Research Paper

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PRISM: a brief screening tool to identify risk in parents of youth with chronic pain

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Abstract

Having a child with chronic pain impacts a parent's life. Reciprocally, parent cognitive, affective, and behavioral responses to the child's chronic pain can influence the child's pain experience. The purpose of this study is to develop a brief self-report screening tool (Parent Risk and Impact Screening Measure [PRISM]) of parent psychosocial functioning and behavioral responses to child pain. This measure assesses parents' reports of their own stress, health, psychosocial functioning, and disruption in activities due to their child's pain and related disability. In an effort to preliminarily validate this screening tool, we examined the PRISM in relation to existing measures of parent distress, parent behavior, and child functioning. An initial 30-item PRISM was administered to 229 parents of children with persistent pain. Parents also reported on distress, protectiveness, pain catastrophizing and family impact, and youth completed measures of pain, pain-related disability, and quality of life. Item refinement resulted in a final 12-item PRISM tool. The PRISM demonstrates strong internal consistency, and initial support for construct validity was shown by associations with parent distress, protectiveness, and catastrophizing. Results also revealed higher PRISM scores are associated with higher child pain intensity, greater functional disability, and poorer quality of life. Cutoff scores were determined to identify parents at differing levels of risk. The PRISM is a brief and clinically important means of screening parent distress and behaviors associated with child pain-related dysfunction. Further validation will use PRISM in longitudinal studies, particularly testing PRISM scores as a predictor of parent and child outcomes over time.

Keywords: Chronic pain, Parents, Children, Adolescents, Stratified care, Stepped care, Questionnaire

1. Introduction

The consequences of pediatric chronic pain extend to parental social and emotional functioning.[4,11] Parent's own pain impacts child pain and functioning, with the offspring of parents with chronic pain being at increased risk of developing chronic pain and psychological problems.[8] Moreover, caregivers' emotional, cognitive, and behavioral responses to their child's pain influence the child's pain experience,[25] and high parent distress predicts less improvement in child function in treatment.[14] Reciprocal parent–child processes are a key tenet of empirically and theoretically derived models of the development and maintenance of pediatric chronic pain, which propose several parent domains.[20,26] These include parent catastrophizing,[5] parent pain-related fears,[24] protective behaviors,[29] family-level factors (eg, conflict),[15] and parent's own pain and mental health.[8] Much of this research has used multidimensional measures (eg, Bath Adolescent Pain-Parent Impact Questionnaire [BAP-PIQ][12]) or unidimensional tools (eg, Pain Catastrophizing Scale for Parents [PCS-P][5]; Adult Responses to Children's Pain [ARCS][29]). Although helpful for in-depth assessment of potential treatment targets, the length of these measures makes it difficult to assess multiple domains of parent function and behavior in busy clinical settings.

Multiple screening tools have emerged to rapidly assess risk of poor prognosis in the context of persistent pain. In adults, the 9-item Keele STarT Back Screening Tool (SBST) was developed for low-back pain.[9] The SBST allocates patients into 1 of 3 risk categories with recommendations for corresponding treatment pathways (eg, high-risk patients receive more intensive treatment compared with medium- and low-risk peers). The SBST has been successful in implementing targeted treatment pathways while being cost-neutral.[1]

A pediatric adaptation of this 9-item tool was recently developed for youth with persistent pain. The Pediatric Pain Screening Tool (PPST[23]) assesses child physical and psychosocial risk factors associated with the child chronic pain experience. The PPST demonstrated excellent accuracy in categorizing patients as high risk who met reference standards for elevated pain-related distress or disability 4 months later (range 71%-79%). These findings have been replicated among youth with headache.[7] Despite evidence that parent function and behavior in the context of a child's chronic pain is important to assess and address, no brief screening tool to assess parent symptomatology, and identify risk exists.

The primary objective of this study is to develop a brief clinical screening tool for parent biopsychosocial functioning and behavioral responses to child pain. Potential items were

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generated through the review of published measures, identified risk factors for poor child outcomes, and expert panel review. Item-level analysis was used for item reduction. In addition to concurrent and discriminant validity, we derived clinical cutoff scores through receiver operating characteristic (ROC) analyses using parent pain catastrophizing and child functional disability, key outcome domains. It was hypothesized that the final measure would be a brief and psychometrically valid screening tool with higher scores correlating with parent distress, maladaptive behavioral responses, and child disability. We also hypothesized that the tool would adequately discriminate between cases and noncases for parent catastrophizing and child function.

