

Adolescents' Observations of Parent Pain Behaviors: Preliminary Measure Validation and Test of Social Learning Theory in Pediatric Chronic Pain

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Abstract

Objective Evaluate psychometric properties of a measure of adolescents' observations of parental pain behaviors and use this measure to test hypotheses regarding pain-specific social learning.

Methods We created a proxy-report of the Patient Reported Outcomes Measurement Information System (PROMIS) Pain Behavior–Short Form (PPB) for adolescents to report on parental pain behaviors, which we labeled the PPB-Proxy. Adolescents ($n = 138$, mean age = 14.20) with functional abdominal pain completed the PPB-Proxy and a parent completed the PPB. Adolescents and their parents completed measures of pain and disability during the adolescent's clinic visit for abdominal pain. Adolescents subsequently completed a 7-day pain diary period. **Results** The PPB-Proxy moderately correlated with the PPB, evidencing that adolescents observe and can report on parental pain behaviors. Both the PPB-Proxy and PPB significantly correlated with adolescents' pain-related disability. **Conclusions** Parental modeling of pain behaviors could represent an important target for assessment and treatment in pediatric chronic pain patients.

Key words: adolescents; assessment; chronic and recurrent pain; gastroenterology; pain; parents; parent illness.

Chronic pain tends to run in families. A recent systematic review and meta-analysis identified increased pain complaints, greater internalizing and externalizing symptoms, and poorer social competence in offspring of parents with chronic pain (Higgins et al., 2015). In clinical populations of children with chronic pain, parental chronic pain characteristics (e.g., current pain severity, number of pain sites for which parents sought treatment) corresponded with greater pain severity and functional impairment in their children (Kashikar-Zuck et al., 2008; Schanberg et al., 2001; Schanberg, Keefe, Lefebvre, Kredich, & Gil, 1998).

Additionally, having a parent with chronic pain may confer greater risk for persistence of chronic pain from childhood into young adulthood (Aasland, Flato, & Vandvik, 1997; Sherman, Bruehl, Smith, & Walker, 2013).

The relation between parental chronic pain and children's pain is complex and best understood within a biopsychosocial framework (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). The intergenerational transmission of risk for chronic pain could be explained by multiple pathways including genetics, early neurobiological changes, pain-specific social learning, general

parenting and health behaviors, and shared environmental stress (Stone & Wilson, *in press*). These factors likely interact with children's individual vulnerabilities to increase or decrease risk for chronic pain in children of parents with chronic pain. The ultimate goal of elucidating mechanisms for the transmission of risk for chronic pain from parents to offspring is to develop preventive interventions for at-risk youth and family-based interventions for pediatric patients whose parents have chronic pain.

The empirical literature often refers to observational learning as a major pathway accounting for the relation between parental chronic pain and children's pain complaints. Social learning theory (Bandura, 1977) would predict that children learn pain-related beliefs and behaviors by observing their parents' pain behaviors and, in turn, adopt similar behaviors in response to their own pain. By observing a parent with chronic pain consistently avoid daily activities, children may learn that activity avoidance is an appropriate way to manage their own chronic pain.

Although a strong theoretical basis exists for the observational learning of pain behavior, no empirical research to date has evaluated the extent to which children actually observe their parents' daily pain behavior and whether children's observations of their parents' behavior is significantly associated with children's own pain experience. Instead, parents with chronic pain often are assumed to model pain behavior despite the fact that parent pain behavior and their children's observations of that behavior have not been assessed. Thus, the present study aimed to (1) evaluate psychometric properties of a proxy-report measure of adolescents' observations of parental pain behaviors in a sample of pediatric patients with functional abdominal pain (FAP) and (2) use this measure to evaluate hypotheses regarding adolescents' pain-specific social learning through observation of their parents' pain behavior. We adapted our proxy-report measure from an adult pain behavior measure developed by the Patient Reported Outcomes Measurement Information System (PROMIS) initiative of the National Institutes of Health (Assessment Center, 2014). The PROMIS pain behavior item bank was calibrated in large samples of adults drawn from the general population and from individuals with chronic pain (Revicki et al., 2009). A seven-item short form (PROMIS–Short Form v.1.0 – Pain Behavior 7a) was derived from the 39-item pain behavior bank and exhibited psychometric properties similar to those of the item bank (Assessment Center, 2014; Cella et al., 2010). We adapted the short form of the PROMIS Pain Behavior measure (PPB) for adolescents to report on their parents' pain behaviors; we refer to our measure as the Parent Pain Behavior-Proxy form (PPB-Proxy).

