Parenting an Adolescent with Chronic Pain: An Investigation of How a Taxonomy of Adolescent Functioning Relates to Parent Distress

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Objective Cluster analyses allow health professionals to classify adolescents with chronic pain into subgroups, which might allow efficient tailoring of treatment. Given the nature of family relationships when a child has chronic pain, we aimed to evaluate whether an adolescent-disability-derived cluster formula would appropriately classify their parents via parenting stress, anxiety, and depression. Methods A patient-report data-derived cluster formula sorted 204 parents of adolescents with chronic pain into 4 groups. Parents completed measures of distress, anxiety, and depression. Results The 4-group solution generally sorted parents accurately, with parents of the least disabled adolescents functioning well and parents of the most disabled adolescents reporting clinically significant levels of stress, anxiety, and depression. Conclusions Findings suggest the patient-derived 4-group cluster solution might be an efficient method of distinguishing subgroups of parents with varying levels of stress, anxiety, and depression, which can be used to guide family-oriented treatment efforts.

Key words adolescents; chronic and recurrent pain; parenting stress; parents.

Recurrent or chronic pain in adolescence is common, occurring in approximately a quarter to a third of youth (El-Metwally, Salminen, Auvinen, Kautianinen, & Mikkelsson, 2004; Goodman & McGrath, 1991; Hakala, Rimpela, A., Salminen, Virtanen, & Rimpela, M., 2002; Huguet & Miró, 2008; Perquin et al., 2000). Although the evidence suggests that the majority of these experiences will not be associated with enduring difficulties (Huguet & Miró, 2008; Mikkelsson et al., 2008), a clinically significant proportion of these adolescents will go on to experience significant pain-related dysfunction in academic, social, emotional, family, and physical realms (e.g., Eccleston, Jordan, McCracken, Sleed, Connell, & Clinch, 2005; Roth-Isigkeit, Ute, Stoven, Schwarzenberger, & Schmucker, 2005), taking economic tolls on the family and society (Palermo, 2000; Sleed, Eccleston, Beecham, Knapp, & Jordan, 2005).

A central clinical role is to identify reliable categories of adolescents presenting with chronic pain and customize treatment accordingly (Turk, 1990). However, the application of pretreatment data to guide and enhance interventions is a daunting task that has yielded frustratingly inconsistent results (McCracken, 1990). Advances in assessment (Cohen et al., 2008; Eccleston, Jordan, & Crombez, 2006; Palermo et al., 2008) and higher-order statistical analyses (e.g., cluster analyses) might provide health care professionals assistance in appropriately triaging chronic pain suffers, tailoring treatments to patient dysfunction, and containing costs. In fact, cluster analysis is being increasingly used for these purposes across a range of pediatric populations (for a review, see Steele & Aylward, 2007). Recently, researchers analyzed coping using the Pain Response Inventory (PRI; Walker, Smith, Garber, & Van Slyke, 1997) of adolescents with chronic abdominal pain (Walker, Baber, Garber, & Van Slyke, 1997) of adolescents with chronic abdominal pain (Walker, Baber, Garber, & Smith, 2008) and diverse chronic pain conditions (Claus, Baber, Simons, Logan, & Walker, 2008) and found 6 cluster groups emerged. These coping clusters were moderately but not consistently different on PRI coping subscales, symptoms, and emotional distress; and the clusters did not differentiate patients well on a number of factors, such as pain reports, pain diagnosis (Claus et al., 2008),
functional disability, or family life events (Walker et al., 2008). Although promising, this 6 coping cluster solution is limited by its inconsistent grouping of adolescents by pain or functioning, which are key targets in chronic pain treatment programs.

A more recent cluster analysis using a measure of pain-related disability, the Bath Adolescent Pain Questionnaire (BAPQ; Eccleston et al., 2005), found that adolescent patients fall into 4 distinct patterns or grades, which differed on levels of severity of pain, as well as emotional and physical functioning (Vowles, Jordan, & Eccleston, in press). These grades were robust with the groups differing on multiple indices of patient disability, including social, physical, school, healthcare, exercise, and family functioning. In general, Grade I contained adolescents with the least pain and disability and Grade IV consisted of the adolescents with the most severe symptoms and functioning. Whereas Grade II fell in between I and IV, Grade III, presented a unique pattern, with high pain and physical disability, positive family functioning, and moderate emotional functioning, underscoring the hypothesis that supportive families might buffer the impact of pain on emotional disability (Scharff et al., 2005).

