Pain Catastrophizing in Youths With Physical Disabilities and Chronic Pain

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Objective The current study examined the associations between catastrophizing and pain intensity, psychological adjustment, functional ability, and community participation in youths with physical disability and chronic pain. **Methods** Participants consisted of 80 youths, aged 8–20 years, with cerebral palsy ($n = 34$), neuromuscular disease ($n = 22$), or spina bifida ($n = 24$). Measures from a cross-sectional survey included demographic, pain, and disability information, the Pain Catastrophizing Scale, the Child Health Questionnaire, and the Functional Disability Inventory. **Results** Results suggested that catastrophizing was significantly associated with pain intensity and psychological adjustment; however, catastrophizing did not demonstrate significant associations with functional ability or community participation. **Conclusions** The study extends previous findings of significant associations between catastrophizing and both pain intensity and psychological adjustment to samples of youths with chronic pain and disabilities not previously examined. Further research that examines the causal association between catastrophizing and outcomes in youths with chronic pain and physical disability is warranted.

Key words catastrophizing; chronic pain; functional ability; pain interference; physical disabilities; psychological adjustment.

Pain catastrophizing can be defined as excessively negative thoughts related to pain, its impact, and one's ability to cope with pain (Sullivan et al., 2001). Recent research suggests that catastrophizing in children with chronic pain is associated with pain intensity (Crombez et al., 2003), psychological distress, and physical functioning (Kashikar-Zuck, Goldschneider, Powers, Vaught, & Hershey, 2001). When excessive attention is paid to pain, an individual may avoid activities that could potentially be painful, and therefore experience a decrease in functioning (Vlaeyen & Linton, 2000). However, none of this research has been conducted using samples of children with physical disabilities. Cerebral palsy (CP), spina bifida (SB), and neuromuscular disease (NMD) are distinct conditions; however, they all have, or have the potential for, musculoskeletal, neurological, and cognitive impairments. Furthermore, pain is a common experience among children with CP (Engel, Petrina, Dudgeon, & McKearnan, 2005; Parkinson, Gibson, Dickinson, & Colver, 2010; Tüzün, Guven, & Eker, 2010), SB (Wood, Watts, Hauser, Rouhani, & Frias, 2009), and NMD (Engel, Kartin, Carter, Jensen, & Jaffe, 2009). The experience of pain has also been found to be related to decreased quality of life in children with CP (Tüzün et al., 2010) and SB (Oddson, Clancy, & McGrath, 2006) and severity of physical impairment in children with CP (Parkinson et al., 2010). It is important to consider other variables that are related to functioning in this population. The purpose of

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this study is to determine whether the significant associations found between catastrophizing and adjustment in samples of youths without physical disabilities replicate in youths with physical disabilities.

Lazarus and Folkman's stress-coping model provides a theoretical framework for understanding how appraisal processes—of which catastrophizing can be a key component—impact coping and emotional responses (Lazarus & Folkman, 1984). In their model, a person's ongoing evaluations of his or her situation directly influence how one responds to that situation, and explains how different people can respond in many ways to the same situation. They distinguish between *primary appraisals* (the implications of the situation for one's well-being), and *secondary appraisals* (thoughts related to what can be done to address the situation). Catastrophizing cognitions are stress evaluations that have both primary (e.g., ''It is terrible and I feel it is never going to get any better.'') and secondary (e.g., ''I feel I can't go on.'') components. The fear-avoidance model of chronic pain states that individuals with these negative expectancies about pain and the consequences of pain are likely to avoid activities in anticipation of pain. Avoiding physical and social activities results in a significant increase in functional disability and deconditioning of one's body over time, which can lead to further painful experiences (Asmundson, 1999; Vlaeyen & Linton, 2000).