2. Methods

2.1. Participants and procedure

Participants were families with a child with persistent pain (ages 10-17 years) and 1 parent presenting for initial evaluation for the child's chronic pain at 2 tertiary care pediatric pain clinics (study site 1 and study site 2) in the United States from April 2015 to August 2016. Potentially eligible families were asked to participate during the clinic appointment. Parents completed study questionnaires through online survey (REDCap; Research Electronic Data Capture) on the day of the appointment. Child data were collected through pain clinic intake questionnaires that were later extracted from the clinic record for the purposes of this study. Inclusion criteria required the child be (1) presenting for a new evaluation for a chronic pain complaint, (2) experiencing pain for >3 months, and (3) free of severe developmental delays that would prohibit independent completion of self-report questionnaires. In addition, all parents and children were able to read and write in English.

Parent and child participants provided consent/assent for the study through a research assistant at each site. All parent measures were completed through REDCap, a secure, web-based application designed to support data capture for research studies. REDCap provides (1) an intuitive interface for validated data entry; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for seamless data downloads to common statistical packages; and (4) procedures for importing data from external sources.[6] All study procedures were approved by the Institutional Review Boards at the respective institutions where data were collected.

2.2. PRISM initial item pool development

To generate the initial PRISM item pool, 19 clinical and research psychologists who specialize in pediatric pain were invited to participate in an expert panel to review the preliminary screening tool that initially consisted of 15 items across 4 hypothesized domains (parent protective behaviors, parent distress, parent health, and family impact). The 3 collaborating authors (L.E.S., A. L.H., and A.C.W.) generated these items and domains deriving some item content from currently published measures (eg, Adults Responses to Child's Symptoms[29]). Panel members were instructed to rate each item for suitability in the screening tool from 0 = not at all important to 4 = very important. They were also prompted to provide any suggested changes to wording of items or additional items/concepts to potentially include. The expert panel consisted of 14 psychologists (n = 11 clinical/research; n = 3 research only) with pediatric pain expertise and at least 5 years of professional experience, with the majority having greater than 15 years of experience in the field of pediatric pain. Panel members represented 10 different institutions, including medical centers and universities and spanned 4 countries (United States, Belgium, Canada, and Germany). Based on feedback from the expert panel, each of the 15 items was rated at or above a mean of 2.3 on the 0 to 4 scale (range 2.3-3.9, average mean item rating of 3.4). Wording modifications to improve the clarity of lower-rated items were made for several items, and all were retained in the item pool. If the panel suggested a new item, it was added to the item pool, resulting in 15 additional items included to yield an initial pool of 30 items to be administered to parents. Sample items include "Our family life is stressful," and "My child's pain controls my life." Measure instructions ask parents to report on their experiences in the past 2 weeks and have a dichotomous response option: "disagree" or "agree," consistent with the SBST[9] and PPST.[23]

2.3. Measures

2.3.1. Demographic and child pain characteristics

2.3.1.1. Family Demographic Questionnaire

Parents completed a measure self-reporting on their own demographics (eg, age, marital status, race, and ethnicity) and those of their child.

2.3.1.2. Parent pain characteristics

Parents were asked to report on a single yes/no item assessing whether they currently have a recurrent pain problem that has been present for 3 months or longer. If they endorsed yes, they were asked to rate their usual pain intensity using a 0 to 100 Visual Analogue Scale.

2.3.1.3. Child Pain Questionnaire

Children completed a pain questionnaire reporting on their pain symptoms during the past month. Individual items were used to assess primary pain location(s), duration of the pain problem, pain frequency, and typical/usual pain intensity. Pain duration was calculated using time from the date of reported pain onset to the date of clinic visit (coded in months). Reports of the frequency of pain symptoms were assessed using a 6-point ordinal scale (0-5; 0 = "less than once/month" to 5 = "daily"). Usual pain intensity was assessed using the Numerical Rating Scale (NRS) (11-point NRS 0-10[27]).

2.3.2. PRISM construct validity measures

2.3.2.1. Patient Reported Outcomes Measurement Information System (PROMIS-29)

The 29-item PROMIS measure assesses 7 domains of adult functioning: physical function, anxiety, depression, fatigue, limitations in social roles and activities, pain interference, and pain intensity.[2] There are 4 items per scale, with the exception of the single-item pain intensity rating. Item responses are on a 5-point Likert-type scale, with the exception of pain intensity on an NRS 0 to 10. Raw subscale scores are created by summing all items for each domain, and T scores are calculated based on published norms. Higher score reflects more difficulty or distress (ie, greater limitations in social roles, depression, pain interference, etc).

