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Abstract

This study examined the relationships among anxiety sensitivity (AS), catastrophizing, somatization and pain in 240 non-clinical children (121 girls; mean age = 12.7 years). Children with pain problems (n = 81; 33.8%) reported greater AS and catastrophizing ($ps < .01$) relative to children without pain problems. AS but not catastrophizing was significantly associated with current pain. However, both AS and catastrophizing were significantly associated with somatization. AS and catastrophizing represent related but partially distinct cognitive constructs that may be targeted by interventions aimed at alleviating pain and somatization in children.

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Keywords

- *anxiety sensitivity*
- *catastrophizing*
- *children*
- *pain*
- *somatization*

THE BIOPSYCHOSOCIAL model of pain purports that biological, social learning and psychological factors play a role in the pain experience (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). This approach has prompted efforts to identify psychological factors that may predispose and/or exacerbate pain. This area of research is important because many individuals with pain also experience somatization, or the experience of somatic complaints in the absence of a clear medical cause (Muris & Meesters, 2004). Considerable research supports the link between somatization and psychosocial factors, such as family environment and psychological distress (Garber, Zeman, & Walker, 1990; Muris & Meesters, 2004). Nevertheless, the current consensus is that somatization does not necessarily suggest a psychological origin (Walker & Garber, 2003); rather, somatization is considered one aspect along a continuum of somatic concern.

One hypothesized psychological factor that may contribute to pain and somatization is anxiety sensitivity (AS). AS refers to the fear of bodily sensations associated with anxious arousal due to a belief that these sensations will have harmful somatic, psychological or social consequences (Reiss & McNally, 1985). Although AS is considered a critical component in the development and maintenance of anxiety and other emotional disorders (Clark, 1986), recent evidence indicates that AS may be a risk factor for conditions other than anxiety disorders. In healthy children, AS has been associated with acute, experimental pain responses (Tsao et al., 2004; Tsao, Lu, Kim, & Zeltzer, 2006) and, in a separate study, was found to be a significant and unique predictor of fear of pain in adolescents (Muris, Vlaeyen, & Meesters, 2001). In children with chronic pain, AS is linked with lower quality of life and poorer overall functioning (Tsao, Meldrum, Kim, & Zeltzer, 2007). Cognitive theories suggest that AS may not be confined to fears of anxiety but may extend to a broader catastrophic style concerning bodily symptoms in that individuals with high AS may hold catastrophic beliefs about the consequences of many physical symptoms, including pain, which results in heightened levels of arousal and increased fear of these symptoms (Cox, Fuentes, Borger, & Taylor, 2001).

The tendency to catastrophize the meaning or implications of physical symptoms may also be a common factor related to pain and somatization. Previous research has demonstrated that catastrophic pain-related beliefs are key predictors of pain experience (Sullivan et al., 2001) and have been associated with hypersensitivity to unpleasant stimuli (Dixon, Thorn, & Ward, 2004). Pain catastrophizing has been linked with acute and chronic pain in adults and children (Drahovzal, Stewart, & Sullivan, 2006; Lu, Tsao, Myers, Kim, & Zeltzer, 2007; Reid, Gilbert, & McGrath, 1998; Vervoort et al., 2008).

Despite evidence pointing to AS and pain catastrophizing as potential common vulnerability factors in the experience of pain and somatization, there is a paucity of research on the specific links among these constructs in younger populations. One prior study in a non-clinical sample of adults found AS and catastrophizing to be empirically separable constructs with each cognitive style independently predicting the presence of headache pain, and in the case of AS, a range of physical symptoms associated with headache (Drahovzal et al., 2006). Because no comparable work has been conducted among youth, we tested the association between the hypothesized common vulnerability factors (AS and catastrophizing) and health outcomes (current pain problems and somatization) in a non-clinical sample of children. It was hypothesized that AS and pain catastrophizing would be moderately, positively correlated and that children who experienced current pain problems would report greater AS and greater pain catastrophizing relative to children who did not experience current pain problems. It was also hypothesized that AS and pain catastrophizing would each contribute independently to the presence of current pain problems and the level of somatization in multivariate analyses.