Children with chronic pain report higher levels of catastrophizing than children without chronic pain (Hermann, Hohmeister, Zohsel, Ebinger, & Flor, 2007). Moreover, catastrophizing has been found to be positively correlated with pain severity in a number of samples of youths with chronic pain. For example, Schanberg and colleagues found that youths with juvenile chronic arthritis who reported infrequent catastrophizing rated their pain significantly lower than did those who catastrophized frequently (Schanberg, Lefebvre, Keefe, Kredich, & Gil, 1997). Similarly, Thastum and colleagues and Walker and colleagues found that catastrophizing responses were associated with higher pain in a sample of youths with juvenile idiopathic arthritis and abdominal pain, respectively (Thastum, Herlin, & Zachariae, 2005; Walker, Smith, Garber, & Van Slyke, 1997). Catastrophizing predicts pain intensity in children with chronic pain above and beyond the effects of sex, age (Crombez et al., 2003), and negative affectivity (Vervoort, Goubert, Eccleston, Bijttebier, & Crombez, 2006). Furthermore, a longitudinal study found that catastrophizing predicts pain intensity 6 months later, controlling for initial pain intensity and level of disability (Vervoort, Eccleston, Goubert, Buysse, & Crombez, 2010).

In addition to pain intensity, Walker et al. (1997) also found that catastrophizing predicted depressive symptoms. Finally, Kashikar-Zuck et al., (2001) found that catastrophizing was related to both depression and functional impairment in youths with a variety of chronic pain conditions, although they did not find that catastrophizing cognitions predicted functional ability over and above the contribution of depression, as has previous research in adults with chronic pain (Keefe et al., 2000). Vervoort et al. (2006), however, found that catastrophizing did predict disability beyond sex, age, and negative affectivity in both community and clinical samples of children.

Despite some inconsistency regarding which domains are most useful in predicting future pain, the consistent findings that catastrophizing and important functioning domains are related in both pediatric and adult chronic pain samples (e.g., Severeijns, Vlaeyen, van den Hout, & Picavet, 2004; Sullivan, Stanish, Waite, Sullivan, & Tripp, 1998; Vervoort et al., 2006, 2010), as well as theory hypothesizing strong links between catastrophizing and important outcomes, suggest the possibility that catastrophizing may play a critical role in the extent to which pain impacts functioning in children with physical disabilities and chronic pain. We expected that, consistent with previous research in samples of youths with chronic pain as a primary presenting problem, pain intensity would be positively associated with pain catastrophizing, and psychological adjustment, functional ability, and community participation would be negatively associated with pain catastrophizing regardless of age, sex, and disability type.

The aim of the current study was to determine the associations between catastrophizing and pain intensity, psychological adjustment, and functional ability in youths with physical disabilities and chronic pain. The sample comprised youths with CP, NMD, and SB who reported persistent bothersome pain. The primary difference between the current study and previously published studies is the focus on catastrophizing and pain in youths with physical disabilities. We expected that, consistent with previous research in samples of youths with chronic pain as a primary presenting problem, pain intensity would be positively associated with pain catastrophizing, and psychological adjustment, functional ability, and community participation would be negatively associated with pain catastrophizing regardless of age, sex, and disability type.

Method

The data used in the current study came from larger studies of the nature and scope of pain in youths with

physical disabilities (Engel et al., 2009). Data were collected from 2002 to 2005. The current analyses focus on a subset of data obtained for these studies during interviewer-administered youth interviews and from parent/guardian-completed questionnaires. This data subset includes youth-reported catastrophizing, pain intensity, psychological adjustment, functional ability, and community participation, as well as parent/guardian-reported demographic information.