2.3.2.2. Bath Adolescent Pain-Parental Impact Questionnaire

The BAP-PIQ uses multiple scales to assess changes in functioning and behavior associated with parenting an adolescent with chronic pain.[12] The BAP-PIQ is scored separately for each subscale. The self-blame and parent behavior subscales were used in this study.

2.3.2.3. Adult responses to children's symptoms

The ARCS assesses parent behavior in response to child pain.[29] The Protect subscale of the ARCS was used in this study. Protect scores are computed by calculating the average across items. Higher scores reflect more frequent use of protective responses.

2.3.2.4. Pain Catastrophizing Scale, parent report

The PCS-P assesses parent negative thinking associated with child pain.[5] It consists of 13 items, which participants rate on a 5-point scale. Response options are on a 5-point scale (0-4) ranging from 0 "not at all" to 4 "extremely." The total score was examined with higher scores reflecting greater parent pain catastrophizing.

2.3.3. Criterion-related validity measures

2.3.3.1. Functional Disability Inventory

The Functional Disability Inventory (FDI) was completed by children to report difficulty in areas of physical and psychosocial functioning due to physical health.[28] The measure consists of 15 items assessing the child's perceptions of their activity limitations during the past 2 weeks. Total scores are computed by summing the items with higher scores to indicate greater disability in the child.

2.3.4. Statistical analyses

Data analysis was conducted using SPSS version 21.0 (SPSS IBM, Armonk, NY). Descriptive statistics were conducted to examine underlying assumptions of normality for all variables of interest. The goal of the analyses conducted was to create a brief (<15-item) screening tool that could assess parent psychosocial functioning and behavioral responses to child pain in a busy clinical setting. Here, we present the analytic processes used in each step of the measure's development, including item refinement, scale variability, concurrent and discriminant validity, and the derivation of cutoff scores.

2.3.4.1. PRISM item refinement

To guide the development of the PRISM tool, we followed published recommendations for measure development and validation.[10] In addition, given the dichotomous response format and the importance of the measure to serve as a brief prognostic indicator of parent psychosocial distress in the context of their child's pain, we refined PRISM items through a 4-step process conducted through consensus (with authors L.E.S., A.L.H., and A.C.W.) that emphasized the predictive value of each item. Similar approaches have been used in measure development for other pain-related screening tools.[9,21] The item reduction process was outlined before conducting analyses. In the first step, we examined the association of each of the 30 initial PRISM items with validated measures of parent distress (general and pain-specific) and behavior as well as child report of functional disability using Pearson correlations. If an item was correlated >0.30 with one of our primary measures of interest (PROMIS-29 subscales [physical function, anxiety, depression, fatigue, limitations in social roles and activities, and pain interference], BAP-PIQ-Parent Behavior, BAP-PIQ-Parent Distress, FDI, or PCS-P), it was retained. In the second step, remaining items were evaluated based on content and using author consensus were divided among the 4 hypothesized measure domains (parent health, parent protective behaviors, parent distress, and family impact). Third, regressions were used to test loadings of each item onto the sum of items within each hypothesized domain. Items with the 50% top loadings in each domain were selected for inclusion. Finally, in the fourth step, we examined the internal consistency of all items on the scale to ensure that all items had an item-total correlation of 0.30 or greater. The retained items were used to compute PRISM total scores.

2.3.4.2. Scale variability

To examine scale variability by demographics (eg, parent gender) and child pain parameters (eg, pain location), Pearson product–moment correlations and 1-way analyses of variance (ANOVAs) were conducted.

2.3.4.3. Concurrent validity

Bivariate correlations were used to assess associations between PRISM total scores and primary parent (PROMIS-29, BAPQ-PIQ, and PCS-P) and child (FDI) validation measures.

2.3.4.4. Discriminant validity

Using ROC curves and by calculating the area under the curve (AUC) for the overall PRISM score, we compared scores against "cases" on relevant reference standards. Reference standard multi-item measures were dichotomized to provide "cases" and "noncases" using established cutoffs. Pain catastrophizing reference standard cases were PCS-P ≥23 based on highest tertile in Pielech et al., 2014.[22] For child outcomes, we examined scores in relation to functional disability (cases defined as FDI score of ≥13).[13] For the PROMIS domains of anxiety, depression, fatigue, and pain interference, reference standard cases were T-score ≥60. For the PROMIS domains of physical function and limitations in social roles and activities, reference standard cases were T-scores ≤40. These values were chosen as they are ±1 SD from the mean (T-score = 50), and given that moderate levels of distress would be important to capture and the tendency of the pediatric chronic pain population to underreport psychological distress.[17] Strength of discrimination was classified according to the following descriptors: 0.7 to <0.8 acceptable discrimination and 0.8 to <0.9 excellent discrimination.[30]

2.3.4.5. Deriving PRISM cutoff scores

One of the goals of creating the PRISM was to provide clinically meaningful subgroups to inform treatment decision-making. To define risk groups, we examined ROC curves for PRISM total scores against reference standard cases of parent pain catastrophizing and functional disability because these 2 domains are highly relevant and have predetermined cutoffs for defining reference cases. As the PRISM is designed to be a screening tool, sensitivity was weighed as more important than specificity. Identified risk groups were then compared on primary parent and child validation measures using a 1-way ANOVA.

3. Results

3.1. Participants

Of the 274 patients eligible for the study, 252 enrolled (92% recruitment rate). Primary reason for not enrolling was research recruitment conflicting with clinic schedule (eg, patient arrived late). Given that the primary purpose of this study was to support validation of the PRISM, participants who did not complete all PRISM items (n = 23) were excluded resulting in a 91% completion rate. Recruitment and completion rates did not differ by study site. Thus, the final sample consisted of 229 families (1 parent and their child with chronic pain; n = 150 from study site 1, n = 79 from study site 2). Parents were predominantly mothers (87.3%) and the majority were married 76.4%. Average age was 44.8 years (SD = 6.47). Parent race was predominantly white (95.6%), and ethnicity was non-Hispanic (92.5%). Parents were generally well-educated with 93.5% completing at least some college or more. Current chronic pain was reported by 30.1% of parents, who reported usual pain intensity of M = 48.37 (SD = 20.50).

Youth were an average of 13.9 years (SD = 2.52, range 8-17 years), 78.6% female, 93.0% white, and 91.6% non-Hispanic. Primary pain locations in the child were 35.7% leg or foot, 18.3% back, 17.4% abdomen, 15.5% head, 6.1% shoulder or neck, 5.2% arm or hand, 1.4% chest, and 0.5% face or jaw. Average child reported pain intensity was 6.05 (SD = 1.71).

Parent sex, race, and ethnicity did not differ by study site. Parents at study site 1 were significantly older than parents at study site 2. Child age and ethnicity did not differ by study site. Children at study site 1 were more likely to be female and white.

3.2. PRISM item reduction

In the first step, we examined correlations between each PRISM item and our variables of interest: PROMIS-29 subscales (physical function, anxiety, depression, fatigue, limitations in social roles and activities, and pain interference), BAP-PIQ-Parent Behavior, BAP-PIQ-Parent Distress, FDI, and PCS-P (supplementary Tables 1 and 2, available at http://links.lww.com/PAIN/A663). If an item was correlated >0.30 with one or more of these variables, it was retained. Among the 30 potential items, 6 were eliminated at this step. In the second step, the 24 remaining items were divided among the 4 hypothesized measure domains: parent health (5 items), parent protective behaviors (6 items), parent distress (7 items), and family impact (6 items) (supplementary Table 3, available at http://links.lww.com/PAIN/A663). In the third step, we regressed each individual domain item on to the domain total score (eg, each of the 7 items separately on the parent distress total score). With the goal of reducing the number of items, we retained the top 50% loading items for each domain. For parent health, 3 items were retained (β = 0.60-0.68), 3 items were retained for parent protective behaviors (β = 0.75-0.75), 4 items for parent distress (β = 0.70-0.74), and 3 items for family impact (β = 0.70-0.81) (supplementary Table 4, available at http://links.lww.com/PAIN/A663). Finally, we conducted an internal consistency analysis across the remaining 13 items with the goal of retaining items with an item-total correlation of 0.30 or greater. One item did not meet this threshold (r = 0.15), "My own health makes it difficult for me to be physically active." All other items ranged from r = 0.41 to r = 0.63 (supplementary Table 5, available at http://links.lww.com/PAIN/A663).