These grades should prove helpful in tailoring clinical interventions to patients’ needs. However, it should be noted that adolescent chronic pain occurs in the context of a family system (Palermo & Chambers, 2005; Simons, Claar, & Logan, 2008). In fact, research has shown that parents’ own distress might heighten adolescents’ pain and disability (e.g., Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006; Walker, Claar, & Garber, 2002; Peterson & Palermo, 2004); and adolescents’ pain and dysfunction predicts parents’ missing work, diminished social lives, and increased stress (e.g., Eccleston, Crombez, Scotford, Clinic, & Connell, 2004; Jordan, Eccleston, McCracken, Connell, & Clinic, 2008b; Hunfeld et al., 2001). Whether these interactions reflect parent modeling of stress and maladjustment, parent reinforcement of adolescent pain behavior, normal responses to parenting a child with a chronic condition, or other explanations remains to be resolved (for a review, see Palermo & Eccleston, in press). Regardless of the reason, as a result of the reciprocal and potential detrimental relationships between parents and their adolescents with chronic pain, parent interventions are increasingly being incorporated into pediatric chronic pain treatment programs (Eccleston et al., 2004; Merlijn et al., 2003).

Thus, any categorizing of pediatric chronic pain patients should be evaluated in terms of the extent to which it is applicable to parents’ adjustment and functioning. Further, given the reciprocal influences of pediatric chronic pain and disability and parent functioning (Jordan, Eccleston, & Osborn, 2007; Palermo & Chambers, 2005; Peterson & Palermo, 2004), a useful taxonomy of adolescent pain sufferers might identify parents in need of assistance, which should benefit the entire family system.

The purpose of this project was to extend the previous cluster analysis of the BAPQ to evaluate the extent to which the 4-cluster solution derived from adolescents’ assessment data would appropriately classify these adolescents’ parents on their own functioning. It was hypothesized that the cluster solution would discriminate among parents of varying levels of distress in a pattern similar to that found for their adolescents in prior work (Vowles et al., in press). Specifically, it was expected that Grade I would contain those parents having the least distress, anxiety, and depression, followed by Grades II, III, and lastly, IV, who would have statistically and clinically elevated levels of distress, anxiety, and depression.

Method
Participants
Two hundred and four parent and adolescent dyads were recruited from two pediatric chronic pain clinics; approximately half of the patients were attending an outpatient rheumatology practice (103; 50.5%) and half a day-treatment pain services center. In general, adolescents were 15 years old (M = 14.8 years; SD = 1.9 years; range = 10.9–18.9 years), female (74.6%), and white European (99.1%). The adolescents had chronic pain for an average of 4 years (M = 4.2, SD = 4.1 years; range = 3 months–17.5 years) and pain was reportedly experienced in all body parts (43.1%), a limb (37.3%), the back (7.7%), the head (4.8%), the abdomen (4.3%), the hip (1%), or chest (.5%). Most patients (72.1%) had non-inflammatory pain (e.g., low back pain) with a minority (27.9%) having inflammatory pain (e.g., arthritis). Diagnostically, adolescents presented with a broad mixture of conditions, ranging from those that were more specific (e.g., complex regional pain syndrome, hypermobility syndrome) to those that were more general in nature (e.g., low back pain). For the purposes of the present analyses, we specifically elected to include as broad a range of conditions as possible in order to maximize the generalizability of findings.

Parents’ average age was 43.8 years (SD = 6.5; range = 29–68 years), they were mostly mothers (94.1%; fathers, 5%, other 4%), and white European (99.1%). Parents were generally employed full-time (30.6%), part-time (36.8%), or homemakers (23%), full or part time.
employed (67%), married (78%), and in good (33%) to very good (31%) health. Due to missing data, sample size varied from 179–204 for all analyses, with the exception being the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983), which included only 102 participants as it was added to the parental assessment packet after data collection had begun. t-Tests for age and duration of pain and Chi-square analyses for gender revealed no differences between participants who completed and those who were missing study data (i.e., Pediatric Inventory for Parents, PIP; Parenting Stress Index-Short Form, PSI-SF; and Hospital Anxiety and Depression Scale, HADS). The sample of adolescents provided the pain-related functioning data used to derive the cluster formula (Vowles et al., in press), and their parents ratings of distress and functioning provide comprise the data for the current study.

**Measures**

Adolescent data were drawn from the Vowles et al. (in press) report and included only the adolescent-completed BAPQ, as detailed in the following paragraphs. All of the parent distress data for the current analyses were parent-completed instruments. A research assistant was available to answer questions and ensure complete data while adolescents and parents were completing the questionnaire measures.

**Bath Adolescent Pain Questionnaire**

Scores on the BAPQ were used in the cluster analyses and to determine group assignments. The BAPQ (Eccleston et al., 2005) is a 61-item self-report questionnaire assessing adolescents’ chronic pain-related disability in the following seven areas: social functioning, physical functioning, depression, general anxiety, pain-specific anxiety, family functioning, and development. Adolescents indicate frequency of disability (e.g., “I go to movies, concerts, or clubs”); “I need help with dressing or bathing”) from never (scored 0) to always (scored 4) scale. Prior work has established the psychometric soundness of the instrument (Eccleston et al., 2005), and reliability was good with the current sample (Cronbach’s alphas ranging from .79 to .89 for BAPQ subscales).

**Pediatric Inventory for Parents**

The PIP (Streisand, Braniecki, Tercyak, & Kazak, 2001) is a 42-item self-report measure of stress related to parenting a chronically ill adolescent. Using a 5-point Likert scale, parents rate the frequency (never to very often) and the difficulty (not at all difficult to extremely difficult) of parenting a child in four domains: communication (e.g., “speaking with child about his/her illness”), emotional distress (e.g., “feeling helpless over my child’s condition”), medical care (e.g., “waiting for my child’s test results”), and role functioning the items (e.g., “being unable to go to work/job”). The PIP produces frequency and difficulty scores for overall parenting stress as well as each of the four domains. The PIP has previously been used with parents of adolescent with chronic pain (Goubert et al., 2006), and in a review of of measures (Jordan, Eccleston, & Crombez, 2008a), the authors indicated that the PIP is the “most promising” measure of the stress of parenting an adolescent with chronic pain. For the current sample, reliability was adequate with Cronbach’s alpha ranging from .73 to .95 across all subscales.

**Parenting Stress Index—Short Form**

The PSI-SF (Abidin, 1995) assesses parenting stress via 36 parent-report queries answered on a 5-point scale. The PSI-SF is The PSI-SF produces a Total Stress Score, which has a clinical cutoff of 90, as well as three subscales: parental distress (e.g., “I often have the feeling that I cannot handle things very well”), parent–child dysfunctional interaction (e.g., “my child rarely does things for me that make me feel good”), and difficult child (e.g., “my child seems to cry or fuss more often than most children”). The PSI-SF has been used to evaluate parenting stress in a number of populations (e.g., Bhavnagri, 1999; Hart & Kelley, 2006), has been shown to be well-validated and reliable in psychiatric evaluations (e.g., Abidin, 1995; Haskett, Ahern, Ward, & Allaire, 2006; Reitman, Currier, & Stickle, 2002), and has been previously used with parents of adolescents with chronic pain (e.g., Gauntlett-Gilbert & Eccleston, 2007). For the current sample, internal consistency estimates ranged from .82 to .89 across subscales and .94 for the Total Stress score.

**Hospital Anxiety and Depression Scale**

The HADS (Zigmond & Snaith, 1983) is a 14-item 4-point scale (0–3) self-report instrument designed to screen for anxiety and depression, and clinical cutoffs of eight have been established for each scale (Olsson, Mykletun, & Dahl, 2005). The HADS was selected for several reasons. Firstly, the HADS has been widely used (e.g., it has been translated in over 25 languages and evaluated in hundreds of studies) and has consistently shown to be psychometrically sound (e.g., Bjelland, Dahl, Haug, & Neckelmann, 2002; Herrmann, 1997; Roberts, Bonnici, Mackinnon, & Worcester, 2001; Spinhoven et al., 1997). Secondly, it is sufficiently brief so that it does not overburden clinical patients and can be used in busy clinical practices. Lastly, it has been used with parents of adolescents with
chronic illness (e.g., Goubert et al., 2006), and, compared with other measures of anxiety or depression, it excludes symptoms that might be somatic aspects of physical illness (e.g., insomnia, fatigue). Cronbach’s alpha for the current sample was .83 and .80 for the anxiety and depression subscales, respectively.

**Analytic Approach**

For the purposes of the present analyses, we used the previously defined cluster formula (Vowles et al., in press), which was based on adolescent BAPQ assessment data. Although these analyses are reported in detail in Vowles et al. (in press), a brief review is provided here. Initially, a series of cluster analyses of the BAPQ data were completed and identified four discrete clusters, which were labeled Grades I through IV with higher grading indicating more significant difficulties in functioning. Grades I, II, and IV differed from one another along what appeared to be a single continuum of severity. Individuals in Grade III reported significant difficulties in physical and social functioning (similar to Grade IV), moderate difficulties in emotional functioning (similar to Grade II), and positive family functioning (scores falling between Grades I and II). Follow-up analyses provided further support for the grading structure, as significant differences occurred in eight of nine measures of functioning including pain intensity, healthcare utilization, school attendance, amount of weekly exercise, depression, disability, social functioning, and frequency of catastrophic thinking. Furthermore, a discriminant analysis was able to correctly classify over 95% of participants into the correct cluster. The formula used to derive cluster assignments (see Supplementary Data), which can be used to classify participants in studies or patients in clinical settings based on BAPQ scores. This formula was derived from discriminant analyses and is detailed in Vowles et al. (in press).

The analyses in the present study involved several steps. First, correlational analyses of all study measures were conducted without correction for familywise error. These analyses were for descriptive purposes and to determine whether the diverse measures of functioning were tapping similar constructs. Next, parents within each of the grades were examined in regards to norm-based clinical cutoffs for stress, anxiety, and depression. Further, Chi-square analyses were used to compare the percentages of parents who met these clinical cutoffs across the four cluster groups. Lastly, we conducted a series of multivariate analyses of variance (MANOVAs) investigating differences among the grades using indices of parental stress and emotional functioning as the dependent variables. Within each MANOVA, familywise error rates were controlled through the use of a Bonferroni-controlled alpha.

**Results**

Nearly all BAPQ adolescent pain-related functioning scores were correlated with parent PIP, PSI-SF, and HADS scores (Table I). The only non-significant correlations were between PIP Medical Care-Frequency and BAPQ Social Functioning, Depression, General Anxiety, and Family Functioning and also PIP Medical Care-Difficulty and BAPQ Social Functioning and Depression. Given that these correlations were for descriptive purposes, no corrective measures against familywise error was taken.

In terms of norm-based data, these parents’ average PIP Total Frequency (PIP-F) score of 104.9 and Difficulty (PIP-D) score of 98.0 is roughly equivalent or higher than the PIP-F and PIP-D means found in samples of parents of adolescents with sickle cell disease (M = 105.4, M = 91.1; Logan, Radcliffe, & Smith-Whitley, 2002), cancer (M = 94.0, M = 112.4; Streisand et al., 2001), diabetes (M = 89.3, M = 78.1; Streisand, Swift, Wickmark, Chen, & Holmes, 2005), obesity (M = 98.0, M = 91.9; Ohleyer et al., 2007), or short stature (M = 90.5, M = 85.5; Preston et al., 2005). However, caution should be taken when comparing scores across studies as a number of variables (e.g., demographics, study procedures) might explain apparent differences. As detailed in Table II, descriptive analyses with the entire sample revealed that nearly a third (28%; 53 of 189) of the parents reported PSI-SF Total Stress scores at or above the clinical cutoff of 90. In addition, over half (56%; 57 of 102) of parents were at or above the HADS Anxiety clinical cutoff of 8 and 31% (32 of 102) were at or above the HADS Depression clinical cutoff of 8.

The grades differed in regard to how many parents met PSI-SF or HADS clinical cutoffs (Table I). Chi-square analyses indicated that Grade I had significantly fewer parents meeting PSI-SF Total Score clinical cut-off than Grades II, III, or IV. Grades II and III had similar numbers of parents meeting PSI-SF cut-off, and both were fewer than Grade IV. The number of parents meeting HADS Anxiety cut-off was similar in Grades I and III, which were both lower than Grades II and IV, who did not differ from one another. In terms of HADS Depression, Grade I had a smaller percentage of parents meeting cut-off than II, III, or IV. Grades II and III did not differ from one another on Depression and Grades III and IV did not differ; however, Grade II had fewer parents meeting Depression cut-off than Grade IV.

