Development of a Group Intervention to Improve School Functioning in Adolescents with Chronic Pain and Depressive Symptoms: A Study of Feasibility and Preliminary Efficacy

Deirdre E. Logan, PhD and Laura E. Simons, PhD

Division of Pain Medicine, Department of Anesthesiology, Perioperative and Pain Medicine, Children’s Hospital Boston, and Department of Psychiatry, Harvard Medical School

All correspondence concerning this article should be addressed to Deirdre Logan, Pain Treatment Service, Children’s Hospital, 333, Longwood Ave Suite 549, Boston, MA 02115, USA.
E-mail: deirdre.logan@childrens.harvard.edu

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Objective To establish feasibility and preliminary efficacy of “Coping with Pain in School” (CPS), an intervention to improve school functioning in adolescents with chronic pain and depressive symptoms.

Methods Forty adolescents and parents participated in this uncontrolled trial. Participants completed measures of pain severity, depression, and school attendance at baseline and one month after participating in a manualized group intervention. Several other indicators of school functioning were explored.

Results CPS was generally acceptable and satisfying to families and feasible to implement but participation was low. Post-treatment analyses suggest that pain, some dimensions of depression, and school attendance improved after treatment. Conclusions CPS is feasible and holds promise in terms of its effects on pain and school attendance. Addressing enrollment challenges, refining the role of depression and its treatment, and further developing treatments with a school-functioning focus for adolescents with chronic pain are key areas for continued research.

Key words adolescents; depression; intervention outcomes; pain; school functioning.

Chronic pain affects up to 25% of children and adolescents (McGrath et al., 2000) with a significant subset of this group experiencing functional disability across many domains of their lives including emotional functioning, family and peer relationships, and school functioning (Gauntlett-Gilbert & Eccleston, 2007; Palermo, 2000; Perquin et al., 2000). In recent years, there has been a growing emphasis on addressing the functional impairment that arises secondary to chronic pain. In response, interventions that focus on restoring functional abilities to children and adolescents with chronic pain have emerged (Eccleston, Malleson, Clinch, Connell, & Sourbut, 2003; Maynard, Amari, Wieczorek, Christensen, & Slifer, 2009; Sherry, Wallace, Kelley, Kidder, & Sapp, 1999). However, to date most efforts have either targeted physical functioning as the primary goal or have conceptualized functional disability in general terms without examining specific realms of functioning in depth. Although functional impairment in the school setting, especially as manifested by school absence, is a well-documented problem among youth with chronic pain, no interventions have yet been developed with the specific aim to improve school functioning within this population.
School is centrally important to the lives of adolescents, with school attendance and performance representing the “work” of this developmental stage. Adolescents with chronic pain disorders experience numerous school difficulties including frequent absences, declining academic performance, poor self-perceptions of academic competence, and impaired ability to cope with the demands of the classroom (Claar, Walker, & Smith, 1999; Logan, Simons, Stein, & Chastain, 2008; Sato et al., 2007). In a large European community-based study, Roth-Isigkeit and colleagues (Roth-Isigkeit, Thyen, Stoven, Schwarzenberger, & Schmucker, 2005) found that approximately half (48.8%) of the youth aged 4–18 years who report chronic pain endorse “sometimes” or “always” missing school due to their pain, with school absence rates increasing with age. In a study focusing on a chronic pain clinic-based sample, Konijnenberg and colleagues (Konijnenberg et al., 2005) found that 51% of children reported missing at least one school day per month, and 14% had not been in school at all over the past three months. Using official school records, a recent clinic-based study in the United States (Logan et al., 2008) demonstrated even more extensive levels of school absence, with 75% of respondents missing one or more days of school in the month prior to assessment and over 20% missing school at least half the time (≥10 days) in the previous month. Expanding the assessment of school functioning beyond attendance rates, this study documents that parents of adolescents presenting in a tertiary care pain clinic setting report significant declines in adolescents’ grades since pain onset. Furthermore, both adolescents and parents subjectively perceive that pain interferes with academic success (Logan et al., 2008). Past research has also highlighted the moderating effects of academic competence on the relation between pain symptoms and resulting levels of functional disability (Claar et al., 1999), suggesting that many aspects of functioning both affect and are affected by the experience of chronic pain.

Although group level data indicate that adolescents with chronic pain experience significant school impairment, both clinical impressions and existing research reveal substantial individual variation in the degree of pain-related school impairment. Furthermore, the extent of school impairment does not appear to correlate directly with pain severity (Logan, Simons, & Kaczynski, 2009). Why, then, do some individuals experience extensive school impairment from their chronic pain while others continue to function adequately despite similar pain presentations? In studies of global pain-related functional disability, depressed mood—which has been shown to be frequently comorbid with chronic pain (Camp, Comer, Jansen-Mcwilliams, Gardner, & Kelleher, 2002; El-Metwally, Salminen, Auvinen, Kautiainen, & Mikkelsen, 2004; Fishbain, 2002)—appears to be an important predictor of functional disability (Hoff, Palermo, Schluchter, Zebracki, & Drotar, 2006; Kashikar-Zuck, Goldschneider, Powers, Vaught, & Hershey, 2001; Peterson & Palermo, 2004). Kashikar-Zuck and colleagues (Hoff et al., 2006; Kashikar-Zuck et al., 2001; Kashikar-Zuck, Vaught, Goldschneider, Graham, & Miller, 2002; Peterson & Palermo, 2004) have shown that depression frequently accounts for much more of the variance in functional disability than does pain severity. In a prospective longitudinal study, Mulvaney and colleagues (Mulvaney, Lamb, Garber, & Walker, 2006) found that children with long-term abdominal pain and disability had the highest baseline levels of depression, along with anxiety and stressful life events.

To date, research on the role of depression specifically on school functioning among youth with chronic pain is limited. Bruener, Smith, and Womack (2004) found that school absences among youth with chronic headaches were more closely associated with depressive symptoms than with headache frequency or intensity. Logan and colleagues (2009) demonstrated that depressive symptoms correlated strongly with a variety of indicators of school functioning and that depressive symptoms mediated the relation between current pain intensity and parent perceptions of the interference of pain on school functioning. This preliminary evidence, combined with both the known associations of depression and global functional disability in pediatric chronic pain populations as well as established links between depression and school impairment in adolescents without chronic pain (Kearney, 1993; Masi et al., 2000) suggests that pain and depression in combination may create a heightened risk for impairment in this important functional domain. Interventions designed to address school impairment among adolescents with chronic pain may benefit from targeting depressive symptoms, particularly negative thinking patterns that may foster school impairment, as a pathway toward improved school functioning.

Cognitive behavioral treatments (CBT) for pediatric chronic pain have been shown to decrease pain complaints and improve functional outcomes (Eccleston, Morley, Williams, Yorke, & Mastroyannopoulos, 2002; Eccleston, Palermo, Williams, Lewandowski, & Morley, 2009). These treatments typically include teaching strategies such as relaxation training, distraction techniques, problem solving, and modifying pain-related negative thoughts. Some CBT for pediatric chronic pain has included a family component (Palermo, Wilson, Peters,
Lewandowski, & Somhegyi, 2009; Robins, Smith, Glutting & Bishop, 2005; Sanders, Shepherd, Clegorn, & Woolford, 1994). In “family CBT” for pain, parents are incorporated into treatment and are typically taught operant strategies for responding to their child in pain in ways that promote adaptive coping and functioning rather than reinforcing pain behaviors (Palermo & Chambers, 2005; Palermo et al., 2009).

The current study incorporated common CBT and family CBT techniques for pain management but differed from previous cognitive behavioral interventions for pediatric chronic pain in its specific emphasis on the primary goal of improving school functioning. For example, with adolescents, role play exercises to develop problem-solving skills focused on navigating challenging school situations related to their pain. Parent education focused on how parents could encourage their adolescents to attend school in spite of their pain and ways to establish positive collaborations with school personnel to encourage adolescents’ adaptive school functioning. Given past findings that group-based CBT for chronic pain is an effective treatment modality (Johnson & Thorn, 1989; Larsson & Carlsson, 1996; Larsson, Carlsson, Fichtel, & Melin, 2005; Thorn, 2009) and our belief that the peer support and peer modeling components of group treatment would be beneficial both to adolescents and parents, the intervention was designed for a group format.

This study represents the first step toward establishing an empirically validated psychosocial intervention aimed at minimizing functional disability in the school setting among adolescents with chronic pain. We sought to develop and assess the acceptability, feasibility, and preliminary efficacy of a cognitive-behavioral group intervention to improve school functioning for this population. We hypothesized that “Coping with Pain in School” (CPS), a group-based cognitive behavioral intervention for adolescents with chronic pain, would show evidence of acceptability to families as demonstrated by their attendance and their ratings of treatment satisfaction. We also sought to explore the feasibility of administering the intervention. Secondly, we hypothesized that adolescents who participated in CPS would show (a) reduction in depressive symptoms, (b) decreased reports of pain on both single-item severity rating scales and daily diary reports, and (c) improved school attendance one month after treatment as compared with baseline (pre-treatment) assessment. On an exploratory basis, we also investigated effects of the treatment on secondary indicators of school functioning (i.e., academic performance, academic competence, and subjective perceptions of the extent to which pain interfered with academic function).

Methods

Participants

Eligible participants were adolescents aged 12–17 years who presented for evaluation at an outpatient pediatric chronic pain clinic within a large, urban Northeastern pediatric hospital between November 2005 and March 2008. Inclusion criteria were 3-month or greater history of pain complaints; a physician assigned diagnosis of a chronic or recurrent pain syndrome without clear organic etiology (e.g., headache, recurrent abdominal pain, Complex Regional Pain Syndrome); absence of severe cognitive impairment by history; and current enrollment in a structured school setting (i.e., not permanently home schooled, although students receiving temporary home-bound instruction were eligible).

Participants were recruited for a two-phase study. The first phase was a cross-sectional study of associations among pain, depressed mood and school functioning (Logan et al., 2009; Logan et al., 2008). From those eligible for the cross-sectional study (n = 247), adolescents reporting elevated depressive symptoms and pain-related school impairment were invited to participate in the CPS pilot intervention study. Elevated depressive symptoms were defined as a Child Depression Inventory (CDI) score ≥ 9 indicating the presence of at least subclinical depressive symptoms. Pain-related school impairment was defined as a positive response by either the adolescent or parent to the screening question “has pain interfered with school in any way for you/your child?”

Parents and adolescents provided written informed consent to participate. Out of 133 adolescents and parents who were eligible, 40 consented and participated in the CPS program, representing a 30.1% participation rate for the intervention. Reasons for refusal to participate included scheduling difficulties and other logistics (e.g., too much travel required) and lack of interest. Figure 1, based on the TREND statement for nonrandomized behavioral and public health interventions (Des Jarlais, Lyles, Crepaz, & the TREND Group, 2004), illustrates the study flow.

Thirty-six (90%) of participating adolescents were female and 37 (92.5%) were Caucasian. These proportions are generally consistent with the clinic population from which the sample was drawn, although the proportion of female participants was higher for this treatment study than for the larger assessment study of school functioning (80.2% female) from which this study sample was recruited. Mean age of adolescents participating in the intervention was 14.7 years. The majority of parents (75%) were married, with 17.5% separated or divorced and 7.5% not reporting marital status. Parents of the
adolescent participants were highly educated; education ranged from 12–22 years for both mothers and fathers with means of 16.7 years ($SD = 2.4$ years) for mothers and 16.4 years ($SD = 3.3$ years) for fathers. In 95% of cases, mothers completed the parent questionnaires for the study, although in some families ($n = 8$) both parents attended the intervention.

Regarding pain characteristics, primary pain complaints included headache (35%), limb pain (nerve-based or musculoskeletal; 35%), abdominal pain (15%), and “other” pain problems (e.g., joint pain, chest pain; 15%). Duration of pain prior to study participation ranged from 3 months to 7 years, with an average pain duration of 26.2 months ($SD = 17.0$ months). Prior to the intervention, all participants reported pain daily or almost daily (with a range of 0–4 pain-free days in the previous 3 weeks based on 30 respondents with complete baseline pain diary data).

**Measures**

The following measures were collected within one month prior to participating in treatment and again one month post-intervention. Primary outcomes included visual analogue scale pain ratings, depressive symptoms, and school absence rates.

**Pain**

Two indicators of pain severity were collected. A 10-cm visual analogue scale (VAS) rating of “worst pain” over the previous week was obtained at baseline and again at
post-treatment follow-up. VAS pain ratings have been shown to be a reliable and valid measure of pain severity in adolescents (Varni & Thompson, 1985). Additional pain outcome data were obtained from daily pain diaries. Adolescents completed 3-week pain diaries daily prior to the intervention and again beginning immediately after treatment completion. They rated pain intensity four times daily (at meals and bedtime) using a 5-point numeric rating from 0 = “no pain” to 4 = “very severe pain.” These ratings were averaged to develop a pain index representing both frequency and intensity of pain. Averages were computed if at least 50% of ratings per week were complete. Similar diary ratings have been used in previous studies with good success (Logan & Scharff, 2005). Prospective pain diaries have been demonstrated to be more valid than retrospective ratings (Palermo, Valenzuela, & Stork, 2004) with three weeks providing sufficient data for reliable estimates of pain impact (Gil et al., 2000; Palermo et al., 2004). Although originally both VAS ratings and the daily diary Pain Index were conceptualized as primary outcome variables, extensive missing data on daily pain diaries limited analyses of pain index data to an exploratory basis in this report. However, VAS pain ratings do constitute a primary outcome.

Depressive Symptoms
Adolescents completed the Children’s Depression Inventory (CDI; Kovacs, 1985), a 27-item self-report measure of current depressive symptomatology. Items are rated on a 3-point scale from 0–2 and summed to obtain a total score and five subscale scores: Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia, and Negative Self Esteem. Higher scores indicate higher levels of depressive symptoms. The CDI has adequate reliability and validity (Kovacs, 1985). Cronbach’s alpha for the current sample was excellent, 0.96 for total scale score.

School Attendance
Official school attendance records were collected for the month prior to the date on which families completed questionnaires and again for the month immediately following the intervention. Information on full days absent, late arrivals, and early dismissals was collected. However, given the strong correlations among these three indicators at each time point (r’s = .75 to .95, p < .001), a variable indicating number of full days absent in the past month was considered the most straightforward representation of school attendance and was used in data analyses.

Additional exploratory indicators of school functioning, assessed at both time points, included:

Academic Performance
Operationalized as parent reports of adolescents’ average grades in the year prior to onset of the pain problem and average current grades (in 9-point multiple choice format from “Mostly A’s” to “Mostly F’s”);

Perceived Pain Interference
Adolescent and parent perceptions of the extent to which pain interfered with school attendance and performance. This was measured with two single item ratings, the first worded, “How much has pain interfered with your [your child’s] attendance at school?” and the second, “How much has pain interfered with your [your child’s] performance at school?” Responses were recorded in 10 cm visual analogue format with anchors of 0 = “did not interfere at all” to 10 = “interfered extremely.” For each respondent, the two items were averaged to form one score representing the extent to which pain interferes with school functioning.

Self-perceived Academic Competence
Using the 6-item “Scholastic” subscale from the Harter Self-Perception Profile for Adolescents (SPPA; Harter, 1988). Most participants completed this measure in its traditional format; participants recruited in the final 9 months of the study received an alternative format that has been shown to be equivalent to the original but easier to complete (Wichstrom, 1995). 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 were .80 for the original version and .84 for the revised format version.

Teacher Perceptions of Academic Competence
Adolescents designated 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), a 53-item scale assessing teacher perceptions of the student’s academic and social skills in the classroom setting. The subscale score for School Adjustment contains items assessing academic competence (e.g., “has good work habits”, “is personally well organized,”) and was used in data analyses. Items are answered on a 5-point scale from 1 = “Never” to 5 = “Frequently,” with high scores indicating better adjustment. Raw scores are converted to standard scores with a mean of 10 and standard deviation of three. Cronbach’s alpha for the School Adjustment subscale was .97.
Acceptability and Satisfaction with Intervention
Immediately upon completing treatment, adolescents and parents responded to multiple choice and open-ended items designed to capture perceptions of the intervention’s feasibility and satisfaction with treatment. Multiple choice items were adapted from the Helpfulness Questionnaire (Beardslee, 1990) which has been used in multiple treatment outcome studies including several for children with chronic physical conditions (Beardslee, 1990; Szigethy et al., 2007). Sample items on the adolescent version include, “I have made changes in how I think and act as a result of this treatment,” and “I would recommend this treatment to other adolescents with chronic pain.”. Sample items on the parent version include, “This treatment was a good way to handle my adolescent’s problem,” and “I would recommend this treatment to parents of other adolescents with chronic pain.”. Items were rated on a 5-point scale from “Strongly Disagree” to “Strongly Agree.”. Open-ended questions solicited perceptions of the strengths and weaknesses of the treatment program, suggestions for changes to the intervention, and barriers to participation.

Procedures
All study procedures were approved by the hospital’s institutional review board. Participants were recruited for the first phase of the study at the time of initial evaluation at the chronic pain clinic. Study participation also necessitated that the family consent to allow contact with schools for attendance records and teacher reports of school functioning. A separate consent form was used for this purpose and sent to schools along with requests for school data. Participants who met additional depressive symptom and school impairment inclusion criteria for the intervention were contacted by phone following their visit and scheduled into treatment groups on a rolling basis if they agreed to participate. One month after completing the last intervention session, families received a packet of follow-up questionnaires by mail which they completed and returned along with post-treatment pain diaries distributed to them at the final treatment session. Families received a small payment (US $50) upon receipt of their completed follow-up questionnaires.

Treatment
The manualized cognitive behavioral intervention consisted of 8 hours of treatment, delivered either in four 2-hour weekly sessions or in a one-day workshop format. A group context was utilized in order to make use of peer support (both for adolescents and parents) and to decrease the sense of isolation that many adolescents with chronic pain report experiencing. Groups were also deemed appropriate because the content of the intervention could be easily taught in this setting and the group afforded opportunities for skill rehearsal that could then be generalized to the school setting (e.g., role playing difficult interactions with peers).

All groups were held at the hospital-based pain clinic. The first two hours and final two hours of intervention were delivered in a conjoint parent-adolescent format. The middle four hours consisted of separate adolescent and parent groups. Group size ranged from three to eight families. Each intervention was led by a PhD psychologist and psychology postdoctoral fellow. For sessions involving separate parent and teen groups, each primary interventionist was assisted by an additional psychology trainee (intern or psychology fellow outside the pain clinic) or by a trained study research assistant who provided support but did not deliver intervention content. For those in the 4-week version of the intervention, any participant missing one session attended an individual makeup session prior to the next group meeting.

The theoretical framework with which the intervention was developed included a blend of cognitive-behavioral and social-learning theories. Although problem solving and increasing a sense of self-efficacy in the face of pain were goals of the treatment, the intervention also included acceptance-based strategies that emphasized a focus on engaging in “normal” adolescent functioning in spite of pain. Intervention goals included: (1) teaching behavioral coping skills to increase participants’ sense of self-efficacy in the face of pain; (2) altering patterns of negative thinking related to pain and school; (3) addressing the role of depressed mood in school impairment; (4) identifying perceived obstacles to school functioning (including depressive symptoms) and generating solutions to these obstacles; (5) working with parents to reduce inadvertent maintenance of pain-related disability; and (6) facilitating teen–parent partnership to improve school functioning. Table 1 provides a general overview of each session and the specific skills taught.

Data Analysis
In preliminary analyses, possible sample bias was explored via comparisons between intervention participants and treatment-eligible non-participants and between participants in the four-week versus one-day intervention formats. These group comparisons were conducted with t-tests for independent samples (for continuous variables) and chi-square analyses (for categorical variables). Patterns of missing data were also explored. Next, means and standard deviations were computed for all treatment outcome
variables. Treatment effects were examined via paired t-test comparisons of pre-treatment and post-treatment scores on the primary outcome variables of pain VAS ratings, CDI total T scores, and school absence rates, along with exploratory variables representing the pain index calculated from daily pain diaries, CDI subscale scores, and additional school functioning outcomes. The potential clinical significance of the intervention was assessed by calculating Cohen’s d effect sizes, comparing percentages of participants who endorsed clinically significant levels of depressive symptoms at baseline and after treatment, and quantifying changes in VAS pain severity ratings at these two time points.

Results
Preliminary Analyses

Intervention participants (n = 40, including participants with some missing data at follow-up) were compared to those who were eligible for the intervention but did not participate (n = 68). The groups were compared on levels of pain, depressive symptoms, and school functioning at baseline. Results show that the groups were equivalent on all variables except school absences. Intervention participants had more school absences at baseline compared to eligible families who declined participation [mean days absent for study participants = 7.9, mean days absent for non-participants = 4.5; t(106) = 2.58, p < .05].

To examine potential differences by type of intervention, we compared those who participated in four weekly intervention sessions (n = 20) versus those who attended the full day workshop (n = 20). There were no statistically significant differences in the variables of interest (depressive symptoms, pain scores, and school attendance at pre- and post-treatment, total treatment satisfaction ratings). Regarding rates of completion of follow-up questionnaires, participants from the 4-week treatment format had significantly higher rates of completion of post-treatment pain diaries compared to participants in the one-day format (12 of 20 completed diaries versus 5 of 20 completed diaries; χ² = 5.01, df = 1, p < .05). When missing data was examined in terms of rates of complete data on two more of the three primary outcome variables (VAS pain scores, CDI total scores, and school absence rates), there were no differences between groups types, with 10% of participants from each group format missing post-treatment data on two or more of the three primary outcome variables.

Although 95% of participants (n = 38) returned their follow-up assessment packets, missing data varied across measures. Post-treatment CDI scores were available for 29 participants (72.5%), VAS pain scores were available for 23 participants (57.5%), and school attendance data were
available for 31 participants (77.5%). We examined differences between those intervention participants who were missing follow-up data on two or more primary outcome variables (n = 4) and participants who had more complete follow-up data. No differences were found on baseline depressive symptoms, baseline VAS pain scores, baseline school attendance, or total treatment satisfaction ratings. For all subsequent analyses, all available data were analyzed and relevant n’s reported.

**Treatment Acceptability and Satisfaction**

Participant attendance and their ratings on the Helpfulness Questionnaire were used to assess treatment acceptability and satisfaction. The overall low participation rate of 30.1% indicates that not everyone who was eligible for the intervention was able or willing to participate. However, among those who began the treatment, attendance was excellent, with all families completing eight hours of treatment. Responses to the modified Helpfulness Questionnaire demonstrate that both adolescents and parents perceived the treatment as helpful, relatively easy to engage in, and lacking in any negative effects. Among participants, all but three adolescents and one parent would recommend the group to others with chronic pain. On a 0–5 rating scale with 5 indicating highest satisfaction, adolescents’ mean total score was 4.1 (SD = 0.41), with item means ranging from 3.5 (for “The group helped me reach goals I have for myself”) to 4.6 (for “The group leaders were helpful and supportive”). Parents’ mean total score was 4.4 (SD = 0.34) with item means ranging from 4.0 (for “This treatment should be effective in changing my adolescent’s problem”) to 4.8 (for “This treatment would not have bad side effects” and “I would recommend this group to other parents of adolescents with chronic pain”).

An item assessing perceived barriers to treatment (“It was hard for me to attend the group sessions because of my schedule or other reasons”) received average ratings of 2.1 from adolescents and 2.6 from parents. In open-ended responses both adolescents and parents commented on the usefulness of the skills they learned, their increased confidence in their ability to function in school (or to support the adolescent to function in school) despite pain, and the benefits of participating in a group-based treatment that offered the opportunity to gain support from peers facing similar challenges. Some participants noted that they would have liked a longer treatment program, and some recommended adding “booster” sessions following the treatment so that group members could return to share their progress with the leaders and other group members. No adverse events were reported as a result of participation in the intervention.

**Analyses of Change from Baseline to Post-treatment: Primary Outcomes**

**Depressive symptoms**

On the CDI total depression scale, study participants as a group fell within the normative range at both baseline and follow-up (see Table II). For pre–post comparisons, one outlier data-point was removed, representing one participant whose depressive symptoms increased over time for reasons that appeared unrelated to her pain condition. At baseline, 20.5% of participants fell in the “clinically significant” range of total CDI scores (T-score ≥ 63); 14.3% of participants who completed the measure post-treatment fell in this range (chi-square = 6.22, p = 0.01). However, a comparison of mean total CDI scores between pre- and post-treatment time points, while in the expected direction, was not statistically significant (Refer to Table II).

**Pain**

The primary pain outcome, VAS ratings of worst pain in the past week, showed a significant decline from baseline to post-treatment follow-up (see Table II). Thirty-nine percent of participants with analyzable data (n = 9) reported decreases of two points or greater on 0–10 VAS ratings of worst pain at follow-up, a change that is considered clinically meaningful (Dworkin et al., 2008).

**School Attendance**

Participants were missing an average of almost 8 school days per month (i.e., out of 20 school days), which significantly decreased to approximately 4 days per month after treatment (see Table II).

**Analysis of Change from Baseline to Post-Treatment: Exploratory Outcomes**

Although the study was not powered for additional analyses of changes post-treatment, several additional outcomes were explored to inform future directions for refining and revising the treatment (see Table II for complete results). To investigate patterns of depressive symptoms more closely, exploratory analyses of individual CDI subscale were conducted. As a group, participants did attain statistically significant improvements on subscales measuring Negative Mood and Negative Self-Esteem following treatment. No significant differences were found on subscales measuring interpersonal problems, ineffectiveness, or anhedonia. Regarding exploratory pain severity outcomes, mean Pain Index scores on the daily pain diaries decreased significantly from baseline to post-treatment for participants who completed the measure at both time points.
### Table II. Pre- and Post-treatment Means, T Scores, and Effect Sizes (with Sample Size) of Primary and Exploratory Outcome Variables

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Pre-Tx M (SD)</th>
<th>Post-Tx M (SD)</th>
<th>T</th>
<th>p</th>
<th>ES</th>
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<tbody>
<tr>
<td><strong>Primary Outcomes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CDI total T score</td>
<td>28</td>
<td>59.4 (8.7)</td>
<td>55.9 (14.2)</td>
<td>1.87</td>
<td>.072</td>
<td>0.30</td>
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<tr>
<td>Worst pain VAS</td>
<td>23</td>
<td>8.6 (1.5)</td>
<td>7.4 (2.7)</td>
<td>2.21</td>
<td>.038</td>
<td>0.32</td>
</tr>
<tr>
<td>Days absent past month</td>
<td>31</td>
<td>7.9 (6.7)</td>
<td>4.3 (5.5)</td>
<td>3.63</td>
<td>.001</td>
<td>0.59</td>
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<tr>
<td><strong>Exploratory Outcomes</strong></td>
<td></td>
<td></td>
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<tr>
<td>CDI Negative Mood T</td>
<td>28</td>
<td>59.8 (11.1)</td>
<td>54.7 (14.6)</td>
<td>2.09</td>
<td>.046</td>
<td>0.39</td>
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<tr>
<td>CDI Interpersonal Problems T</td>
<td>28</td>
<td>50.6 (11.8)</td>
<td>48.6 (12.4)</td>
<td>1.00</td>
<td>.33</td>
<td>0.17</td>
</tr>
<tr>
<td>CDI Ineffectiveness T</td>
<td>28</td>
<td>51.9 (9.3)</td>
<td>55.1 (15.2)</td>
<td>1.56</td>
<td>.13</td>
<td>-0.25</td>
</tr>
<tr>
<td>CDI Anhedonia T</td>
<td>28</td>
<td>61.8 (8.4)</td>
<td>58.6 (11.7)</td>
<td>1.45</td>
<td>.16</td>
<td>0.31</td>
</tr>
<tr>
<td>CDI Neg. Self-esteem T</td>
<td>28</td>
<td>53.7 (8.3)</td>
<td>50.0 (12.3)</td>
<td>2.85</td>
<td>.008</td>
<td>0.35</td>
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<tr>
<td>Pain Index (pain diary)</td>
<td>15</td>
<td>2.4 (0.9)</td>
<td>2.0 (0.9)</td>
<td>2.50</td>
<td>.026</td>
<td>0.44</td>
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<tr>
<td>Perceived pain interference (adol. rating)</td>
<td>27</td>
<td>6.9 (3.0)</td>
<td>5.2 (3.2)</td>
<td>2.34</td>
<td>.027</td>
<td>0.55</td>
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<tr>
<td>Perceived pain interference (parent rating)</td>
<td>29</td>
<td>6.7 (2.9)</td>
<td>5.2 (3.3)</td>
<td>2.40</td>
<td>.023</td>
<td>0.48</td>
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<td>Grade change</td>
<td>22</td>
<td>1.4 (1.4)</td>
<td>1.1 (1.8)</td>
<td>0.90</td>
<td>.38</td>
<td>0.19</td>
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<td>Academic competence (self report)</td>
<td>28</td>
<td>3.0 (.49)</td>
<td>2.9 (.57)</td>
<td>0.27</td>
<td>.79</td>
<td>0.19</td>
</tr>
<tr>
<td>Academic competence (teacher report)</td>
<td>20</td>
<td>12.9 (2.9)</td>
<td>11.9 (2.6)</td>
<td>1.95</td>
<td>.091</td>
<td>0.36</td>
</tr>
</tbody>
</table>

Note: Days absent in past month reflects number of school days missed out of the total number of days the school was open in the past month, with maximum value = 20.
Pain Index = Average of four daily diary ratings of pain intensity on a 0–4 numeric scale.
*One outlying datapoint was removed from these analyses.

Beyond school absence rates, several other school functioning outcomes were explored. Adolescent ratings of the extent to which pain interfered with school functioning decreased significantly with treatment [baseline $M = 6.9$, $SD = 3.0$ to post-treatment $M = 5.2$, $SD = 3.2$; $t(26) = 2.34$, $p < .05$; $d = 0.55$]. Similarly, parent ratings of pain interference with school functioning decreased with treatment [baseline $M = 6.7$, $SD = 2.9$ to post-treatment $M = 5.2$, $SD = 3.3$; $t(28) = 2.40$, $p < .05$; $d = 0.49$]. Although academic performance—as indicated by parent report of adolescents’ grades—showed a slight shift in the positive direction at one month post-treatment compared to immediately prior to treatment, this change was not statistically significant [$t(28) = -0.90$, ns, $d = 0.17$].

