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CHILD'S AND PARENTS' CATASTROPHIZING ABOUT PAIN IS ASSOCIATED WITH
PROCEDURAL FEAR IN CHILDREN: A STUDY IN CHILDREN WITH DIABETES
AND THEIR PARENTS^{1,2}

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Summary . The present study investigated the contribution of the child's and parents' catastrophizing about pain in explaining procedural pain and fear in children. Procedural fear and pain was investigated in 44 children with type I diabetes undergoing a finger prick. The relationship between parents' catastrophizing and parents' own fear and estimates of their child's pain was also investigated. The children and their mothers completed questionnaires prior to a routine consultation with the diabetes physician. Children completed a situation specific measure of pain catastrophizing scale (PCS-C) and provided ratings of their experienced pain and fear on a 0-10 numerical rating scales (NRS). Parents completed a situation specific measure of the pain catastrophizing scale for parents (PCS-P) and provided estimates of their child's pain and their own experienced fear on a 0-10 NRS. Analyses indicated that higher levels of child catastrophizing were associated with more fear and pain during the finger prick. Scores for parents' catastrophizing about their child's pain were positively related to parents' scores for their own fear, estimates of their child's pain and child-reported fear, but not the amount of pain reported by the child. The findings attest to the importance of assessing for and targeting child and parents' catastrophizing about pain. Addressing catastrophizing and related fears and concerns of both parent and children may be necessary to assure appropriate self-management. Further investigation of the mechanisms relating catastrophizing to deleterious outcomes is warranted.

Pain catastrophizing, characterized by a tendency to focus on and exaggerate the threat value of painful stimuli is important in understanding an individual's pain experience (Sullivan *et al.*, 2001). Considerable research in adults, both in acute and chronic pain samples, revealed that catastrophizing about pain is related to deleterious outcomes such as intensified pain and disability (Sullivan, Bishop & Pivik, 1995; Sullivan *et al.*, 2001). From a cognitive-affective perspective upon pain, attentional processes might be invoked to explain how catastrophizing exerts its negative influence upon pain and disability outcomes (Eccleston & Crombez, 1999; Sullivan *et al.*, 2001). Specifically, increased attention to pain may function to amplify pain sensations and interfere with daily functioning. Recent evidence has also pointed at the importance of investigating pain catastrophizing in children (Crombez *et al.*, 2003; Vervoort, Goubert, & Crombez, 2009; Vervoort, Goubert, Eccleston, Bijttebier, & Crombez, 2006). As in adults (Sullivan *et al.*, 2001), pain catastrophizing in children has been found to play a significant role in understanding deleterious pain outcomes such as heightened disability, pain and distress, both in schoolchildren and clinical paediatric chronic pain samples (Crombez *et al.*, 2003; Vervoort *et al.*, 2006; Vervoort, Eccleston, Goubert, Buysse, & Crombez, 2010). Child pain catastrophizing may also be important in understanding responses to acute painful medical procedures. Previous evidence has documented the role of cognitive and affective variables in understanding painful medical procedures (e.g. Cohen *et al.*, 2001; Liossi, White, Franck, & Hatira, *et al.*, 2007; McCarthy *et al.*, 2010). To the best of our knowledge, however, no study has investigated the unique role of child pain catastrophizing in the context of medical procedures. Guided by previous evidence on the role of child pain catastrophizing in both school children and clinical paediatric chronic pain samples (Crombez *et al.*, 2003; Vervoort *et al.*, 2006; Vervoort *et al.*, 2010), it is likely that pain catastrophizing may, within the context of medical procedures, also be associated with deleterious outcomes such as increased pain or fear. This is particularly important for children

who repeatedly undergo painful procedures for diagnostic purposes or treatment. High levels of pain catastrophizing may then instigate a vicious cycle of increased pain and fear that may interfere with or hinder future and necessary painful procedures (Sullivan & Neish, 1998; Vlaeyen *et al.*, 2004) .