Our first aim evaluated the psychometric properties of the PPB-Proxy in a sample of adolescents with FAP. We evaluated the reliability of the PPB-Proxy and expected it to exhibit a level of alpha reliability similar to that reported for the original PROMIS Pain Behavior–Short Form (Cella et al., 2010). We examined concurrent validity by evaluating the level of agreement between the PPB-Proxy and parent reports of their own pain behavior on the PROMIS Pain Behavior–Short Form. We hypothesized that adolescents' observations of parental pain behaviors on the PPB-Proxy would be moderately associated with parents' self-reported pain behaviors on the PPB. This hypothesis was based on a similar investigation in the depression literature that found a moderate correlation between children's perceptions of maternal sadness and mothers' self-reported depressive symptoms (Goodman, Tully, Connell, Hartman, & Huh, 2011). We evaluated convergent and discriminant validity by examining the relation between the PPB-Proxy and parent reports of their own pain-related disability, number of current chronic pain locations, and symptoms of anxiety and depression. Because the PPB-Proxy measures specific observable pain behaviors, we anticipated the PPB-Proxy would exhibit higher correlations with parent-reported pain-specific constructs than with more general measures of parents' emotional distress.

Our second aim examined pain-specific social learning, i.e., parent modeling of pain behaviors, as a possible pathway between parent and child chronic pain. We examined the concurrent relations between adolescents' observations of parent pain behaviors (PPB-Proxy), parent self-reported pain behaviors (PPB), and adolescent-reported measures of their own abdominal pain and pain-related disability. Because the PPB-Proxy assessed parents' pain behavior that was observable and therefore could have been a model for children's pain behaviors such as limiting activities, we expected a stronger relation between the PPB-Proxy and adolescents' pain-related disability than between the PPB-Proxy and adolescents' abdominal pain severity. We examined the predictive relation between adolescents' observations of parent pain behaviors on the PPB-Proxy and adolescents' subsequent ratings of their pain severity, pain bother, and number of daily pain locations during a 7-day online pain diary period completed following their clinic evaluation for abdominal pain.

Current literature often assumes parental modeling based on the presence of chronic pain in both parents and their children (Higgins et al., 2015; Stone & Wilson, 2016). We extended the literature by evaluating whether, after controlling for the presence of parent chronic pain, a measure of adolescents' observations of parental pain behaviors would explain

additional variance in adolescent pain. We hypothesized that, controlling for parental chronic pain status, adolescents' observations of parent pain behaviors would predict adolescents' pain severity, pain bother, and number of daily pain locations reported during the 7-day diary period.

Methods

Participants

Participants comprised pediatric patients between 11 and 17 years of age and a caregiver presenting to the pediatric gastroenterology clinic at Monroe Carell Jr. Children's Hospital at Vanderbilt for their initial evaluation for abdominal pain. Inclusion criteria for pediatric patients included: (1) recurrent abdominal pain for at least the past 2 months, (2) can read and write in English at sixth grade level, and (3) easy access to a computer for completion of diary. Exclusion criteria for pediatric patients included: (1) presence of chronic disease (e.g., inflammatory bowel disease, diabetes) and (2) hospitalization within the month prior to study enrollment.

We enrolled 153 dyads who met eligibility requirements for participation in the study. Dyads where either one or both did not complete the baseline surveys were excluded from analyses ($n = 8$). Through an examination of medical records from the clinic evaluation, one dyad was excluded because the adolescent was diagnosed with inflammatory bowel disease. For the purposes of this article on parent pain behaviors, adolescents who participated with their grandmother ($n = 4$) were excluded from analyses. Two adolescents did not complete the measure of parent pain behaviors and were excluded from analyses. Thus, the final sample comprised 138 dyads (adolescent age: $M = 14.20$, $SD = 1.82$; adolescent sex: 68.1% female; 92.0% mothers).