Thus, the final PRISM tool (α = 0.85) consists of 12 items (**Table 1**). The Distress domain consists of 4 items (α = 0.77), the Protect domain consists of 3 items (α = 0.74), the Family Impact domain consists of 3 items (α = 0.74), and the Parent Health domain consist of 2 items (no internal consistency calculated).

3.3. Scale variability

PRISM total scores in this clinical sample ranged from 0 to 12 with mean 6.31 and SD 3.61. Among the items on the PRISM, "I find it difficult to tolerate my child's suffering" (66.7%) was the most frequently endorsed item, whereas "My usual activities have not been as enjoyable" (37.6%) was least frequently endorsed. Frequency of endorsement for each item is detailed in **Table 1**. Using 1-way ANOVAs, PRISM scores did not significantly differ by child pain location, f(7, 205) = 1.32, *ns*, and scores were not associated with pain duration based on bivariate correlation analyses (r = 0.07, *ns*). For parent characteristics, mothers (M = 6.56, SD = 3.54) reported higher PRISM scores compared with fathers (M = 4.59, SD = 3.61) t(227) = −2.80, $P < 0.05$. Given the lack of racial diversity, we were unable to examine this variable in relation to PRISM scores. Scores did not correlate significantly with parent age (r = 0.03, *ns*).

3.4. Concurrent validity

Spearman's Rho correlations were conducted between PRISM total and domain scores with parent pain catastrophizing, parent self-blame, parent behavior, PROMIS-29 subscales, and child disability. All associations were significant in the expected direction with most correlations medium to large in magnitude (**Table 2**).

3.5. Discriminant validity

We generated ROC curves to derive the AUC for the PRISM score against reference standard cases to examine how well the screening tool could discriminate cases from noncases. The AUC

Table 1

Frequency of PRISM item endorsement.

PRISM items	Agree (%)	Disagree (%)
Distress		
I worry all the time about my child's pain.	57.0	43.0
My child's pain overwhelms me.	40.2	59.8
I believe that my child's pain problem is out of control.	57.7	42.3
I find it difficult to tolerate my child's suffering.	66.7	33.3
Parent behavior		
I allow my child to skip family activities because of my child's pain.	52.2	47.8
I let my child sleep later than usual in the morning because of my child's pain.	55.5	44.5
I do my child's chores instead of making him/her do them.	50.0	50.0
Family impact		
Our family life is stressful because of my child's pain.	43.2	56.8
I stay home or come home early because of my child's pain.	50.2	49.8
Our family routines are disrupted by my child's pain.	57.9	42.1
Parent health		
I have felt sad or down.	65.1	34.9
My usual activities have not been as enjoyable.	37.6	62.4

Table 2

Correlations, mean values, and SDs for PRISM, parent, and child factors.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. PRISM-Total	—	**0.79**	**0.77**	**0.82**	**0.63**	**0.49**	**0.66**	**0.48**	**0.56**	**0.50**	**0.45**	**0.31**	**0.26**	**−0.53**	**−0.18**	**0.45**
2. PRISM-Distress		—	**0.39**	**0.49**	**0.37**	**0.53**	**0.68**	**0.36**	**0.38**	**0.39**	**0.34**	**0.21**	0.10	**−0.31**	−0.10	**0.29**
3. PRISM-Protect			—	**0.58**	**0.37**	**0.26**	**0.37**	**0.42**	**0.41**	**0.31**	**0.33**	**0.23**	**0.25**	**−0.39**	**−0.23**	**0.42**
4. PRISM-Family Impact				—	**0.42**	**0.32**	**0.48**	**0.43**	**0.44**	**0.38**	**0.35**	**0.18**	**0.23**	**−0.49**	−0.09	**0.40**
5. PRISM-Parent Health					—	**0.36**	**0.43**	**0.22**	**0.55**	**0.52**	**0.42**	**0.40**	**0.25**	**−0.47**	*−0.15*	**0.25**
6. Pain Catastrophizing						—	**0.55**	**0.38**	**0.36**	**0.46**	**0.27**	**0.24**	0.10	**−0.22**	−0.05	**0.25**
7. BAPQ-Parent Self-blame							—	**0.35**	**0.56**	**0.54**	**0.48**	**0.36**	*0.14*	**−0.44**	−0.10	**0.27**
8. BAPQ-Parent Behavior								—	**0.29**	**0.28**	**0.28**	*0.15*	**0.21**	**−0.30**	*−0.13*	**0.33**
9. Depression Symptoms									—	**0.72**	**0.53**	**0.36**	**0.29**	**−0.52**	**−0.20**	**0.29**
10. Anxiety Symptoms										—	**0.54**	**0.41**	**0.36**	**−0.49**	**−0.22**	**0.21**
11. Fatigue Symptoms											—	**0.52**	**0.37**	**−0.59**	**−0.36**	*0.16*
12. Sleep Disruption												—	**0.34**	**−0.43**	**−0.27**	**0.20**
13. Pain Interference													—	**−0.47**	**−0.66**	**0.22**
14. Social Relations														—	**0.40**	**−0.29**
15. Physical Function															—	*−0.15*
16. Child Functional Disability																—

