, and 0.35 are considered small, medium, and large, respectively (Cohen, 1988).

*p < .05; **p < .01; ***p < .001.
intensity was statistically significant ($\beta = .44$, $t = 2.29$, $p < .05$). The final requirement to show mediation is a reduction in the strength of the association between the independent variable (current pain intensity) and the dependent variable (parent perceptions of pain interference scores) in the presence of the proposed mediator, depressive symptoms. These results, reported in Table IV, support a partial mediation effect. The more conservative Sobel test, assessing statistical significance of the extent of mediation (i.e., the magnitude of the indirect effect, accounting for error and variance) also supported the hypothesized mediation effect (Sobel $z = 1.93$, $p < .05$).

### Discussion

Building from previous work with these data documenting broadly defined school impairment in adolescents with chronic pain (Logan et al., 2008), the aim of the present study was to examine associations between depressive symptoms and school functioning in the context of chronic pain. In this clinical sample of adolescents with complex and varied chronic pain conditions, depressive symptoms were associated with school impairment as measured by multiple indicators (e.g., school-reported attendance, parental and adolescent perceptions of academic performance and competence). This finding is consistent with previous research demonstrating the influence of depression on functional outcomes in children and adolescents with chronic pain (Claar & Walker, 2006; Gauntlett-Gilbert & Eccleston, 2007; Kashikar-Zuck et al., 2001). This study extends the literature by examining the association between depressive symptoms and school functioning specifically. This is an important domain of functioning that has only recently begun to receive increased attention in pediatric chronic pain research.

Although an association between depressive symptoms and school impairment may not be surprising in itself, the finding is more striking when combined with the fact that pain characteristics were not associated with many of the school impairment indicators assessed in this study. In other words, among a group of adolescents with chronic pain syndromes, those reporting pain of higher-average intensity or longer duration did not necessarily have poorer school functioning. Instead, level of depressive symptoms was a more consistent indicator of school impairment.

Notably, the study sample was generally characterized by moderate levels of depressive symptoms, with only 20% of the sample falling in the at-risk or clinically significant range of depressive symptomatology. These rates are not dramatically higher than the rates of depression in the general adolescent population (e.g., Orvaschel, Beeferman, & Kabacoff, 1997). Some evidence suggests that adolescents presenting for evaluation and treatment of chronic pain may minimize psychological distress on self-report (e.g., Logan & Claar, 2008); alternatively, these relatively normal rates of depressive symptoms may indicate resilience in this population. As has been found in the adolescent depression literature (e.g., Orvaschel et al., 1997), depressive symptoms increased with age in this predominantly female sample. It has been previously observed that adolescent pain patients may infrequently evidence diagnosable levels of depression, but that depressive symptoms, even at subclinical levels, may be meaningful because they indicate poorer emotional coping resources
(Eccleston et al., 2004). Given the findings in this and previous studies that depressive symptoms are associated with functional abilities in the face of chronic pain, even subclinical levels of depressive symptoms deserve attention and represent a potentially powerful target of treatment aimed at functional restoration.

Our second hypothesis, that depressive symptoms would mediate associations between pain characteristics and school functioning, was partially supported by the data. The relationship between current pain ratings and parent perceptions of the interference of pain on school functioning showed evidence of a mediating role for depressive symptoms, but this mediational pathway was not found between other pain-characteristic school functioning variable pairs. The lack of broader support for the hypothesized mediational models was primarily due to the fact that pain characteristics were only weakly correlated with school functioning outcomes. Although this pattern was contrary to our expectations, it is consistent with recent findings by Gauntlett-Gilbert and Eccleston (2007), who found that although pain intensity was closely related to global functional disability it bore no significant relation to school attendance. Synthesizing these findings with our own, we posit that in the context of complex chronic pain conditions in adolescence, specific pain characteristics such as pain intensity may correlate with overall disability (especially physical disability, the primary construct measured by common checklists such as the FDI), but may have less influence on specific domains such as school functioning, which are likely to be more strongly associated with psychosocial phenomena.

In recent years, there has been increased emphasis both in the research literature and in clinical practice on placing a primary focus on functional restoration in patients with pediatric chronic pain (e.g., Gauntlett-Gilbert & Eccleston, 2007; Palermo, 2000). An earlier published study based on the current data (Logan et al., 2008) lent additional support to the tenet that functional disability is a multifaceted construct and highlighted the importance of looking more closely at school functioning in particular when investigating functional abilities of adolescents with chronic pain. The conclusion that school functioning is significantly impaired in many adolescent chronic pain patients raised questions about what psychological factors might influence the extent of school impairment across individuals. The current study begins to address these questions and shows that symptoms of depression likely influence school functioning. In light of the growing evidence for the effectiveness of cognitive behavior-oriented treatments for pediatric chronic pain (Degotardi et al., 2006; Eccleston, Malleson, Clinch, Connell, & Sourbut, 2003; Kashikar-Zuck et al., 2001), it is useful to consider how treatments targeting depressive symptoms and negative thinking may improve school functioning outcomes for this population.