The majority of parents reported at least one chronic pain site (74.6%, $n = 103$). The most commonly reported locations for parental chronic pain were head (47.1%, $n = 65$), back (46.4%, $n = 64$), shoulder (29.0%, $n = 40$), neck (28.2%, $n = 39$), and abdomen (28.2%, $n = 39$). On average, parents reported 2.34 chronic pain locations ($SD = 2.07$).

Procedures

A member of our research staff approached patients and parents who agreed to hear more about our study in the clinic. Informed consent was obtained from parents and informed assent was obtained from adolescents. Both adolescents and their parents completed a baseline survey during their clinic visit on REDCap, a secure online survey site (Harris et al., 2009). Adolescents were informed that they were going to be asked questions about pain, mood, sleep,

and activities. Research staff did not provide any additional rationale for the PPB-Proxy beyond the instructions included with the measure. Adolescents and parents completed their surveys independently and neither was allowed to see the others' answers. Following the initial clinic visit, adolescents completed a 7-day online daily diary that assessed pain, pain bother, and number of pain locations during each day.

Baseline Adolescent-Report Measures

Adolescent Proxy-Report of Parent Pain Behaviors

We adapted the short form (version 1.0, 7a) of the PROMIS Pain Behavior (PPB) instrument (Assessment Center, 2014) for adolescents to report on their parents' pain behaviors over the past 7 days (PPB-Proxy; Appendix). As modified, this measure, PPB-Proxy, is not an official PROMIS measure. Adolescents provided separate reports of pain behaviors for mothers and fathers with whom they had contact during the past month. The PPB-Proxy utilized the stems "When my mother had pain..." and "When my father had pain..." As modified, this measure, Pain Behavior Proxy Report, is not an official PROMIS measure. Response options ranged from (1) "Had No Pain" to (6) "Always." When we administered the PPB-Proxy, some adolescents asked for a definition for "thrashed." Thus, we have included a brief definition for the word "thrashed" (i.e., "tossed and turned") in the PPB-Proxy. Items were scored by computing a total raw score ranging from 7 to 42. Separate totals were computed for proxy reports of mothers' and fathers' pain behavior. For data analysis, we used either the mother or father report depending on which parent participated in the study, so that adolescents and parents reported on the same individual.

Adolescent Abdominal Pain Severity

The Abdominal Pain Index (API) is a patient self-report measure of abdominal pain duration, frequency, and intensity over the past 2 weeks (Laird, Sherman, Smith, & Walker, 2015). The revised scoring method for the API computes a composite score that is the mean of all four items on a 5-point scale ranging from 0 to 4, with higher scores indicating greater abdominal pain severity. Alpha reliability for the API in this sample was .79.

Adolescent Pain Interference

The PROMIS Pediatric Pain Interference-Long Form (Varni et al., 2010) comprises 13 items assessing self-reported consequences of pain on adolescent's life, including social, cognitive, emotional, and physical domains over the past 7 days, and is considered a measure of pain-related disability. Adolescents responded to each item on a 5-point scale ranging from 0 (never) to 4 (almost always). Item responses

were summed yielding a total score, with higher scores indicating greater adolescent pain interference. Alpha reliability for the PROMIS Pediatric Pain Interference–Long Form in this sample was .89.

Baseline Parent-Report Measures

Parent Pain Behaviors

The PROMIS Pain Behavior–Short Form 7b Version 1.0 for adults assessed parental pain behaviors (Assessment Center, 2014; Cella et al., 2010; Revicki et al., 2009). The PROMIS Pain Behavior (PPB) instrument was designed to assess self-reported observable behaviors that typically indicate to others that the individual is in pain (e.g., “When I was in pain, I moved extremely slowly”). Parents were asked to indicate how often they displayed each of these seven pain behaviors over the past 7 days. Response options ranged from (1) “Had No Pain” to (6) “Always.” Items were scored by computing a total raw score ranging from 7 to 42. Alpha reliability for the PROMIS Pain Behavior–Short Form was .93 in this sample.

