Brief Report: A Confirmatory Approach to Exploring the Factor Structure of the Social Consequences of Pain Questionnaire

Amy F. Sato,1 PhD, W. Hobart Davies,1,2 PhD, Kristoffer S. Berlin,3 PhD, Katherine Simon Salamon,1 MS, Kimberly Anderson Khan,2,4 PsyD, and Steven J. Weisman,2,4 MD
1University of Wisconsin-Milwaukee, 2Medical College of Wisconsin, 3Brown Medical School and Bradley Hasbro Children’s Research Center and 4Children’s Hospital of Wisconsin

Objective  Confirmatory factor analysis was used to evaluate the factor structure of the Social Consequences of Pain (SCP) questionnaire in youth referred for specialty pain treatment. The existing four-factor structure (i.e., Positive Attention, Negative Attention, Activity Restriction, Privileges) was compared to an alternate three-factor structure merging Positive Attention and Privileges into a single scale (Favorable Consequences).

Methods  Participants were 373 youth (aged 8–18 years) with chronic pain referred to a tertiary pain clinic. Most participants presented with pain in the head, abdomen, legs, or back. Participants completed the SCP questionnaire at or before an intake appointment.

Results  Both three-factor and four-factor solutions were acceptable. The three-factor solution emerged as preferable due to stronger internal consistencies.

Conclusions  Findings support the validity of the SCP for the assessment of social consequences in diverse presentations of pediatric chronic pain.

Key words  Assessment; chronic and recurrent pain; pain; structural equation modeling.

Introduction

Social consequences of pain (SCP) represent a primary reinforcement mechanism in the development of children’s adaptive and maladaptive pain behaviors (Chambers, Craig, & Bennett, 2002). When children receive favorable social consequences (e.g., special attention, privileges) and restriction of routine daily activities (e.g., staying home from school) in response to their pain, their symptoms and disability are likely to be reinforced and maintained (Walker, Claar, & Garber, 2002). Sympathetic or encouraging parental responses to pain behavior are positively associated with children’s pain severity, days of illness, child distress, and difficulties in coping with pain (e.g., Gidron, McGrath, & Goodday, 1995). Consistent with a social learning theory perspective, reinforcing consequences may lead to increased duration of a child’s pain-related condition and adoption of the sick role (Huguet, Miró, & Nieto, 2008; Walker & Zeman, 1992; Wall, Holden, & Gladstein, 1997). Although it has been hypothesized that ignoring or responding negatively to pain behaviors (e.g., expressing irritation) may serve to decrease their frequency and improve functioning (Kerns et al., 1991), unfavorable consequences have received less attention in the literature and results are mixed with regard to their impact (Chambers et al., 2002).

The purpose of this study was to further evaluate a measure of social consequences in pediatric chronic pain. The social context plays a critical role in the experience of pain and should be considered a valuable target of assessment efforts (Karoly, 1985). There is a pressing need for contextual measures that assess specific social consequences in pediatric chronic pain (Bursch, Walco, & Zeltzer, 1998). Coaching parents on how to respond to children’s pain complaints has been an integral part of pediatric chronic pain treatment protocols (e.g., Robins, Smith, Glutting, & Bishop, 2005). The ability to quantify the types and levels of responses parents and significant others provide to children’s pain complaints has important implications for treatment process research. Clinically, tools that assess social consequences could be useful in...
identifying familial targets for intervention and social processes that influence the course of pain (Huguet et al., 2008).

A review of the pediatric pain literature reveals five instruments that have been used to assess social consequences. These include the Parent Response to Children’s Recurrent Pain Episodes scale (Wall et al., 1997), Children’s Headache Assessment Scale (Budd, Workman, Lemsly, & Quick, 1994), Illness Behavior Encouragement scale (Walker & Zeman, 1992), Inventory of Parent/Caregiver Responses to the Children’s Pain Experience (Huguet et al., 2008), and SCP questionnaire (Walker et al., 2002). Of these, the SCP questionnaire is unique given its assessment of both favorable and unfavorable social consequences, availability of scales to assess various aspects of such consequences, development with a clinical sample, and acceptable psychometric properties.