Turning to academic competence, there were no statistically significant changes in adolescent self-perceptions or teacher ratings of academic competence following treatment. It is instructive to note that mean ratings of academic competence by both adolescents and teachers fell within the normative range prior to treatment.

### Discussion

The CPS program is a cognitive behavioral intervention for adolescents with chronic pain and depressive symptoms, the primary goal of which is to improve school functioning. Specific components of the CPS program include an emphasis on improving functional abilities, helping adolescents to identify links between stress and pain in the school setting and learn to manage both pain and school stress, providing tools for coping with pain and depressive symptoms, learning the cognitive model and using it to alter negative thoughts related to pain and school, teaching parents ways to encourage adaptive functioning in the school setting in spite of pain and depressive symptoms, and helping adolescents and parents to work together as teams to manage symptomatic distress and improve school functioning.

The initial evaluation of this treatment yielded some positive results. Participating adolescents and parents reported satisfaction with the intervention, indicating that those who were willing and able to participate in the intervention found it to be helpful, safe, and relatively easy to attend. From the perspective of the study team, the treatment was feasible to implement in terms of time, safety, and staffing resources. The largest limitation to the intervention’s feasibility was the low rate of recruitment into the treatment groups. Some families refused participation because they did not want to permit contact with their child’s school. Although this information was not collected systematically, it is also possible that the focus of the treatment and the resulting inclusion criteria were too narrowly defined. By limiting eligibility to adolescents with depressive symptoms, we targeted a group who were by definition difficult to motivate to engage in treatment (e.g., Lewinsohn, Rohde, Klein, & Seeley, 1999). It may have been premature at this stage to target the treatment only to...
adolescents with depressive symptoms; a better approach may be to offer the treatment to all adolescents with chronic pain and assess the role that depressive symptoms play in the extent to which individuals benefit from the intervention. By contrast, our school impairment inclusion criteria (assessed by a single question about whether pain currently interfered with school in any way), may have been overly broad, capturing adolescents who did not feel that school functioning was truly a problem for which they needed treatment.

Among those who were eligible for treatment and consented to all aspects of the study, scheduling was a major hurdle to participation. This problem appeared largely to lie in the difficulty coordinating multiple families to participate in a group treatment at a mutually convenient time. To address this, we expanded the treatment model mid-study in order to deliver the treatment in two formats (i.e., four weekly late afternoon/evening sessions and an all-day weekend workshop). This allowed more flexibility in accommodating families’ schedules and did improve our enrollment rate to some extent. Based on our analyses, this alternative format did not appear to have an impact on treatment outcomes, with the exception of a reduced likelihood of completing the post-treatment pain diary. This is a somewhat surprising finding, as participants in the all-day workshop format did not have the opportunity to consolidate gains or engage in homework practice during the treatment. Further comparison of these treatment approaches in a larger sample and with a longer follow-up (to assess whether differences arise in longer term outcomes or maintenance of gains) is warranted before concluding that these two intervention formats are truly equivalent.

Clearly, these recruitment challenges may have resulted in sample bias, although it is noteworthy that our examination of differences revealed that adolescents who missed more school (and thus may have been more in need of intervention) were more likely to enroll in the CPS program. The recruitment rate also underscores the difficulty coordinating multiple families to participate in a group treatment at a mutually convenient time. To address this, we expanded the treatment model mid-study in order to deliver the treatment in two formats (i.e., four weekly late afternoon/evening sessions and an all-day weekend workshop). This allowed more flexibility in accommodating families’ schedules and did improve our enrollment rate to some extent. Based on our analyses, this alternative format did not appear to have an impact on treatment outcomes, with the exception of a reduced likelihood of completing the post-treatment pain diary. This is a somewhat surprising finding, as participants in the all-day workshop format did not have the opportunity to consolidate gains or engage in homework practice during the treatment. Further comparison of these treatment approaches in a larger sample and with a longer follow-up (to assess whether differences arise in longer term outcomes or maintenance of gains) is warranted before concluding that these two intervention formats are truly equivalent.

Regarding support for preliminary efficacy of the intervention, compared to their status at baseline (just prior to undergoing treatment) adolescents displayed improved school functioning one month after treatment participation, as indicated by decreased school absence rates. In addition, participants reported significantly less pain following treatment participation. Effect size estimates indicate that the reductions in school absences and pain ratings were in the medium range (Cohen, 1988), providing some support for the clinical significance of these changes. Further support for the clinical meaningfulness of these changes can be drawn from the finding that 39% of responding participants reported a decrease of two points or more on a 0–10 visual analogue scale assessing their worst pain following the intervention.

Evidence of change in depressive symptoms after treatment was statistically weaker, with no significant change in total CDI scores after treatment. Exploring changes in specific subscales of the CDI shows some small but statistically significant changes in Negative Mood and Negative Self Esteem symptoms. The percentage of participants falling in the clinically significant range of the CDI did decrease from 20.5% to 14.3% with treatment. Depressive symptoms are common among youth with chronic pain, but symptoms are typically sub-clinical, with relatively few pediatric chronic pain sufferers meeting full diagnostic criteria for depressive disorders (Campo et al., 2002; Kashikar-Zuck et al., 2001; Varni et al., 1996; Williamson, Walters, & Shaffer, 2002). The current study indicates that even when depressive symptoms are not severe enough to signal the presence of a depressive disorder, addressing and reducing depressive symptoms may be one important target area to include in attempts to help adolescents with chronic pain improve their functioning in the school context. However, as noted above, adolescent pain sufferers without depressive symptoms may also benefit from treatment aimed at improving school functioning, a possibility that merits further study.

Our preliminary explorations of other indicators of school functioning beyond absence rates yielded mixed results in this small sample. Both adolescents and parents did perceive pain to interfere less with school attendance and performance following treatment. However, students’ grades did not change following treatment. This may have been due to the short window between baseline and follow-up, which may not have allowed sufficient time for improved academic performance to manifest. We also failed to observe changes in self-perceived academic competence. Both reporters viewed participants as relatively academically competent at baseline, so there may have been no room for improvement. Perhaps existing measures...
of academic competence, which typically assess whether students follow directions, are organized, and so forth, do not capture the problems that adolescents with chronic pain experience in the school setting.

Although the effects of individual elements of the intervention were not assessed independently, it is important to note that the inclusion of parents in this treatment is a strength of the protocol. Incorporating parents in this type of treatment aligns with the principles of family-centered care and likely played a role in the treatment success. Anecdotally, many parent participants expressed uncertainty about how to respond when adolescents complained of pain and refused to go to school, and parents appeared eager for education and strategies to help them negotiate this situation. The importance of including parents in the treatment of pediatric chronic pain has been noted in the literature (Guite, Logan, McCue, Sherry, & Rose, 2009; Palermo & Chambers, 2005), but few interventions with parent components exist (for exceptions see Eccleston et al., 2003; Palermo et al., 2009; Robins et al., 2005; Sanders et al., 1994). Helping parents understand the goals of functional approaches to pain management and working with them to respond adaptively when the adolescent struggles with pain in the school context are important steps toward the aim of improving school functioning in youth with chronic pain. A direction for future research is to assess both the extent of parental behavior change following interventions such as this one and the strength of associations between parental changes and adolescent functional improvements. It would also be useful to gather more information about the participating parents (including both demographic and psychological characteristics) in order to assess the influence of parent characteristics (both malleable and non-malleable) on intervention outcomes.

The results of the study must be taken in the context of its limitations. This was a first step in the development of treatment techniques to address pain, depression, and school functioning. Without a control group and randomized assignment, it is not possible to know whether the changes in symptoms and functioning can truly be attributed to participation in the intervention. The design did not allow us to isolate specific aspects of this treatment from non-specific effects, such as the role of peer support in the group setting, which may have been a potent contributor to the effects of the treatment given the isolating nature of pediatric chronic pain. Future larger scales studies are needed to address this question. Additionally, we lack information regarding normative patterns of school attendance in this age group and how these shift over time, which would improve our understanding of the patterns observed here. The follow-up window of one month may have been too short to detect some treatment effects. Similarly, the dose of treatment was small, as reflected in participant feedback about the need for additional sessions. A larger treatment dose may have yielded greater behavioral changes. The loss of power in our final sample due to missing data may have introduced Type II error in our statistical analyses. Finally, sampling bias and group homogeneity on a number of characteristics (e.g., highly educated parents, overwhelmingly female adolescent participants, exclusion of home schooled adolescents) limit the conclusions that can be drawn about treatment generalizability. Of note, the elevated proportion of female participants in this study, even in comparison to typically predominantly female pediatric chronic pain samples, was likely due to the added inclusion criteria of depressive symptoms which are more common among adolescent girls than boys. It is also important to note that those who participated in the treatment were likely to be particularly highly motivated to address their school functioning problems, which may have played a role in the positive outcomes obtained.

This preliminary study raises important questions for future research. We have speculated that the dose of treatment was too short, but more research is needed to determine effective treatment doses, possible added benefits of booster sessions, etc. Specific to the school functioning focus of this intervention, much remains unknown about the influence that schools themselves may have upon levels of school impairment in adolescents with chronic pain. For example, currently schools implement a range of accommodations designed to help children with chronic pain succeed in the school context, but we know little about how effective various accommodations are at promoting improved school functioning. An intriguing question for further study is whether interventions aimed at improving school functioning are more effective if school personnel are actively involved in the treatment. Ultimately, larger randomized controlled studies with longer follow-up periods that incorporate intervention components directed at adolescents, their parents, and school personnel can help us understand how best to optimize functional outcomes for youth with chronic pain.

In terms of the clinical implications of this work, once the effects of this type of treatment have been clearly established, the treatment can be adapted to work within a number of venues, from outpatient chronic pain services to inpatient and day hospital multidisciplinary rehabilitation programs to in-school settings. Helping adolescents with pain to function better in school may avoid prolonged patterns of disability into adulthood, reduce costly special
education services, and have a powerful effect on helping these adolescents feel more in control of their pain problems. By improving school functioning, youth who have been disabled by chronic pain and depressive symptoms may take an important step toward regaining a healthy adolescence.

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