Method

Participants

Participants were 244 non-clinical children (124 girls; 49.6%) (mean age: 12.7 years; SD = 3.0, range = 8–18) who took part in a laboratory study on puberty and pain responses. In the current study, 'non-clinical' referred to children who, by parent-report did not have an acute or chronic illness, that is, heart condition or arthritis, recent surgery on, or an injury to any limb, history of frostbite, history of fainting spells or developmental delay. The wide age range of the current sample was intended to include children across the five stages of puberty. Participants were recruited via mass mailing, posted advertisements and classroom presentations. Potential participants were screened by telephone. A trained research assistant asked parents whether their child met any of the following exclusionary criteria:

(1) acute or chronic illness (as defined above); (2) developmental delay or significant anatomic impairment that would preclude understanding of study procedures (e.g. developmental age of < 8 years), or participation in pain induction procedures (e.g. arm immersion in cold water); or (3) daily use of opioid medication. Following confirmation of study eligibility and verbal consent from a parent, informed parent consent and child assent forms were mailed for review and signature. The university Institutional Review Board approved all study procedures. Four participants had missing data on the measures of interest and were excluded from the analyses. The final sample consisted of 240 children; additional demographic information for the final sample is displayed in Table 1.

Measures

The Childhood Anxiety Sensitivity Index (CASI) (Silverman, Fleisig, Rabian, & Peterson, 1991) is an 18-item scale assessing the specific tendency to interpret anxiety sensations as dangerous. The CASI has demonstrated good internal consistency (alpha = .87) and adequate test–retest reliability over two weeks (range = .62–.78) (Silverman et al., 1991). Construct validity is supported by good correlations with measures of trait anxiety (*r*s = .55–.69); however, the CASI also accounts for variance in fear that is not attributable to trait anxiety measures (Weems, Hammond-Laurence, Silverman, & Ginsburg, 1998). Factor analytic studies have supported the multidimensional, hierarchical structure of AS in children and recent confirmatory factor analysis of the CASI has identified four factors: disease concerns; unsteady concerns; mental illness concerns; and social concerns (Silverman, Goedhart, & Barrett, 2003).

The Pain Coping Questionnaire (PCQ) (Reid et al., 1998) is a 39-item questionnaire assessing how children cope with general pains that last a few hours or days by rating the frequency of how often each coping strategy was used. Items are scored on a five-point scale (never, hardly ever, sometimes, often, very often). The PCQ has been validated in relation to self-report responses and pressure pain threshold (Reid et al., 1998). The internalizing/catastrophizing subscale was used as a measure of pain catastrophizing. This scale contains five items (e.g. ‘worry that I will always be in pain’).

Children’s Somatization Inventory (CSI) (Garber, Walker, & Zeman, 1991; Walker & Garber, 2003) assesses children’s perceptions of the nonspecific somatic symptoms. Respondents rate how much they were bothered by each of 35 symptoms (e.g. headaches) during the last two weeks using a five-point scale (not at all, a little, some, a lot, a whole lot). Adequate reliability and validity have been established. In healthy samples, internal consistency for the CSI has been shown at .92 (Garber et al., 1991), and test–retest reliability at .66 ($p < .001$) (Walker, Garber, & Greene, 1991).

The presence of current pain problems was assessed in an interview format using items developed for the purposes of this study. Participants were asked by a researcher whether they currently experienced any pain problems. Children were asked, ‘Do you have any pain problems right now (such as headaches, stomachaches, fibromyalgia, back pain, other)?’ (yes/no). If children answered affirmatively they were further asked to list where they experienced pain using an open-ended format (i.e. ‘Where is the pain?’ [What part of your body?]). The total number of body locations was calculated by summing the number of pain locations listed by the child.

