Relations Between Pain Characteristics, Child and Parent Variables, and School Functioning in Adolescents With Chronic Headache: A Comparison of Tension-Type Headache and Migraine

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Objective To assess for differences in headache characteristics and psychosocial factors based on headache diagnosis, and to evaluate whether headache diagnosis moderates relations between psychosocial factors and school difficulties. Methods Retrospective chart review was conducted with 262 adolescents with chronic tension-type headache (TTH; N = 153) and migraine evaluated at a pediatric headache clinic. Adolescents completed measures of anxiety, depression, and pain coping. Parents completed a measure of parental protective behavior and school functioning. Results Adolescents with TTH reported greater depression symptoms, and their parents endorsed greater school difficulties, whereas parents of adolescents with migraine reported more protective parenting. Protective parenting was positively associated with school difficulties in both groups, but the relation was significantly stronger in adolescents with TTH. Headache duration and depression symptoms were significant predictors of school functioning in both groups. Conclusions Headache duration and depression may impact school functioning independent of headache diagnosis. Protective parenting, in particular, seems to be linked to school-related disability in adolescents with TTH, and this link may be important to consider in assessment and treatment.

Key words adolescents; chronic tension-type headache; migraine; protective parenting; school functioning.

Pediatric Headache: The Scope of the Problem

Headache is the most common pain complaint in pediatrics (Perquin et al., 2000). Results of a recent systematic review indicate that 60% of children and adolescents world-wide experience headaches of varying frequency and duration (Abu-Arafeh, Razak, Sivaraman, & Graham, 2010). Tension-type headache (TTH) and migraine are the most frequent primary headache diagnoses, with population-based studies reporting a prevalence of ~15–20% for TTH and 10% for migraine in adolescents (e.g., Kröner-Herwig, Heinrich, & Morris, 2007). Headache accounts for a substantial proportion of visits to pediatric providers (Freed, Nahra, Venus, Schech, & Wheeler, 2005), and unfortunately, the majority of pediatric headache patients continue to exhibit headaches up to 40 years of age after their initial presentation (Bille, 1997). Thus, headaches are a common and persistent problem in children and adolescents.

Research on adults with chronic pain often focuses on workplace disability, and school is analogous to the workplace for children and adolescents. School is the primary domain for the development of cognitive, social, and community-related skills; thus, school impairment related to chronic pain may have pervasive negative effects on child and adolescent development (Eccleston, Crombez, Scotford, Clinch, & Connell, 2004). In addition to the immediate negative effects on cognitive and social development, school impairment can result in the need for...
expensive special education services and can increase the risk for long-term disability, including school failure (Shapiro & Manz, 2004). Thus, it is imperative that school difficulties be addressed to prevent negative immediate and long-term effects on development.

The Impact on School Functioning

Difficulties with school functioning, particularly attendance, are well documented in the broader pediatric chronic pain literature (Sato et al., 2007). For example, Logan et al. (2008) found high rates of school absences in a sample of youth with diverse chronic pain complaints, with youth with episodic pain (e.g., headaches, abdominal pain) exhibiting greater school absences than youth with persistent pain (e.g., neuropathic pain). Youth with functional abdominal pain demonstrate more school absences and general functional disability than healthy peers, even several years after treatment (Walker, Garber, & Van Slyke, 1995). Similarly, youth with inflammatory bowel disease exhibited greater school absences than healthy peers, and internalizing symptoms were more predictive of absences than disease-related variables (Mackner, Bickmeier, & Crandall, 2012). Frequent school absences and lower academic achievement have been found in youth with sickle cell disease compared with healthy siblings, and absences were not correlated with low achievement, suggesting another process may impact school attendance in this population (Ogunfowora, Olanrewaju, & Akenzua, 2005). Thus, although pediatric chronic pain negatively impacts school attendance across diagnoses, different factors have been correlated with school absences in different diagnostic groups.

Chronic headaches may be particularly detrimental to a child’s ability to function in school (Powers, Gilman, & Hershey, 2006). The cognitive strain of attending school may exacerbate headaches, making school attendance especially challenging. Even when children are able to attend school, headaches may interfere in their ability to complete schoolwork, resulting in decline in performance. Stress related to frequent absences, make-up work, and declining performance may aggravate headaches further, resulting in an escalating cycle of pain- and school-related disability. Indeed, research indicates that children with chronic headaches exhibit greater school absences than children with other chronic illnesses (Newacheck & Taylor, 1992). Adolescents with TTH and migraine may perceive the demands of school to be greater than their headache-free peers (Milde-Busch et al., 2011), resulting in increased school stress, headaches, and absences (Newacheck & Taylor, 1992). Some evidence suggests that migraines are particularly detrimental to school functioning. Migraine episodes have been linked to the timing of examinations and homework quantity (Bener, Uduman, & Qassimi, 2000), and children with migraine are absent from school because of their headaches more often than children with TTH or healthy peers (Laurell, Larsson, & Eeg-Olofsson, 2005). School policies related to illness may also play a role, with children with migraines potentially sent home from school more frequently than children with TTH because of associated symptoms of migraine (e.g., vomiting). Thus, it may be that different factors account for school difficulties in adolescents with migraine and TTH, consistent with findings in the broader pediatric chronic pain literature, indicating that correlates of school difficulties differ by diagnostic group (e.g., Logan, Simons, Stein, & Chastain, 2008; Ogunfowora et al., 2005). It will be important to elucidate the specific risk factors associated with school difficulties in children and adolescents with chronic headache, and whether risk factors differ based on headache diagnosis, to appropriately tailor interventions.

