

Parent Reports of Coping and Stress Responses in Children With Recurrent Abdominal Pain

Alexandra Harding Thomsen, PhD, Bruce E. Compas, PhD, Richard B. Colletti, MD, Catherine Stanger, PhD, Margaret C. Boyer, BA, and Brian S. Konik, BA
University of Vermont

Objective: To examine relationships among coping, stress responses, pain, somatic symptoms, and anxious/depressed symptoms in a sample of children and adolescents with recurrent abdominal pain (RAP).

Method: We assessed parents' reports of coping and involuntary responses to stress in relation to pain, somatic symptoms, and symptoms of anxiety and depression in a sample of 174 children and adolescents with RAP.

Results: Based on parent reports, children's primary control engagement coping (e.g., problem solving, emotional modulation) and secondary control engagement coping (e.g., acceptance, distraction, positive thinking) in response to pain were associated with fewer somatic complaints and symptoms of anxiety and depression; secondary control engagement coping was also associated with less pain. Involuntary engagement (e.g., physiological reactivity, rumination) and disengagement (e.g., escape, inaction) responses to pain were associated with more somatic symptoms and higher levels of anxiety and depression.

Conclusions: We highlight implications of these findings for understanding processes of coping and stress reactivity in children with RAP.

Key words: *recurrent abdominal pain; children; coping; stress responses; somatic symptoms; anxiety/depression.*

Recurrent abdominal pain (RAP) is one of the most common types of pediatric pain, affecting up to 20% of children and adolescents (Colletti, 1998). Children with RAP experience at least three episodes of abdominal pain within 3 months (Apley, 1975). Whereas some children with RAP have a detectable disease or organic cause of the pain, most children do not. This lack of an identifiable pathological condition is often frustrating to physicians and families and leaves limited treatment options. In addition, children with RAP have been shown to have higher levels of symptoms of depression,

anxiety, and somatization than do well children (e.g., Garber, Zeman, & Walker, 1990; Walker, Garber, & Green, 1993), pointing to the role of psychological factors in RAP.

Research examining cognitive and behavioral responses to recurrent pain (e.g., Gil, Williams, Thompson, & Kinney, 1991), and more specifically to RAP (Walker, Garber, Smith, & Van Slyke, 1997), suggests that how children respond to pain may affect their level of pain and psychological adjustment. Models of coping and stress responses provide a framework for understanding adaptive and maladaptive responses to stress in general and to pain in particular. Responses to stress include both voluntary coping efforts and involuntary/

All correspondence should be sent to Bruce E. Compas, Department of Psychology, University of Vermont, Burlington, Vermont 05405. E-mail: bruce.compas@uvm.edu.

automatic stress responses (Compas, Connor, Oso-wiecki, & Welch, 1997; Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001), both of which may be important in understanding and adapting to chronic pain. Coping is defined as voluntary efforts to regulate emotion, thought, behavior, physiology, and the environment in response to stressful events or circumstances (Compas et al., 2001). Coping responses include three categories: primary control engagement coping, or efforts to directly change the stressor or one's emotions (problem solving, emotional expression, emotional modulation); secondary control engagement coping, or attempts to adapt to the stressor by regulating attention or cognition (cognitive restructuring, positive thinking, acceptance, distraction); and disengagement coping, or efforts to orient away from the stressor or one's emotions (wishful thinking, avoidance, denial). Involuntary stress responses fall into two categories: involuntary engagement (rumination, intrusive thoughts, physiological arousal, emotional arousal, impulsive action) and involuntary disengagement (emotional numbing, cognitive interference, inaction, escape) (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000).

Studies of children and adolescents coping with pain have generally found that children who use disengagement coping strategies (e.g., avoidance) to try to manage their pain show greater pain and distress (e.g., Gil et al., 1991). Primary control coping strategies, or attempts by the individual to act directly on the pain or other sources of stress, are related to poorer adjustment to uncontrollable stressors, including some forms of pain, but are related to better adjustment with controllable illness-related stressors (e.g., Band & Weisz, 1990). In contrast, secondary control engagement coping strategies, which are directed at adapting to and engaging with pain by regulating attention or cognition, have been shown to be helpful with uncontrollable, pain-related stress (e.g., Schanberg, Lefebvre, Keefe, Kredich, & Gil, 1997; Weisz, McCabe & Dennig, 1994).

Research on children's coping with RAP has been more limited. In one of the few empirical studies in this area, Walker et al. (1997) examined children's reports of active coping (similar to primary control engagement coping), accommodative coping (similar to secondary control engagement coping), and passive coping (similar to disengagement coping). Passive (disengagement) coping responses were strongly associated with increased levels of pain and somatic and depressive symptoms. In con-

trast, accommodative (secondary control) coping responses were generally related to decreased levels of pain. Active (primary control) responses were associated with increased levels of pain and somatic complaints, but decreased depressive symptoms. Additional information is now needed about the types of coping that may be associated with fewer depressive, anxious, and somatic symptoms, central components of the constellation of symptoms associated with RAP.

Studies of RAP have also begun to consider the role of involuntary or automatic responses in pain perception and behavior, typically autonomic nervous system reactivity and recovery. Results of laboratory studies have been mixed, with some suggesting that children with RAP show slower sympathetic nervous system recovery from pain than do well children (Rubin, Barbero, & Sibinga, 1972), and others showing no difference in initial reactivity or recovery (Feuerstein, Barr, Francoeur, Houle, & Rafman, 1982) or a trend suggestive of increased reactivity (Battistella, Carra, Zaninotto, Ruffilli, & Da Dalt, 1992). In addition, extensive relevant literature indicates that stress reactivity or involuntary engagement (e.g., intrusive thoughts, physiological reactivity, emotional arousal) is related to internalizing problems in children (e.g., Biederman et al., 1990; Kagan, Snidman, & Arcus, 1995), and highly reactive children show higher illness rates under increased stress (Boyce et al., 1995).

The purpose of this study was to examine the relation of parental reports of children's coping to levels of pain, somatic complaints, and symptoms of anxiety/depression in children and adolescents with RAP. Parent reports were selected for two reasons (cf. Holmbeck et al., 1998). First, parent reports allow for the assessment of a wide age range of children and adolescents, including younger children who may not be able to provide reliable self-reports. Second, parents are most likely to initiate the process of seeking medical treatment, and therefore it is important to understand their perspective on their children's functioning. In addition, this study sought to extend research by examining the role of parental report of children's involuntary responses to pain as predictors of pain and emotional and somatic symptoms. We hypothesized that primary control and secondary control engagement coping would be related to lower levels of pain, somatic complaints, and emotional distress. Further, we hypothesized that disengagement coping strategies would be related to increased levels of pain, somatic complaints, and distress. Finally, we hypothesized

that involuntary engagement and disengagement responses would be linked to increased pain, somatic complaints, and distress.

Method

Participants

Participants were 190 children and adolescents with RAP and one of their parents (93% mothers). Due to missing data, 16 cases were removed from analyses. Subsequent results are reported on a reduced sample of 174 participants. The children's ages ranged from 7 to 18 years, with a mean of 11.6 years ($SD = 2.9$); 66.7% of the sample was female. The mean occupational status of the parents, based on the Hollingshead Occupational Scores (Hollingshead, 1975), was 6.0 ($SD = 2.2$), or that of technicians, semi-professionals, and small business owners. The sample was primarily Caucasian (94%), which is representative of the demographics of Vermont and northern New York State, where the sample was drawn.

Procedure

Participants were recruited from a pediatric gastroenterology practice that serves northern Vermont and northern New York state; therefore, this sample is considered a representative sample of children and adolescents with RAP who are referred to a specialist. A retrospective sample was recruited at the outset of the study and was drawn from all RAP patients seen within the previous year ($n = 41$). All new RAP patients were then recruited at the time of the initial medical evaluation for RAP ($n = 133$) and recruitment was continued over the next 2 years.

To classify cases as functional versus organic abdominal pain and to record specific diagnoses, medical chart reviews were conducted by three research assistants who were trained using a procedure developed by one of the authors (RBC; details about the chart review procedure can be obtained from the authors). Ten charts were randomly selected from the sample and were independently coded by two raters for the purposes of training. Training was continued until all raters reached at least 90% reliability with the ratings of one of the authors (RBC), who served as the expert rater. Chart reviews revealed that 52.9% of patients had functional pain (e.g., functional abdominal pain, irritable bowel syndrome, functional dyspepsia), 33.9% had an organic cause (e.g., gastroesophageal reflux, lactose

Table 1. Organic and Functional Diagnoses of Recurrent Abdominal Pain

Diagnosis	<i>n</i> (%)
Functional diagnoses	92 (52.9)
Functional recurrent abdominal pain	47 (27.0)
Irritable bowel syndrome	32 (18.4)
Functional dyspepsia	9 (5.2)
More than one functional diagnosis	4 (2.3)
Organic diagnoses	59 (33.9)
Gastroesophageal reflux	17 (9.8)
Lactose malabsorption	9 (5.2)
Crohn's disease	9 (5.2)
Dyspepsia or gastritis	4 (2.3)
Infectious or postinfectious process	5 (2.8)
Unspecified inflammatory bowel disease	2 (1.1)
More than one organic diagnosis	4 (2.3)
Organic diagnosis not otherwise specified (e.g., rib pain, ovarian cyst)	9 (5.2)
Unknown diagnosis	23 (13.2)

malabsorption, Crohn's disease, dyspepsia, gastritis), and 12.1% had an unknown etiology of their pain (see Table 1). The category of unknown etiology was used to categorize patients who did not complete follow-up tests or procedures that would have provided necessary diagnostic information. To be considered in the functional pain category, participants had no evidence of an underlying disorder causing the pain. At their initial appointments with the pediatric gastroenterologist, participants reported a mean of 3.77 symptoms ($SD = 1.83$), were assessed with a mean of 3.65 tests ($SD = 3.65$), and reported having abdominal pain for a mean of 23.26 months ($SD = 29.05$; range: 3–120).

Participants were considered eligible for the study if they had experienced abdominal pain at least three times within at least 3 months (Apley, 1975) and they were between the ages of 7 and 18 years old. In the retrospective sample (contacted by letter), 39% of those eligible agreed to participate and returned questionnaires (mean of 243 days since diagnosis, $SD = 115$). In the group recruited in person, 93% of eligible patients agreed to participate and 69% of the parents of eligible patients completed questionnaires (mean of 16 days since diagnosis, $SD = 19$). Comparisons of demographic, medical, and psychological variables between the two groups showed that they did not differ on any variables. Therefore, the groups were combined for subsequent analyses.

Informed consent was obtained from parents and assent was obtained from children and adoles-

cents. Parents and adolescents completed written questionnaires at home (results from the adolescents' reports are presented elsewhere; Boyer et al., 20001). Children and parents were each paid \$20 for their participation in the study if their questionnaires were returned within 10 days, and \$10 if returned after 10 days.

Measures

Abdominal Pain Symptoms. Symptoms of abdominal pain were measured with parents' reports on the Abdominal Pain Index (API; Walker et al., 1997), a five-item measure that includes ratings of frequency, duration, and intensity of pain. The frequency of abdominal pain within the last 2 weeks is rated on a 6-point scale from "not at all" to "every day." The daily frequency is assessed on a similar 6-point scale from "none" to "constant during the day." The typical duration of pain is rated on a 9-point scale from "none" to "all day." The typical intensity and maximum intensity are rated using a 10-point scale ranging from "no pain" to "the most pain possible." Because the items on the API use different scales, responses to the five pain ratings were standardized, and a sum was computed to provide an index of abdominal pain. Alpha reliability for the API in previous studies has ranged from .80 to .93 (Walker et al., 1997); the alpha for this sample was .78.

Emotional and Behavioral Problems. The Child Behavior Checklist (CBCL; Achenbach, 1991) measured participants' levels of symptoms of anxiety and depression and somatic complaints. The CBCL is a 118-item checklist of problem behaviors and competencies that parents rate from not true (0) to very true or often true (2) of their child in the past 6 months. The CBCL assesses internalizing (anxiety/depression, social withdrawal, somatic complaints) and externalizing (aggression, delinquency) emotional and behavioral problems. Because of their relevance to symptoms associated with RAP, scores from the anxiety/depression and somatic complaints scales were used in this study. Data are reported as normalized T scores based on age and sex norms, but raw scores were used in the analyses to allow for maximum variance. Reliability and validity of the CBCL are well established.

Coping and Involuntary Responses to Stress. Coping and involuntary responses to stress were measured with the parent form of the abdominal pain version of the Responses to Stress Questionnaire (RSQ; Connor-Smith et al., 2000). For this version of the RSQ,

the stressor is identified in each item as a "stomachache." The RSQ includes 57 items reflecting volitional coping efforts as well as involuntary responses to pain. Participants indicate how true each item is with respect to their responses to the stress of abdominal pain in the last 6 months on a 4-point scale ("not at all true" to "often true").

Items on the RSQ were selected to reflect 10 categories of coping and 9 categories of involuntary responses to stress that represent both engagement and disengagement responses. Confirmatory factor analysis supported a five-factor model (Connor-Smith et al., 2000). Primary control engagement coping includes problem solving (e.g., My daughter tries to think of different ways to make her stomachache feel better or go away. One plan she thought of is: ____), emotional expression (e.g., My son lets someone or something know about his feelings—parent, teacher, friend), and emotional modulation (e.g., My daughter keeps her feelings under control when she has to, then lets them out when they won't make things worse). Secondary control engagement coping includes distraction (e.g., My daughter thinks about happy things to take her mind off of her stomachache or her emotions), acceptance (e.g., My son realizes that he just has to live with things the way they are), positive thinking (e.g., My daughter tells herself that everything will be all right), and cognitive restructuring (e.g., When my son has a stomachache, he thinks about things he is learning from the situation or something good that will come from it). Disengagement coping includes avoidance (e.g., My daughter tries not to think about her stomachache, to forget all about it), denial (e.g., When my son gets a stomachache, he says to himself, "This isn't real"), and wishful thinking (e.g., My daughter deals with her stomachaches by wishing they would just go away, that everything would work itself out). Involuntary engagement responses include intrusive thoughts (e.g., When my son is having a stomachache, he can't stop thinking about it when he tries to sleep, or he has bad dreams about it), rumination (e.g., When my daughter gets stomachaches, she can't stop thinking about how she is feeling), emotional arousal (e.g., When my son has a stomachache, right away he feels—angry, sad, worried/anxious), physiological arousal (e.g., When my daughter has stomachaches, she feels it in other places in her body—her heart races, her breathing speeds up, her muscles get tight), and impulsive action (e.g., When my son has a stomachache, sometimes he acts without think-

ing). Finally, involuntary disengagement responses include emotional numbing (e.g., My daughter doesn't feel like herself when she has a stomachache, it's like she's far away), cognitive interference (e.g., My son's mind just goes blank when he has a stomachache, he can't think at all), escape (e.g., My daughter just has to get away from everyone when she has stomachaches; she can't stop herself), and inaction (e.g., My son just freezes when he has a stomachache, he can't do anything).

In this study, scores for the five factors were recalculated on each scale as a proportion of total responses on the RSQ, and these proportions were used in all correlations and path analyses. In previous studies, proportional scoring has been shown to be important for coping research, as it controls for the total amount of responses of each individual, thereby providing an index of the relative amount of each response category used (Osowiecki & Compas, 1999; Vitaliano, Maiuro, Russo, & Becker, 1987).

In previous studies of adolescents' responses to economic stress and parental conflict, alphas for parents' reports on the five factors ranged from .67 to .88 (Connor-Smith et al., 2000; Wadsworth & Compas, in press). In this study, alphas (using item scores) on the five factors for parents' reports were: primary control coping = .68, secondary control coping = .65, disengagement coping = .53, involuntary engagement = .86, involuntary disengagement = .69. Convergent validity correlations between parents' and adolescents' reports on the RSQ are significant and moderate in magnitude (mean r s from .24 to .48), and significantly higher than discriminant validity correlations (Connor-Smith et al., 2000). Test-retest reliability on a sample of adolescents ranged from .69 to .81 (mean of .77) for the five factors (Connor-Smith et al., 2000).

Results

Independent-samples t tests compared functional and organic groups on the demographic variables of gender, age, ethnicity, socioeconomic status (SES), parent who completed questionnaires, number of months with pain, number of symptoms, and number of procedures. Only the number of symptoms reported at the initial visit with the physician was significantly different ($t[149] = 3.73, p < .01$). Patients with organic pain had a higher number of symptoms ($M = 4.4, SD = 2.1$) than patients with functional pain ($M = 3.4, SD = 1.5$).

For the psychological variables, a multivariate analysis of variance (MANOVA) was conducted using the independent variable of medical status (organic vs. functional) and eight dependent variables: the five factors from the RSQ, two CBCL factors (anxiety/depression, somatic complaints), and the single API score. Using Wilks's criterion, the overall MANOVA was significant, $F(8, 142) = 2.05, p < .05$. One-way analyses of variance (ANOVAs) were used to explore which of the outcome variables differed by diagnostic status. The only significant differences were found on the RSQ—participants with organic pain used more secondary control engagement coping, $F(1, 149) = 6.69, p < .05$; and participants with functional pain were higher in involuntary engagement responses to stress (e.g., rumination, physiological arousal, emotional arousal), $F(1, 149) = 8.15, p < .01$.

Means and standard deviations for the pain and psychological variables are displayed in Table II. Parents reported that their children were experiencing moderate levels of pain and exhibited moderately elevated symptoms of anxiety and depression (mean T score of 57) and high levels of somatic symptoms on the CBCL (mean T score of 66). Although parents reported that their children used all three types of coping, scores were higher for primary control engagement coping strategies ($M = 2.78, SD = 0.53$) than either secondary control engagement coping strategies ($M = 2.08, SD = 0.46; t[174] = 16.07, p < .001$) or disengagement coping strategies ($M = 2.12, SD = 0.41; t[174] = 14.26, p < .001$). Proportion scores on the RSQ factors were primary control engagement coping .21, secondary control engagement coping .21, disengagement coping .16, involuntary engagement .23, and involuntary disengagement .18.

Gender was not significantly related to pain or psychological symptoms. However, parents reported that girls responded to their pain with significantly more involuntary engagement than boys ($t[172] = -2.07, p = .04$). Age was related only to primary control coping (see Table II).

Correlational Analyses

The correlations of the RSQ factors with each other and with pain, somatic symptoms, and symptoms of anxiety/depression are presented in Table II. Disengagement coping was negatively related to pain; however, none of the other coping strategies or involuntary responses was significantly related to

Table II. Means, Standard Deviations, and Correlations Among Coping, Stress Responses, Pain, Somatic Complaints, and Anxiety/Depression

Variable	1	2	3	4	5	6	7	8	9	M	SD
1. Age										11.6	2.9
2. Primary control engagement coping	-.16 ^{a*}									2.8	0.5
3. Secondary control engagement coping	.03	.24 ^{b***}								2.1	0.5
4. Disengagement coping		.11	-.28 ^{b***}	.11						2.1	0.4
5. Involuntary engagement	-.07	-.41 ^{b***}	-.76 ^{b***}	-.27 ^{b***}						1.8	0.6
6. Involuntary disengagement		.11	-.53 ^{b***}	-.48 ^{b***}	-.14	-.15 ^{a*}				1.8	0.5
7. Pain	.13	.08	-.13	.17 ^{a*}	.05	-.10				24.5	8.6
8. Somatic complaints (T score)		.12	-.22 ^{b***}	-.29 ^{b***}	-.01	.24 ^{b***}	.24 ^{b***}	.14		66.1	8.0
9. Anxiety/depression (T score)	.05	-.32 ^{b***}	-.41 ^{b***}	.06	.41 ^{b***}	.21 ^{b***}	.08	.45 ^{b***}	—	57.4	8.6

N = 174.

^aThe RSQ subscales ranged in value from 1 ("not at all true") to 4 ("often true"). Means per item on the RSQ are reported. The anxiety/depression and somatic complaints T scores were based on a normative sample with a mean of 50 and a standard deviation of 10.

^bProportional scores were used for the RSQ factors, with the exception of the correlations with age, where raw scores were used.

**p* < .05.

***p* < .01.

****p* < .001.

level of pain. Symptoms of anxiety/depression and somatic symptoms on the CBCL were unrelated to reports of pain on the API. Consistent with hypotheses, correlational analyses showed that primary control coping and secondary control coping were inversely related to somatic symptoms, whereas involuntary engagement and disengagement responses were positively correlated with somatic symptoms. Similarly, primary control coping and secondary control coping were inversely related to levels of anxiety/depression symptoms, whereas involuntary engagement and disengagement were positively correlated with symptoms of anxiety/depression. Disengagement coping was unrelated either to somatic symptoms or anxiety/depression.

Model Testing Procedures

Path modeling was used to test the hypothesized models. Maximum likelihood estimates of the model coefficients were obtained using AMOS (Arbuckle, 1997). As proportional scoring was used for the RSQ factors, it was not possible to enter all five factors into one model. (In proportional scoring, the scores of the five factors sum to one. Thus, if all five scales are included in a single analysis, any one of the five factors is a perfect linear function of the other four.) Therefore, the association of the three coping factors with pain, somatic complaints, and level of anxiety/depression was tested in one model, and the relations of the two involuntary factors with pain, somatic complaints, and level of anxiety/depression was tested in a second model. Age was

not included as a predictor in the models, given the lack of relation shown between age and the outcome variables in correlations. Models were also tested that included age as a predictor of coping ($\chi^2[5] = 8.97$, *p* = .110, Goodness of Fit Indices [GFI] = .98) and age as a predictor of involuntary responses ($\chi^2[5] = 10.20$, *p* = .07, GFI = .98). When the chi-squares of the coping and involuntary models with and without age are compared, there are no significant differences. The model without age appeared to be the most parsimonious both for coping and involuntary responses, as it had the smallest chi-squares (coping, $\chi^2 = 3.20$; involuntary responses, $\chi^2 = 4.43$).

Because differences were demonstrated between participants with organic and functional pain in their responses to stress in the MANOVA, we ran multiple group analyses using structural equation modeling. We simultaneously estimated models for children with organic (*n* = 92) versus functional (*n* = 59) abdominal pain for both the coping and involuntary responses to stress models. These analyses each included two models. Model 1 contained no equality constraints on the parameter estimates across the two groups being compared; coping model ($\chi^2[4] = 10.1$); involuntary model ($\chi^2[4] = 10.6$). Model 2 constrained the paths to be equal across the two groups; coping model ($\chi^2[17] = 23.5$); involuntary model ($\chi^2[12] = 16.1$). A chi-square difference test between models 1 and 2 tested whether the parameter estimates differed for children with organic versus functional abdominal pain. For the models of both coping and involun-