Participants

Participants were a convenience sample of youths with disabilities (CP, $n = 34$; NMD, $n = 22$; SB, $n = 24$), from the Seattle metropolitan area, and their parents/guardians. Inclusion criteria were (1) primary diagnosis of CP, NMD, or SB; (2) chronological age between 8 and 20 years; (3) pain of a minimum 3 months' duration; (4) capacity for expressive communication, with or without the use of augmentative communication devices; (5) no more than mild cognitive impairment, as determined by a brief telephone screening with the parent/guardian and a passing score on modified version of the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975), administered either in person or over the telephone; and (6) use of English as the primary language. As the current study is one of the first known studies in this area, a wide age range was used to examine associations in the broader population. Age differences will be explored by examining age as a covariate in subsequent analyses. The MMSE has been validated for use via telephone with adults (Roccaforte, Burke, Bayer, & Wengel, 1992), has been modified for use in a pediatric outpatient setting (Ouvrier, Goldsmith, Ouvrier, & Williams, 1993), and has been used successfully with children as young as 4 years (Ouvrier et al., 1993). The present study used a version of the MMSE modified to include eight youth-appropriate items, with a total possible score of 25 points if administered in person, or 22 points if administered over the telephone (because of the omission of certain items requiring in-person interaction). To preserve the approximate percentage of the cutoff score of 24 of 30 recommended by Folstein et al. (1975) for the adult version of the MMSE, minimum passing scores of 17 of 25 (in-person) or 15of 22 (over the telephone) were established as cutoff scores in the present study. In addition, parents were asked to validate whether their child could answer study questions. The ability to give meaning to nociception, pain, and suffering is related to one's cognitive development. Therefore, despite the occurrence of chronic pain in those persons with moderate-to-severe cognitive impairment, they were excluded from the study because of the difficulties of measuring pain and pain catastrophizing in youths who are not highly verbal or able to use self-report measures. See Table I for further demographic information.

Table I. *Demographic Characteristics*

Demographic Characteristics	*n* (%)	*M (SD)*	Range
Age	80	14.35 (3.04)	8–20
Sex			
Male	46 (58)		
Female	34 (43)		
Ethnicity			
Caucasian	59 (77)		
Asian	8 (10)		
African American	2 (3)		
Hispanic	2 (3)		
American Indian	3 (4)		
Other	3 (4)		
Family income[a]			
<$10,000	2 (4)		
$10,000–$20,000	4 (7)		
$20,000–$30,000	4 (7)		
$30,000–$40,000	8 (14)		
$40,000–$50,000	9 (16)		
$50,000–$60,000	5 (9)		
$60,000–$70,000	3 (5)		
Over $70,000	21 (38)		
Cerebral palsy[b]	34 (43)		
Diplegia	24 (71)		
Hemiplegia	3 (9)		
Quadriplegia	7 (21)		
Neuromuscular disease diagnosis[c]	22 (28)		
Duchenne muscular dystrophy	8 (40)		
Myotonic muscular dystrophy	4 (20)		
Spinal muscular atrophy	3 (15)		
Charcot-Marie-Tooth disease	2 (10)		
Congenital muscular dystrophy	1 (5)		
Limb-girdle muscular dystrophy	1 (5)		
Other	1 (5)		
Spina bifida diagnosis	24 (30)		
Myelomeningocele	21 (88)		
Meningocele	1 (4)		
Other	2 (8)		
Hydrocephalus	16 (67)		

[a]Total $n \neq 80$ because of missing data.
[b]Percentages $\neq 100$ because of rounding.
[c]Total $n \neq 22$ because of missing data.

Measures

Youths and parents/guardians both completed questionnaires. Youth questionnaires were interviewer administered, and included measures that assessed catastrophizing, pain intensity, psychological adjustment, functional ability, and community participation. Demographic

information was obtained through parent/guardian questionnaires.

Demographic Data

Descriptive data included the youth's disability diagnosis, age, sex, ethnicity, and the total family income.

Catastrophizing

Youth participants reported on their use of catastrophizing using a modified version of the Pain Catastrophizing Scale, which was originally developed for use in adult patients (Sullivan, Bishop, & Pivik, 1995). The Pain Catastrophizing Scale (PCS), child version (PCS-C) used in the current study, includes 12 items that assess how often respondents have certain thoughts or feelings when they have experienced pain using a 3-point Likert scale ranging from 0 (*no, not at all*) to 2 (*yes, I think this all the time*). The PCS-C consists of helplessness, magnification, and rumination subscales, and is scored by averaging individual items into subscores ranging from 0 to 2. Current analyses, which focused on catastrophizing as a whole, used a mean PCS-C score. Lower scores on the three subscales indicate less catastrophizing. The Cronbach's α for the current sample was .80, indicating that the scale has good internal consistency, and supporting its internal reliability. In 2003, Crombez et al. published a preliminary validation of a version of the PCS modified for use with children. However, data collection for the current study began before the availability of Crombez et al.'s (2003) pediatric PCS. The modified version of the PCS used in the current study is similar to that developed by Crombez et al. (2003). It consists of items from the PCS rephrased for more appropriate use with a younger population, with one item from the adult PCS, ''I anxiously want the pain to go away,'' eliminated, as the authors determined that this item reflects an emotional response (anxiety) as opposed to a cognition. See Table II for a list of PCS-C items used in the current study.