Also, the extent to which parents catastrophize about their child's pain may be relevant in understanding deleterious outcomes. In fact, catastrophizing about their child's pain likely is both aversive to the parents as well as having a negative impact upon the child. Preliminary evidence in a sample of parents of school children suggests that facing child's pain becomes particularly attentionally demanding for high catastrophizing parents (Vervoort *et al.*, in press a). Furthermore, evidence in parents of school children has also shown that parents with high levels of catastrophizing are more likely to infer higher levels of pain in their child (Goubert, Vervoort, Cano, & Crombez, 2009), and more likely to be distressed or fearful about their child's pain (Caes, Vervoort, Eccleston, & Goubert, 2011; Goubert, Vervoort, Sullivan, Verhoeven, & Crombez, 2008). Accordingly, it is reasonable to assume that parents' catastrophizing about their child's pain, by means of associated behavioural parental responses, might also promote fear and pain in their child (Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006). To date, evidence on the impact of parents' catastrophizing upon the child's response to pain is limited. In addition, no studies are available on the role of parents' catastrophizing for their child's response to pain during medical procedures.

The present study investigated the role of the child's pain catastrophizing and parents' catastrophizing about their child's pain in a sample of children with type 1 diabetes and their parents. This sample was chosen as it allows an initial look at the potential importance of child and parent catastrophizing within the context of daily medical procedures. Specifically, for children with diabetes who require insulin, frequent monitoring of blood

glucose level by means of a finger prick is a daily component of self-management. Despite innovative technologies resulting in less pain during finger prick (Bui, Perlman, & Daneman, 2005, Hanas, 2004), evidence suggests that the experience of pain may remain a clinical issue for a small but significant number of children, and constitute a vulnerability factor to fear responses (Hanas, 2004; Hanas & Ludvigsson, 1997), which may hamper the child's self-management (Mollema, Snoek, Pouwer, Heine, & Van der Ploeg, 2000; Mollema, Snoek, Adèr, Heine, & Van der Ploeg, 2001; Zambanini, Newson, Maisey, & Feher, 1999).

The hypotheses tested by the present study are: (1) pain catastrophizing in the child with type 1 diabetes is significantly associated with heightened child-reported fear and pain during the finger prick (2) parents' catastrophizing about their child's finger prick pain is significantly associated with heightened parents' estimates of their child's finger prick pain, heightened parent-reported fear and with heightened child-reported finger prick fear and pain.

Method

Participants

Children with type 1 diabetes and their parents were recruited from a paediatric department at the University Hospital of Ghent. Inclusion criteria for this study included (1) the parents and the children were Dutch-speaking, (2) children were between the age of 8 and 15 years, (3) had a diagnosis of type 1 diabetes and (4) were not suffering from any other physical or pervasive developmental disorder. We did not select younger children since measures used within the present study have not been validated within younger age groups. A total of 74 pairs of children between the age of 8 and 15 years and both of their parents were approached and invited to participate in this study. Of these, 18 did not wish to take part, mainly because of lack of time, and 7 did not take part due to changes in their appointment with their diabetes physician. The final study sample that participated in this study consisted

of 49 children, 44 mothers and 16 fathers. Given the small number of fathers that participated in the present study only data from mother and child dyads ($n = 44$; 26 girls, 18 boys; response rate 59.5%) were included in further analyses. All 44 children indicated administering the finger prick themselves and 77.30% of them used a classic finger pricker. Demographics of the final study sample are presented in Table 1.

- Insert Table 1 about here -

Finger prick

Glucose testing (i.e. finger prick) was performed by means of the Glucojet Dual® finger pricker (A. Menarini Diagnostics). This apparatus has adjustable depth and force settings and requires a tiny blood sample. Furthermore, and unlike a classic finger pricker, it is characterized by a comfort zone technology consisting of microdots that gently stimulate nerve endings that mask the sensation of the lancet.

Measures

Child measures

Child pain catastrophizing.— To measure the child's catastrophizing thoughts about pain during the finger prick, a situation-specific measure was developed based upon the original Pain Catastrophizing Scale for Children (PCS-C; Crombez *et al.*, 2003). Development of a situation-specific measure of catastrophizing, i.e. catastrophizing assessed with regard to a particular stimulus, is consistent with previous studies (Vervoort *et al.*, 2009; Goubert *et al.*, 2009). Recent evidence also suggests the importance of measuring catastrophizing related to specific, definable events since dispositional PCS-C scores (child catastrophizing about pain 'in general') may relate only minimally to very specific pain experiences (i.e. pain related to finger prick) (Campbell *et al.*, 2010). The original PCS-C consists of 13 items describing different thoughts and feelings that children may experience when they are in pain and yields three subscale scores for rumination, magnification and

helplessness. It has shown to be a reliable and valid instrument in children from 9 to 15 years (Crombez *et al.*, 2003). The situation-specific measure that was developed for the present study consisted of one adapted item for each subscale (PCS-C-state; Rumination: “At this moment, to what extent do you keep thinking about how much pain you might experience during the finger prick?”; Magnification: “At this moment, to what extent do you keep thinking about other painful experiences?”; Helplessness: “At this moment, to what extent do you think there is nothing you can do to stop the pain you might have during the finger prick?”). By including one item of each of the three subscales, the situation specific measure of catastrophizing captured the multidimensionality of catastrophizing about pain. The 3 items of the situation-specific PCS-C were rated on an 11-point numerical rating scale (0 :not at all; 10: very much), and were completed before the finger prick. The total score on catastrophizing (summation of the three items) could range from 0 to 30 and was used as an index of the child’s catastrophizing thoughts about anticipated pain during the finger prick. Cronbach’s alpha of the child measure on pain catastrophizing was only moderate ($\alpha = .52$).

Child-reported fear and pain.— The child’s experienced fear and pain during the finger-prick was assessed using an 11-point 1-item scale with the endpoints 0: not anxious/scared and 10: very anxious/scared, and 0: no pain and 10: a lot of pain. Immediately after the finger-prick, children were prompted to provide written ratings of their experienced fear (‘how anxious and/or scared were you during the finger prick?’), respectively pain (‘how much pain did you have during the finger prick?’).

Parent measures

Parents’ pain catastrophizing.—To measure parents’ catastrophizing thoughts about their child’s pain related to the finger prick, a situation-specific measure of the Pain Catastrophizing Scale for Parents (PCS-P; Goubert *et al.*, 2006) was developed. Use of such a situation-specific measurement of catastrophizing is consistent with previous studies

(Vervoort *et al.*, 2009; Goubert *et al.*, 2009) and also recommended (Campbell *et al.*, 2010). The PCS-P is an adaptation of the adult Pain Catastrophizing Scale (PCS; Sullivan, Bishop & Pivik, 1995) and the Pain Catastrophizing Scale for Children (PCS-C; Crombez *et al.*, 2003), both consisting of 13 items divided in three subscales (see above). The PCS-P has been shown to be reliable and valid (Goubert *et al.*, 2006). Similar to the child measure of catastrophizing, the PCS-P-state consisted of one item for each subscale (PCS-P-state; Rumination: “At this moment, to what extent do you keep thinking about how much pain your child might experience during the finger prick?”; Magnification: “At this moment, to what extent do you keep thinking about other painful experiences of your child?”; Helplessness: “At this moment, to what extent do you think there is nothing you can do to stop the pain your child might have during the finger prick?”). The items of the PCS-P state were rated on an 11-point numerical rating scale (0 : ‘not at all; 10: very much), and were completed before the parents observed their child undergoing the finger prick. Similar to the child measure of catastrophizing, the total score on parents’ catastrophizing (summation of the three items) could range from 0 to 30 and was used as an index of the parent’s level of catastrophizing thoughts about anticipated pain of their child during the finger prick. Cronbach’s alpha within the present study was .85.