Spearman's Rho correlations are 2-tailed; correlations 0.20 to 0.49 are medium in magnitude, 0.50 or greater are large in magnitude; significant associations at $P < 0.01$ are in bold, significant associations at $P < 0.05$ are in italics, and nonsignificant associations are in plain text; variables 9 to 15 are PROMIS-29 subscales.
BAPQ, Bath Adolescent Pain Questionnaire.

for the overall PRISM ranged from fair to good discrimination with the strongest discrimination for the PROMIS-Depression reference cases (**Table 3**).

3.5.1. Deriving PRISM cutoff scores

Using an approach similar to that used in previous studies,[9,23] ROC curves were examined to derive cutoff scores for the PRISM. The ROC curves for disability and pain catastrophizing are depicted in **Figure 1**. Balancing sensitivity and specificity, a PRISM total score of 6 or greater was the best concurrent predictor of a reference standard case of moderate to severe functional disability. Similarly, a PRISM total score of 6 or greater was the best concurrent predictor of a reference standard case of moderate to high levels of parent pain catastrophizing. Given this cutoff score, the proposed risk screening reference point was 6 or greater. Within this tertiary care sample, 58% of parents had scores of 6 or more, thus it may be clinically indicated to use a higher cutoff for this group. We therefore examined scores 1 SD above the mean as the "highest" risk group with scores of 9 or more. See **Table 4** for differences across the groups with a cutoff of 6 (**Table 4**) and across 3 risk groups (low, 0-5; moderate, 6-8; and high, 9+; **Table 5**).

4. Discussion

This study introduces a screening tool to identify parents of youth with chronic pain who may benefit from targeted intervention. This measure is an important contribution to the field as treatment of chronic pain is a challenge, and parents can play an important role in child outcomes. A key strength of the PRISM is assessment of multiple domains within a brief measure. The PRISM is the only multidimensional tool for assessing parent psychosocial functioning and behavioral

Table 3

Discriminant validity: area under the receiver operating characteristic (RUC) curve for PRISM total score against reference standard cases.

Reference standards	Case definition	PRISM total score, AUC (95% CI)
Parent		
High pain catastrophizing	PCS-P ≥23	0.73 (0.66-0.79)
Elevated depression symptoms	PROMIS-depression T-score ≥60	0.78 (0.71-0.85)
Elevated anxiety symptoms	PROMIS-anxiety T-score ≥60	0.75 (0.68-0.82)
Elevated fatigue symptoms	PROMIS-fatigue T-score ≥60	0.71 (0.64-0.77)
Elevated sleep disruption	PROMIS-sleep T-score ≥60	0.60 (0.51-0.70)
Elevated pain interference	PROMIS-pain inteference T-score ≥60	0.68 (0.59-0.77)
Impaired social relations	PROMIS-social relations T-score ≤40	0.74 (0.62-0.85)
Impaired physical function	PROMIS-physical function T-score ≤40	0.62 (0.50-0.74)
Child		
Moderate to severe child disability	FDI ≥13	0.71 (0.63-0.79)

95% CI, 95% confidence interval; AUC, area under the curve; FDI, Functional Disability Inventory; PCS-P, Pain Catastrophizing Scale for parents.