Parental Chronic Pain

The Persistent Pain Questionnaire (PPQ) assessed parental chronic pain (Bruehl & Chung, 2006; Bruehl, France, France, Harju, & al’Absi, 2005; Sherman et al., 2013). Parents identified locations of current chronic pain based on eight standard body locations described by the International Association for the Study of Pain (Merskey & Bogduk, 1994): head, neck, shoulder/arm/hand, chest, abdomen, pelvic area, upper or lower back, and legs/feet. For each site, parents were asked if they had experienced chronic pain daily or almost daily for the past 3 months. If they responded positively to this question, they were asked to rate their current pain intensity on a scale of 0–100. Parents were considered to have current chronic pain at a body location if they rated the pain at that site at greater than or equal to 30. We computed a total score indicating the number of current chronic pain sites for each parent.

Parental Pain Interference

The six-item PROMIS Pain Interference–Short Form 6b v1.0 for adults assessed parental pain interference (Amtmann et al., 2010). Parents completed this measure that assessed self-reported consequences of pain on one’s life, including social (e.g., “How often did pain keep you from socializing with others?”), cognitive (e.g., “How much did pain interfere with your ability to concentrate?”), emotional (e.g., “How much did pain interfere with your enjoyment of life?”), and physical (e.g., “How much did pain interfere with your day-to-day activities?”) domains, over the past 7 days. Response options ranged from (1) “Not at all”

to (5) “Very much,” and item responses were summed to yield a total score between 6 and 30. Higher scores indicate greater parental pain interference. Alpha reliability for the PROMIS Pain Interference–Short Form in this sample was .96.

Parental Anxiety and Depression

Parents’ anxious and depressive symptoms were assessed with the PROMIS Anxiety–Short Form-7a and PROMIS Depression–Short Form-8b (Cella et al., 2010; Pilkonis et al., 2011). The PROMIS Anxiety measure consists of seven items and the PROMIS Depression measure consists of eight items. Both measures asked parents to rate each item on a 5-point scale ranging from 1 (never) to 5 (almost always). Item responses were summed yielding a total score with higher scores indicating higher levels of anxious or depressive symptoms. Alpha reliabilities were .93 and .95 for anxiety and depression, respectively.

Adolescent-Reported Daily Diary Measures

An online, secure, 7-day diary assessed children’s daily pain severity following their initial clinic visit. Adolescents were given up to 14 days to complete seven diary entries. Each day, adolescents reported on their pain intensity using an 11-point numerical rating scale (0 = no pain and 10 = worst pain). Higher scores indicate greater pain severity. Daily diary pain ratings were averaged across the 7 days to yield a pain severity mean score. Each day adolescents were also asked to rate the extent to which their pain bothered them on a 5-point scale (0 = not at all and 5 = very much). Bother ratings were averaged across 7 days to yield a mean pain bother score. Adolescents reported the locations of their pain each day using a body map (Savdra, Tesler, Holzemer, Wilkie, & Ward, 1989). Pain locations were coded into nine categories: face, head and neck, shoulders, chest, arms/hands, upper back, lower back, abdomen/pelvic, and legs/feet. An average was computed for the mean number of pain locations reported daily during the 7-day diary period.

Data Analyses

Analyses were conducted with IBM SPSS Statistics Version 23 (2015). We computed alpha reliability as a measure of internal consistency. For concurrent validity, we examined the level of agreement between parent self-reports and adolescent proxy-reports of parental pain behaviors by computing the intraclass correlation coefficient (ICC) utilizing a two-way mixed-effects model, absolute agreement, single measure. Convergent and discriminant validities were evaluated by computing zero-order Pearson r correlations. For computing confidence intervals for correlation coefficients, we utilized the SPSS macro developed by Weaver and Koopman (2014). When relevant, we

tested the statistical significance of differences between correlations with the software developed by Lee and Preacher (2013) based on Steiger's (1980) procedures for comparing dependent correlations with one variable in common.