Parent-reported fear .—Similar to the child measure of fear, parents’ experienced fear during the finger-prick of their child was assessed using an 11-point 1-item scale with the endpoints 0: not anxious/nervous and 10: very anxious/nervous. Immediately after the finger-prick was administered to the child, parents were prompted to provide written ratings of their experienced fear (‘how anxious and/or nervous were you during the finger prick of your child?’).

Parents’ estimates of their child’s pain .—To measure parents’ estimates of the child’s pain, parents were provided with a rating form after the child underwent the finger prick.

Parents' ratings of experienced pain intensity of the child were assessed using an 11-point scale with the endpoints 0: no pain and 10: a lot of pain. Parents were instructed to provide a written rating of how much pain their child had experienced during the finger prick.

Procedure

All children with diabetes (between 8 and 15 years) and their parents who were previously seen at the paediatric department of the University Hospital Ghent received a letter that explained the purpose of the present study; i.e. parents and children were told that the study involved the investigation of pain and fear responses for blood-testing (i.e. finger prick) in children with diabetes and their parents. One week after the letter was sent, they were phoned by a research assistant to discuss their interest in participation. When parents and children provided consent, they were invited to the paediatric department one hour before the child and parent had a previously scheduled three-monthly routine consult with their physician. A letter confirming their appointment was sent to them. Upon arrival at the department, a research assistant accompanied the parent and child to the test-room. After the purpose and procedure of the study was explained, written parent consent and child assent were obtained. Blood (glucose) testing was conducted by means of a Glucojet Dual® finger pricker (A. Menarini Diagnostics). For standardization purposes, children did not administer the finger prick themselves, but received the finger prick on the index finger of the non-dominant hand from a nurse specialized in diabetes care. The finger pricker was adjusted to the same force and depth for all children. The parent was present during the whole procedure and observed the child receiving the finger prick. Self-report measures (see above) for the child and parent were administered before and after the child's glucose-testing. Ethical approval for the present study was obtained in accordance with institution review board requirements of Ghent University Hospital.

Statistical analyses

For data processing and analyses the SPSS statistical package v 15.0 was used. Prior to analysis Kolmogorov-Smirnoff (KS) tests of normality were performed for all variables. KS tests indicated a non-normal distribution for three variables; child-reported fear (KS Z-score = 2.41, $p < .0001$) and pain (KS Z-score = 2.33, $p < .0001$), and parent-reported fear (KS Z-score = 1.39, $p = .05$), which were both skewed to the left. Closer examination of the data indicated that transformations were not possible since there was a considerable number of children and mothers who reported having no fear (35/49 children and 16/44 mothers) and children who reported having no pain (32/49 children) during the finger prick. Therefore, ratings of 0 on child-reported fear or pain and parent-reported fear were computed as one group; i.e. no child-reported fear or pain and no parent-reported fear (coded '0'). All other values (> 0) were regarded as a group with child fear/pain, respectively parents' fear (coded '1'). The statistical significance level was set at $p < .05$ (two-tailed). Bonferroni correction for multiple comparisons was not appropriate as the current study did not meet any of the conditions for applying this adjustment (d.i., (a) a universal null hypothesis is of interest, (b) a same test is repeated in many subsamples, (c) searching for significant associations without a priori hypotheses for multiple tests) (Perneger, 1998). Because of the non normal distribution of some of the variables included in the present study, bivariate Spearman correlations instead of Pearson correlations were performed. In case of dichotomous outcome variables (i.e. non normally distributed variables 'child-reported fear', 'child-reported pain' and 'parent-reported fear'), stepwise binary logistic regression analyses were conducted as non parametric tests to identify the unique contribution of the explanatory variables. Results of the logistic regression analyses are presented as odds ratios with 95% confidence intervals (CI)³. For normally distributed outcome variables (i.e. 'parents'

³ Reanalyses of the data with parametric equivalent tests and original continuous measurement revealed similar findings as those obtained with non-parametric tests/dichotomous variables, thereby attesting to the robustness of the findings.

estimates of the child's pain'), hierarchical regression analysis was conducted to identify the unique contribution of the explanatory variables.