Table II. *Items in the Pain Catastrophizing Scale, Child Version (PCS-C)*

Item
1. I worry about if the pain will stop.
2. I feel I can't go on.
3. It's terrible and I think it's never going to get any better.
4. It's awful.
5. I feel I can't stand it anymore.
6. I become afraid that the pain might get worse.
7. I think of other times I've had pain.
8. I can't keep the pain out of my mind.
9. I keep thinking about how much it hurts.
10. I keep thinking about how much I want the pain to stop.
11. There is nothing I can do to make the pain better.
12. I wonder if something bad might happen.

Pain Intensity

Youth participants reported their average pain intensity for the past week using an 11-point numeric rating scale (NRS) ranging from 0 (*no pain*) to 10 (*pain as bad as could be*). The NRS has been determined to be appropriate for use with children as young as 5 years (McGrath & Gillespie, 2001).

Psychological Adjustment

Youth participants reported on their psychological adjustment using the Mental Health (MH) scale of the child form of the Child Health Questionnaire (CHQ-CF87; Landgraf, Abetz, & Ware, 1996). The CHQ-CF87 includes 87 self-report items designed to assess youths' physical and psychosocial well-being. The 16-item MH scale, one of 12 scales that comprise the questionnaire, is designed to capture anxiety, depression, and positive affect by measuring the frequency of positive and negative states. Participants rate how often they experienced different moods and feelings over the course of the past 4 weeks on a 5-point Likert scale ranging from 1 (*all of the time*) to 5 (*none of the time*). The CHQ-CF87 MH is scored using the method outlined by Landgraf et al., by first computing a raw score for each participant and then transforming raw scores to standardized scores ranging from 0 to 100. Lower scores on the CHQ-CF87 MH indicate that the child feels anxious and depressed more of the time; higher scores indicate that he or she feels peaceful, happy, and calm more of the time. Scores on this subscale are negatively correlated with the number of chronic conditions that a child has, including depression and anxiety (Raat, Mangunkusumo, Landgraf, Kloek, & Brug, 2007). CHQ-CF87 MH items left blank in the current study were prorated by calculating means based on answered items. The CHQ-CF87 MH has demonstrated adequate internal consistency in youths with both psychological and physical diagnoses (e.g., attention deficit hyperactivity disorder, asthma, JRA, and epilepsy; Cronbach's $\alpha = .82–.86$; Landgraf et al., 1996). The Cronbach's α for the current sample was .87. The scale has demonstrated validity for measuring youths' psychosocial well-being (Landgraf et al., 1996).

Functional Ability

Youth participants reported on their functional ability (i.e., whether he or she can do something) using the Functional Disability Inventory (FDI; Walker & Greene, 1991). The FDI includes 15 items designed to assess the impact of

illness, pain, or disability on youths' physical and psychosocial functioning in everyday social roles. Participants rate the amount of difficulty they have had in the past few days when doing typical physical and social activities on a 5-point Likert scale ranging from 0 (*no trouble*) to 4 (*impossible*). The FDI is scored as a total sum of items, with scores ranging from 0 to 60. Lower scores on the FDI indicate a higher level of functional ability. Of the 80 participants, 22 (27.5%) left at least 1 of the 15 FDI items blank: 5 (6.3%) answered 10 items, 4 (5%) answered 11 items, 4 (5%) answered 13 items, and 9 (11.3%) answered 14 items. These blank items were subsequently prorated, that is, substituted with the mean of the answered items, to derive the FDI scale score. The FDI has demonstrated good internal consistency in youths with minor health complaints (e.g., dysmenorrhea, gastrointestinal upset, upper respiratory infections) and pediatric abdominal pain (Cronbach's $\alpha = .85–.92$; Walker & Greene, 1991), and has been used in studies of recurrent headache, juvenile idiopathic arthritis, and sickle cell disease (Logan & Scharff, 2005; Peterson & Palermo, 2004). The Cronbach's α for the current sample was .84. The scale has demonstrated validity as a measure of illness, pain, or disability through its significant correlation with scores on other measures of physical and emotional health (Walker & Greene, 1991).