We conducted multiple regression analyses to examine the predictive relation, controlling for parental chronic pain status, between adolescents' observations of parent pain behaviors (PPB-Proxy) and adolescents' pain reports over a 7-day online diary period. Parental chronic pain status (yes/no) was entered in Step 1 and adolescents' observations of parent pain behaviors (PPB-Proxy) at baseline were entered in Step 2. Analyses were conducted with three different dependent variables from the 7-day diary period: average pain severity, average pain bother, and mean number of chronic pain locations reported daily.

Results

Descriptive Characteristics

The mean for the PPB-Proxy was 16.26 with a standard deviation of 8.83. Scores ranged from 7 to 39. The

Table I. Descriptive Statistics for Adolescent Proxy-Report Items of the PROMIS Pain Behavior–Short Form

| Item | Item Mean (SD) | Corrected item-total correlation |
|------------------------------------------------------------------------------------------------|----------------|----------------------------------|
| Proxy-Report Parent Pain Behavior (PPB-Proxy) (When my mother/father was in pain he/she...) | | |
| 1. Became irritable | 2.64 (1.62) | .86 |
| 2. Grimaced | 2.28 (1.40) | .88 |
| 3. Moved extremely slowly | 2.53 (1.62) | .89 |
| 4. Moved stiffly | 2.51 (1.54) | .90 |
| 5. Called out for someone to help him/her | 2.07 (1.33) | .78 |
| 6. Isolated himself/herself from others | 2.14 (1.30) | .80 |
| 7. Thrashed | 1.85 (1.02) | .82 |

Table II. Correlations Between the PPB-Proxy and Measures of Parents' Own Pain Behaviors, Disability, Pain, and Emotional Distress

| Variable | 1 | 2 | 3 | 4 | 5 |
|-------------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 1. PPB-Proxy | | | | | |
| 2. PPB | .52** (.39–.64) | | | | |
| 3. Parent self-reported pain interference | .47** (.33–.59) | .81** (.74–.86) | | | |
| 4. Number of parental chronic pain sites | .44** (.29–.56) | .60** (.48–.70) | .52** (.39–.63) | | |
| 5. Parental anxiety | .25* (.09–.40) | .44** (.30–.57) | .50** (.37–.62) | .43** (.28–.56) | |
| 6. Parental depression | .24* (.08–.39) | .44** (.30–.57) | .50** (.36–.61) | .45** (.31–.58) | .72** (.62–.79) |

Note. PPB-Proxy = adolescent proxy reported parent pain behaviors; PPB = parent-reported PROMIS Pain Behaviors; each cell contains Pearson r correlation coefficient and 95% confidence interval.

* $p < .05$; ** $p < .001$.

PPB-Proxy did not correlate with adolescent age ($r = -.08$, $p = .37$). There was a nonsignificant trend for sex ($t(136) = 1.69$, $p = .09$, Cohen's $d = 0.31$), with female adolescents reporting higher scores on the PPB-Proxy compared with male adolescents (females: mean = 17.12, $SD = 8.98$; males: mean = 14.41, $SD = 8.28$).

Psychometric Properties of the PPB-Proxy

Internal Consistency

The PPB-Proxy demonstrated a high level of internal consistency measured by Cronbach's alpha coefficient ($\alpha = .95$). Item means, standard deviations, and corrected item-total correlations are presented in Table I.

Concurrent Validity

The adolescent proxy-report and parent self-report versions of the Pain Behavior–Short Form exhibited a moderate level of agreement (ICC = 0.48; 95% confidence interval: 0.30–0.62).

Convergent and Discriminant Validity

Convergent and discriminant validities for the PPB-Proxy were evaluated by examining the pattern of correlations with parent report measures of their own pain interference, number of current chronic pain sites, anxiety, and depression (Table II). Higher scores on the PPB-Proxy significantly correlated with higher levels of parents' self-reported pain interference, more parental chronic pain locations, and higher levels of parental anxiety and depression. As expected, the correlation between the PPB-Proxy and parent-reported pain interference was significantly greater than the correlation between the PPB-Proxy and parental anxiety (z -score = 2.86, $p < .01$) and the correlation between the PPB-Proxy and parental depression (z -score = 3.01, $p < .01$). As expected, the correlation between the PPB-Proxy and parent-reported pain interference did not differ significantly from the