To partial out the impact of demographic variables upon pain expression, we controlled for the child's age and sex (girls coded 0, boys coded 1) in each regression analysis. We also controlled for the mean duration of diagnosis and whether children normally use a classic finger pricker at home (0= yes; 1= no).

Results

Descriptive statistics

Mean scores, standard deviations and spearman correlation coefficients between measures are reported in Table 2. The mean level of the child's pain catastrophizing was low. Children also reported low levels of fear and pain during the finger prick. For those children who reported pain ($n = 17$) or fear ($n = 14$), the mean level was 2.13 ($SD=1.50$; range 1-6), respectively 2.00 ($SD=1.75$; range 1-7). Parent reports of pain catastrophizing were moderate. Parents reported low levels of experienced fear and estimated low levels of pain related to their child's finger prick. For those parents who reported to have had fear ($n = 28$) or perceived the finger prick of their child as painful ($n=32$) the mean level was 4.00 ($SD=2.96$; range 1-10), respectively 3.53 ($SD=2.11$; range 1-8). Wilcoxon Signed Rank tests indicated that parents' own fear and parents' estimates of their child's pain during the finger prick were significantly higher than the child's level of fear ($Z= -4.07, p < .0001$), respectively child-reported pain ($Z= -4.60, p < .0001$). Similarly, paired samples t-test indicated that parents' level of catastrophizing about their child's pain was significantly higher than the child's level of catastrophizing ($t(43) = -4.84; p < .0001$).

Correlations

Of particular interest for this study were the correlations between the child's pain catastrophizing and child-reported fear and pain, and between parents' pain catastrophizing, child-reported fear, parent-reported fear and parents' estimates of the child's pain (see Table 2). Spearman correlation analyses indicated that the child's pain catastrophizing was significantly positively associated with the child's experienced level of fear during the finger prick. Of further interest, the correlation between the child's catastrophizing and self-reported pain and parents' estimates of the child's pain were almost the same magnitude although not significant (both $p \leq .10$). Parents' catastrophizing about their child's pain was significantly positively correlated with both the child's and parents' level of fear during the finger prick and with parents' estimates of their child's pain. There was no significant correlation between parents' catastrophizing and the child's self-reported level of pain. Interestingly, child's fear, parents' own fear, parents' pain estimates and child-reported pain were, except for the association between parents' anxiety and child-reported pain, all significantly positively correlated with each other.

- Insert Table 2 about here -

Explanatory value of the child's catastrophizing for child-reported fear and pain.

Two logistic regression analyses were performed to investigate the relationship between the child's pain catastrophizing and child-reported fear and pain. In each analysis, the child's gender (boys coded as 1, girls coded as 0) and age were entered in step 1 to control for possible effects of these sociodemographic variables. In the subsequent step, the mean duration of diagnosis and use of classic finger pricker (0= yes; 1= no) was entered. In the third step, the child's pain catastrophizing was entered. The logistic regression analysis with child-reported fear as dependent variable indicated that the child's age ($OR = 1.55$; $p = .04$; $CI 1.02-2.36$) and the child's pain catastrophizing ($OR = 1.26$; $p = .03$; $CI 1.02-1.56$; ($OR = 1.23$; $p = .03$; $CI 1.02-1.48$; R^2 of entire model=34%.) had a significant positive contribution,

indicating that older children and higher catastrophizing children were more likely to be fearful during the finger prick compared to younger children and children who reported lower levels of catastrophizing. The logistic regression analysis with child-reported pain as dependent variable revealed similar findings; higher catastrophizing children are more likely to report pain during the finger prick compared to lower catastrophizing children ($OR= 1.23$; $p =.03$; $CI 1.02-1.48$; R^2 of entire model=21%).

Explanatory value of parents' pain catastrophizing for parents' own fear and inferences of their child's pain .