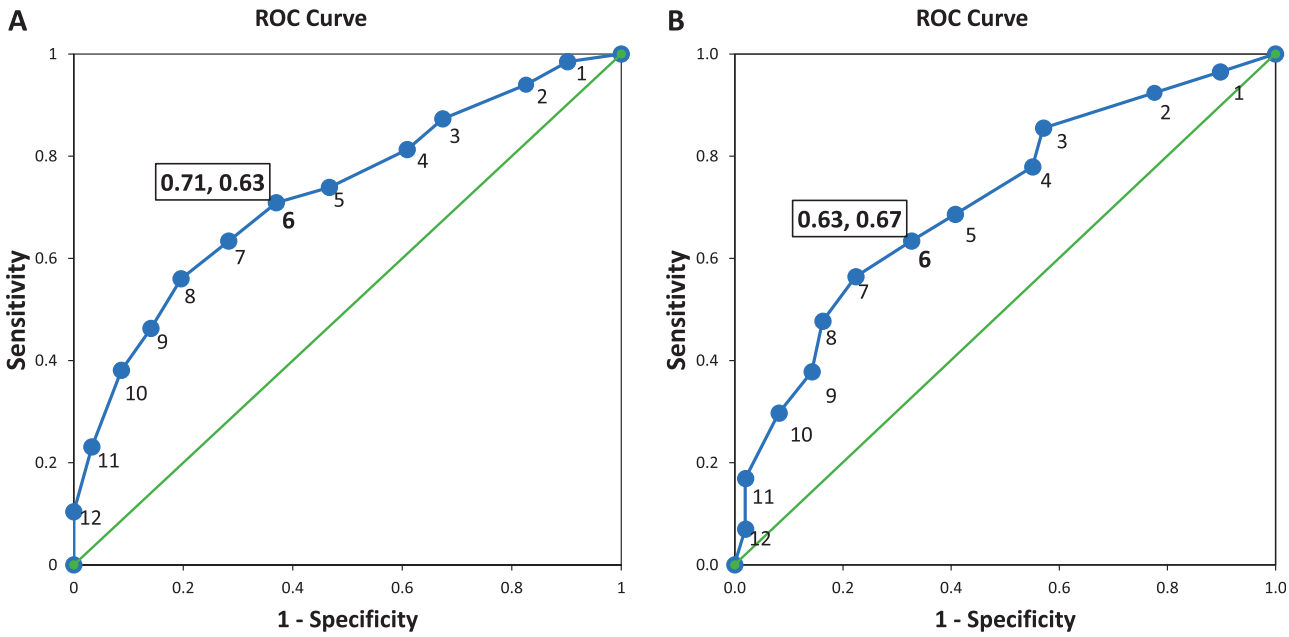

Figure 1. Scoring cutoffs for subgroup allocation. Receiver operating characteristic (ROC) curves for overall tool score and psychosocial subscale score against reference standard cases for (A) pain catastrophizing for parents (total), (B) child functional disability. Boxed numbers indicate sensitivity and specificity values. The green line signifies the null.

responses to child pain. Further results support the validity of PRISM both in associations with measures of parent symptoms and behaviors, as well as child pain and pain-related disability. Contrary to our hypothesis, items on the parent health domain were not retained in the final PRISM measure. There is substantial data supporting the link between parent pain and health and child pain and related outcomes.[8,26] However, much of the existing evidence for this comes from clinical samples of parents who have chronic pain. In the current study, parents reported on the presence or absence of chronic pain, but information about clinical severity or whether they were treatment-seeking was not collected. Thus, parent endorsement of chronic pain or single-item assessment of pain-related disability may not be the most salient or immediate predictors of child functioning in this pediatric pain clinic sample.

The 12-item PRISM can be used in a busy clinical setting promoting questionnaire completion and decreasing the likelihood of responder fatigue. Simplifying the clinical screening process will promote fast and accurate assessment of parental factors that contribute to the child pain experience. Furthermore, with the inclusion of clinical cutoffs identifying parents at low, moderate, and highest risk, results of the PRISM are readily interpretable. Like measures of child pain-related disability (FDI[28]) and catastrophizing (PCS-C[3]) that have published cutoffs, having scores that quickly signify elevated symptoms is useful in the busy clinical environment. The risk groups might inform the selection of parents and families who could benefit from more thorough assessment of family function, referrals for parent-focused treatment, or targeted pain-related interventions for parents (eg, the addition of parent problem solving).[18] Identifying parent risk at initial pain clinic evaluation is a critical component for treatment planning. Parents are consistently viewed as playing an important role in cognitive behavioral therapy for pediatric pain. Data demonstrate that parents who engage in family-based cognitive behavioral therapy demonstrate less protective behavior and distress.[14,19] It is also possible that the PRISM could be used to efficiently track changes in parents over the course of treatment, although additional research will be needed to demonstrate the utility of the measure for assessing treatment response. In the research setting, risk group might be used to stratify or assign participants to study conditions with the goal of achieved tailored treatments.