Psychosocial Correlates of Disability

According to the biopsychosocial model (Engel, 1977), chronic pain and associated disability are centrally mediated phenomenon, shaped jointly by physiologic, psychological, social, and environmental forces (Turk, 1996; Varni, 1989). The physiologic aspect of different headache diagnoses differs, with migraines involving a neurovascular process resulting in blood vessel dilation and activation of nociceptive afferent processes, and TTH possibly involving muscle or psychological tension. These physiologic differences may be associated with differences in the ability to attend and to function in school in these two populations. Similarly, differences in psychological, social, and environmental risk factors in adolescents with TTH or migraine may be associated with differences in school functioning in these two populations. For example, our clinical experience suggests that teacher reactions to pain episodes may differ depending on the type of headache, with teachers tending to react more dismissively or critically to youth with chronic TTH, but more solicitously to youth with migraines. These different teacher responses may result in differences in school attendance and performance in these groups.

Comorbid anxiety and depression symptoms have been associated with poorer overall functioning in youth with diverse chronic pain complaints (Kaczynski, Simons,
& Claar, 2011; Kashikar-Zuck, Goldschneider, Powers, Vaught, & Hershey, 2001), and depression in particular has been found to be related to school difficulties in youth with chronic headache independent of headache diagnosis and severity (Breuner, Smith, & Womack, 2004). Clinic-based research suggests that although pediatric patients with both migraine and TTH have elevated symptoms of anxiety and depression compared with healthy control subjects, patients with TTH have greater anxiety and depression symptoms than patients with migraine (Mazzone, Vitiello, Incorpora, & Mazzone, 2006). Anxiety and depression symptoms are associated with school difficulties in adolescents independent of health status (Derdikman-Eiron et al., 2011), and the combination of anxiety and depression symptoms and chronic headaches is likely a particular challenge to school performance and attendance. More research is needed to better understand the role of anxiety and depression symptoms in school functioning in youth with migraine compared with TTH.

Adolescents with chronic headaches and comorbid anxiety and depression symptoms may be more likely to cope with their pain and emotional distress passively (Kaczynski et al., 2011), which may exacerbate school difficulties (Eccleston et al., 2004). The use of passive coping strategies, such as rest, self-isolation, and activity avoidance, may be particularly detrimental in school, as an adolescent may choose to stay home from school to rest and avoid the cognitive and emotional demands of school. Some research suggests that youth with chronic TTH or migraine may be more likely than headache-free peers to use passive coping strategies to manage pain and stress (Kröner-Herwig, Morris, & Heinrich, 2008), independent of their emotional functioning. It is unclear whether passive coping impacts school functioning differently in adolescents with different headache diagnoses when the contribution of comorbid internalizing symptoms is taken into account.

In addition to psychological factors, social factors also contribute to functioning in adolescents with chronic pain, according to the biopsychosocial model (Turk, 1996). The way parents respond to their child’s chronic headaches may be particularly relevant to school functioning, as adolescents cannot independently limit school attendance without parental consent. Parents who respond to their child’s headache complaints with overly solicitous protective behavior (e.g., allowing their child to rest) may be inadvertently reinforcing pain behavior by rewarding their child’s passive coping strategies while simultaneously allowing their child to avoid a potentially stressful school environment (Chambers, Craig, & Bennett, 2002; Claar, Simons, & Logan, 2008; Logan & Scharff, 2005). Indeed, protective parental responses have been found to be associated with increased disability in general in youth with chronic headaches (Claar et al., 2008; Kaczynski, Claar, & Logan, 2009). Protective parental responses to their child’s headache in the context of comorbid anxiety and depression symptoms may be particularly detrimental to school functioning (Claar et al., 2008), as parents may believe that their child is especially vulnerable and unable to function and may, therefore, limit functioning even more. Interestingly, some research with a diverse pediatric chronic pain sample suggests that parents respond more protectively when their child engages in less passive coping strategies (Simons, Claar, & Logan, 2008), suggesting that parents may override a child’s attempts to function adaptively, inadvertently promoting greater disability. Because migraine may be considered by parents to be intense and is often associated with symptoms that may be particularly problematic in the school setting (e.g., vomiting, photophobia), protective parenting responses may be more frequent in youth with migraine than TTH. It is our clinical experience that parents often respond more protectively towards their child when there is a migraine diagnosis, further impacting school functioning in these youth. No research could be identified, however, evaluating whether parental responses impact school functioning differently in these two populations.

The Current Study

The current cross-sectional study was designed as a preliminary effort to evaluate which individual and parenting variables have a unique relation to school functioning in adolescents with chronic migraine or TTH when other psychosocial variables are taken into account. In addition, we assessed for differences in headache characteristics and psychosocial variables based on headache diagnosis, and whether headache diagnosis moderates associations between psychosocial variables and school functioning in a clinic-based sample of adolescents. We expected that each individual and parenting variable would be independently linked to school functioning. Based on previous research showing greater comorbid anxiety and depression symptoms in adolescents with TTH compared with migraine (Mazzone et al., 2006) and the negative impact of comorbid internalizing symptoms on school functioning in youth with chronic headache (Breuner et al., 2004), we predicted that youth with TTH would exhibit greater symptoms of anxiety and depression than youth with migraine, and that these symptoms would be more strongly
associated with school difficulties in youth with TTH than migraine. We expected that in both groups, passive coping would be elevated and would be associated with school difficulties, consistent with research showing that youth with TTH and migraine are more likely to use passive coping strategies than headache-free peers (Kröner-Herwig et al., 2008). Finally, we predicted that parents of youth with migraine would report more protective responses, and that these parenting behaviors would be more strongly linked to school difficulties in youth with migraines than TTH, based on our clinical experience that parents of youth with migraines tend to exhibit greater protective responses; thus, their child’s school functioning may be more impaired. Additional analyses were conducted to evaluate whether psychosocial variables in combination were related to school difficulties; given the exploratory nature of these analyses, no hypotheses were proposed.