Several limitations should be considered when evaluating this research. First, results from this demographically homogenous sample, referred through several levels of care to a tertiary chronic pain clinic, may not generalize to other groups. The sample consists predominantly of female, Caucasian adolescents from highly educated families, limiting our ability to apply results beyond this group. For example, we were unable to examine possible gender differences in the relationship between depression and school impairment, given the low numbers of boys included in our sample. The specific demographics of the sample, such as the overrepresentation of females, also limit comparisons to samples used to establish normative information for some of the measures included in the study and may explain relatively high scores on ratings of academic competence. However, these characteristics are reflective of the majority of patients presenting to tertiary care pediatric chronic pain programs. More work needs to be done to determine why so few boys and relatively few members of ethnic minorities are treated in these settings. Second, the study was cross-sectional and correlational in design. As such, it is not possible to determine causal links between the variables of interest. Although we have conceptualized depressive symptoms as instrumental in determining the extent of school impairment (and used this conceptualization in developing the tested mediational models), it is possible that in the presence of chronic pain, adolescents may experience pain-related school impairment, which then gives rise to depressive symptoms. Studies with longitudinal approaches that follow the trajectories of pain, depression, and school impairment over time are necessary to verify the causal relations among these constructs.

A number of measurement issues bear consideration. Some study measures differed in the time frame assessed for recent symptoms (e.g., “the last two weeks” vs. “the previous month of school”); this may account for some discrepancies across the information collected. Pain characteristics assessed in this study were limited to time since pain onset and pain intensity, which was assessed by numeric rating scales at a single time point. Previous studies suggest that pain diaries that measure both intensity and frequency of pain over a period of days to weeks provide a more robust indicator of pain severity (e.g., Gil et al., 2000). This is particularly important when assessing recurrent pain conditions where pain waxes and wanes. Including multiple reporters (i.e., parents, teachers)
in the assessment of adolescent depression would strengthen future studies.

Measurement limitations associated with the selected school functioning indicators are discussed in a previous publication (Logan et al., 2008). Briefly, there are limits inherent in relying on adolescents’ and parents’ subjective and retrospective views of school functioning. For example, parent reports of adolescents’ grades over a potentially lengthy time period (i.e., prior to pain onset) are subject to recall bias; confirming grades with school records was not possible, given the time span involved for some participants and the possibility of participants having attended multiple schools during this time. Several of the measures of school functioning were single-item, unvalidated measures, so caution must be used in interpreting the findings. Furthermore, the lack of normative data for most of the school functioning indicators precludes comparisons of adolescents with chronic pain to healthy peers. Study participants nominated the teacher who completed the WMS; this ensured that teacher respondents knew the participant well, but this came at the cost of standardizing respondents and may have led to inflated ratings. Nonetheless, the scope of school functioning measures included in this study expands on what has typically been assessed, thereby increasing our knowledge of how adolescents with chronic pain are functioning in the school context. More research is needed to enable accurate and comprehensive assessment of school impairment in youth with chronic pain. Future research should focus on longitudinal assessments of school functioning and should strive to incorporate both subjective and objective methods of assessment, including measures such as standardized test scores with comparisons to normative results.

It is also important to note that some of the effect sizes for our findings were relatively small. In particular, analyses with less than medium effect size (particularly the analysis of teacher-reported school adjustment and parent-reported grade change where effect sizes are smallest) may not indicate clinically significant findings. The focus of the study was exclusively on depressive symptoms and school function, but the variables examined herein are likely part of a larger, more complex biopsychosocial framework that accounts for the interplay between pain characteristics, demographic qualities, and psychosocial variables and their impact on functional outcomes of the chronic pain experience. One important area not fully addressed in this study is the role of the parent–child relationship; future studies should incorporate parent–child relationship variables, such as parental responses to pain, to understand how these may affect school functioning outcomes in the presence of chronic pain and depressive symptoms. Another important direction for future research is to compare the pattern of associations between depressive symptoms and school functioning found in this sample of adolescents with chronic pain to patterns among other chronically ill adolescents and among healthy peers. Only such comparison studies can clarify whether these patterns are unique to adolescents with chronic pain syndromes or whether similar patterns exist outside the context of chronic pain.

In conclusion, study results contribute to an emerging literature base on specific domains of pain-related functional disability. They lend further evidence to the finding that when school outcomes are the focus of pain-related functional disability assessment, psychosocial variables such as depressive symptoms (even symptomatology below the level of psychiatric diagnosis) are more closely linked to functional outcomes than are specific pain characteristics such as intensity or duration. Levels of depressive symptoms appear to explain, at least in part, why some youth with chronic pain function adequately in the school setting, whereas others are severely disabled. These results set the stage for future research to better understand how depression may interact with chronic pain to influence school functioning, and how these factors can inform functional rehabilitative approaches to pediatric chronic pain treatment.

Acknowledgments

The authors thank Michelle Stein, Laura Chastain, and Laura Blackwell for research assistance, and the adolescents and parents who participated in the study.

Funding

Klingenstein Third Generation Foundation (to D. E. L.).

Conflict of interest: None declared.

Received May 28, 2008; revisions received December 12, 2008; accepted December 14, 2008

References


Glenview, IL: American Pain Society.


Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological