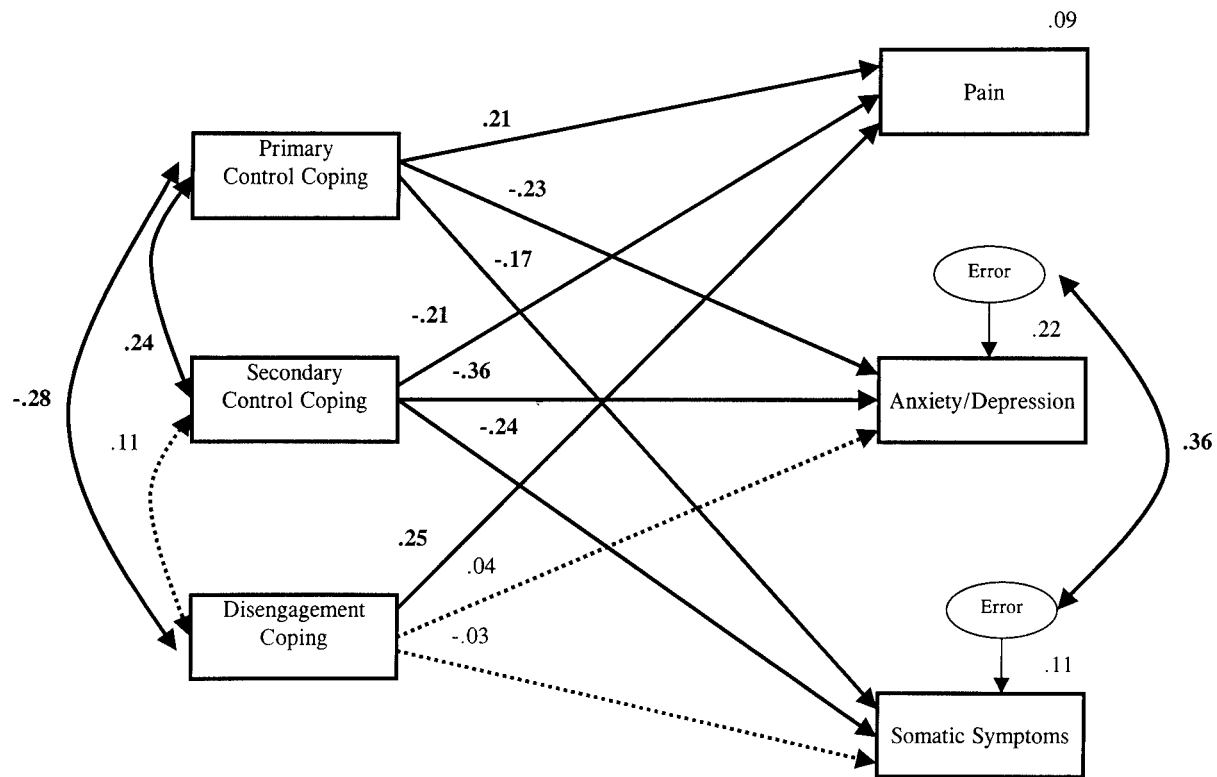


Figure 1. Predicting pain and adjustment from coping. $N = 174$, $\chi^2(2) = 3.198$, $p = .20$, $GFI = .99$. Paths with solid lines and numbers in bold are statistically significant, $p < .05$. Paths with dotted lines and numbers not in bold are not statistically significant. Numbers in or on paths are standardized regression coefficients. Numbers above variables are percent of variance accounted for by the model (squared multiple correlations).

tary responses to stress, there were no significant differences between models 1 and 2, indicating no differences for children with organic versus functional abdominal pain in relations between coping ($\chi^2[13] = 13.4$), and involuntary responses to stress ($\chi^2[8] = 5.5$), and children’s anxiety/depression, somatic complaints, or pain.

Because the organic and functional groups were equivalent in the multiple group analyses, we present the results of the single group model using the full sample ($N = 174$). Results of the path analyses are presented in Figures 1 and 2. Both models provide an adequate fit to the data, with GFI of .994 (coping model) and .990 (involuntary model). Using the criteria recommended by Bentler and Chou (1987) and Bollen (1989) of 10 or more cases per parameter estimate, we have adequate power to detect moderate effects in both models. All variables examined were congruent with assumptions of path modeling, including normality of distribution, linear relations between variables, and lack of outlier

values. In all path analyses, the error terms of the Anxiety/Depression and Somatic Complaints scales were covaried. As both the Anxiety/Depression and Somatic Complaints scales were from the same measure (the CBCL), correlating the error terms served to account for variance due to informant effects (see Hinden, Compas, Achenbach, & Howell, 1997). The path between the error terms was significant in both models ($r = .36$ for the voluntary coping model, and $r = .37$ for the involuntary responses model). In addition, the RSQ factors were covaried in each model. All covaried paths in both models were significant, with the exception of the path between secondary control engagement coping and disengagement coping.

Parent report of the use of primary control engagement coping was negatively related to the level of anxiety/depression ($\beta = -.23$, $p < .01$) and somatic symptoms ($\beta = -.17$, $p < .05$), but was positively related to the amount of pain ($\beta = .21$, $p < .01$). Secondary control engagement coping was