Method
Sample
Two hundred sixty-two patients aged 11–17 years (mean 14.7 years, SD = 1.6) who underwent a multidisciplinary evaluation at a tertiary headache clinic in a large urban northeast pediatric hospital between October 2009 and November 2011 were included in this study. Our clinic population for this timeframe includes patients with TTH (40.4%), migraine (28.8%), both TTH and migraine (19.5%), and other headaches (e.g., trigeminal neuralgia, cluster headaches; 11.3%). Only patients with a primary diagnosis of TTH (N = 153) or migraine (N = 109) were included in this study for diagnostic clarity in evaluating whether headache diagnosis moderates associations between psychosocial variables and school functioning. Patients attending regular school full-time (69.9%), part-time (24.9), or receiving home-schooling or home-bound education (5.6%) were included to represent the full range of educational circumstances encountered in our clinic population. The sample was predominantly Caucasian (89.6%) and female (68.5%), representative of patients seen in the clinic. At the time of the evaluation, patients’ mean duration of pain was >2 years, M = 25.7 months (SD = 25.9). The majority of parents were married (76.8%) and well educated (i.e., college graduate or above: 66.1% of mothers and 63.0% of fathers).

Procedure
Approval from the hospital’s Institutional Review Board was obtained before conducting the retrospective chart review. Questionnaires were mailed to families before the child’s multidisciplinary headache clinic evaluation. Parents and adolescents were asked to complete the questionnaires individually and return them on the date of the evaluation. Questionnaires were reviewed by a clinical psychologist for completeness and were returned to the parent or adolescent for completion if needed. Adolescents then underwent a multidisciplinary evaluation by a pediatric neurologist and clinical psychologist. The neurologist, who specializes in diagnosing and treating pediatric headache, assigned the headache diagnosis based on International Headache Classification (ICHD-II) criteria. Specifically, TTH was defined as episodic or persistent pain, which is typically bilateral, pressing or tightening in quality, of mild to moderate intensity, possibly with photophobia or phonophobia but without associated nausea or vomiting. Migraine was defined as episodic pain that is unilateral, pulsating in quality, of moderate to severe intensity, aggravated by routine physical activity, and associated with nausea and/or photophobia and phonophobia.

Measures
Demographics
Basic demographic (e.g., age, gender) and medical information (e.g., diagnosis) were collected from a review of patients’ medical records.

Headache Characteristics
Patient-reported ratings of headache frequency, duration, and intensity were obtained during the evaluation with the psychologist. Headache frequency was coded from 0 (never) to 7 (daily). Headache duration was coded from 0 (none) to 8 (constant). Headache intensity was coded from 0 (no pain) to 10 (worst pain experienced).

Revised Children’s Manifest Anxiety Scale
The Revised Children’s Manifest Anxiety Scale (RCMAS) (Reynolds & Richmond, 1978; Reynolds & Bigler 1997) is a 37-item yes/no self-report questionnaire that assesses symptoms of anxiety. Total anxiety scores are calculated by summing all items to which the child responded “yes” with the exception of the seven lie scale items. Total raw scores range from 0 to 28, with higher scores indicating higher levels of anxiety. The RCMAS is a well-validated and reliable measure of anxiety for children aged 7–17 years (Reynolds & Richmond, 1978; Reynolds & Bigler 1997). α reliability for this sample was adequate (α = .91). Raw scores were used for analyses.
The Children’s Depression Inventory
The Children’s Depression Inventory contains 27 self-report items that assess depressive symptoms (Kovacs, 1981, 1992). Items are rated on a 3-point scale and summed to obtain a total score. Total raw scores range from 0 to 54, with higher scores indicating higher levels of depressive symptoms. The Children’s Depression Inventory has been found to have adequate reliability and validity for children aged 7–17 years (Saylor, Finch, Spirito, & Bennett, 1984). \( \alpha \) reliability for this sample was adequate (\( \alpha = .90 \)). Raw scores were used for analyses.

Pain Response Inventory
The Pain Response Inventory (Walker, Smith, Garber, & Van Slyke, 1997) is a child-report measure of pain coping strategies that comprises three higher-order composite scales: passive coping (15 items), active coping (16 items), and accommodative coping (16 items). Only the passive coping subscale was used for this study, based on past research with this measure showing that only passive coping is linked with functional outcomes in pediatric chronic pain, whereas active and accommodative coping are generally not (e.g., Kaczynski et al., 2011). Passive coping strategies include self-isolation, activity restriction, and catastrophizing. Children report the frequency with which they use different coping strategies on a 5-point scale ranging from 0 (never) to 4 (always). A total score is computed by taking the average of the item scores, and higher scores indicate higher levels of passive coping. The Pain Response Inventory has demonstrated adequate validity and reliability (Walker et al., 1997). \( \alpha \) reliability for the passive coping subscale for this sample was acceptable: .90.