Table III. Correlations Between the PPB-Proxy, Parents' Self-Reported Pain Behaviors, and Adolescent Pain-Related Measures

| Variable | PPB-Proxy | PPB | Adolescent abdominal pain severity |
|------------------------------------|-----------------------|----------------------|------------------------------------|
| Adolescent abdominal pain severity | .14 (-.03 to .30) | .16 (-.01 to .32) | |
| Adolescent pain interference | .34** (.18 to .48) | .21* (.04 to .36) | .48** (.34 to .60) |

Note. PPB-Proxy = adolescent proxy reported parent pain behaviors; PPB = parent-reported PROMIS Pain Behavior; each cell contains Pearson *r* correlation coefficient and 95% confidence interval.

* $p < .05$; ** $p < .001$.

correlation between the PPB-Proxy and number of parent-reported chronic pain sites (z -score = 0.52, $p = 0.60$). Thus, the PPB-Child Proxy exhibited higher correlations with parent-reported pain constructs than parent-reported emotional distress.

Pain-Related Social Learning

Concurrent Relations. Table III presents the correlations between adolescent observations of parent pain behaviors on the PPB-Proxy, parents' self-reported pain behaviors on the PPB, and adolescent-reported measures of their own abdominal pain severity and pain interference. Higher scores on both the adolescent-reported PPB-Proxy and the parent-reported PPB were significantly correlated with higher levels of adolescent pain interference but not with adolescents' abdominal pain severity. As expected, the correlation between the PPB-Proxy and adolescent pain interference was significantly greater than the correlation between the PPB-Proxy and adolescent abdominal pain severity (z -score = 2.36, $p < .05$).

Predictive Relations. Adolescents' observations of parental pain behaviors on the PPB-Proxy at baseline significantly predicted adolescents' subsequent reports of their own pain intensity, pain bother, and mean number of daily pain locations during the 7-day diary period, above and beyond parents' chronic pain status. Table IV presents the results from these analyses.

Discussion

Researchers have long hypothesized that children develop pain behaviors through observational learning of their parents' pain behaviors. Evidence in support of this hypothesis is weak, however, as it is based on studies finding a significant association between the presence of parent chronic pain to chronic pain in

their offspring (Higgins et al., 2015). These studies do not account for the fact that parents with chronic pain do not necessarily exhibit pain behavior that is observed by their children. Our study aimed to develop and evaluate the psychometric properties of a measure of adolescent observations of parental pain behaviors to facilitate research in this area. The adolescent proxy-report of parent pain behaviors (PPB-Proxy) exhibited strong internal consistency comparable with that of the adult version of the PROMIS Pain Behavior–Short Form. Consistent with another study where children reported on parental depressive symptoms (Goodman et al., 2011), adolescents' reports of their parents' pain behaviors were moderately concordant with parents' self-reports of their own pain behaviors. The relation between the PPB-Proxy and parents' self-reported pain interference was stronger than the relation between the PPB-Proxy and parents' self-reported emotional distress, evidence for adolescents' ability to discriminate between parental pain behaviors and parents' emotional symptoms. Thus, adolescents observe and can report on parental pain behaviors.

Adolescents with FAP who observed more frequent pain behaviors in their parents reported significantly greater pain-related interference. The relation between adolescents' reports of parent pain behaviors on the PPB-Proxy and adolescents' self-reported pain interference was greater than the relation between observed parent pain behaviors and adolescents' self-reported abdominal pain severity. This finding is consistent with the notion that adolescents' observations of parental pain behaviors may affect their own learned behavioral responses to pain.

In this study, adolescents' observations of parental pain behaviors at baseline, controlling for parental chronic pain status, predicted adolescents' subsequent average daily pain severity, pain bother, and number of daily pain locations reported during a 7-day online diary period. This suggests that adolescents' observations of parent pain behaviors contribute to adolescents' pain experiences above and beyond parental chronic pain status. Measuring parent pain behaviors rather than the simple presence or absence of chronic pain in parents may provide a more accurate picture of a child's exposure to parent modeling of pain behavior.