To investigate the relationship between parents' catastrophizing about their child's pain and parent-reported fear, a similar logistic regression analysis as described above, but with the parent's level of catastrophizing entered in the third step was performed. The analysis indicated that only parents' catastrophizing had a significant contribution ($OR= 1.21$; $p =.006$; $CI 1.06-1.39$; R^2 of entire model= 35%), indicating that higher catastrophizing parents were more likely to experience fear during the finger prick of their child compared to lower catastrophizing parents.

Next, a hierarchical linear regression analysis, with parents' estimates of their child's pain entered as dependent variable and the same independent variables entered, was performed. Findings indicated that, again, only the parents' level of catastrophizing had a significant positive contribution ($\beta = .51$, $p= .001$; R^2 of entire model= 36%), indicating that higher parents' catastrophizing was associated with higher inferences of finger prick pain of their child.

Explanatory value of parents' catastrophizing for child-reported fear and pain

The relationship between parents' catastrophizing and child-reported fear was investigated by means of two logistic regression analyses, similar to those described above. The analysis with child-reported fear revealed that only parents' catastrophizing had a

significant positive contribution ($OR = 1.14$; $p = .03$; $CI 1.02-1.27$; R^2 of entire model = 36%), indicating that high catastrophizing parents were more likely to have children who reported to be fearful during the finger prick compared to parents reporting lower levels of pain catastrophizing. The analysis with child-reported pain found no significant findings ($OR = 1.03$; ns ; $CI .94-1.12$).

Discussion

The present study investigated the role of child pain catastrophizing and parents' catastrophizing about their child's pain in understanding procedural pain and fear. Children with type 1 diabetes and their parents were chosen as the participants for this study. In particular, this study investigated the relationship of child and parents' pain catastrophizing with finger prick related fear and pain. The results may be readily summarized. First, and in line with expectations, results of regression analyses showed that both the child's and parents' catastrophizing about the child's procedural pain were significantly associated with the outcome measures; (a) the child's level of catastrophizing, measured prior to the finger prick, was associated with higher child-reported fear and pain during the finger prick; (b) parents' level of catastrophizing about their child's pain was uniquely positively related to inferences of their child's pain and parent's own fear; (c) parents' catastrophizing was also significantly associated with heightened child-reported fear, but not child-reported pain. Second, findings also indicated that parents overestimated the finger prick-related pain of their child, and were also more fearful and higher on the measure of catastrophizing as compared to fear responses and pain catastrophizing in their child.

The present findings substantiate earlier research on the importance of both child and parents' catastrophizing in understanding deleterious outcomes in both schoolchildren and children suffering chronic pain (Crombez *et al.*, 2003; Goubert *et al.*, 2006; Langer,

Romano, Levy, Walker, & Whitehead, 2009; Vervoort *et al.*, 2006). However, this study is, to our knowledge, the first study that has investigated the role of child and parents' catastrophizing about procedural pain; i.e. finger prick related pain and fear in a sample of children with diabetes and their parents. Our findings suggest that catastrophizing about pain by both children and parents might be important as it is likely to be associated with increased pain and fear which may, in turn, interfere with or hinder future and necessary procedures (Sullivan & Neish, 1998; Vlaeyen *et al.*, 2004). Caution, however, is needed when considering potential clinical implications for children with diabetes and their parents, particularly since finger pricks were not experienced as highly threatening; i.e. finger pricks induced only low levels of fear or pain. Accordingly, generalizability of the findings is limited. Future research investigating the impact of child and parent catastrophizing for more aversive and threat-inducing procedures is needed.

Nevertheless, the present findings may have important theoretical implications which need, however, to be addressed within future studies. In particular, from a theoretical account, several pathways have been identified that may explain how both catastrophizing about one's own pain (i.e. child's catastrophizing in the present study) and catastrophizing about someone else's pain (parents' catastrophizing in the present study) may be associated with negative outcomes such as enhanced fear and pain. According to the cognitive-affective model of pain (Eccleston & Crombez, 1999) threat-related appraisals of pain, such as catastrophizing about one's own pain, may be associated with negative outcomes through processes related to heightened attention or vigilance to threat. Specifically, hypervigilance to pain may, amongst other factors, function to maintain and amplify bodily sensations and, as a consequence, give rise to enhanced pain and fear responses (Eccleston & Crombez, 1999). Future research, however, is needed to elucidate whether child hypervigilance underlies the relationship between child catastrophizing and increased pain and fear.