Adult Responses to Children’s Symptoms
The Adult Responses to Children’s Symptoms (ARCS) (Van Slyke & Walker, 2006) is a parent-report measure that includes three subscales assessing parents’ responses to their children’s pain: parental protectiveness, minimization of pain, and encouraging and monitoring responses. For the current study, only the protect scale was used (16 items, \( \alpha = .80 \)), as previous research validating this measure has shown that only the protect scale, but not the minimizing or encouraging/monitoring scales, is associated with psychosocial outcomes in pediatric chronic pain samples (Claar, Guite, Kaczynski, & Logan, 2010). Items on the protect scale include giving the child special attention and limiting the child’s normal activities. Although this scale includes little school-specific content, it was considered a good general measure of protective parenting responses. Responses are rated on a 5-point scale ranging from 0 (never) to 4 (always). A total score is computed by taking the average of the item scores, and higher scores indicated greater levels of protective parenting. The ARCS has been developed and validated in parents of children aged 8–18 years (Van Slyke & Walker, 2006). The ARCS was completed by one parent, typically mothers, although data on parent gender were not collected.

PedsQL School Functioning Scale
The PedsQL School Functioning scale (Varni, Seid, & Kurtin, 2001) is a 5-item subscale of the PedsQL that assesses school functioning in the past month. To decrease shared method variance because of the same reported completing most measures, parents completed this measure to report on their child’s school functioning. Although this measure is not ideal, as it combines school attendance with the ability to function at school, the PedsQL is the most commonly used standardized measure of child functioning in the context of illness and/or pain, and the School Functioning subscale is regularly used as a measure of overall school functioning (Gorodzinsky, Hainsworth, & Weisman, 2011). In addition, for the purposes of our clinic-based assessment, the PedsQL was considered the most suitable measure because of its brevity and breadth. Parent and child reports of school functioning have been found to be highly correlated; therefore, parent-report was considered an acceptable proxy for child self-report in this study (Logan et al., 2008). Because we originally administered this measure for clinical purposes, we had modified the timeframe covered by the questionnaire to 3 months to assess our patients’ school functioning during the current school term. Thus, in the current study, the stem for each item was, “In the past 3 months, how much of a problem have you had with…” Items on the school functioning scale assess difficulty paying attention in class, forgetting things, keeping up with school, missing school because of not feeling well, and missing school because of medical appointments and hospitalizations. Responses are rated on a 5-point scale ranging from 0 (never) to 4 (almost always). A total score is computed by calculating the mean rating. Raw scores were used to make interpretation of results easier, with higher scores indicating greater difficulty with school functioning. \( \alpha \) reliability was .87.

Analytic Plan
Preliminary analyses were conducted using Statistical Package for the Social Sciences 19.0 for Windows. Data were initially screened to ensure that they met Mplus structural equation modeling (SEM) requirements for normality.
Kaczynski, Claar, and LeBel

used to evaluate model fit: Per Bentler and Bonett (1980), the following statistics were likelihood estimation was used to account for missing data. Full information maximum model fit (Holmbeck, 1997). Full group analysis with SEM software controlling individual pathways to be equal in both groups and testing whether constraints lead to deterioration in model fit (Holmbeck, 1997). Full information maximum likelihood estimation was used to account for missing data. Per Bentler and Bonett (1980), the following statistics were used to evaluate model fit: $\chi^2$, comparative fit index (CFI; > .90 acceptable, > .95 excellent), and root mean square error of approximation (RMSEA; < .08 acceptable, < .05 excellent).

### Results

#### Sample Characteristics

Means and standard deviations are presented in Table I. Correlations are presented in Table II. In our clinical sample, the majority of patients endorsed symptoms of anxiety (94.3%) and depression (89.3%) in the normative range.

#### Preliminary Analyses

All variables met the SEM requirements for normality (i.e., skewness < 3.0; kurtosis<10.0; Kline, 2005). Correlation analyses indicated that age was significantly associated with several study variables in patients with migraine and TTH (Table II); therefore, age was controlled for in all subsequent analyses.

T-tests showed that there were significant differences between patients with migraine and TTH in terms of age ($t(296) = -3.77, p < .01; d = .44$), headache frequency ($t(296) = -11.94, p < .001; d = 1.39$), headache severity ($t(293) = 4.41, p < .001; d = .52$), and headache duration ($t(294) = -2.57, p < .05; d = .30$). See Table I for group means. Patients with TTH were older, and their headaches occurred more frequently and were of longer duration than patients with migraine, whereas patients with migraine reported that their headaches were more severe than patients with TTH. In terms of the psychosocial variables, significant differences were found in depression symptoms ($t(289) = -2.57, p < .05; d = .30$) and protective parenting ($t(279) = 3.73, p < .001; d = .45$). Adolescents with TTH reported higher levels of depressive symptoms than adolescents with migraine, whereas parents of adolescents with migraine reported engaging in protective responses to their child’s headaches more often than parents of adolescents with TTH, consistent with expectation. No group differences were found in child anxiety symptoms or passive coping. Finally, there was a significant difference in school functioning ($t(283) = -2.37, p < .05; d = .28$).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Tension HA only</th>
<th>Migraine HA only</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N$ M (SD)</td>
<td>$N$ M (SD)</td>
<td>$N$ M (SD)</td>
</tr>
<tr>
<td>Age</td>
<td>153 14.91* (1.57)</td>
<td>109 14.43* (1.65)</td>
<td>262 14.71 (1.62)</td>
</tr>
<tr>
<td>Time since onset (in months)</td>
<td>150 25.57* (26.89)</td>
<td>107 35.19* (30.84)</td>
<td>257 29.57 (28.93)</td>
</tr>
<tr>
<td>HA frequency</td>
<td>153 6.53* (1.12)</td>
<td>109 4.63* (1.84)</td>
<td>262 5.74 (1.73)</td>
</tr>
<tr>
<td>HA duration</td>
<td>153 6.37* (2.25)</td>
<td>107 5.79* (2.47)</td>
<td>260 6.13 (2.35)</td>
</tr>
<tr>
<td>HA severity</td>
<td>153 6.01* (1.77)</td>
<td>107 6.94* (1.79)</td>
<td>260 6.39 (1.84)</td>
</tr>
<tr>
<td>CIDI total depression</td>
<td>152 10.32* (7.93)</td>
<td>108 8.52* (7.26)</td>
<td>260 9.57 (7.70)</td>
</tr>
<tr>
<td>RCMAS total anxiety</td>
<td>129 12.39 (8.58)</td>
<td>102 11.23 (8.12)</td>
<td>231 11.87 (8.38)</td>
</tr>
<tr>
<td>PRI passive coping scale</td>
<td>151 1.26 (0.82)</td>
<td>103 1.46 (0.84)</td>
<td>254 1.34 (0.83)</td>
</tr>
<tr>
<td>ARCS protect scale</td>
<td>144 1.39* (0.56)</td>
<td>105 1.68* (0.58)</td>
<td>249 1.51 (0.58)</td>
</tr>
<tr>
<td>PedSQL school functioning scale</td>
<td>147 10.12* (5.23)</td>
<td>104 9.19* (4.57)</td>
<td>251 9.74 (4.98)</td>
</tr>
</tbody>
</table>

Note: HA = headache; CIDI = Children’s depression inventory; RCMAS = Revised Children’s Manifest Anxiety Scale; PRI = Pain Response Inventory; ARCS = Adult Responses to Children’s Symptoms; PedSQL = Pediatric Quality of Life Inventory.

*Means are significantly different between groups at $p < .05$.
with adolescents with TTH reporting more difficulties in school functioning than adolescents with migraine.

SEM Regression Model

We first conducted a confirmatory factor analysis to test the proposed latent variables (i.e., headache characteristics and internalizing symptoms) in the multi-group context. Unfortunately, the confirmatory factor analysis models testing the latent variables separately and together could not be identified, as indicated by a negative residual variance that suggests model misspecification. Thus, it was not possible to compute the factor loadings or to test the fit of the hybrid model. Therefore, we decided to include each predictor variable in the model individually, rather than combining predictors in latent variables (Figure 1). Age was also included in the regression model as a control variable. Furthermore, we included covariances for all pairs of predictor variables to represent potential inter-relations among these variables in predicting school functioning. The unconstrained regression model had zero degrees of freedom, and thus model fit could not be assessed. Therefore, because the correlation between headache frequency and headache severity was not significant in both groups, we decided to constrain the covariance between these variables to zero to free up two degrees of freedom. The modified model provided excellent fit to the data, \( \chi^2(2) = 1.34, \) \( p = .51; \) CFI = 1.00; RMSEA = 0.00 [90% confidence interval \( \{CI\} \) 0.00–0.15].

Next, regression pathways were constrained to be equal in both groups one by one, and model constraints that resulted in a significant deterioration in model fit, as indicated by a significant \( \Delta \chi^2 \), indicated that headache diagnosis moderates the constrained pathway. Mplus does not provide effect sizes for \( \Delta \chi^2 \); however, fit indices are considered to be equivalent to effect sizes in SEM (Savalei & Bentler, 2010); therefore, a nonsignificant \( \Delta \chi^2 \) indicates a nonsignificant effect size. First, the path from age to school functioning was constrained to be equal, resulting in a nonsignificant deterioration in model fit, suggesting that this path was not moderated by headache diagnosis (\( \Delta \chi^2(1) = .20, \) \( ns \)). Next, the paths from headache severity (\( \Delta \chi^2(1) = .01, \) \( ns \)), headache frequency (\( \Delta \chi^2(1) = .56, \) ns), and headache duration (\( \Delta \chi^2(1) = .53, \) ns) to school functioning were constrained to be equal, with no significant change in model fit. Thus, the relations between headache characteristics and school functioning were not moderated by headache diagnosis. Next, we constrained the paths from anxiety (\( \Delta \chi^2(1) = .29, \) ns) and depression (\( \Delta \chi^2(1) = 1.03, \) ns) to school functioning to be equal, with no deterioration in model fit. Thus, relations between child anxiety and depression symptoms and school functioning did not vary by headache diagnosis, contrary to expectation. Constraining the path from passive coping to school functioning to be equal also did not result in significant deterioration in model fit (\( \Delta \chi^2(1) = .29, \) ns), as predicted. Finally, we constrained the path from protective parenting to school functioning to be equal, resulting in significant deterioration in model fit (\( \Delta \chi^2(1) = 13.74, \) \( p < .05 \)). The relation between protective parenting and school difficulties was significant in both groups; however, it was significantly stronger in patients with TTH (\( r = .46, \) \( p < .001 \)) than in patients with migraine (\( r = .17, \) \( p < .05 \)), contrary to prediction.