Although the FDI is a valid and reliable measure of the impact of illness, pain, or disability, it focuses solely on the physical interference experienced by youths while they perform activities. Youths with physical disabilities may be restricted in participation by more than physical limitations. For example, they may feel social anxiety about taking part in athletics with peers or be discouraged from pursuing extracurricular activities because of difficulties with transportation. These are important additional issues to consider when evaluating the participation of youths with physical disabilities.

Community Participation

Youth participants reported on their community participation (i.e., activity performance with others) using the Pediatric Community Participation Questionnaire (PCPQ; Washington, Wilson, Engel, & Jensen, 2007). The PCPQ includes 18 items designed to assess participation in routine activities of daily living and play or leisure. Participants rate the degree of difficulty performing each activity on a 6-point Likert scale ranging from 1 (*no problem*) to 6 (*can't do*). The PCPQ is scored as a total sum of items, with scores ranging from 19 to 108. Lower scores on the PCPQ indicate more community participation. The vast majority (78, 97.5%) left at least 1 of the 19 PCPQ items blank. Most participants answered 16 or 17 items (33.8% each). PCPQ items left blank in the current study were prorated by calculating means based on answered items. The PCPQ has demonstrated excellent internal consistency in youths with CP, limb deficiency, NMD, and SB (Cronbach's $\alpha = .92$; Washington et al., 2007). The Cronbach's α for the current sample was .92. The scale has demonstrated convergent validity through its significant correlation with a measure of functional ability and discriminant validity through its ability to distinguish between ambulatory and nonambulatory participants (Washington et al., 2007).

Procedures

Participants were recruited using multiple recruitment strategies, including mailings from clinics at the local regional children's hospital, public postings, word of mouth, and a local summer camp for youths with muscular dystrophy. The study was approved by the Institutional Review Board at Seattle Children's Hospital & Regional Medical Center; all participants and participating parents/guardians gave written informed assent/consent. Youth participants completed one-time interviewer-administered questionnaires in the participant's home, at the medical center, at a local summer camp, or over the telephone. Parents/guardians completed questionnaires during the youth interview or by mail. Whenever possible, youths were interviewed in private settings to minimize potential response interference and to ensure privacy.

Data Analysis

Pearson correlation coefficients were computed between numeric study variables (age, pain intensity, psychological adjustment, functional ability, community participation, and catastrophizing) to determine the strengths of the first-order associations between these variables (i.e., when associations were not controlled for other variables). In addition, differences in pain intensity, psychological adjustment, functional ability, community participation, disability diagnosis, and catastrophizing were assessed using *t*-tests for sex and ethnicity (coded as Caucasian/non-Caucasian) or using a one-way analysis of variance for disability diagnosis.

To assess the association between the various scales and catastrophizing while controlling for possible confounding due to sex, age, and disability diagnosis, we performed linear regression analyses. The regression models were not interpreted as prediction models because the data were collected in a cross-sectional survey, but they are useful to show whether associations between catastrophizing and the other measures are still present after

we account for sex, age, and disability diagnosis. The criterion measure for the first model was the 11-point NRS scale (pain intensity), and the explanatory variables were sex, age, disability diagnosis, and the catastrophizing measure. For the next three models, the criterion measures for these analyses were the CHQ-CF87 MH scale (psychological adjustment), the FDI (functional ability), and the PCPQ (community participation), with the same explanatory variables. However, because it is possible that pain could impact both catastrophizing cognitions and these criterion measures, pain intensity was also entered as an explanatory variable in the last three regression models. Thus, demographic variables were entered in the first step and disability diagnosis was entered in the second step in all four models. Pain intensity was entered in the third step of the models explaining psychological adjustment, functional ability, and community participation; catastrophizing was entered in the final step in all four models. We used a significance level of .05, and because this study has an exploratory nature and the results will be interpreted as preliminary, we did not adjust the significance level for multiple comparisons. Statistically significant results should be confirmed in future studies.