The MANOVAs revealed significant differences on PIP scores, PSI-SF scores, and HADS scores across the four
cluster groups (all ps < .001). Follow-up ANOVAs for overall PIP, PSI-SF, and HADS scores were also each significant (all ps < .001). Bonferroni-controlled post hoc paired comparisons, using an alpha of $p < .0125$, revealed a pattern that generally supported the 4-group cluster structure (Table II and Table III; Figures 1–3 detail the relative scores for the PIP, PSI-SF, and HADS, respectively). Parents of Grade I patients had significantly lower PIP, PSI-SF, and HADS scores on all 16 indices than parents of Grade IV adolescents (all ps < .001). Grade I parents were also lower on all except five measures (PIP Communication-F, PIP Communication-D, PIP Medical Care-F, PIP Medical Care-D, HADS Anxiety) than Grade II parents (all ps < .001) and lower except three measures (PIP Communication-D, PIP Medical Care-D, HADS Anxiety) than Grade III parents.

In addition to reporting higher distress than Grade I parents, Grade II parents reported significantly lower distress on all measures but two (PIP Medical Care-Frequency, HADS Anxiety) than Grade IV parents (all ps < .001). Notably, and as indicated in Figures 1–3, Grades II and III did not significantly differ on any index of parent stress, anxiety, or depression.

In addition to the differences noted above, Grade III parents were lower than Grade IV parents on roughly half of the distress measures (PIP Total-D, PIP Communication-D, PIP Emotional Distress-F, PIP Emotional Distress-D, PIP Role Function-D, PSI-SF Total Stress, PSI-SF Parental Distress, PSI-SF Difficult Child, and HADS Anxiety (all ps < .001). As detailed in the sections above, Grade IV parents had higher distress than Grade I parents on all 16 indices, than Grade II parents on 14 of 16 indices, and the Grade III parents on 9 indices.

### Discussion

The aim of the current study was to evaluate whether the adolescent chronic pain cluster 4-group cluster formula

### Table I. Correlations among Adolescent BAPQ and Parent PIP, PSI-SF, and HADS Scores

<table>
<thead>
<tr>
<th></th>
<th>Social functioning</th>
<th>Physical functioning</th>
<th>Depression</th>
<th>General anxiety</th>
<th>Pain-specific anxiety</th>
<th>Family functioning</th>
<th>Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIP Total (F)</td>
<td>.24**</td>
<td>.43**</td>
<td>.27**</td>
<td>.33**</td>
<td>.43**</td>
<td>.29**</td>
<td>.29**</td>
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<tr>
<td>PIP Total (D)</td>
<td>.18*</td>
<td>.38**</td>
<td>.24**</td>
<td>.34**</td>
<td>.43**</td>
<td>.28**</td>
<td>.26**</td>
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<tr>
<td>PIP Function (F)</td>
<td>.19*</td>
<td>.32**</td>
<td>.21**</td>
<td>.25**</td>
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<td>.22**</td>
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<tr>
<td>PIP Function (D)</td>
<td>.18*</td>
<td>.29**</td>
<td>.22**</td>
<td>.34**</td>
<td>.40**</td>
<td>.25**</td>
<td>.21**</td>
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<tr>
<td>PIP Distress (F)</td>
<td>.28**</td>
<td>.39**</td>
<td>.36**</td>
<td>.39**</td>
<td>.50**</td>
<td>.31**</td>
<td>.31**</td>
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<tr>
<td>PIP Distress (D)</td>
<td>.18*</td>
<td>.30**</td>
<td>.28**</td>
<td>.30**</td>
<td>.44**</td>
<td>.26**</td>
<td>.26**</td>
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<tr>
<td>PIP Medical Care (F)</td>
<td>.10</td>
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<td>.19**</td>
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<td>.15*</td>
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<tr>
<td>PIP Medical Care (D)</td>
<td>.08</td>
<td>.31**</td>
<td>.13</td>
<td>.25**</td>
<td>.30**</td>
<td>.18*</td>
<td>.16*</td>
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<td>PIP Role function (F)</td>
<td>.20**</td>
<td>.35**</td>
<td>.22**</td>
<td>.32**</td>
<td>.34**</td>
<td>.33**</td>
<td>.23**</td>
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<tr>
<td>PIP Role function (D)</td>
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<td>.19**</td>
<td>.30**</td>
<td>.31**</td>
<td>.31**</td>
<td>.22**</td>
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<tr>
<td>PSI-SF Total stress (n = 189)</td>
<td>.28**</td>
<td>.24**</td>
<td>.38**</td>
<td>.43**</td>
<td>.34**</td>
<td>.49**</td>
<td>.35**</td>
</tr>
<tr>
<td>PSI-SF Parental distress (n = 198)</td>
<td>.22**</td>
<td>.21**</td>
<td>.24**</td>
<td>.33**</td>
<td>.28**</td>
<td>.40**</td>
<td>.31**</td>
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<tr>
<td>PSI-SF Parent–Child dys. int. (n = 198)</td>
<td>.29**</td>
<td>.27**</td>
<td>.41**</td>
<td>.41**</td>
<td>.30**</td>
<td>.41**</td>
<td>.30**</td>
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<tr>
<td>PSI-SF Difficult child (n = 193)</td>
<td>.25**</td>
<td>.18*</td>
<td>.35**</td>
<td>.39**</td>
<td>.28**</td>
<td>.44**</td>
<td>.30**</td>
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<tr>
<td>HADS Anxiety (n = 102)</td>
<td>.28**</td>
<td>.35**</td>
<td>.45**</td>
<td>.34**</td>
<td>.35**</td>
<td>.38**</td>
<td>.46**</td>
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<tr>
<td>HADS Depression (n = 102)</td>
<td>.46**</td>
<td>.22*</td>
<td>.38**</td>
<td>.30**</td>
<td>.37**</td>
<td>.46**</td>
<td>.34**</td>
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</table>