Catastrophizing about one's own pain may also induce a more indirect route to enhanced fear and pain. In particular, previous evidence in school children and children with chronic pain has shown that those who highly catastrophize about pain engage in higher levels of pain expression (Vervoort *et al.*, 2009; Sullivan, Martel, Savard, & Crombez, 2006a; Vervoort *et al.*, 2008; Vervoort *et al.*, in press b). Accordingly, it is possible that, within the present study, children who reported higher levels of catastrophizing also showed more pain in presence of their parent. Heightened expression of pain in high catastrophizers, in turn, may serve to attract other's (e.g. parents') attention, instigate higher pain inferences in others⁴ (Sullivan *et al.*, 2006a; Vervoort *et al.*, 2009), and may lead to enhanced social responses ranging from solicitous ones to the provision of negative responses to the sufferer's pain (Cano, 2004; Vervoort, Goubert, & Crombez, 2010). Both types of responses, however, are expected to maintain or increase the child's catastrophizing by reinforcing catastrophizing of the child, respectively further adding to the aversiveness of catastrophizers' pain experience (McCracken, 2005, Sullivan *et al.*, 2001). Future research assessing both child pain expression and related parental responses to their child's pain is, however, needed to investigate if and to what extent child catastrophizing impacts upon outcome through its effects within an interpersonal context.

The hypervigilance route described above may also apply to the effects of catastrophizing about someone else's pain. In line with the cognitive-affective model of pain, in which the interruptive function of pain is central (Eccleston & Crombez, 1999) it is highly likely that individuals (e.g. parents) who engage in high catastrophizing about someone else's (e.g. child's) pain will also be more attentive to the pain signals and pain cues of others (Sullivan, Martel, Tripp, Savard, & Crombez, 2006b, Van Damme, Crombez, & Lorenz, 2007;c Vervoort *et al.*, in press a), will become more distressed and fearful about the other's

⁴ Within the present study, the expressive nature of child catastrophizing is supported by a positive correlation with parental pain inferences.

pain (Goubert *et al.*, 2008; Caes *et al.*, 2011), and estimate the pain of others to be more severe (Goubert *et al.*, 2009; Sullivan *et al.*, 2006b). How these responses translate in specific behaviour oriented towards the person in pain is unclear. Preliminary evidence, however, suggests that responses of high catastrophizing parents have maladaptive consequences for the child in pain; catastrophizing thoughts in caregivers have been found to be associated with higher levels of functional disability in children suffering chronic pain (Goubert *et al.*, 2006). Within the present study, higher levels of parent catastrophizing were associated with increased child fear, but not increased pain. Although additional research is needed, it is likely that parental own fear may underlie the relationship between parent catastrophizing and child increased fear. For instance, it may be reasonable to assume that, within the present study, parents who reported higher levels of catastrophizing not only experienced increased fear but also behaviourally responded to their child's pain in such a way that they directly contributed to heightened fear responses in their child (Blount *et al.*, 1989; Blount, Piira & Cohen, 2003; McMurthy, Chambers, McGrath, & Asp, 2010). In addition, parents may also indirectly fuel fear in their child. Specifically, children may have learned about the threat value of the medical procedure from observing their parents' fear and distress responses (Goubert, Vlaeyen, Crombez, & Craig, 2011).

Of further interest, the present findings also indicated some remarkable differences between children and mothers. Specifically, mothers overestimated the pain of their child, were more fearful and also higher on the measure of catastrophizing as compared to fear and pain responses and pain catastrophizing in their child. These findings partially corroborate previous ones (Hanas & Ludvigsson, 1997) and are likely to be a reflection of the general distress parents of children with diabetes may experience due to e.g. uncertainty about the child's self-management and associated potential complications (Boman, Viksten, Kogner, & Samuelsson, 2004). Addressing the fears and concerns of parents may be necessary to assure

appropriate self-management in children with diabetes (Bernard & Cohen, 2006; Penner *et al.*, 2008; Silverstein *et al.*, 2005). So, these current findings emphasize the importance of assessing not only for child characteristics but, in particular, also for parent characteristics.