The SCP questionnaire assesses youth’s perceptions of favorable and unfavorable social consequences in response to abdominal pain. Exploratory factor analysis (EFA) of the SCP questionnaire was conducted by Walker and colleagues (2002) using a principal-components extraction with varimax rotation. This suggested a four-factor solution: Positive Attention (i.e., positive attention from others), Activity Restriction (i.e., relief from responsibilities and restriction of activities), Negative Attention (i.e., criticism and failure of others to validate the child’s symptoms), and Privileges (i.e., granting of special privileges). Correlations between the scales ranged from 0.02 to 0.50. A preferable design (Russell, 2002) would have utilized an oblique rotation, which allows for such correlations and is appropriate when the factors are thought to be moderately or highly related.

Although Walker and colleagues (2002) completed initial work using EFA and have proposed a preliminary factor structure, further evaluation of the measure, including confirmation of the proposed factor structure, has not been conducted. In addition, the SCP questionnaire has only been validated for youth with abdominal pain. Given the range of pediatric chronic pain complaints that commonly occur, support for validity across a broader spectrum of pain complaints would enhance the clinical and research utility of this measure. This study sought to accomplish two goals. First, we sought to further the development of the SCP questionnaire by adopting a confirmatory analytic approach to evaluate the previously proposed four-factor structure and to compare this structure to an alternative, theoretically derived three-factor structure. Conceptually, the content of the items on the Positive Attention and Privileges scales both represent favorable rewards, suggesting they may be better represented by a single Favorable Consequences scale. The moderate internal consistency of the Privileges scale (α = .67) and strong correlation between the Privileges and Positive Attention scales (r = .45) reported by Walker et al. (2002) further support this exploration. The second goal of this study was to expand the applicability of the SCP questionnaire past abdominal pain by examining the measure’s validity among a broader sample of youth presenting with a range of pain complaints.

Methods
Participant Characteristics
This study was based on 388 consecutive youth with chronic pain (pain that recurs or persists for ≥3 months) referred for a multidisciplinary evaluation between February 2005 and January 2007 at a tertiary chronic pain clinic at a Midwest Children’s Hospital. Patients were seen in the clinic across a 2-year time frame. Consistent with the initial validation of the instrument, youth aged 8–18 years were included. Of the 388 potential participants, 15 were <8 years of age, leaving an eligible sample of 373 patients within the selected age range. Of these 373 participants, 20 youth did not complete the SCP questionnaire, yielding a participation rate of 94.6%. Of these 353 youth, participants were primarily females (70.6%) and were on average 13.1 years old (SD = 3.1 years). The sample was 82% Caucasian, 10% African American, 5% biracial, 3% Latino, and <1% Asian and Native American.

The most common pain locations were the head (32.6%), abdomen (25.3%), legs (14.7%), and back (10.3%). Other reported pain locations included generalized pain (5.3%), chest (3.5%), joints (3.2%), upper extremity (1.8%), neck (1.2%), and other locations (1.5%). Nearly one-third (29.8%) of participants reported pain duration of 3–6 months, 16.1% >6 months to 12 months, 11.9% >1 year, 14.6% >2 years, and 27.7% >3 years.

Procedure
As part of the clinic’s intake evaluation prior to the development of a treatment plan, all youth scheduled for an intake evaluation were mailed the SCP questionnaire as part of a packet of questionnaires. Patients were asked to return questionnaires by mail in a pre-paid envelope before the first appointment or to complete them in the clinic at the time of the initial appointment. Data were de-identified and retrieved archivally for the
current study. This study was approved by the appropriate institutional review boards.