*p < .05; **p < .01.

### Table II. Number of Participants (% of Sample) at or above PSI-SF, HADS Anxiety, and HADS Depression Clinical Cutoffs among the Four Clusters

<table>
<thead>
<tr>
<th></th>
<th>Total sample</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSI-SF Total stress (n = 189)</td>
<td>53 (28%)</td>
<td>3 (1.6%)a</td>
<td>19 (10.1%)b</td>
<td>10 (5.3%)b</td>
<td>21 (11.1%)c</td>
</tr>
<tr>
<td>HADS Anxiety (n = 102)</td>
<td>57 (55.9%)</td>
<td>10 (9.8%)a</td>
<td>18 (17.6%)b</td>
<td>10 (9.8%)a</td>
<td>19 (18.6%)b</td>
</tr>
<tr>
<td>HADS Depression (n = 102)</td>
<td>32 (31.4%)</td>
<td>2 (2%)a</td>
<td>7 (6.9%)b</td>
<td>9 (8.8%)b,c</td>
<td>14 (13.7%)c</td>
</tr>
</tbody>
</table>

Different subscripts indicate significant chi-square differences, $p < .05$. 

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Cohen, Vowles, and Eccleston
developed by Vowles et al. (in press) appropriately classified their parents according to parenting stress, anxiety, and depression. Correlational analyses revealed that nearly all indices of adolescent pain-related functioning were moderately associated with measures of parenting stress, anxiety, and depression, which suggests that adolescent and parent functioning might act in concert, which is consistent with other data (for reviews, see Palermo, 2000; Palermo & Eccleston, in press). Descriptive analyses revealed that significant portions of parents were reporting distress, anxiety, and depression in clinical ranges. Appreciation of the complex dynamics in the family (Palermo & Chambers, 2005) has lead to pediatric chronic pain programs targeting parents’ stress as a primary goal as well as to help the pediatric patient (Eccleston et al., 2004; Merlijn et al., 2003).

Consistent with hypotheses, findings with the cluster groups suggest that the adolescent-report BAPQ-derived cluster structure was robust, and the four grades differed on parents’ report of their distress in patterns similar to those of their children (i.e., the grades reflect increasing levels of dysfunction or distress). In fact, given the consistency of these four clusters at differentiating adolescents with chronic pain (Vowles et al., in press) as well as these finding with their parents, the adolescent assessment