Initial validation of these items was conducted in a subset of the current sample (n = 131; 54.6% of the total sample) who were administered the Child Health Questionnaire (CHQ CF-87; Landgraf, Abetz, & Ware, 1999). The CHQ is a measure of physical and psychosocial well-being and one of the most widely used measures for children. Bodily pain subscale scores for the CHQ were found to be significantly lower indicating more pain among children who reported current pain problems (n = 32; 25.2%) (M = 70.9; SD = 17.7), compared to those who did not (n = 98; 74.8%) (M = 81.7; SD = 16.7) ($t(128) = 3.12, p < .01$). The number of pain locations was significantly inversely correlated with bodily pain scores ($r = -.16, p < .02$), indicating that more pain locations was associated with lower bodily pain scores (indicating more pain).

Procedure

Participants completed the questionnaires in a quiet room prior to taking part in a laboratory pain study. Procedures and results of the laboratory pain study have been reported elsewhere (Lu et al., 2007; Tsao et al., 2004). For their participation, children received a $30 gift certificate and a T-shirt.

Results

Statistical analysis

Bivariate analyses were used to preliminarily examine the relationships among the variables prior

Table 1. Descriptive statistics for the study measures according to key sociodemographic characteristics and pain group status

	n (%) of total sample	*Current pain problems n (%)*	*Mean CSI score (SD)*	*Mean PC score (SD)*	*Mean CASI score (SD)*	*Mean CASI disease score (SD)*	*Mean CASI unsteady score (SD)*	*Mean CASI social score (SD)*	*Mean CASI mental score (SD)*
Sex									
Female	121 (50.4)	43 (35.5)	12.6 (12.1)	1.9 (0.7)	27.9 (5.8)	5.5 (1.7)	4.9 (1.8)	6.2 (1.4)	3.9 (1.3)
Male	119 (49.6)	38 (31.9)	11.9 (10.7)	1.9 (0.7)	27.1 (4.6)	5.4 (1.5)	4.9 (1.4)	6.1 (1.5)	3.9 (1.1)
Race/Ethnicity									
African-American	34 (14.2)	8 (23.5)	10.4 (10.2)	2.0 (0.8)	27.6 (5.8)	5.8 (1.8)	4.6 (1.8)	6.3 (1.7)	3.6 (1.0)
Latino	56 (23.3)	21 (37.5)	12.0 (8.7)	1.8 (0.5)	27.4 (4.9)	5.7 (2.0)	4.8 (1.4)	6.1 (1.3)	4.1 (1.5)
Asian-American	22 (9.2)	8 (36.4)	11.8 (9.8)	2.1 (0.8)	27.9 (5.2)	5.1 (1.1)	5.0 (1.6)	5.8 (1.2)	4.1 (1.3)
Caucasian	98 (40.8)	32 (32.7)	12.6 (10.2)	1.9 (0.7)	27.0 (5.0)	5.2 (1.4)	4.9 (1.5)	6.2 (1.5)	3.8 (1.1)
Other	30 (12.5)	12 (40.0)	14.0 (18.9)	1.8 (0.8)	28.8 (6.2)	5.4 (1.4)	5.4 (1.9)	6.2 (1.3)	4.0 (1.1)
Mother Education									
> High school	15 (6.5)	4 (26.7)	10.6 (10.8)	2.1 (0.6)	28.0 (4.4)	5.7 (2.0)	5.1 (1.8)	6.1 (1.2)	4.0 (1.1)
High school diploma	24 (10.3)	7 (29.2)	14.1 (11.2)	2.5 (0.9)	29.3 (5.6)	6.2 (2.1)	5.0 (1.4)	6.3 (1.0)	4.0 (1.5)
Some college/AA degree	64 (27.6)	23 (35.9)	13.5 (15.2)	1.9 (0.8)	27.2 (5.2)	5.3 (1.6)	4.8 (1.6)	6.0 (1.6)	4.1 (1.3)
College degree	62 (26.7)	21 (33.9)	10.2 (8.7)	1.8 (0.6)	26.8 (4.7)	5.2 (1.3)	4.8 (1.5)	6.0 (1.3)	3.8 (1.1)
Graduate degree	67 (28.9)	22 (32.8)	12.4 (9.7)	1.9 (0.7)	28.0 (5.7)	5.4 (1.4)	5.0 (1.7)	6.4 (1.4)	3.9 (1.2)
Pain group status									
Current pain group	81 (33.8)	–	16.1 (13.6)	2.1 (0.8)	29.5 (5.7)	5.9 (1.9)	5.4 (1.6)	6.3 (1.3)	4.4 (1.4)
No pain group	159 (66.2)	–	10.2 (9.8)	1.8 (0.7)	26.7 (4.7)	5.2 (1.3)	4.7 (1.5)	6.1 (1.4)	3.7 (1.1)
Total sample	240 (100)	81 (33.8)	12.3 (11.4)	1.9 (0.7)	27.5 (5.3)	5.4 (1.6)	4.9 (1.6)	6.2 (1.4)	3.9 (1.2)