Measures

Pain Rating
As part of the multidisciplinary intake evaluation, youth were asked to rate their best, worst, and usual pain intensity on a standard 11-point verbal numerical rating scale (Varni, Thompson, & Hanson, 1987), where 0 represents no pain and 10 represents the most pain possible. The average best, worst, and usual pain ratings were 2.3, 8.8, and 6.2, respectively.

Social Consequences
The SCP questionnaire (Walker et al., 2002) is a 32-item youth-report scale developed to measure the social consequences of pain in interaction with parents, teachers, and peers for youth between the ages of 8 and 18 years. The measure asks youth to rate, on a 5-point Likert-type scale ranging from 0 (“Never”) to 4 (“Always”), how often they receive a particular social consequence when they have abdominal pain. Walker et al. (2002) presented four scales: Positive Attention (11 items), Activity Restriction (11 items), Negative Attention (6 items), and Privileges (4 items). Higher scores indicate greater levels of the named construct. Scale scores are calculated as the mean of unweighted item ratings, with a possible range from 0 to 4.

To assess the applicability to diverse pediatric pain patients, the stem for each item was changed from “When you have a bad stomach ache, how often . . .” to “When you have bad pain, how often . . .” The three items referring specifically to abdominal pain were altered to make them broadly applicable to chronic pain. These items, with original wording bracketed, were: “Does your mom or dad tell you not to make such a fuss about your pain [stomach]?”; “Does your mom or dad tell you that there’s nothing they can do about your pain [stomach ache]?”; and “Does your mom or dad ignore you when you talk about your pain [stomach hurting]?”.

Analytic Plan
The first step in data analysis involved evaluating the internal consistency of the four original scales and the proposed Favorable Consequences scale. Following this, confirmatory factor analysis (CFA) using a robust maximum-likelihood estimation method in LISREL 8.54 (Jöreskog & Sörbom, 2003) was employed to evaluate the original four-factor structure of the SCP questionnaire and the alternate three-factor structure (Favorable Consequences, Activity Restriction, Negative Attention). This method was preferred over transformations as it allowed for the computation of a Satorra–Bentler Scaled $\chi^2$ (SB $\chi^2$) and robust standard errors, which adjusts for multivariate kurtosis (Satorra & Bentler, 1988) and leaves items and factors in the same scale and range of scores (improving comparability across studies). Because the traditional chi-square statistic as a test of absolute fit is sensitive to sample size (Hu & Bentler, 1999), the Comparative Fit Index (CFI) was also included to assess the fit of the measurement models. CFI values of .90 and .95 represent an acceptable and good model fit, respectively (Hoyle & Panter, 1995). The Root Mean Square Error of Approximation (RMSEA) was supplied as an indication of the population error variance. Interpretation of RMSEA values is as follows: good (<0.05), acceptable (0.05–0.08), marginal (0.08–0.10), and poor (>0.10) (Hu & Bentler, 1999). As recommended by Hu and Bentler (1999), the Standardized Root-Mean Square Residual (SRMR), a residual-based fit index, was calculated. The SRMR has a range of 0–1; values <0.08 are desired. For comparisons of non-nested models, the Akaike (1974) information criterion (AIC) was calculated, with preference going to the model with the lowest AIC.

Missing Data
Of the 353 total participants, 72% ($n = 253$) completed all 32 items of the SCP questionnaire. There were no differences between those with complete and incomplete data in terms of age: $t(373) = 1.63, p = .11, d = .17$; age of pain onset: $t(342) = 0.77, p = .44, d = .08$; pain duration: $t(336) = 1.18, p = .24, d = .13$; or gender $\chi^2 (1) = 0.01, p = 0.99, \phi = .001$. To account for missing data three methods were used: listwise deletion; multiple imputation with an EM algorithm; and replacing missing values with the average of the other items in that subscale. Consistent results across methods suggested that these missing data strategies had a negligible effect on the results; therefore, only the listwise deletion results are presented. Additional details for the factor analyses, including the covariance matrices and fit statistics based on each missing data strategy, are available on the Journal of Pediatric Psychology website.