Observational learning of pain behaviors may have greater implications for disability behaviors than one's own pain severity. The effect sizes for the relations between adolescents' observations of parent pain behaviors and measures of adolescent pain severity were small. Although both pain severity and pain-related disability are contributed to by a range of biological, psychological, and contextual factors (Gatchel et al., 2007), both pain behaviors and pain-related

Table IV. Adolescents' Perceptions of Parental Pain Behaviors Predict Adolescents' Self-Reports of Pain Over a 7-Day Online Pain Diary

| Independent variable | | Dependent variable | | | | |
|--------------------------------------------------|------------------------------------------|----------------------|------|---------|----------|-----------------------|
| | | B (95% CI) | SE | β | <i>p</i> | R ² change |
| Adolescent pain severity (pain diary) | | | | | | |
| Step 1 | Constant | 4.61 (3.98, 5.24) | 0.32 | | | 0.02 |
| | Parent chronic pain status (yes/no) | 0.65 (-.09, 1.38) | 0.37 | 0.15 | 0.08 | |
| Step 2 | Constant | 4.15 (3.40, 4.91) | 0.38 | | | 0.03* |
| | Parent chronic pain status | 0.38 (-.39, 1.14) | 0.39 | 0.09 | 0.33 | |
| | Adolescent-reported parent pain behavior | 0.04 (.01, .08) | 0.02 | 0.19 | 0.04 | |
| Adolescent pain bother (pain diary) | | | | | | |
| Step 1 | Constant | 2.30 (1.93, 2.67) | 0.19 | | | 0.01 |
| | Parent chronic pain status (yes/no) | 0.20 (-.22, .63) | 0.22 | 0.08 | 0.35 | |
| Step 2 | Constant | 1.94 (1.50, 2.37) | 0.22 | | | 0.06* |
| | Parent chronic pain status | -0.01 (-.45, .43) | 0.22 | -0.01 | 0.97 | |
| | Adolescent-reported parent pain behavior | 0.03 (.01, .05) | 0.01 | 0.26 | 0.004 | |
| Number of adolescent pain locations (pain diary) | | | | | | |
| Step 1 | Constant | 1.56 (1.19, 1.93) | 0.19 | | | 0.00 |
| | Parent chronic pain status (yes/no) | -0.01 (-.44, .42) | 0.22 | -0.01 | 0.97 | |
| Step 2 | Constant | 1.21 (.77, 1.65) | 0.22 | | | 0.06* |
| | Parent chronic pain status | -0.21 (-.66, .23) | 0.23 | -0.08 | 0.34 | |
| | Adolescent-reported parent pain behavior | 0.03 (.01, .05) | 0.01 | 0.25 | 0.01 | |

Note. *R² statistically significant at the *p* < .05 level.

disability represent more observable behaviors than pain severity, which may in part explain the stronger relation between these measures. Compared with parental pain behaviors, one may expect a stronger relation between parental pain severity or the presence of parental chronic pain and adolescents' pain severity because of genetic contributions to pain sensitivity. The relation between parental pain sensitivity and adolescents' pain sensitivity may be location-dependent, and our composite measure of parental chronic pain may not have captured this specific relation. We also did not capture potential timing effects for the relation between parent and adolescent pain severity. Because of the often episodic nature of chronic pain, parents may have experienced more intense pain or disability at some

point in time, but did not report severe chronic pain at the time of the questionnaire.

The relation between parental chronic pain and children's chronic pain is complex and likely influenced by a range of factors including genetics, environmental stressors, social learning, and parenting. As researchers begin to examine mechanisms for the relation between parental chronic pain and children's chronic pain, longitudinal research is needed utilizing measures capturing possible mechanisms for the transmission of risk for chronic pain from parents to offspring. The measure presented in this article represents one method for capturing parental modeling of pain behaviors. Results of this study indicate that the PPB-Proxy is a reliable tool for use in studies

of social learning mechanisms influencing this relation.

