Parental reactions to the pain of their child: An affective-motivational analysis

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# Table of Contents

<table>
<thead>
<tr>
<th>General Introduction</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 1:</strong> Parental catastrophizing about child’s pain and its relationship with activity restriction: the mediating role of parental distress</td>
<td>33</td>
</tr>
<tr>
<td><strong>Chapter 2:</strong> Negative emotional responses elicited by the anticipation of pain in others: psychophysiological evidence</td>
<td>69</td>
</tr>
<tr>
<td><strong>Chapter 3:</strong> The impact of parental catastrophizing and contextual threat on parents’ emotional and behavioural responses to their child’s pain</td>
<td>95</td>
</tr>
<tr>
<td><strong>Chapter 4:</strong> Parents who catastrophize about child pain experience lumbar punctures and bone marrow aspirations as more distressing and engage more in pain-attending behaviour</td>
<td>123</td>
</tr>
<tr>
<td><strong>Chapter 5:</strong> Parental catastrophic thoughts about child pain predict an increase in parental distress over the course of child lumbar punctures and bone marrow aspirations</td>
<td>147</td>
</tr>
<tr>
<td><strong>Chapter 6:</strong> Parents who catastrophize about their child’s pain prioritize attempts to control pain</td>
<td>173</td>
</tr>
<tr>
<td>General Discussion</td>
<td>195</td>
</tr>
<tr>
<td>Nederlandstalige Samenvatting</td>
<td>229</td>
</tr>
<tr>
<td>Dankwoord</td>
<td>247</td>
</tr>
</tbody>
</table>
G E N E R A L  I N T R O D U C T I O N

P A I N :  P R E V A L E N C E  A N D  I M P A C T

Pain is a common experience in adults as well as in children. Ample research is available on pain in adulthood (Chung & Wong, 2006; Mäntyselkä et al., 2001; Picavet & Schouten, 2003), but evidence indicating that pain is an integral part of children’s everyday experience is also accumulating. Specifically, preschoolers and young school-age children encounter approximately one painful event every three awaking hours (Fearon, McGrath, & Achat, 1996). Similarly, findings indicated that healthy school children (ranging from 9 to 13 years) on average experience approximately 3.5 incidences of pain every month (van Dijk, McGrath, Pickett, & VanDenKerkhof, 2006). Headache is the most frequently reported and most bothersome type of pain (Du, Knopf, Zhuang, & Ellert, 2001; Petersen, Brulin, & Bergstörm, 2006; van Dijk et al., 2006). Moreover, headache combined with stomach pain is the most prevalent multiple pain symptom (Du et al., 2011). Girls tend to report higher levels of pain compared to boys and the overall prevalence of pain experiences has been found to increase with age (Martin, McGrath, Brown, & Katz, 2007; Perquin et al., 2000; Sunblad, Saartok, & Engström, 2007; Unruh, 1996). These findings all represent acute pain experiences, defined as pain of a relatively brief duration, with a sudden onset and an apparent etiology such as everyday bumps and hurts, medical procedures or illness (Cummings, Reid, Finley, McGrath, & Ritchie, 1996). Although acute pain constitutes the child’s major experience with pain, a considerable amount of children also experiences chronic pain. Chronic pain can be described as continuous pain lasting longer than three months or as frequent recurrent pain with a minimum duration of 3 months, often without a clear biomedical cause (American Pain Society, 2001; McGrath, 1999). The meta-analysis of King and colleagues (2011) reported a prevalence of pediatric chronic pain between 11% and 38%, with higher prevalence in girls and older children. Headache (8-83%), abdominal pain (4-53%) and musculoskeletal pain (4-40%) were the most frequently reported and investigated types of pain (King et al., 2011). Moreover, the experience of chronic pain seems to persist in a considerable proportion of children and adolescents (Perquin et al., 2003) and may be predictive of long-term pain complaints and pain-related disability in adulthood (Brattberg, 2004; Fearon & Hotopf, 2001; King et al., 2011).
Although the experience of pain is an aversive one, it is vital to one’s survival (Williams, 2002). Specifically, pain is a crucial signal in directing attention to potential sources of injury and motivates actions aimed at reducing, escaping and avoiding pain (Auvray, Myin, & Spence, 2010; Eccleston & Crombez, 1999). Despite its inherent adaptive nature, the experience of pain, especially chronic pain, has the potential to impose a significant burden on the child in pain. In particular, several findings pointed out that chronic pain can interfere with daily functioning manifested by impaired sleep patterns, and worse academic, physical, and social functioning (Gauntlett-Gilbert & Eccleston, 2007; Konijnenberg et al., 2005; Logan & Scharff, 2005; Logan, Simons, Stein, & Chastain, 2008; Long, Krishnamurthy & Palermo, 2008). Moreover, the experience of chronic pain in children and adolescents has been found to be related to lower quality of life in several domains such as psychological functioning, physical and functional status (Bruijn et al., 2009; Hunfeld et al., 2001). In addition, evidence indicated that pain can negatively influence children’s emotional functioning. In particular, children with chronic pain reported more depressive and anxious symptoms and a lower self-esteem (Eccleston, Crombez, Scotford, Clinch, & Connell, 2004; Peterson & Palermo, 2004; Varni, Rapoff, Waldron, Bernstein, & Lindsley, 1996). Further, child pain not only impacts the child’s functioning, but may also be a strain for their parents. Research investigating the parental experience of their child’s pain is scarce and has mainly focused on caring for a child with chronic pain. Parents of a child with chronic pain commonly report high levels of parental stress, anxiety, depressive symptoms, marital problems, restrictions in personal and family activities and a high impact of child pain on their social life (Hunfeld et al., 2001; 2002; Lipani & Walker, 2006; Palermo, 2000; Palermo & Eccleston, 2009). Jordan, Eccleston, and Osborn (2007) found that parents caring for a child with chronic pain report a fundamentally and unexpectedly changed life characterized by the struggle to adapt to a life filled with uncertainty, fear, distress and loss.