Results
See Table I for scale internal consistencies, means, standard deviations, and ranges based on the four-factor and three-factor structures of the SCP examined in this study. As can be seen in Table I, Cronbach’s alphas are comparable to those presented in the original development.
study (Walker et al., 2002), with a wider range across the four scales of the SCP questionnaire (current study: $a = 0.55–0.88$, $M = 0.75$; Walker et al., 2002: $a = 0.67–0.84$, $M = 0.77$).

In the CFAs for both the three-factor and four-factor structures, all items served as statistically significant indicators of their proposed latent factors. Based upon listwise deletion, model fit for the three-factor solution ($df = 461$) was as follows: SB-$\chi^2$ (1043.48), RMSEA (0.07), CFI (0.92), SRMR (0.08), and AIC (1177.48). Model fit statistics for the four-factor solution ($df = 458$) were: SB-$\chi^2$ (1023.29), RMSEA (0.07), CFI (0.92), SRMR (0.08), and AIC (1163.29).

### Discussion

Social consequences of pediatric pain hold important implications for children’s pain experiences and should be a focus of assessment. However, the measures available for assessing social consequences of pediatric chronic pain are hindered by limited scope of assessment and incomplete evaluation of psychometric properties. The empirical test of the internal structure of the SCP questionnaire was based on the theoretical framework suggested by Walker and colleagues (2002), who conceptualized the social consequences of pediatric chronic pain on this measure as spanning the areas of positive attention, activity restriction, negative attention, and privileges.

The confirmatory approach to model fit adopted by this study suggested that both the three-factor and four-factor solutions of the SCP questionnaire were adequate, with minimal differences in model fit. The RMSEA, CFI, and SRMR suggested acceptable fit for both solutions. Even in the context of comparable model fit, the three-factor solution of the SCP questionnaire is preferable for two reasons. First, inspection of internal consistency suggests that the scales within the three-factor structure are more robust than the four-factor structure. Specifically, whereas reliability of the Privileges scale within the four-factor solution was unacceptable in this study and was the lowest of all scales in the development study (Walker et al., 2002), all scales within the three-factor structure showed robust internal consistency. The second reason that the three-factor structure is preferable is conceptual in nature. Specifically, the Positive Attention and Privileges scales within the four-factor structure are similar, with items from both scales representing reinforcing consequences of chronic pain. Thus, conceptually it makes sense for these items to be combined into one scale.

The identification and modification of socioenvironmental factors that may influence pain expression and functioning are an important part of cognitive-behavioral therapy for chronic pain (Varni, 1983). In particular, the role of parents in managing contingencies (i.e., favorable and unfavorable social consequences) for pain behavior has been conceptualized as a crucial component of cognitive-behavioral interventions for pediatric chronic pain. Several CBT protocols (e.g., Robins et al., 2005) have included a parent-training component focused on how to modify parents’ responses to their children’s chronic pain.

### Table I. Scale Internal Consistencies, Means, and Standard Deviations of the SCP Questionnaire from the Current Study and Walker et al. (2002) Development Study