Table III. *Descriptive Statistics for Each Measure*

Measure	*n*	Mean	*SD*	Median	Range	Cronbach's α
NRS	80	3.21	2.50	3.00	0–10	N/A
PCS-C	80	0.68	0.35	0.75	0.00–1.58	.80
CHQ-CF87 MH	80	73.65	14.73	75.00	25.00–96.88	.87
FDI	80	12.40	9.43	10.50	0.00–34.00	.84
PCPQ	80	31.98	13.63	28.22	19.00–76.00	.92

Note. NRS = numeric rating scale, average pain intensity for the past week; PCS-C = Pain Catastrophizing Scale, child version; CHQ-CF87 MH = Mental Health scale of the Child Health Questionnaire, child version; FDI = Functional Disability Inventory; PCPQ = Pediatric Community Participation Questionnaire.

Table IV. *Pearson Correlation Matrix Between Demographic, Criterion, and Explanatory Variables*

Measure	Age	NRS	PCS-C	CHQ-CF87 MH	FDI
NRS	0.14				
PCS-C	0.05	−.25*			
CHQ-CF87 MH	−.18	−.47**	−.39**		
FDI	0.14	0.37**	0.19	−.29*	
PCPQ	0.19	0.13	0.20	−.11	0.65**

Note. NRS = numeric rating scale, average pain intensity for the past week; PCS-C = Pain Catastrophizing Scale, child version; CHQ-CF87 MH = Mental Health scale of the Child Health Questionnaire, child version; FDI = Functional Disability Inventory; PCPQ = Pediatric Community Participation Questionnaire. *$p < .05$, **$p < .01$.

Results

Descriptive statistics for each of the measures used in the current study are listed in Table III. Correlation coefficients between age, criterion (pain intensity, psychological adjustment, functional ability, and community participation), and predictor variables (pain intensity, disability diagnosis, and catastrophizing) are presented in Table IV. Pain intensity was significantly associated with catastrophizing, psychological adjustment, and functional ability; catastrophizing was also significantly associated with psychological adjustment; and functional ability was significantly associated with psychological adjustment and community participation. As age was not significantly correlated with any of the criterion or explanatory variables, it was not included in the subsequent regression analyses. *T*-tests and an analysis of variance testing for any significant differences on criterion variables as a function of sex, ethnicity, or disability diagnosis revealed two statistically significant effects. Girls ($M = 69.26$) scored significantly lower than boys ($M = 76.88$) on the CHQ-CF87 MH, indicating poorer psychological adjustment ($t = 2.26$ [$df = 59.7$ using correction], $p = .03$). Participants with NMD ($M = 37.53$) scored significantly higher than those with CP ($M = 31.64$) or SB ($M = 27.40$) on the PCPQ, indicating less community participation, $F\ (2,80) = 3.38$, $p = .04$.

The regression analysis of pain intensity showed that catastrophizing accounted for 5% of the variance of pain intensity after adjusting for the effects of demographic variables and disability diagnosis (see Table V), and it was the only statistically significant factor. The regression analysis of psychological adjustment indicated that pain intensity and catastrophizing were the only two factors statistically significant, with catastrophizing adding 6% to the explained variance of psychological adjustment after accounting for the other variables. The regression analysis for functional ability had only pain intensity as a statistically significant factor. For community participation, disability diagnosis was statistically significant, whereas catastrophizing was marginally significant ($p = .056$). Children with NMD were more likely to have less participation (higher PCPQ) when compared with children with SB. Children with CP were not statistically different from SB, though the coefficient indicated also a higher PCPQ.