A number of limitations of the study deserve consideration. First, our study had a small sample size and only allowed analyses of reports from mothers and their children, not for fathers. A more comprehensive view on the role of parents' catastrophizing demands the inclusion of fathers in research (Dashiff, Morrison, & Rowe, 2008; Hechler *et al.*, in press). Second, fear and pain were assessed each with a single item, and hence, cannot be considered representative of the various facets of pain and fear (Mollema *et al.*, 2000; Simmons *et al.*, 2007). Similarly, child and parent catastrophizing were assessed with only three items. Single or low number of items are less reliable and decrease the statistical power to detect differences. In addition to this, cronbach's alpha of the child measure on pain catastrophizing was only moderate. However, since alpha is dependent not only on the magnitude of the correlations among items, but also on the number of items in the scale (i.e. cronbach's alpha may significantly increase with increasing number of items), low size of the coefficient alpha might not always indicate problems with the construction of the tool (Cortina, 1993; Cronbach, 1951). Nevertheless, caution is needed when interpreting findings. Third, although using one type of blood glucose monitor and administering the check for all children in the same way (i.e. same force and depth) increased standardization, this may compromise external validity of the findings. For instance, same force and depth may have meant more or less pain and fear given differences in finger size with varying age. Fourth, the present study investigated catastrophizing, fear and pain related to finger pricks only, and not to insulin injection. Within the present study, finger pricks were perceived as only small threats and induced low levels of pain and fear for only a minority of the children. In addition, finger pricks were not administered by the children themselves. As a consequence, replication of the

study (1) using a more elaborated measurement of both injection or finger prick related pain and fear (e.g. Simmons *et al.*, 2007) and pain catastrophizing, (2) having the child self-administering the finger prick/injection and (3) using larger samples of children with diabetes and *both* of their parents, is needed to further investigate the generalizability of the findings. In addition, investigation of the impact of the child's and parents' catastrophizing for children undergoing more severe medical procedures (e.g., lumbar punctures; Zernikow *et al.*, 2005) is needed to provide a stronger test of the hypotheses advanced within the present study and to further assess generalizability of the findings. However, the present findings are the first assessing child and parent catastrophizing thoughts about pain with regard to procedural pain and fear in the child.

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Table 1

Demographic characteristics of the study sample ($N = 44$ mothers and their child)

	<i>M</i>	<i>SD</i>	%
Child's age (years)	11.6	2.1	--
Mother's age (years)	40.7	4.8	--
Mean duration since diagnosis (months)	57.0	39.7	--
Mother's education beyond 18 years (%)	--	--	51.0
Marital status (married or co-habiting) (%)	--	--	77.6

Table 2

Means (*M*), Standard deviations (*SD*) and Spearman correlation coefficients for all parent and child measures⁵

	<i>M</i>	<i>SD</i>	2	3	4	5	6
1. Pain catastrophizing-Child	4.43	3.93	.29*	.25	.14	.04	.28
2. Experienced fear - Child	.63	1.35	--	.38**	.34*	.30*	.43**
3. Experienced pain Child	.77	1.36		--	.10	.13	.47**
4. Pain Catastrophizing- Parent	10.43	7.77			--	.71***	.48**
5. Experienced fear - Parent	2.32	2.86				--	.51***
6. Pain estimates - Parent	2.57	2.40					--

* $p < .05$, ** $p < .005$, *** $p < .0001$

⁵ Scores on catastrophizing can range from minimum 0: not at all to maximum 30: very much. Scores on fear can range from minimum 0: not anxious/scared to maximum 10: very anxious/scared. Scores on pain can range from minimum 0: no pain to maximum 10: a lot of pain.