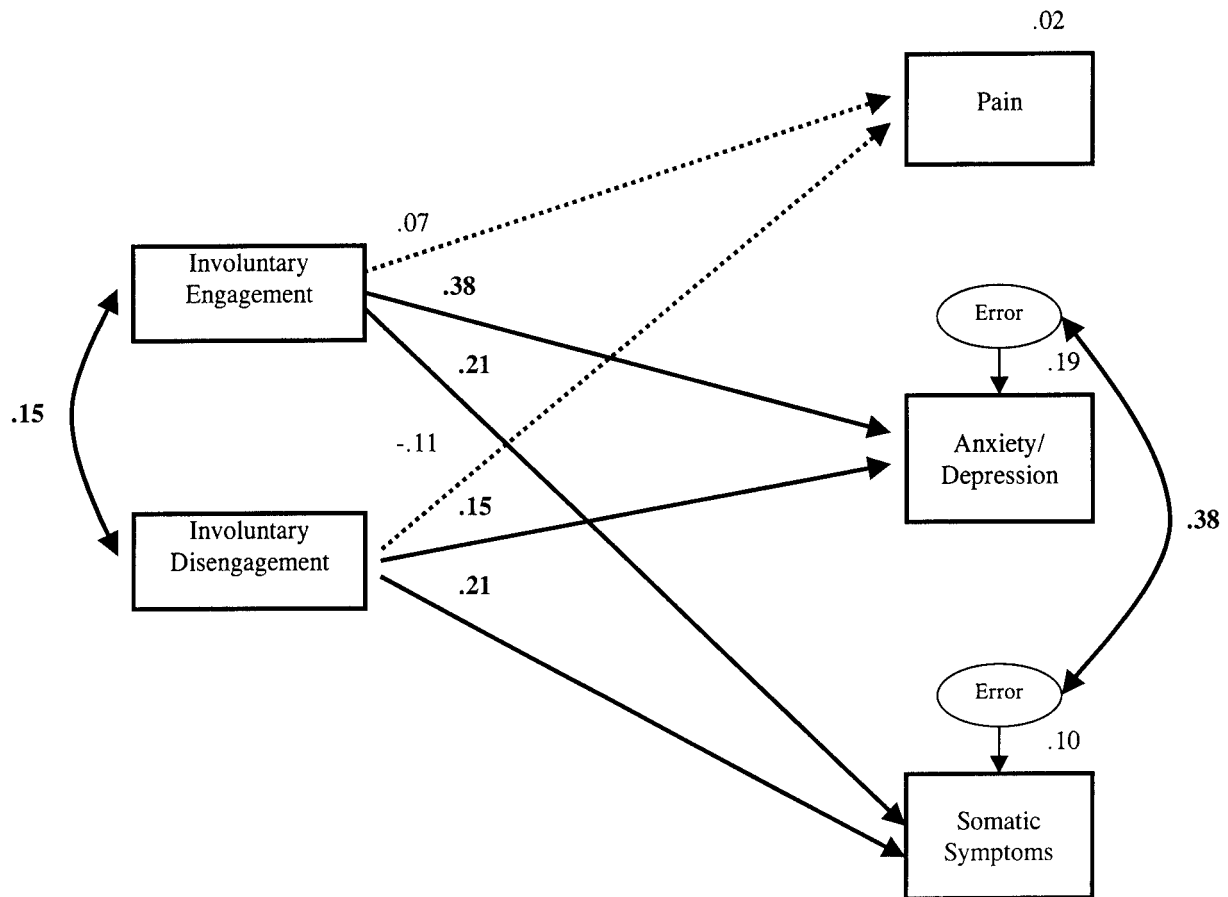


Figure 2. Predicting pain and adjustment from involuntary responses. $N = 174$, $\chi^2(2) = 4.428$, $p = .11$, GFI = .99. Paths with solid lines and numbers in bold are statistically significant, $p < .05$. Paths with dotted lines and numbers not in bold are not statistically significant. Numbers in or on paths are standardized regression coefficients. Numbers above variables are percent of variance accounted for by the model (squared multiple correlations).

negatively related to the level of anxiety/depression ($\beta = -.36$, $p < .01$), somatic complaints ($\beta = -.24$, $p < .01$), and amount of pain ($\beta = -.21$, $p < .01$). Disengagement coping was positively related only to level of pain ($\beta = .25$, $p < .01$). The model predicting pain and adjustment from coping accounted for 22% of the variance in anxiety/depression, 9% of the variance in pain, and 11% of the variance in somatic symptoms.

Parent report of involuntary engagement was related to more symptoms of anxiety/depression ($\beta = .38$, $p < .01$) and somatic symptoms ($\beta = .21$, $p < .01$), but was unrelated to level of pain. Similarly, involuntary disengagement was positively related to the level of somatic symptoms ($\beta = .21$, $p < .01$) and anxiety/depression ($\beta = .15$, $p < .05$), and was unrelated to amount of pain. The model predicting

pain and adjustment from involuntary responses accounted for 19% of the variance in anxiety/depression, 2% of the variance in pain, and 10% of the variance in somatic symptoms.

Discussion

Results highlight important associations among parents' reports of coping, involuntary responses to pain, and levels of pain, somatic symptoms, and anxiety/depression symptoms in children presenting with RAP. In particular, primary and secondary control engagement coping, as hypothesized, were related in both simple correlations and path modeling to lower levels of somatic symptoms and anxiety/depression symptoms. Those children who were

reported by their parents as engaging either in strategies to regulate their emotions or their pain, or in strategies aimed at accepting or adapting to their pain, were also reported by their parents to be better adjusted. In addition, secondary control engagement coping was negatively related to level of pain in path analyses and marginally related in simple correlations ($p = .07$), suggesting that children who use more distraction, acceptance, positive thinking, and cognitive restructuring experienced less pain. In contrast, primary control engagement coping was related to increased levels of pain in path analyses, but was unrelated in simple correlations. The emergence of primary control engagement coping as a predictor of pain in path analyses, where no relation was evident in simple correlations, can be attributed to the effect of cooperative suppression and should be interpreted cautiously (Cohen & Cohen, 1975). (Cooperative suppression occurs when two independent variables [disengagement and primary control engagement coping] correlate positively with the dependent variable [pain] and negatively with each other [$r = -.45, p < .001$]. The correlation between these two variables involves a portion of the overall variance, which is unrelated to the dependent variable. Thus, when entered into the same regression equation, the independent variables are partialled from each other and relations with the dependent variable are enhanced [Cohen & Cohen, 1975]. In this case, the strong negative relationship between primary control engagement coping and disengagement coping suggests that more work should be done examining the relations between the three coping factors of the RSQ.)

Findings for disengagement coping (e.g., avoidance, denial, wishful thinking) were less robust. No association was evident with somatic symptoms or anxiety/depression symptoms in simple correlations. However, in both the simple correlations and path modeling, disengagement coping was positively related to level of pain. Similar to findings reported by Walker et al. (1997), the more avoidance, denial, and wishful thinking a child used, the more pain he or she experienced. The findings for disengagement coping may be weaker in these analyses because the reliability for disengagement coping factor was somewhat lower than for other scales ($\alpha = .53$).