Notes: CSI = Children's Somatization Inventory; CASI = Childhood Anxiety Sensitivity Index; PC = Internalizing/Catastrophizing subscale of the Pain Coping Questionnaire; AA = Associates Degree. Scores for all measures except CASI Social concerns were significantly higher in the current pain group compared to the no pain group (*p*s < .01).

to multivariate modeling. Independent *t*-tests and chi-square tests for continuous and categorical data respectively were used to test for sex differences among the study variables. To examine differences based on maternal educational level and child race/ethnicity, chi-square tests for categorical data and one-way ANOVAs for continuous data were conducted followed by Tukey's honestly significant different (HSD) post-hoc tests. Pearson product moment correlation coefficients were generated to characterize the association between age and the questionnaire measures, that is, CASI, PCQ internalizing/catastrophizing subscale (PC) and CSI, as well as the zero-order correlations among these measures. Reliability coefficients (Cronbach's alpha) were calculated for the questionnaire measures. An uncorrected α level of .05 (two-tailed) was used to evaluate these bivariate results (corrections to the α level were applied to the confirmatory analyses—see below).

For the confirmatory analyses, a series of ANCOVAs were first used to compare PC and CASI total and subscale scores between the pain and no pain groups, controlling for age, sex and maternal education. These sociodemographic variables were controlled for because prior research has indicated that older age and female sex are associated with increased pain responsivity (Tsao et al., 2004); in the current study, maternal education was correlated with catastrophizing (see later). To evaluate the relative contribution of CASI and PC scores to the likelihood of pain group membership, sequential multiple logistic regression was used. Sociodemographic variables (age, sex, mother education) were entered in Step 1, followed by CASI and PC scores in Step 2. These analyses were also conducted with the four CASI subscales (disease concerns, unsteady concerns, mental illness concerns, social concerns) and PC scores entered in Step 2. For the logistic regression analyses of total CASI scores, two outliers with studentized residuals in excess of 2 were identified and excluded.

To evaluate the relationship of CASI and PC scores with CSI scores, sequential linear regression was conducted with sociodemographic variables entered in Step 1, followed by CASI and PC scores in Step 2. To examine the CASI subscales, these analyses were also conducted with the four CASI subscales and PC scores entered in Step 2. For the linear regression analyses of CSI scores, five outliers with standardized residuals in excess of 3 were identified and excluded. A Bonferroni correction for the two main outcome measures (pain group membership; CSI scores) was used to reduce the likelihood of Type 1 error. Therefore, a corrected α level of .025 (two-tailed) was used to evaluate the confirmatory results.

Preliminary analyses—bivariate results

Table 1 shows descriptive statistics for the study measures. Cronbach's alpha indicated good reliability for the CASI (.80), PC (.74) and CSI (.88). CASI scores were in the normative range for a non-clinical sample of boys and girls (Silverman et al., 1991); scores on the CSI and the PC were somewhat lower than previously reported in non-clinical samples (Reid et al., 1998; Walker & Garber, 2003). There were no differences in CASI, PC or CSI scores based on sex or race/ethnicity. Child age was inversely correlated with CASI scores ($r = -.16$, $p < .02$). PC scores differed significantly based on mother education ($F(4, 227) = 5.05$, $p < .01$). Post-hoc tests indicated that children of mothers with a high school diploma reported higher PC scores compared to children of mothers with more education (see Table 1).