Table III. Mean (SD) Subscale Scores among the Four Clusters

<table>
<thead>
<tr>
<th>Grade</th>
<th>Total sample</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
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<tbody>
<tr>
<td>PIP Total (F) (n = 185)</td>
<td>104.89 (27.00)</td>
<td>90.57 (23.78)</td>
<td>104.03 (26.47)</td>
<td>110.17 (22.43)</td>
<td>119.49 (27.27)</td>
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<tr>
<td>PIP Total (D) (n = 180)</td>
<td>97.92 (28.40)</td>
<td>85.91 (26.47)</td>
<td>97.38 (26.40)</td>
<td>98.20 (24.80)</td>
<td>113.78 (30.37)</td>
</tr>
<tr>
<td>PIP Communication (F) (n = 187)</td>
<td>22.51 (6.01)</td>
<td>20.19 (5.35)</td>
<td>22.30 (6.05)</td>
<td>22.94 (5.32)</td>
<td>25.41 (6.06)</td>
</tr>
<tr>
<td>PIP Communication (D) (n = 185)</td>
<td>19.56 (6.59)</td>
<td>17.60 (6.10)</td>
<td>19.08 (5.76)</td>
<td>19.31 (6.79)</td>
<td>23.08 (7.16)</td>
</tr>
<tr>
<td>PIP Emotional distress (F) (n = 190)</td>
<td>42.76 (10.89)</td>
<td>35.91 (10.11)</td>
<td>42.77 (10.50)</td>
<td>45.31 (8.31)</td>
<td>49.03 (10.07)</td>
</tr>
<tr>
<td>PIP Emotional distress (D) (n = 188)</td>
<td>42.65 (11.92)</td>
<td>36.81 (12.18)</td>
<td>43.08 (11.50)</td>
<td>43.63 (9.94)</td>
<td>48.43 (11.08)</td>
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<td>PIP Medical care (F) (n = 189)</td>
<td>17.75 (6.86)</td>
<td>16.17 (6.11)</td>
<td>16.95 (6.66)</td>
<td>19.49 (6.82)</td>
<td>19.43 (7.66)</td>
</tr>
<tr>
<td>PIP Medical care (D) (n = 186)</td>
<td>14.80 (5.82)</td>
<td>13.94 (5.29)</td>
<td>14.02 (4.98)</td>
<td>14.57 (5.64)</td>
<td>17.38 (7.24)</td>
</tr>
<tr>
<td>PIP Role function (F) (n = 187)</td>
<td>21.87 (6.99)</td>
<td>18.30 (5.63)</td>
<td>22.02 (6.94)</td>
<td>22.43 (6.84)</td>
<td>25.62 (6.80)</td>
</tr>
<tr>
<td>PIP Role function (D) (n = 187)</td>
<td>20.91 (7.73)</td>
<td>17.57 (6.45)</td>
<td>21.20 (7.39)</td>
<td>20.69 (7.64)</td>
<td>24.89 (8.20)</td>
</tr>
<tr>
<td>PSI-SF Total stress (n = 189)</td>
<td>77.72 (22.40)</td>
<td>63.45 (16.71)</td>
<td>78.83 (21.34)</td>
<td>79.63 (20.62)</td>
<td>93.08 (21.95)</td>
</tr>
<tr>
<td>PSI-SF Parental distress (n = 198)</td>
<td>26.71 (8.70)</td>
<td>22.14 (6.71)</td>
<td>27.14 (7.95)</td>
<td>26.82 (8.77)</td>
<td>32.06 (9.13)</td>
</tr>
<tr>
<td>PSI-SF Parent–child dys. int. (n = 198)</td>
<td>23.05 (7.12)</td>
<td>18.57 (5.42)</td>
<td>23.27 (6.79)</td>
<td>24.47 (6.01)</td>
<td>27.22 (7.74)</td>
</tr>
<tr>
<td>PSI-SF Difficult child (n = 193)</td>
<td>27.96 (9.83)</td>
<td>22.74 (7.57)</td>
<td>28.42 (9.94)</td>
<td>28.34 (8.88)</td>
<td>33.81 (9.95)</td>
</tr>
<tr>
<td>HADS Anxiety (n = 102)</td>
<td>8.64 (4.16)</td>
<td>6.20 (3.24)</td>
<td>9.85 (3.94)</td>
<td>7.87 (3.83)</td>
<td>11.22 (3.97)</td>
</tr>
<tr>
<td>HADS Depression (n = 102)</td>
<td>5.56 (3.75)</td>
<td>3.07 (2.52)</td>
<td>5.65 (3.33)</td>
<td>6.22 (3.74)</td>
<td>8.04 (3.77)</td>
</tr>
</tbody>
</table>

Different subscripts indicate significant pairwise differences at a Bonferroni-correct alpha.

Figure 1. PIP Z-scores (means) across four clusters

Figure 2. PSI-SF Z-scores (means) across four clusters
data-derived clusters could also be conceptualized as representing grades of family distress.

However, there are subtle details in the parent data that should be highlighted. At the simplest level, parents of Grade I patients and Grade IV patients appear to be having quite distinct experiences in terms of their own distress; Grade I parents reported significantly less distress on all indices than Grade IV parents. In fact, of the four grades, only parents of Grade IV patients reported average scores at or above all of the clinical cutoffs for parenting stress, anxiety, and depression. These parents were also reporting greater frequency and difficulty with a range of health-related stressors, as measured by the PIP, than those reported in other samples of parents of patients with chronic conditions (e.g., Ohleyer et al., 2007; Preston et al., 2005; Streisand et al., 2001). In short, parents in Grade IV are likely to be in need of immediate attention and intervention.