A brief questionnaire measure capturing adolescents' observations of parental pain behaviors could be useful in applied clinical settings and clinical research protocols to assess the potential for observational learning of parent pain behaviors. Specifically, clinical interventions targeted at reducing both parent and adolescent pain behaviors could be important for increasing family physical functioning. Because adolescents are situated within the context of their families, interventions targeted only at adolescent disability behaviors may produce initial improvements. However, these gains may deteriorate over time for adolescents in families with high levels of disability behaviors due to the social context. Family-based interventions targeting both parent and child behaviors have shown efficacy in other pediatric populations, such as obesity (Epstein, Valoski, Wing, & McCurley, 1994). Including both a parent-reported measure of pain behaviors and their children's observations of parent pain behavior on the PPB-Proxy would allow for the measurement of change in clinical trials for family-based behavioral interventions for pediatric chronic pain. In the future, it will be important to assess the treatment sensitivity and clinical utility of the PPB-Proxy.

This study represents a preliminary validation of a measure of adolescents' observations of parental pain behaviors. Several limitations should be considered. We evaluated the psychometric properties of this measure in a sample of adolescents aged 11–17. Although there was not a significant correlation between the PPB-Proxy and adolescent age, we do not know at what age children can reliably report on parental pain behaviors. Our sample included too few fathers to allow for investigation of possible sex differences in adolescents' observations of parental pain behavior. Additionally, our measure assumed that adolescents attributed the observed parent behaviors to pain. Future studies might consider separating observed behaviors and attribution of the parents' pain into two constructs to enhance construct validity. However, our preliminary findings regarding discriminant validity suggest that the PPB-Proxy is more closely related to parent-reported pain constructs than to parental measures of psychological symptoms, indicating that adolescents likely attributed these behaviors to parental pain rather than to parental anxiety or depression. Finally, our sample was homogeneous, comprised only of adolescent patients with FAP and their parents. Further investigation of this measure is needed in additional pediatric chronic pain populations and populations of healthy adolescents to further examine risk and resiliency in children of parents with chronic pain.

Parental modeling of pain behaviors could represent an important target for assessment and treatment in pediatric chronic pain patients. Observational learning of pain behaviors represents one mechanism that could increase risk for long-term maintenance of pediatric chronic pain in the presence of parental chronic pain. Child and parent interventions targeted at social learning of pain behavior in the family (Levy et al., 2010) might reduce children's pain-related disability. Developing measures that can capture these social learning mechanisms in a brief but meaningful way will help investigators further examine dyadic processes and their influence on the trajectory of pediatric chronic pain.

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Conflicts of interest: None declared.

Appendix

Parent Pain Behavior-Proxy

Please respond to each item by circling one option per row.

In the past 7 days, did your mother/father have pain?

Yes No*

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In the past 7 days. . .

| | | | | | |
|---------------------------------------------------------------------------------|--------------|---------------|------------------|--------------|---------------|
| When my mother/father was in pain she/he became irritable | Never (2) | Rarely (3) | Sometimes (4) | Often (5) | Always (6) |
| When my mother/father was in pain she/he grimaced | Never (2) | Rarely (3) | Sometimes (4) | Often (5) | Always (6) |
| When my mother/father was in pain she/he moved extremely slowly | Never (2) | Rarely (3) | Sometimes (4) | Often (5) | Always (6) |
| When my mother/father was in pain she/he moved stiffly | Never (2) | Rarely (3) | Sometimes (4) | Often (5) | Always (6) |
| When my mother/father was in pain she/he called out for someone to help her/him | Never (2) | Rarely (3) | Sometimes (4) | Often (5) | Always (6) |
| When my mother/father was in pain she/he isolated herself/himself from others | Never (2) | Rarely (3) | Sometimes (4) | Often (5) | Always (6) |
| When my mother/father was in pain she/he thrashed (tossed and turned**) | Never (2) | Rarely (3) | Sometimes (4) | Often (5) | Always (6) |

Notes. *If child selects no, discontinue measure. “Had no Pain” equals 1 point for each item, so the child is then assigned a score of 7 for the measure sum score.

** “Tossed and turned” did not appear in the original administered measure, but has been added as an alternative definition based on participant feedback.

Measure adapted from the PROMIS Pain Behavior–Short Form accessible online through the PROMIS Assessment Center. As modified, this measure, Parent Pain Behavior Proxy, is not an official PROMIS measure.