Table 4

PRISM risk groups using 6-point cutoff and outcomes.

	PRISM risk group			
	0-5 (n = 97), M (SD)	6-12 (n = 132), M (SD)	*df*	t
Parent				
Pain catastrophizing	20.06 (8.24)	28.19 (9.63)	224	−6.68*
Depression symptoms	46.96 (7.22)	54.55 (8.27)	224	−7.18*
Anxiety symptoms	51.05 (7.89)	58.3 (7.94)	225	−6.83*
Parent distress	7.58 (4.75)	14.02 (5.07)	225	−9.70*
Parent behavior	22.17 (5.62)	26.24 (5.06)	226	−5.73*
Child				
Functional disability	17.95 (9.98)	26.61 (10.6)	219	−6.18*

* $P < 0.01$.

Table 5

PRISM risk groups using 6-point and 9-point cutoff and outcomes.

	PRISM risk group			
	0-5 (n = 97), M (SD)	6-8 (n = 55), M (SD)	9-12 (n = 77), M (SD)	F
Parent				
Pain catastrophizing	20.06 (8.24)[a]	24.72 (9.04)[b]	30.69 (9.32)[c]	30.85*
Depression symptoms	46.96 (7.22)[a]	50.80 (8.08)[b]	57.20 (7.37)[c]	39.89*
Anxiety symptoms	51.05 (7.89)[a]	55.77 (6.77)[b]	60.16 (8.26)[c]	29.32*
Parent distress	7.58 (4.75)[a]	11.85 (4.59)[b]	15.57 (4.84)[c]	60.81*
Parent behavior	22.17 (5.62)[a]	24.20 (4.23)[a]	27.70 (5.12)[b]	24.88*
Child				
Functional disability	17.95 (9.98)[a]	24.85 (10.57)[b]	27.91 (10.50)[b]	20.58*

Different letter superscripts are significantly different through Bonferroni post hoc pairwise comparisons (eg, a is different from b) at $P < 0.05$.
* $P < 0.01$.

Study findings should be considered in light of several limitations. Despite recruiting patients from 2 multidisciplinary pain clinics located in different geographical regions of the United States, the sample lacked demographic and ethnic diversity. Although this is reflective of the patients seen in tertiary care pediatric pain clinics,[13,16] it warrants purposeful sampling in future validation studies to recruit non-white samples and families with a wider variety of education backgrounds and income levels to ensure that measure generalizability. For example, items such as "I allow my child to skip family activities because of my child's pain" may be interpreted and endorsed differently based on family context and available resources (eg, vacations vs mealtime). Using the "think aloud" method to identify how parents are interpreting test items in future studies would lead to ways to refine the items for greater clarity. In addition, parent participants were predominantly mothers of female children. Although these characteristics reflect the composition of patients seen in many specialty pediatric pain clinics, findings may not be generalizable to all youth with chronic pain. In addition, while the method we selected for item refinement was based on published guidelines for measure development, different methodological approaches could have been used, which might have impacted the final PRISM items.

This study was also limited by a single time-point design. Because participants completed the PRISM measure exclusively at the time of new pain clinic evaluation, we do not know the value of the PRISM in predicting pain outcomes over time and have not examined how PRISM scores might change over the course of treatment. This is an important future direction. Finally, the current study included a heterogeneous pain clinic sample, particularly youth with different pain conditions. Although results did not show differences in PRISM scores by child pain location or duration, it is possible that within a larger sample, differences may emerge. A key future direction will be to validate the PRISM and examine cutoff scores within specific chronic pain populations (headache and abdominal pain). Larger and more diverse samples will be needed to examine the measure as it relates to child and parent sociodemographic variables. Validation of the PRISM in the context of pediatric acute pain can also be considered. Emerging research has focused on examining biobehavioral and family predictors of child pain and pain-related disability even in the acute period.

To summarize, the PRISM is a brief and clinically important means of screening parent distress and behaviors associated with child pain-related dysfunction. Study findings show that the PRISM can be used to identify parents with elevated symptoms and distress who may benefit from targeted interventions.

Conflict of interest statement

The authors have no conflict of interest to declare.

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Appendix A. Supplemental digital content

Supplemental digital content associated with this article can be found online at http://links.lww.com/PAIN/A663.

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