As shown in Table 1, roughly one-third of the total sample reported current pain problems. The type of pain problems were as follows: headache ($n = 43$; 17.9%), stomachache ($n = 25$; 10.4%); back/neck ($n = 13$; 5.4%); legs/feet ($n = 12$; 5.0%); arms ($n = 4$; 1.7%); other ($n = 14$; 5.8%). The number of pain problems ranged from one to four ($M = 0.5$; SD = 0.8). Frequencies were: one problem ($n = 56$; 22.3%); two problems ($n = 18$; 7.5%); three problems ($n = 5$; 2.1%) and four problems ($n = 1$; 0.4%). Children in the current pain group did not differ from the no pain group based on sociodemographic factors. Age was inversely correlated with the number of pain problems ($r = -.16$; $p < .02$). CASI total and subscale scores were significantly correlated with each other, as well as with PC and CSI scores (*r*s = .17–.80, all *p*s < .01). PC scores were also significantly correlated with CSI scores ($r = .38$, $p < .01$).

Confirmatory analyses—mean differences

Total CASI and PC scores were significantly higher in the pain group compared to the no pain group, after controlling for age, sex and maternal education (CASI—($F(1, 227) = 14.06$, $p < .001$); PC—($F(1, 227) = 8.81$, $p < .01$)) (see Table 1). Analyses of the CASI subscales indicated that the pain group scored significantly higher on all subscales except for social

Table 2. Sequential logistic regression of demographic, anxiety sensitivity and catastrophizing measures on pain group membership

Step	*Predictor variable*	*β*	*Odds ratio*	*95% CI*	*χ^2 to remove*	*d.f.*
Results for Total CASI scores						
1	Sex	−.17	.08	0.47–1.51	4.22	3
	Age	−.07	.94	0.84–1.04		
	Mother education	.08	1.09	0.8–1.40		
2	Total CASI	.09*	1.09	1.02–1.17	21.55	5
	PCQ	.32	1.37	0.85–2.22		
Results for CASI subscale scores						
1	Sex	−.17	.85	0.47–1.51	3.24	3
	Age	−.05	.95	0.86–1.05		
	Mother education	.08	1.08	0.84–1.39		
2	CASI Disease	.03	1.03	0.81–1.31	22.82	8
	CASI Unsteady	.15	1.16	0.94–1.43		
	CASI Social	−.03	.98	0.78–1.22		
	CASI Mental	.35*	1.42	1.09–1.84		
	PC	.26	1.29	0.80–2.09		

Notes: For Sex, boys and girls coded as '1' and '2', respectively; pain group coded as '0' no pain and '1' current pain, respectively; β = Standardized regression coefficient; CI = Confidence Interval; d.f. = degrees of freedom
*$p < .025$

concerns (Disease—($F(1, 227) = 8.58$, $p < .01$); Unsteady—($F(1, 227) = 8.05$, $p < .01$); Mental Illness—($F(1, 227) = 14.57$, $p < .001$)). The pain group also scored significantly higher on the CSI compared to the no pain group ($F(1, 227) = 12.83$, $p < .001$).

Confirmatory analyses—multivariate regression results

Results of the sequential logistic regression analysis of pain group membership are presented in Table 2. For the initial model with total CASI and PC scores, there was a good model fit (discrimination among groups) ($\chi^2(8) = 3.30$; $p = .91$; Log likelihood = 268.89); the overall model explained 9 percent of the variance in group membership (Cox & Snell R^2). Inclusion of the demographics in Step 1 did not reliably improve model fit. However, entry of total CASI and PC scores in Step 2 significantly improved model fit. The significant odds ratio (OR) in Table 2 indicates that a one unit increase in total CASI scores increased the likelihood of being in the current pain group by 1.09 units. PC scores were not significantly associated with pain group membership. Results of the logistic regression analysis for the CASI subscale scores are also shown in Table 2. The overall model explained 13 percent of the variance in group membership. Only the CASI mental concerns subscale was significantly associated with pain group membership. The significant OR in Table 2 indicates that a one unit increase in CASI mental illness concerns scores increased the likelihood of being in the pain group by 1.42 units.