The final model fit the data well: \( \chi^2(9) = 4.25, \) \( p = .89; \) CFI = 1.00; RMSEA = 0.00 [90% \( \{CI\} \) 0.00–0.04; Figure 1]. All regression paths were constrained to be

### Table II. Correlations Among Study Variables for Adolescents With TTH and Migraine

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>1.00</td>
<td>.084</td>
<td>.243**</td>
<td>.270**</td>
<td>.148</td>
<td>.206*</td>
<td>.301**</td>
<td>.305**</td>
<td>−.045</td>
<td>.343**</td>
</tr>
<tr>
<td>2. Time since onset (in months)</td>
<td>−.17</td>
<td>1.00</td>
<td>−.361**</td>
<td>−.116</td>
<td>.348*</td>
<td>.071</td>
<td>−.107</td>
<td>.060</td>
<td>.067</td>
<td>.036</td>
</tr>
<tr>
<td>3. HA frequency</td>
<td>.079</td>
<td>−.201</td>
<td>1.00</td>
<td>.207*</td>
<td>−.037</td>
<td>.150</td>
<td>.209*</td>
<td>.166</td>
<td>−.111</td>
<td>.231**</td>
</tr>
<tr>
<td>4. HA duration</td>
<td>.201**</td>
<td>−.064</td>
<td>.420**</td>
<td>1.00</td>
<td>.134</td>
<td>.000</td>
<td>.045</td>
<td>.043</td>
<td>.134</td>
<td>.304**</td>
</tr>
<tr>
<td>5. HA severity</td>
<td>.192*</td>
<td>.193</td>
<td>.066</td>
<td>.089</td>
<td>.100</td>
<td>−.073</td>
<td>.057</td>
<td>.268**</td>
<td>.050</td>
<td>.120</td>
</tr>
<tr>
<td>6. RCMAS total anxiety</td>
<td>.107</td>
<td>.125</td>
<td>−.024</td>
<td>−.105</td>
<td>.071</td>
<td>1.00</td>
<td>.784**</td>
<td>.383**</td>
<td>−.023</td>
<td>.281**</td>
</tr>
<tr>
<td>7. CDI total depression</td>
<td>.189*</td>
<td>.044</td>
<td>−.009</td>
<td>−.031</td>
<td>.061</td>
<td>.761**</td>
<td>1.00</td>
<td>.478**</td>
<td>.024</td>
<td>.396**</td>
</tr>
<tr>
<td>8. PRI passive coping scale</td>
<td>.139</td>
<td>−.068</td>
<td>.122</td>
<td>.051</td>
<td>.155*</td>
<td>.457**</td>
<td>.568**</td>
<td>1.00</td>
<td>−.089</td>
<td>.211*</td>
</tr>
<tr>
<td>9. ARCS protect scale</td>
<td>−.98</td>
<td>.152</td>
<td>−.120</td>
<td>.009</td>
<td>.328</td>
<td>.017</td>
<td>.014</td>
<td>.120</td>
<td>1.00</td>
<td>.222*</td>
</tr>
<tr>
<td>10. PedsQL school functioning</td>
<td>.125</td>
<td>.056</td>
<td>.050</td>
<td>.221**</td>
<td>.241**</td>
<td>.138</td>
<td>.226**</td>
<td>.148</td>
<td>.491**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note. Correlations for Tension HAs are reported below the diagonal. Correlations for Migraine HAs are reported above the diagonal.

HA = headache; CDI = Children’s Depression Inventory; RCMAS = Revised Children’s Manifest Anxiety Scale; PRI = Pain Response Inventory; ARCS = Adult Responses to Children’s Symptoms; PedsQL = Pediatric Quality of Life Inventory.

*p < .05.

**p < .01.
equal between diagnostic groups with exception of the path from protective parenting to school functioning. Model parameters reported represent standardized values that correspond to effect sizes (these values differ slightly between groups despite equality constraints because of different variances). In both groups, child age, headache duration, depression symptoms, and protective parenting were significantly positively associated with school functioning. Unexpectedly, headache severity and frequency, child anxiety symptoms, and passive coping were not associated with school functioning in either diagnostic group. In both groups, there were significant covariances between headache duration and frequency (TTH: $\varphi = .39$, $p < .05$; migraine: $\varphi = .25$, $p < .05$), anxiety and depression (TTH: $\varphi = .77$, $p < .05$; migraine: $\varphi = .77$, $p < .05$), anxiety and passive coping (TTH: $\varphi = .42$, $p < .05$; migraine: $\varphi = .42$, $p < .05$). In the TTH group, there was also a significant covariance between headache severity and protective parenting ($\varphi = .25$, $p < .05$). In the migraine group, there were significant covariances between headache frequency and passive coping ($\varphi = .19$, $p < .05$) and headache severity and passive coping ($\varphi = .28$, $p < .05$). The model accounted for 36.6% of the variance in school functioning in youth with TTH and 24.4% of the variance in school functioning in youth with migraine in this clinic-based sample.