Grades II and III parents’ distress are more complex. On first observation, it could be argued that these two groups are sufficiently similar to be collapsed resulting in a 3-group solution. However, it is not that simple. First, whereas Grade IV parents reported significantly more distress than Grade II parents, Grade III and IV differed on only half of the parent distress indices. Taking a norm-based approach with Grades II and III parents, only parents in Grade II had an average score above a clinical cut-off; these parents reported a clinically significantly level of anxiety on the HADS. Further, Grade II parents compared with Grade III parents had nearly double the number of parents falling in the clinical range for stress and anxiety. In short, whereas time, effort, and money might be saved using the cluster solution in triaging families in Grades I and IV, families in Grades II and III might require additional pretreatment assessment to determine what unique stressors and needs are present.

These findings have clear clinical applicability. For example, with only the cluster formulas (see Supplementary Data) and an adolescent’s BAPQ scores, a clinician could calculate whether the adolescent and parent fell into Grade I, II, II, or IV. The clinician would then be armed with information and testable hypotheses about the parent’s stress, anxiety, and depression. It is a strength that these data suggest that parents generally fall into the same clusters as their children (Vowles et al., in press), indicating that treatment might target the family as well as the individuals. However, additional research is in order to determine how to best treat parents in each of the four clusters, whether response to treatment differs by clusters, whether the formula is applicable to parents of other backgrounds or of patients of different ages, and a host of other research and clinical questions. In short, it would be prudent to await additional evaluations of this cluster formula prior to relying on it for triaging parents to treatment regimens. We encourage researchers to use the available grade system (see Supplementary Data) to further evaluate its utility.

Some caveats to these findings should be noted. The sample is homogenous with the patients being adolescents, the majority of patients and parents being of White European descent, and almost all parents were mothers. Future work might evaluate the usefulness of the 4-factor solution with patients of different backgrounds. That said, based on findings that pain diagnoses rarely lead to distinct treatment (e.g., Malleson & Clinch, 2003; Vetter, 2008), we would tentatively suspect that this 4-cluster solution would be applicable to the parents of patients presenting with a range of chronic pain complaints. In addition, we examined the cluster in parents presenting in two settings, which provides some support for external validity. Given the paucity of research examining non-maternal caregivers, it remains unclear whether fathers or other caregivers have unique stressors related to parenting an adolescent with chronic pain. We choose to evaluate the 4-cluster formula on measures of parent stress, anxiety, and depression; however, it might be fruitful to examine parents’ adaptive coping, resilience, or other strengths that could be critical to treatment. Although the 4-factor cluster has demonstrated its utility in classifying patients (Vowles et al., in press) and parents with unique stressors, future work should examine whether the clusters are sensitive to treatment effects (e.g., post-intervention change in cluster assignment). Lastly, whereas the clusters are useful in grouping patients and parents, critical research is needed...
to specify optimal treatment approaches tailored to each of these categories.

In summary, the 4-cluster structure was generally well-suited to categorizing parents according to their stress levels, based on both statistical and clinical significance. Although ideally each family should receive individualized assessment and treatment tailored to their unique circumstances and needs, clinicians might use the cluster formula to efficiently identify and triage adolescent chronic pain patients and their parents. A word of caution is in order. Although Grade I demonstrated relatively lower stress across indices, and they did not reach clinical cutoffs in terms of overall average scores, these parents are reporting struggles in parenting adolescents with chronic pain, and their needs should not be ignored or minimized. For example, over a third of these parents are scoring at or above the clinical cutoff for anxiety. Given the unique patterns found in Grades II and III parents, a prudent professional should more closely evaluate these families to determine the best course of action and may want to comprehensively assess in more detail the impact of adolescent chronic pain on parental experience (Jordan et al., 2008b). Parents in Grade IV warrant immediate attention, as they are reporting clinically significant levels of anxiety, parenting stress, and depression and stressors at levels higher than parents of children with other chronic conditions. On a positive note, it is encouraging that technological advances in assessment and statistics might assist clinicians facing pressures to efficiently and effectively treat pediatric patients with chronic pain within a complex family system.

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**Supplementary Data**

Supplementary data can be found at: http://www.jpepsy.oxfordjournals.org/

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**References**