Results of the sequential linear regression analysis for CSI scores are presented in Table 3. Total CASI and PC scores in Step 2 accounted for significant incremental variance of 11 percent and 5 percent respectively. The complete model including all predictors explained 28 percent (26 percent adjusted) of the variance in CSI scores. Results of additional analyses of the CASI subscales are also shown in Table 3. CASI unsteady and CASI mental concerns subscales explained 4 percent and 5 percent of incremental variance respectively in CSI scores. PC scores accounted for 6 percent of incremental variance. The complete model including all predictors explained 29 percent (26% adjusted) of the variance in CSI scores.

Discussion

As hypothesized, children who reported current pain problems evidenced significantly higher global fears of anxious arousal and elevated pain catastrophizing relative to children who did not report current pain problems after controlling for key sociodemographic characteristics (i.e. age, sex and maternal education). Additional analysis of AS dimensions indicated that

Table 3. Sequential multiple linear regression of demographic, anxiety sensitivity and catastrophizing measures on CSI scores

Step	*Variables entered*	β	sr^2 *(incremental)*	*Model* R^2	*Change in* R^2
Results for Total CASI scores					
CSI scores (DV)					
1	Sex	−.04	.00	.01	.01
	Age	−.07	.00		
	Mother education	−.06	.00		
2	Total CASI	.36**	.11	.28	.27**
	PC	.23*	.05		
Results for CASI subscale scores					
CSI scores (DV)					
1	Sex	.04	.00	.01	.01
	Age	−.08	.00		
	Mother education	−.06	.00		
2	CASI Disease	.02	.00	.29	.28**
	CASI Unsteady	.22*	.04		
	CASI Social	.02	.00		
	CASI Mental	.22*	.05		
	PC	.26**	.06		

Notes: sr^2 = incremental contribution of IV to R^2; Model R^2 = Coefficient of determination (goodness of fit) for overall regression model after entry of each independent variable; Change in R^2 = incremental contribution of an independent variable to R^2 in the total set of independent variables
*$p < .01$; **$p < .001$

children with current pain problems reported greater fears of the physical consequences of anxiety sensations, and heightened fears of the psychological consequences of anxious arousal. However, children with and without current pain problems did not differ on fears of the social consequences of anxiety. Also as hypothesized, AS and pain catastrophizing were moderately, positively associated (range: *r*s = .29 to .56). Contrary to expectation, AS but not catastrophizing was significantly associated with the presence of current pain problems after controlling for sociodemographic characteristics (see Table 2). However, both AS and catastrophizing were independently associated with somatization. Moreover, analyses of the AS dimensions indicated that AS psychological and AS unsteady concerns were significantly associated with somatization, accounting for 5 percent and 4 percent of incremental variance, respectively.

The findings of moderate, positive correlations between AS and pain catastrophizing are consistent with similar findings in non-clinical adults (Drahovzal et al., 2006). As discussed by Drahovzal et al., it has been posited (Sullivan, Thorn, Rodgers, & Ward, 2004) that pain catastrophizing is a cognitive construct (i.e. an exaggerated negative mental set in relation to pain) which is related to and yet partially distinct from fear of pain, an emotional construct (i.e. negative emotional reaction to pain involving escape/avoidance behavior). Drahovzal et al. purport that like catastrophizing, AS is a cognitive construct and thus AS and catastrophizing are empirically separable but overlapping constructs that may be conceptualized as a common cognitive dimension—that is, the general tendency to catastrophize the meaning of aversive physical sensations.