<table>
<thead>
<tr>
<th>Scale</th>
<th>Reliability</th>
<th>Scale score</th>
<th>Scale range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cronbach’s $\alpha$</td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td><strong>Current study</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three-factor solution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Favorable consequences$^a$</td>
<td>.85</td>
<td>1.40</td>
<td>.72</td>
</tr>
<tr>
<td>Activity restriction</td>
<td>.88</td>
<td>1.97</td>
<td>.93</td>
</tr>
<tr>
<td>Negative attention</td>
<td>.72</td>
<td>1.00</td>
<td>.72</td>
</tr>
<tr>
<td>Four-factor solution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive attention</td>
<td>.85</td>
<td>1.60</td>
<td>.83</td>
</tr>
<tr>
<td>Activity restriction</td>
<td>.88</td>
<td>1.97</td>
<td>.93</td>
</tr>
<tr>
<td>Negative attention</td>
<td>.72</td>
<td>1.00</td>
<td>.72</td>
</tr>
<tr>
<td>Privileges</td>
<td>.55</td>
<td>0.85</td>
<td>.73</td>
</tr>
<tr>
<td><strong>Walker et al. (2002)$^b$</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive attention</td>
<td>.84</td>
<td>1.97</td>
<td>.81</td>
</tr>
<tr>
<td>Activity restriction</td>
<td>.83</td>
<td>1.76</td>
<td>.76</td>
</tr>
<tr>
<td>Negative attention</td>
<td>.73</td>
<td>0.89</td>
<td>.74</td>
</tr>
<tr>
<td>Privileges</td>
<td>.67</td>
<td>1.11</td>
<td>.84</td>
</tr>
</tbody>
</table>

$^a$Favorable Consequences scale formed by combining items from the Positive Attention and Privileges scales.

$^b$Scale maximum and minimum values not reported by Walker et al. (2002).
behaviors (e.g., limiting reinforcing consequences, contingent social attention, encouraging “well behavior”).

Study findings, including support for the validity of the SCP questionnaire among a broader spectrum of pain complaints, are important for at least two reasons. First, the development of measures to assess social consequences across the spectrum of pain complaints may be useful for future research interested in mechanisms of change. It is conceivable that targeting social consequences (contingency management) represents an important mechanism of change in CBT for pediatric pain (e.g., do changes in particular social consequences predict pain duration?). The range of scores observed on each of the scales suggests that the SCP questionnaire picks up a good amount of variability in the potential range created by the measure. Second, the SCP questionnaire may be valuable as a quick way to assess environmental consequences of pediatric chronic pain. Particularly if treatment involves a parent-training component, the SCP questionnaire could potentially be helpful in exploring perceptions of social consequences, developing behavioral targets for parents related to the delivery of social consequences, and evaluating changes in social consequences within the family environment over the course of treatment.

Limitations and Future Directions

Study findings should be considered in light of the following limitations. First, computations within CFA assume univariate and multivariate normality; however, an analysis of the data indicated that nearly all of the items exhibited univariate combined skewness and kurtosis, and that data were multivariate kurtotic as well. While data transformation procedures typically yield improved standard errors for parameter estimates, they do not directly correct the goodness of fit statistics in CFA and, importantly, may limit the meaningfulness of results because results must be interpreted in the context of the transformation used. For these reasons, data transformation procedures were not applied and it is suggested instead to be aware that some non-normality may be present when interpreting the results of these analyses. Second, this study is limited by reliance on one subjective measure by a single rater for the assessment of social consequences of pain. Inclusion of objective measures would help tease out to what extent discrepancies exist between perceived and observed social consequences of pain. Third, in the original study (Walker et al., 2002) the SCP questionnaire was administered by an investigator, whereas in this study youth completed the SCP questionnaire independently.

This difference may have impacted the results. Fourth, although the context of pain (i.e., specific pain syndrome) is important and may hold unique experiences, the study sample size was insufficient for examining each presenting pain condition separately. Therefore, while this study took a first step in evaluating measurement equivalence by showing that the SCP questionnaire worked reasonably well across a diverse sample, further research with specific chronic and recurrent pain groups is needed to examine the levels and impact of social consequences across specific pain conditions. Finally, because this study did not track whether participants completed questionnaires at home or in clinic, we are unable to rule out the potential confounds of situational anxiety and demand characteristics.

In conclusion, the present investigation furthered the development of the SCP questionnaire by employing CFA to confirm the factor structure. This study supports the SCP questionnaire as a valid and reliable measure to be used to assess social consequences of pain in children and adolescents.

Conflict of interest: None declared.

Received December 31, 2008; revisions received and accepted July 27, 2009

References