Contrary to the hypotheses, neither involuntary engagement nor involuntary disengagement was related to pain in either simple correlations or in path analyses. However, both involuntary engagement

and disengagement were positively related to anxiety/depression in simple correlations as well as path analyses, suggesting that the more involuntary responses observed by parents, the more symptoms of anxiety and depression a child exhibited. This finding is consistent with the literature cited earlier that addresses the positive relation between intrusive thoughts and stress reactivity (including physiological arousal) with emotional distress (e.g., Kagan et al., 1995). Although some symptoms of anxiety are similar to the items of physiological arousal on the involuntary engagement scale (e.g., racing heart, sweaty palms), this association does not appear to be the result of confounded measures, as the correlation remained significant even after possibly confounded items were removed. Involuntary engagement and disengagement were also positively related to somatic symptoms in both simple correlations and path analyses. That is, the more involuntary responses the parents reported observing, the more likely they were to report general somatic symptoms in their children. These findings are consistent with previous research on the association of disengagement responses and somatic symptoms (Walker et al., 1997). These findings suggest this association may be due to involuntary responses in addition to voluntary disengagement coping.

The findings of greatest interest are consistent with the Walker et al. (1997) study, as they reflect replication across child and parent reports and different measures. Secondary control engagement coping strategies, or accommodative coping in Walker et al. (1997) (e.g., acceptance, distract/ignore, self-encouragement), were associated with lower levels of symptoms for children with RAP in both studies. Both studies also found that disengagement coping strategies or passive coping (e.g., behavioral disengagement, self-isolation) were related to increased levels of pain. There were also several differences found between the two studies. This study found that the increased use of either primary (active) or secondary (accommodative) control coping was related to decreased levels of anxiety/depression and somatic symptoms; in contrast, Walker et al. (1997) found no significant associations between coping and decreased depressive or somatic symptoms. Walker et al. (1997) found that passive (disengagement) coping related to greater somatic complaints and depression, whereas this study found that involuntary disengagement responses, but not disengagement coping, related to somatic symptoms.

Although there are differences between the results of these two studies, taken together they suggest that the coping responses of children with RAP are associated with emotional as well as somatic and pain symptoms. Furthermore, it is striking that this convergence was found across the use of parent reports in this study and child reports in the Walker et al. (1997) study. Furthermore, this study used proportional scores of coping and stress responses, whereas Walker et al. used raw scores. Differences in the findings between these two studies are likely attributable to the different subscales included on each of the factors. For example, Walker et al. included "catastrophizing" on their passive coping factor, a strategy that is closer to "intrusive thoughts" or "rumination" on the involuntary engagement scale of the RSQ and not a part of the RSQ disengagement coping scale.

Despite differences in etiological origins of participants' pain, the models predicting psychological and somatic outcomes from responses to stress fit for children across the two diagnostic categories. This evidence of similarity between children with organic and functional pain is consistent with reports from other researchers who have found that certain psychosocial factors are related to pediatric pain, regardless of the etiology of pain (e.g., Walker et al., 1993). Such evidence provides support for conceptualizations of RAP as neither solely organic nor functional, but a result of multiple environmental, psychological, and biological mechanisms (Walker, 1999).

There are several limitations to this study. First, it relies on parents' reports of how their children cope with RAP and does not present the data from the children's reports of their own coping; direct comparison of parent and adolescent reports of coping and symptoms will be important. Second, this study was cross-sectional, and the causal direction of the relations between responses to stress and pain, somatic and anxiety/depression symptoms cannot be determined. For example, children who

are more depressed may use more disengagement coping techniques because they do not have the energy, attention, or emotional resources to engage in secondary control techniques. These complex relationships will be more carefully examined in a longitudinal, prospective study.

These limitations notwithstanding, the findings of this study extend the pediatric literature on adaptation to pain and increase our understanding of the role of coping in the somatic and emotional functioning of children with RAP. Specifically, they provide information on potentially adaptive forms of coping for children with RAP, offering further support for the role of secondary control coping in positive adaptation to pain and suggesting the value of primary control strategies including emotional expression and regulation. In addition, this study expands the scope of research on children's coping and stress responses to include stress reactivity and other forms of automatic, involuntary responses to pain. In addition to the heuristic value of understanding the different ways in which children respond to stress, the identification of more, as well as less, adaptive responses to pain and other stress should provide the foundation for interventions to teach more effective skills in managing, reducing, and controlling pain (Compas & Boyer, 2001). Future research examining the effectiveness of interventions aimed at increasing secondary control engagement strategies and decreasing disengagement strategies would provide important experimental data to corroborate the findings of this and other descriptive studies.

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References

- Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4-18 and 1991 Profile*. Burlington: University of Vermont.
- Apley, J. (1975). *The child with abdominal pain* (2nd ed.). Oxford: Blackwell Scientific Publications.
- Arbuckle, J. L. (1997). *Amos users' guide version 3.6*. Chicago: Small Waters Corporation.
- Band, E. B., & Weisz, J. R. (1990). Children's coping with diabetes: Understanding the role of cognitive development. *Journal of Pediatric Psychology, 15*, 27-41.