This conceptualization is somewhat at odds with the present finding of an association between AS and the presence of current pain problems but no such relationship for catastrophizing. In support of their conceptual model, Drahovzal et al. (2006) found that *both* AS and catastrophizing independently predicted the presence of headache pain. Since Drahovzal et al. studied adults, it may be that differences due to age and/or cognitive development are responsible for this divergence. It is also possible that our findings may be due to the non-clinical nature of the current sample since a recent investigation found stronger relationships among catastrophizing, pain and pain behaviors in children with chronic pain, compared to non-clinical children (Vervoort, Goubert, Eccleston, Bijttebier, & Crombez, 2006).

However, the Drahovzal sample was also non-clinical. Alternatively, pain catastrophizing may be especially relevant to the experience of headaches rather than pain symptoms in general. Nevertheless, post-hoc analyses of headache group membership (headache pain—yes/no) (data not shown) in the present sample yielded similar results to that reported for overall pain.

The current results are consistent with Drahovzal et al.'s (2006) findings that global AS but not catastrophizing predicted both headache pain intensity and the number of accompanying physical symptoms (e.g. nausea; vomiting). Drahovzal et al.'s analysis of the AS subscales indicated that AS psychological concerns predicted headache intensity whereas AS physical concerns predicted the number of physical symptoms. Similarly, in the present sample, children with current pain problems reported elevated AS physical and AS psychological concerns relative to children without pain problems. The current findings support Drahovzal et al.'s conclusion that the AS construct appears to provide additional information in the prediction of pain experiences beyond that explained by catastrophizing alone.

In the present study, both AS and catastrophizing were associated with somatization in multivariate analyses. It should be noted however, that global AS accounted for more than twice the incremental variance in somatization (11%) compared to catastrophizing (5%). The current results agree with prior work in a younger sample of non-clinical children aged 8–13 years ($M = 10.6$) which found that somatization was associated with the frequency of pain symptoms and with AS (Muris & Meesters, 2004). This earlier study did not examine the AS dimensions nor pain catastrophizing. The current analysis indicated that AS psychological, AS unsteady concerns and catastrophizing were all significantly associated with somatization; each construct accounted for roughly the same amount of variance (4%, 5% and 6% respectively) (see Table 3).

The current findings are consistent with recent data pointing to high levels of comorbidity across chronic pain, somatoform and anxiety disorders (Wang, Juang, Fuh, & Lu, 2007). The considerable overlap among these conditions is consistent with the view that there may be a common vulnerability to develop fears related to somatic and emotional symptoms and suggests that interventions targeting this common vulnerability may prove beneficial.

Caveats to the present findings should be mentioned. First, AS, catastrophizing and somatization were all assessed by questionnaires and thus, the results may be due to shared method variance. Second, the assessment of current pain problems was limited to a single interview question, although there is preliminary support for the validity of this item. Future work may include more established measures of current pain, pain-related disability and a variety of assessments for measuring these constructs. Finally, the current study was cross-sectional and correlational in nature and so no inferences regarding causality may be made. Additional longitudinal studies are needed to determine whether AS and catastrophizing constitute cognitive vulnerability factors that lead to the development of chronic pain in children.

As Drahovzal et al. (2006) point out, the clinical and conceptual utility of the constructs AS and catastrophizing depend on the extent to which they may be distinguishable from each other and from other related constructs (e.g. fear of pain) as well as their ability to predict pain-related outcomes. Although AS and catastrophizing appear to tap a general tendency to catastrophize aversive physical sensations, the present findings suggest that AS is more salient than catastrophizing in the experience of pain and somatization among non-clinical children. One clinical implication of this study to be tested in future research is the possibility that interventions focused on reducing AS in children may prevent the development of chronic pain. Additional work may examine whether interventions addressing both AS and catastrophization lead to lower levels of somatization. Understanding how the inter-related cognitive styles of AS and catastrophizing contribute to pain and somatization in children may inform the development of targeted intervention efforts directed at alleviating these distressing symptoms.

Note

This article is dedicated to the memory of Cynthia Delano Myers.

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