Discussion

The current study tested four hypothesized associations concerning the relationships between catastrophizing and

Table V. *Multiple Regression Analyses Examining the Association of Catastrophizing After Adjusting for Sex, Disability Type, and Pain Intensity*

Step and variables	R^2	ΔR^2	ΔF	Final Standardized β	*p* Value[a]
Pain intensity (NRS)					
Sex (Ref: Female)	.03	.03	2.65	−.16	.16
Disability type (Ref: SB)	.05	.02	.87		
CP				−.01	.97
NMD				−.13	.31
Catastrophizing (PCS-C)	.10	.05	4.03*	.23	.05
Psychological adjustment (CHQ-CF87 MH)					
Sex (Ref: Female)	.07	.07	5.53*	.15	.13
Disability type (Ref: SB)	.09	.03	1.13		
CP				.10	.37
NMD				−.03	.61
Pain Intensity	.29	.19	2.24**	−.39	<.001
Catastrophizing (PCS-C)	.35	.06	7.03**	−.26	.01
Functional ability (FDI)					
Sex (Ref: Female)	.00	.00	.01	.10	.36
Disability type (Ref: SB)	.00	.00	.11		
CP				.04	.77
NMD				.13	.32
Pain intensity	.16	.15	13.58**	.38	.001
Catastrophizing (PCS-C)	.17	.01	1.16	.12	.28
Community participation (PCPQ)					
Sex (Ref: Female)	.00	.00	.04	.04	.71
Disability type (Ref: SB)	.08	.08	3.33*		
CP				.21	.10
NMD				.39	.003
Pain intensity	.11	.03	2.72	.13	.23
Catastrophizing (PCS-C)	.16	.04	3.76***	.22	.06

Note. NRS = numeric rating scale, average pain intensity for the past week; PCS-C = Pain Catastrophizing Scale, child version; CHQ-CF87 MH = Mental Health scale of the Child Health Questionnaire, child version; FDI = Functional Disability Inventory; PCPQ = Pediatric Community Participation Questionnaire; CP = cerebral palsy; NMD = neuromuscular disease; SB = spina bifida.

[a]The *p* value for unstandardized β coefficients on the final model.

***$p < .10$, *$p < .05$, **$p < .01$.

pain intensity, psychological adjustment, functional ability, and community participation in a sample of youths with physical disabilities and chronic pain. Consistent with two of our hypotheses, pain-related catastrophizing cognitions contributed significantly in the model for pain intensity and psychological adjustment, after controlling for sex, disability diagnosis, and, in the model for psychological adjustment, controlling for pain intensity. Contrary to our predictions, however, catastrophizing did not demonstrate statistically significant associations with functional ability or community participation at the .05 significance level, although there was a trend in the model for community participation ($p = .056$). These findings have important implications for understanding the possible role that catastrophizing may play in adjustment to disability-related chronic pain in youths.

The finding that pain catastrophizing was associated with pain intensity is consistent with previous research concerning this relationship among youths with chronic pain (Crombez et al., 2003; Schanberg et al., 1997; Thastum et al., 2005; Vervoort et al., 2006, 2010; Walker et al., 1997). Because this is a correlational study, causal conclusions between these variables cannot yet be drawn. However, this consistent relationship indicates that research studying the possible causal effect of catastrophizing on pain is warranted. One possible study design that might shed some light on this relationship is to apply an intervention that targets catastrophizing (e.g., cognitive-behavioral therapy). A multiple-baseline across-subjects design study could assess the change in catastrophizing due to the intervention in the middle of the study period and the change in pain level at the end of the study period. To the extent that changes in catastrophizing are followed by changes in pain, this would support a causal impact of catastrophizing on pain.

Although we found a statistically significant correlation between catastrophizing and psychological adjustment through Pearson correlation and after adjusting for sex, disability diagnosis, and pain through the regression analysis, the direction of the cause–effect, if any, is still unclear. Future research is needed that would focus, in particular, on whether systematic changes in psychological adjustment (e.g., via effective antidepressant medications) might impact catastrophizing, or whether changes in catastrophizing (e.g., providing an effective cognitive-behavioral intervention) impacts psychological functioning. Given the importance of psychological adjustment for overall quality of life, if such research determines that an intervention focused on addressing catastrophizing cognitions effectively improves a youth's sense of well-being, it may be particularly important to determine the extent to which youths can be taught to reduce these cognitions and whether this impacts overall quality of life. Providing such cognitive restructuring skills early in life could potentially have important life-long benefits for those youths who can learn these skills.