**Exploratory Analyses**

Exploratory analyses were conducted to evaluate potential links between psychosocial risk factors in predicting school difficulties, based on previous research and the results of this study. First, we tested the strength of the indirect relation from headache characteristics to school difficulties via depression symptoms. We tested this relation separately for headache duration, severity, and frequency, and each time the addition of a pathway from the headache variable to depression resulted in a model with poor fit to the data, a nonsignificant direct effect from the headache variable to depression, and a non-significant indirect effect. Thus, there does not seem to be an indirect relation between headache characteristics and school difficulties via depression. Next, we tested an indirect relation between depression and school difficulties via passive coping. The model including a pathway from depression to passive coping fit the data well ($\chi^2(19) = 23.67$, $p = .21$; CFI = .97; RMSEA = .042 [90% CI 0.00–0.089]), and the pathway from depression to passive coping was significant in both groups (TTH: $b = .51$, $p < .05$; Migraine $b = .43$, $p < .05$). However, tests of the indirect effect were not significant in either group, suggesting that although depression and passive coping are related, they likely impact school functioning in combination rather than through an indirect, mediated effect. Finally, based on significant direct effects, we tested whether there was an interaction between depression symptoms and protective parenting in predicting school difficulties. The interaction was not significant in either group (TTH: $b = .05$, ns; Migraine $b = .16$, ns), suggesting depression symptoms and protective parenting are linked to school difficulties independently.

**Discussion**

Results of this cross-sectional, clinic-based study highlight both commonalities in the experience of chronic headache...
and unique differences with respect to headache diagnosis. Echoing results of previous studies (Fitchel & Larsson, 2002), we found that those patients with increased headache duration had greater difficulties functioning in the school setting. As would be expected, when adolescents experience longer headache episodes, there is a greater likelihood of pain interfering with the school day itself as well as during the afternoon and evening hours when homework would be completed. Interestingly, headache severity and frequency were not related to school functioning, suggesting that a more intense and frequent but shorter headache may be less detrimental to adolescents’ school performance.

We also found that adolescents’ depressive symptoms predicted difficulties with school functioning. Past research with pediatric patients with chronic headache has linked children’s depressive symptoms with more global difficulties in functioning (e.g., Kashikar-Zuck et al., 2001). In addition, in patients with diverse pain complaints, including chronic headaches, depressive symptoms were associated with school impairment in particular (Logan, Simons, & Kaczynski, 2009). Although passive coping was not directly associated with school difficulties in this study, passive coping and depression were significantly correlated in adolescents with both TTH and migraine, suggesting that adolescents with chronic headaches and comorbid depression symptoms may be more likely to cope with their pain passively, which may negatively impact their ability to function in school. We were surprised that passive coping was not directly linked with school difficulties, as past research has indicated that higher levels of passive coping are associated with higher levels of functional disability in general (e.g., Claar, Baber, Simons, Logan, & Walker, 2008; Walker et al., 2007; Walker, Baber, Garber, & Smith, 2008). Perhaps the contribution of passive coping in school impairment is mitigated by depression symptoms and no longer is a strong influence, as suggested by the exploratory analyses. That is, if a patient exhibits comorbid symptoms of depression and tends to cope with headaches passively, depression symptoms may be more detrimental to school functioning than passive coping attempts because depression is more pervasive. Clinically, results suggest that treatment that involves teaching active coping strategies alone may be inadequate to improve the functioning of adolescents with chronic headaches and comorbid depression symptoms, and that a broader cognitive behavioral approach that addresses depression symptoms may be necessary with these youth (Sieberg, Huguet, Von Baeyer, & Seshia, 2012).

Interestingly, and contrary to our hypotheses, adolescents’ anxiety was unrelated to difficulties with school functioning in the regression model. Although in the bivariate correlations, there was a significant relation between anxiety and school difficulties in adolescents with migraine, but not TTH, this relation was no longer significant when the full model was assessed. It may be that the other variables in the model explained a larger proportion of the variance in school functioning, and that there was no longer adequate unexplained variance to allow for an association with anxiety. Indeed, anxiety was significantly linked to depression in both groups, suggesting that there may be an interaction between anxiety and depression symptoms in relations with school functioning, although depression seems to be more strongly linked with school difficulties. To test this possibility, we re-ran the model without depression, and in fact, anxiety was significantly associated with school difficulties in adolescents with both TTH ($\beta = .19$, $p < .05$) and migraine ($\beta = .19$, $p < .05$). Thus, although depression seems to be more strongly associated with school difficulties in youth with chronic headaches, anxiety may also play a role. Indeed, recent research from our laboratory supports the role of anxiety in general functional disability (Kaczynski et al., 2011), and it is likely that anxiety impacts school functioning in particular. It may be that anxiety is more weakly linked with school difficulties than depression because anxiety plays a different role for different adolescents, motivating more perfectionistic youth to continue to attend school despite headaches to maintain high academic standards, whereas resulting in school avoidance in others. It may also be that this relation was not significant because of a floor effect in reported anxiety symptoms. The majority of the sample did not endorse elevated symptoms of anxiety, and perhaps the relation between anxiety and school difficulties would hold more strongly for those adolescents who report clinically elevated anxiety. Future research with larger clinical samples will be needed to better understand the role of anxiety in school functioning.

In general, adolescents in our sample tended to report low levels of anxiety and depression symptoms. This finding is consistent with previous research showing that, although children and adolescents with chronic headaches may endorse slightly elevated internalizing symptoms, they generally do not report clinically significant symptoms (Simons, Sieberg, & Claar, 2012; Vulić-Prtorić et al., 2007). This reporting pattern is often typical of patients with chronic pain, who, consciously or unconsciously, may tend to minimize emotional distress because of a desire to present favorably and to have their pain as the focus of the evaluation in an attempt to legitimize the physical nature of
their pain complaint (Logan, Claar, & Scharff, 2008). Indeed, 34.4% of our sample exhibited an elevated lie scale on the RCMAS, suggesting a tendency to minimize psychological distress to present positively. Because of this tendency to minimize, self-report measures may not be the best method of assessing anxiety and depression symptoms in pediatric pain patients, and reports from other respondents or clinical interviews with a psychologist may provide more accurate information. For example, based on the evaluation with the clinical psychologist, 29.4% of adolescents in this sample were diagnosed with a clinically significant anxiety disorder (i.e., generalized anxiety disorder, adjustment disorder with anxiety, anxiety disorder Not Otherwise Specified (NOS), Obsessive Compulsive Disorder, Posttraumatic Stress Disorder, specific phobia, or social phobia), and 11.5% were diagnosed with a mood disorder (i.e., major depression, adjustment disorder with depressed mood, or mood disorder NOS), suggesting that adolescents with chronic headache do exhibit clinically significant comorbid anxiety and depression when assessed objectively. It is likely that these comorbid psychiatric issues impact their ability to function in school.