- Battistella, P. A., Carra, S., Zaninotto, M., Ruffilli, R., & Da Dalt, L. (1992). Pupillary reactivity in children with recurrent abdominal pain. *Headache, 32*, 105–107.
- Bentler, P. M., & Chou, C. P. (1987). Practical issues in structural modeling. *Sociological Methods and Research, 16*, 78–117.
- Biederman, J., Rosenbaum, J. F., Hirshfeld, D. R., Faraone, S. V., Bolduc, E. A., Gersten, M., Meminger, S. R., Kagan, J., Snidman, N., & Reznick, S. (1990). Psychiatric correlates of behavioral inhibition in young children with and without psychiatric disorders. *Archives of General Psychiatry, 47*, 21–26.
- Bollen, K. A. (1989). *Structural equations with latent variables*. New York: John Wiley & Sons.
- Boyce, T., Chesney, M., Alkon, A., Tschann, J. M., Adams, S., Chesterman, B., Cohen, F., Kaiser, P., Folkman, S., & Wara, D. (1995). Psychobiologic reactivity to stress and childhood respiratory illness. *Psychosomatic Medicine, 57*, 411–422.
- Boyer, M. C., Compas, B. E., Stanger, C., Colletti, R. B., Thomsen, A. H., Konik, B. S., & Morrow, S. B. (2001). *Coping with recurrent abdominal pain: Latent variable analyses of parent and child reports*. Unpublished manuscript, University of Vermont.
- Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology, 56*, 267–283.
- Cohen, J., & Cohen, P. (1975). *Applied multiple regression/correlation analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum.
- Colletti, R. B. (1998). Recurrent abdominal pain. In F. D. Burg, J. R. Ingelfinger, E. R. Wald, & R. A. Polin (Eds.), *Current pediatric therapy*. Philadelphia: W. B. Saunders.
- Compas, B. E., & Boyer, M. C. (2001). Coping and attention: Implications for children's health and pediatric conditions. *Journal of Developmental and Behavioral Pediatrics, 22*, 1–11.
- Compas, B. E., Connor, J. K., Osowiecki, D. M., & Welch, A. (1997). Effortful and involuntary responses to stress: Implications for coping with chronic stress. In B. H. Gottlieb (Ed.), *Coping with chronic stress*. New York: Plenum.
- Compas, B. E., Connor-Smith, J. K., Saltzman, H., Thomsen, A. H., & Wadsworth, M. E. (2001). Coping with stress during childhood and adolescence: Progress, problems, and potential in theory and research. *Psychological Bulletin, 127*, 87–127.
- Connor-Smith, J. K., Compas, B. E., Wadsworth, M. E., Thomsen, A. H., & Saltzman, H. (2000). Responses to stress in adolescence: Measurement of coping and involuntary stress responses. *Journal of Consulting and Clinical Psychology, 68*, 976–992.
- Feuerstein, M., Barr, R. G., Francoeur, T. E., Houle, M., & Rafman, S. (1982). Potential biobehavioral mechanisms of recurrent abdominal pain in children. *Pain, 13*, 287–298.
- Garber, J., Walker, L. S., & Zeman, J. (1991). Somatization symptoms in a community sample of children and adolescents: Further validation of the Children's Somatization Inventory. *Psychological Assessment, 3*, 588–595.
- Garber, J., Zeman, J., & Walker, L. S. (1990). Recurrent abdominal pain in children: Psychiatric diagnoses and parental psychopathology. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*, 648–656.
- Gil, K. M., Williams, D. A., Thompson, R. J., & Kinney, T. R. (1991). Sickle cell disease in children and adolescents: The relation of child and parent pain coping strategies to adjustment. *Journal of Pediatric Psychology, 16*, 643–663.
- Hinden, B., Compas, B. E., Achenbach, T., & Howell, D. (1997). Covariation of the anxious-depressed syndrome during adolescence: Separating fact from artifact. *Journal of Consulting and Clinical Psychology, 65*, 6–14.
- Hollingshead, A. B. (1975). Four factor index of social status. Unpublished paper, Yale University, Department of Sociology, New Haven, CT.
- Holmbeck, G. N., Belvedere, M. C., Christensen, M., Czerninski, A. M., Hommeyer, J. S., Johnson, S. Z., & Kung, E. (1998). Assessment of adherence with multiple informants in pre-adolescents with spina bifida: Initial development of a multidimensional, multitask parent-report questionnaire. *Journal of Personality Assessment, 70*, 427–440.
- Kagan, J., Snidman, N., & Arcus, D. (1995). The role of temperament in social development. In G. P. Chrousos et al. (Eds.), *Stress: Basic mechanisms and clinical implications* (pp. 485–490). *Annals of the New York Academy of Sciences, 771*.
- Kovacs, M. (1980/1981). Rating scales to assess depression in school aged children. *Acta Paedopsychiatrica, 46*, 305–315.
- Osowiecki, D. M., & Compas, B. E. (1999). Psychological adjustment to cancer: Control beliefs and coping in adult cancer patients. *Cognitive Therapy and Research, 22*, 483–499.
- Rubin, L. S., Barbero, G. J., & Sibinga, M. S. (1967). Pupillary reactivity in children with recurrent abdominal pain. *Psychosomatic Medicine, 2*, 111–120.
- Schanberg, L. E., Lefebvre, J. C., Keefe, F. J., Kredich, D. W., & Gil, K. M. (1997). Pain coping and the pain experience in children with juvenile chronic arthritis. *Pain, 73*, 181–189.
- Tobin, D. L., Holroyd, K. A., Reynolds, R. V., & Wigal, J. K. (1989). The hierarchical factor structure of the Coping Strategies Inventory. *Cognitive Therapy and Research, 13*, 343–361.
- Vitaliano, P. P., Maiuro, R. D., Russo, J., & Becker, J. (1987). Raw versus relative scores in the assessment of coping strategies. *Journal of Behavioral Medicine, 10*, 1–18.
- Wadsworth, M. E., & Compas, B. E. (in press). Coping with

- family conflict and economic strain: The adolescent perspective. *Journal of Research on Adolescence*.
- Walker, L. S. (1999). The evolution of research on recurrent abdominal pain: History, assumptions, and a conceptual model. In P. J. McGrath & G. A. Finley (Eds), *Chronic and recurrent pain in children and adolescents. Progress in Pain Research and Management* (vol. 13, pp. 141–172). Seattle, WA: IASP Press.
- Walker, L. S., Garber, J., & Greene, J. W. (1993). Psychosocial correlates of recurrent childhood pain: A comparison of pediatric patients with recurrent abdominal pain, organic illness, and psychiatric disorders. *Journal of Abnormal Psychology, 102*, 248–258.
- Walker, L. S., & Greene, J. W. (1989). Children with recurrent abdominal pain and their parents: More somatic complaints, anxiety, and depression than other patient families? *Journal of Pediatric Psychology, 14*, 231–243.
- Walker, L. S., Smith, C. A., Garber, J., & Van Slyke, D. A. (1997). Development and validation of the Pain Response Inventory for children. *Psychological Assessment, 9*, 392–405.
- Weisz, J. R., McCabe, M. A., & Dennig, M. D. (1994). Primary and secondary control among children undergoing medical procedures: Adjustment as a function of coping style. *Journal of Consulting and Clinical Psychology, 62*, 324–332.