The finding that catastrophizing was not significantly associated with functional ability in this sample was inconsistent with our initial hypothesis and also with some previous research findings in youths without physical disabilities. In a sample of youths with a variety of chronic pain conditions, for example, Kashikar-Zuck et al. (2001) found a significant association between catastrophizing and functional ability. Other studies have found that catastrophizing is related to functioning when controlling for negative affect (Vervoort et al., 2006), and initial pain intensity and functional ability (Vervoort et al., 2010). This lack of association may be due, at least in part, to the restricted range of physical functioning in our sample. For example, all the participants in the current study required mild-to-moderate assistance to complete their daily routines. This restricted range of physical functioning could attenuate the strength of the associations found. It is possible that in youths with physical disabilities and chronic pain, factors other than catastrophizing (e.g., their physical restrictions, amount of assistance from others) may play a larger role in physical functioning than catastrophizing does. If this finding replicates in other samples of youths with physical disabilities and chronic pain, these results would suggest that treatments designed to impact catastrophizing cognitions alone would probably have, at best, only a minimal impact on physical functioning in youths with disabilities. If improvement in functional ability is the primary goal, treatments other than those that solely impact catastrophizing may be indicated. Such treatments may include behavioral coping (e.g., pacing) or quota-based reactivation (Engel & Kartin, 2004).

Contrary to our hypothesis, for community participation, neither pain intensity nor catastrophizing was statistically significant, although the latter was close to significance. The lack of a significant association between catastrophizing and community participation might mean that catastrophizing cognitions may have little impact on community participation in youths with physical disabilities and chronic pain. As there was a trend toward statistical significance, however, additional research is needed to determine whether this finding replicates in other samples with larger sample sizes. Level of functional disability was significantly correlated with level of community participation. Aside from disability diagnosis, level of functional disability should be examined to determine its relation to community participation. If catastrophizing does not impact community participation, treatments that impact catastrophizing would likely have little effect on the degree to which patients are integrated into community activities. As such, if an increase in community participation is a treatment goal, then treatments designed specifically for this purpose (e.g., systematic reinforcement and praise for advances made toward identified community integration) would likely be needed.

Although the current study has a number of strengths, including the use of a measure specifically designed to assess for catastrophizing cognitions in youths, certain limitations should be highlighted. Of primary importance, and as previously discussed, the study used a cross-sectional design and a correlational analysis. Therefore, no causal conclusions can be drawn from the current results concerning the associations between catastrophizing cognitions, pain intensity, and psychological functioning.

A second study limitation is the use of youth self-report measures to assess the predictor and criterion variables; it is possible that some of the significant associations found may have been due to an overlap related to source bias. Although self-report measures are necessary for some of the variables studied (e.g., pain intensity, psychological functioning), future research should use concurrent and independent third-party reports of study variables, as well as observational measures of functional ability and community participation, when possible. A third limitation is that the data used in this study were collected 7 to 9 years ago, and we used an older version of the PCS. Although we do not see a clear reason that the findings would not replicate in a contemporary sample of youths using a contemporary version of the PCS, replication of the findings would be needed to test this assumption.

Despite the study's limitations, the findings make important contributions to our understanding of the associations between catastrophizing and important functioning variables in youths with disability-related chronic pain. Most importantly, the finding that catastrophizing significantly explains pain intensity and psychological adjustment replicates previous research, while extending research to include youths with diagnoses not yet examined in the research base. Important next steps are to (1) determine the extent to which changes in catastrophizing effectively alter pain and psychological adjustment, especially, perhaps, in those youths who suffer from severe pain or acute depressive symptoms; and (2) identify the psychosocial factors most closely associated with functional ability and community participation in youths with physical disability and chronic pain, to develop interventions intended to target these factors. Ultimately, such research may provide these youths with an opportunity for maximizing quality of life, despite the presence of disability and pain.

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