We also found that protective overly solicitous parenting behavior, such as allowing children to rest and remain home from school and giving children extra attention, is associated with impairments in school functioning. Many parents will provide special attention, increased privileges, or limitations of normal activities and responsibilities when their child is experiencing chronic pain (e.g., Van Slyke & Walker, 2006; Walker, Claar, & Garber, 2002). Although these behaviors may be well intentioned, the current study demonstrates that these parental protective behaviors are detrimental to normal school functioning and performance. Anecdotally, we hear from parents that expecting their child to attend school feels “mean” when their child is experiencing chronic headaches. This is consistent with the results of a recent study which showed that protective parenting mediates the link between the parent’s negative thoughts about their child’s pain and the child’s difficulties functioning in school (Logan, Simons, & Carpino, 2012). Although protective parenting may be initially beneficial within the context of acute pain or injury, results of this study, as well as several previous studies, document how continued use of protective parenting behavior is associated with increased school impairment in adolescents with chronic headache (e.g., Claar et al., 2008; Palermo, Putnam, Armstrong, & Daily, 2007) and is detrimental rather than helpful. Clinically, findings support the importance of addressing protective parental responses to their child’s headaches in an effort to improve school functioning, consistent with the results of a recent Cochrane review that emphasized the benefits of including a parenting component in Cognitive Behavioral Therapy with children and adolescents with chronic pain to address functional difficulties (Eccleston, Palermo, Fisher, & Law, 2012). Interestingly, and contrary to our expectations, results of this study indicate that the relation between parental protective behavior and difficulties with school functioning is stronger for adolescents with TTH than adolescents with chronic migraine. We had expected that parents of patients with migraines may be especially likely to respond protectively because migraines may be considered more intense and are associated with symptoms that may be especially problematic in the school setting, such as nausea, vomiting, and photophobia. Although parents of patients with migraines exhibited significantly higher levels of protective parenting behavior than parents of patients with TTH, it may be that the greater frequency and longer duration of TTH contributes to the link between protective parenting and school functioning. In addition, adolescents with TTH report greater difficulties with school functioning in general, and parents may be more protective when school is a more significant stressor and also may be viewed as a headache trigger. Children and adolescents may look to parents to evaluate the severity of their headaches, and parental encouragement of decreased functioning, either intentional or unintentional, may signal to children that their headaches are in fact serious and, therefore, require decreased participation and functioning at school. Stress related to missed classwork and compounding make-up work may exacerbate TTHs, leading to greater parental protectiveness and perpetuating the vicious cycle of pain and disability. Thus, to improve school performance and attendance, interventions that focus on parent guidance and decreased protectiveness may be most beneficial, particularly for adolescents with TTH.

Our findings must be interpreted in the context of several limitations. First, the high rates of female and Caucasian patients limit the generalizability of findings to males and diverse ethnic groups; however, our sample is commensurate with other pediatric pain clinics (Bursch, Tsao, Meldrum, & Zeltzer, 2006; Eccleston et al., 2004). Furthermore, several of our measures had few items (e.g., school functioning measure), and measures were completed by a single informant, which may limit their construct validity. In addition, the school functioning measure was limited because of the combined assessment of school attendance and school performance, which does not allow for specificity in determining which aspects of school functioning are impacted. Additionally, as with all research-derived models, our model is likely incomplete,
and other variables likely contribute to school functioning in youth with chronic pain. Social functioning in particular has been identified as an important variable that relates to pain intensity and school functioning in this population (Simons, Logan, Chastain, & Stein, 2010) and should be included in future studies. Different school policies and responses from school personnel to a student’s headaches and associated symptoms may also contribute to school difficulties and should be further assessed. Finally, as with all cross-sectional research, we cannot establish causality among children internalizing, protective parenting, and school functioning. Longitudinal studies are needed to further understand the interplay of parent and child factors with school functioning for patients with chronic headaches.

Results of the current study point to the importance of treating comorbid depressive symptoms in an effort to improve school functioning. In a sample of patients with diverse pain complaints, Logan and Simons (2010) found that a cognitive behavioral intervention that included an emphasis on improving patients’ depressive symptoms was associated with improvement in school attendance. This type of intervention also may improve school performance and attendance of patients with chronic headaches and comorbid depressive symptoms. Future research also may examine whether the efficacy of this type of intervention is enhanced if combined with parent training to decrease parental protective behavior.

In summary, we found that regardless of patients’ headache diagnosis, headache duration and adolescents’ depressive symptoms may impact school functioning. Protective parenting is also associated with school difficulties, and this relation is particularly strong in adolescents with chronic TTH and should be targeted in treatment with this population. A focus on parent guidance and improving patients’ emotional distress may be particularly useful targets for improving patients’ school attendance and performance.

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References