A biomedical perspective upon pain has proven insufficient to fully comprehend pain and its consequences. Growing evidence has indicated that psychological and social factors also have a profound impact on the sufferer’s pain experience. A biopsychosocial perspective upon pain, describing pain as the result of a dynamic interaction between biological, psychological and social factors, is now widely accepted as the most heuristic perspective to understand pain (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). The importance of a biopsychosocial perspective upon pain is well incorporated within the
general definition of pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (International Association for the Study of Pain Task Force on Taxonomy, 1994, p. 210). This definition recognizes that pain not only encompasses specific sensory characteristics, but is often accompanied by an emotional response such as anger, sadness and anxiety (Fernandez & Turk, 1992; Robinson & Riley, 1999). Further, this definition of pain stresses that there exists no absolute correspondence between pain and tissue damage. This entails that pain can occur in the absence of tissue damage and a person may have tissue damage without feeling pain (Fernandez & Turk, 1992; Fordyce, 1988). Lastly, this definition acknowledges that pain is a subjective negative experience, not completely determined by objective biological factors. This is in line with a biopsychosocial perspective of pain, postulating that although a better understanding of the biological factors is vital, psychological and social factors cannot be ignored in order to fully understand painful experiences (Gatchel et al., 2007; Gatchel & Turk, 1999). An affective-motivational perspective upon pain lends itself particularly well in explaining the influence of both psychological as well as social factors upon the pain experience. First I will discuss the importance of an affective-motivational perspective within the intrapersonal pain experience. I will later on propose that an affective-motivational perspective of pain is also valuable in understanding the interpersonal context of pain experiences.

**AFFECTIVE-MOTIVATIONAL INTRAPERSONAL ACCOUNT OF PAIN**

The interruptive nature of pain is central to an affective-motivational perspective upon pain. Specifically, an affective-motivational perspective considers pain as an archetypical sign of threat, interrupting attention, inducing fear and distress, and motivating behaviour aimed at reducing, avoiding or escaping from pain (Eccleston & Crombez, 1999; Van Damme, Crombez, & Eccleston, 2008; Van Damme, Legrain, Vogt, & Crombez, 2010). In normal circumstances, these pain-related processes serve a protective and adaptive function by preventing further tissue damage and enhancing pain relief (Auvray et al., 2010; Williams, 2002). However, cognitive-affective factors may modulate these processes and lead to less than optimal reactions. The construct of pain catastrophizing has received considerable research attention in this respect. Catastrophic thoughts about pain are defined as an exaggerated negative orientation towards actual or anticipated pain experiences involving: 1) rumination (i.e., the tendency to increase
attentional focus on pain-related thoughts), 2) magnification (i.e., the tendency to exaggerate the threat value of the pain stimulus) and 3) helplessness (i.e., the tendency to adopt a helpless orientation in coping with the pain experience; Sullivan, Bishop, & Pivik, 1995). Although pain-related catastrophic thoughts are mostly considered as a stable response to a variety of painful experiences (Sullivan et al., 2001a), evidence arises indicating differences according to the specific situation (Campbell et al., 2010; Quartana, Campbell, & Edwards, 2009). Furthermore, compared to males, higher levels of catastrophizing about pain have been observed in females (Crombez et al., 2003; Sullivan et al., 1995), which might account for the heightened level of pain intensity by females (Keogh & Eccleston, 2006; Sullivan, Tripp, & Santor, 2000). Interestingly, considerable evidence has indicated that the interruptive and threatening aspects of pain are particularly prevalent in people endorsing catastrophic thoughts about their pain (Eccleston & Crombez, 1999; Leeuw et al., 2007; Vlaeyen & Linton, 2000). Specifically, numerous experimental studies indicated that heightened pain catastrophizing is associated with hypervigilance to pain, characterized mostly by disengagement difficulties from pain (Crombez, Eccleston, Baeyens, & Eelen, 1998; Van Damme, Crombez, & Eccleston, 2002; 2004; Van Damme, Crombez, Eccleston, & Koster, 2006). Moreover, a threatening or catastrophic appraisal of pain is assumed to be a precursor for pain-related fear or distress, which is associated with a heightened motivation to reduce, escape or avoid pain situations (Eccleston & Crombez, 2007; Leeuw et al., 2007; Vlaeyen & Linton, 2000). Indeed, several studies, in pain-free individuals as well as in various chronic pain conditions, have found that endorsing high levels of pain catastrophizing is related with heightened reports and psychophysiological indices of emotional distress or fear (Bradley, Silakowski & Lang, 2008; Eccleston et al., 2004; Severeijns, Vlaeyen, Van den Hout, & Weber, 2001; Sullivan et al., 2001). Moreover, evidence indicates that pain-related fear has a strong impact on individual’s behavioural performance. Specifically, heightened pain-related fear has been found to be associated with a higher tendency to escape and avoid physical activities, which resulted in poorer behavioural performance (Buer & Linton, 2002; Crombez, Vlaeyen, Leuts, & Lysens, 1999; Geiser, Haig, & Theisen, 2000; Swinkels-Meeuwisse, Roelofs, Oostendorp, Verbeek & Vlaeyen, 2006). Although these emotional and behavioural consequences induced by perceiving pain as threatening might be adaptive by fostering pain relief, it could prove maladaptive when maintained for a long period of time. Specifically, perseverance in pursuing the goal of pain relief despite several failed attempts has the potential to interfere with other...
important life aspirations, thereby leading to frustration and disability (Crombez, Eccleston, Van Damme, Vlaeyen, & Karoly, in press; Eccleston & Crombez, 2007). Moreover, evidence suggests that individuals who catastrophize about their pain tend to have the belief that reducing their pain is inevitable to regain a valuable way of living (Crombez, Eccleston, van Hamme, & De Vlieger, 2008; De Vlieger, Van den Bussche, Eccleston, & Crombez, 2006). Consequently, endorsing catastrophic thoughts about pain might hinder disengagement of pain relief goals, which may lead to a greater level of goal conflict and pain-related interference and disability (Karoly, Okun, Reuhlman, & Pugliese, 2008; Karoly & Reuhlman, 2007; Massey, Garnefski, & Gebhardt, 2009). In support of this, numerous studies have demonstrated the determinative role of catastrophizing about pain in explaining deleterious pain outcome in adults (Quartana et al., 2009; Sullivan, Rodgers, & Kirsch, 2001a) as well as in children (Vervoort, Goubert, Eccleston, Bijttebier, & Crombez, 2006). Specifically, catastrophic thoughts about pain have been found to be related with a heightened experience of pain (Crombez et al., 2003; Sullivan et al., 2001a; Vervoort et al., 2006) and disability in several domains of daily functioning, such as occupational or academic, recreational, physical and psychosocial disability (Crombez et al., 2003; Lynch-Jordan, Kashikar-Zuck, Goldschneider, & Jones, 2006; Martin et al., 1996; Sullivan, Stanish, Waite, Sullivan, & Tripp, 1998; Vervoort et al., 2006). The findings of Buer and Linton (2002) indicated that catastrophizing is already present in early stages of the pain process and may play a role in the transition from acute to chronic pain.

While these intrapersonal features of pain experience are crucial, pain is rarely a private event and the interpersonal role of pain and associated affective-motivational processes must be appreciated. Specifically, research is accumulating suggesting that pain has also the potential to grasp the attention of others, thereby influencing the behaviour of others in the social environment (Hadjistavropoulos et al., 2011). It is likely that affective-motivational principles may also explain observers’ responses to another’s pain. For a comprehensive understanding of pain as a social experience, I will first discuss the socio-communication model of pain, which provides a heuristic framework to foster the understanding of the complex social interactions among sufferers in pain and their caregivers (Hadjistavropoulos & Craig, 2002; Prkachin & Craig, 1995).
**THE SOCIO-COMMUNICATION MODEL OF PAIN**

The socio-communication model of pain is based upon Rosenthal’s (1982) model of non-verbal communication and takes into account non-verbal as well as verbal pain communications. The model recognizes three important steps in the process of communicating pain. The first step entails the sufferer’s internal experience of pain (step A), which is encoded in expressive pain behaviours (= step B, second step). The observer can decode the sufferer’s expressive behaviour in order to draw inferences about the pain experience of the sufferer (step C). The behavioural responses of the observer, based upon the inferences the observer draw, may, in turn, have an impact upon the sufferer’s pain experience (step A) and pain expression (step B; see Figure 1; Hadjistavropoulos et al., 2011). Detecting, interpreting and responding to pain of others can have important implications for the recovery or survival of the person in pain. Moreover, recognizing another’s pain could also yield important survival advantage for the observer as it could allow identification of potential danger and the opportunity to avoid harm (Williams, 2002).

*Figure 1: The socio-communications model of pain (adapted from Hadjistavropoulos et al., 2011).*
The internal pain experience (step A) is an interplay of somatic sensations, thoughts, feelings, and distinct brain activations (Apkarian, Bushnell, Treede, & Zubieta, 2005, Craig, 2009; Hadjistavropoulos et al., 2011). Although this internal experience is a personal and subjective experience, the cultural, interpersonal and situational context are potential determinants of the pain experience (Hadjistavropoulos et al., 2011). For example, Goodman and McGrath (2003) found that children observing exaggerated pain expression by their mother had a lower pain threshold than children observing their mother’s usual or minimized pain expression. This internal pain experience is often accompanied by several pain behaviours (e.g., rubbing, guarding, avoidance and escape behaviour, non-verbal pain expressions and pain verbalizations), which have the potential to communicate pain to others (= step B). Non-verbal behavioural expressions are the main repertoire of young infants to communicate pain. With increasing age, non-verbal behaviour gradually expands with other means of communication, such as verbal expression of pain (Craig & Korol, 2008). Of these various expressions of pain, facial pain expressions and pain verbalizations have been found to be among the most salient ones in communicating pain to others. Specifically, facial display of pain has been found to be a major source for observers to make a judgment about the other’s pain (Prkachin, 1992; Vervoort, Goubert, & Crombez, 2009; Williams, 2002) and several studies found that pain estimations increase with increasing facial pain expression (Goubert, Vervoort, Cano, & Crombez, 2009a; Hadjistavropoulos, Craig, Grunau, & Whitfield, 1997; Sullivan, Martin, Tripp, Savard, & Crombez, 2006).

In the last step, step C, the model describes factors that influence the observer’s decoding of the sufferer’s pain expressions. To this end, not only the clarity, intensity and type of pain expression are important; also cultural, situational and interpersonal factors, such as the relation between observer and sufferer (Lanzetta & Englis, 1989; Logan, Guite, Sherry, & Rose, 2006) and observers’ characteristics (e.g., catastrophic thinking; Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006; Goubert, Vervoort, Sullivan, Verhoeven, & Crombez, 2008) likely impact observers’ inferences and related behavioural response. For example, Leibenluft, Gobbini, Harrison and Haxby (2004) found that viewing the face of one’s own child evokes stronger emotional responses compared with observing the face of less familiar children. Furthermore, not all pain situations are alike and there is reason to believe that specific contextual features such as additional information concerning the situation (Leventhal, Brown, Shacham, & Engquist, 1979; Vlaeyen et al., 2001) or characteristics of the pain complaint (i.e., the
intensity or duration of the pain symptom; Eccleston & Crombez, 1999; Goubert et al., 2008; McCracken & Gauntlett-Gilbert, 2011), can moderate observers’ reactions to another’s pain. For example, while mostly underestimation of another’s pain is observed, in highly threatening situations, such as the end stage of cancer, findings have indicated that caregivers tend to overestimate the sufferer’s pain (Redingbaugh, Baum, DeMoss, Fello, & Arnold, 2002; Zernikow et al., 2005).

A recently formulated model on empathy in the context of pain further refines these decoding processes by specifying distinct, but related cognitive, emotional and behavioural components of observers’ empathic reaction. Specifically, the model defines empathy as “a sense of knowing the experience of the other” and in accordance with the socio-communication model recognizes the impact of bottom-up (i.e., characteristics of the pain sufferer), top-down (i.e., characteristic of the observer) and contextual influences on the empathic reaction to another’s pain (Goubert et al., 2005; see Figure 2).

*Figure 2: The empathy model in the context of pain (adapted from Goubert et al., 2005).*
The cognitive component of an observer’s empathic reaction reflects the extent to which observers understand the sufferer’s pain experience (Goubert, Craig, & Buysse, 2009), with estimation of child pain level as a frequently used method to assess this cognitive component. In most cases, research indicated discrepancies (i.e., mostly observer underestimation, but also overestimation has been observed) in pain estimation between the pain sufferer and observers (Chambers, Reid, Craig, McGrath, & Finley, 1998; Goubert, et al., 2009a). An inaccurate estimation of another’s pain could have negative implications for effective, well-adjusted caregiving responses. For example, while underestimations involve the risk that pain sufferers might feel misunderstood and receive inadequate care, overestimation could potentially lead to ‘over’-protective care thereby hampering normal and independent functioning (Goubert et al., 2005).

With regard to the emotional component, the empathy-model differentiates two main categories of emotional empathic responses to others’ pain: responses oriented to the observer (i.e., self-oriented responses) and responses oriented to the other in pain (i.e., other-oriented responses; Goubert et al., 2005). The self-oriented emotional responses comprise feelings of distress and anxiety when faced with another in pain, while other-oriented responses comprise feelings such as empathic concern and sympathy for the sufferer (Davis, 1996). Although both emotions can occur at the same time, they are qualitatively distinct and imply different motivational tendencies (Batson, Fultz, & Schoenrade, 1987; Eisenberg & Eggum, 2009). Specifically, research on empathic emotional responses in the context of helping behaviour has shown that feelings of distress towards another person in need are related to an egoistic or self-oriented motivation of helping the other person in order to alleviate their own feelings of distress. Such an egoistic motivation is often reflected by behavioural tendencies of escaping or avoiding the threatening situation. Feelings of sympathy on the other hand seem associated with an altruistic motivation and behavioural tendencies attuned to the needs of the sufferer rather than to their own needs (Batson et al., 1987; Cialdini et al., 1987; Davis, 1983; Eisenberger & Miller, 1987). Within the context of pain, studies using functional Magnetic Resonance Imaging (fMRI) suggest that the affective dimension of own pain and observing others’ pain are represented in common neural circuits, indicating that another’s pain mainly evokes affective distress in observers (Decety & Jackson, 2006; Singer et al., 2004). Moreover, preliminary evidence indicates that observing another in pain automatically triggers self-oriented distress rather than empathic concern and sympathy responses (Cheetham, Pedroni, Antly, Slater, & Jäncke,
2009; Yamada & Decety, 2009). These findings suggest that feelings of distress and their associated escape and avoidance tendencies may be automatically activated when perceiving someone else in pain, and that feelings of sympathy only occur in a second phase, after adequate regulation of distress (Cheetham et al., 2009; Goubert et al., 2009; Van Ryswyk, 2009; Yamada & Decety, 2009).

According to the socio-communication model, these empathic responses may in turn have an impact upon the sufferer’s pain experience. Understanding social consequences of pain and its reciprocal impact upon the sufferer’s pain are particularly important in the pediatric pain context since children highly depend upon adults (primarily their parents) for help and care (Chambers, 2003; Palermo & Chambers, 2005). Considerable research is available demonstrating that parental behavioural responses to child pain may profoundly impact the child’s pain experience and functioning (Chambers, 2003; Palermo & Eccleston, 2009).

THE IMPACT OF PARENTAL BEHAVIOUR ON THE CHILD’S PAIN EXPERIENCE

Most studies investigating parental response to child pain are driven by operant behavioural principles stressing the importance of reinforcement processes in the development and maintenance of child pain behaviour. In particular, parental protective reactions to child pain, which are primarily aimed at reducing or controlling child pain (e.g., by limiting the child’s activities, avoiding child pain, spending more time with the child, monitoring child pain), are seen as a primary source of reinforcement of the child’s pain behaviour. Reinforcement of child pain behaviour is likely to result into more symptoms, pain and pain behaviour (Fordyce, 1976; Newton-John, 2002). Several findings support this hypothesis by showing that parental protective responses are related with more child functional disability, more pain complaints in the child (Claar, Simons, & Logan, 2008; Peterson & Palermo, 2004; Simons, Claar, & Logan, 2008; Walker, Claar, & Garber, 2002; Walker, Garber, & Greene, 1993), and greater use of health care services (Levy et al., 2004; Walker, Levy, & Whitehead, 2006). Similarly, in the context of procedural pain, parental protective responses such as reassuring, comforting the child and providing empathic comments, have been associated with more pain and distress experienced by the child (Blount, Devine, Cheng, Simons, & Hayutin, 2008; Gonzalez, Routh, & Armstrong, 1993; Manimala, Blount, & Cohen, 2000; McMurtry, McGrath, Asp, & Chambers, 2007; Sweet & McGrath, 1998). However, not all studies provided support for the maladaptive influence of protective parental responses upon child
functioning. For example, several studies did not find a direct association between parental protective behaviour and child functional disability (Guite, Logan, McCue, Sherry, & Rose, 2009; Jellesma, Rieffe, Terwogt, & Westenberg, 2008; Reid, McGrath, & Lang, 2005). These findings indicated that the specific influence of parental behaviour upon child functioning is complex (Guite et al., 2009). In particular, recent evidence pointed to the importance of taking into account child characteristics when considering the influence of parental responses on child functioning. Specifically, children reporting high levels of distress or catastrophizing or low levels of self-worth or academic competence were more vulnerable for the maladaptive impact of parents’ protective responses; i.e., resulting in a heightened sick role identification by the child (i.e., reporting more symptoms and disability; Claar et al., 2008; Walker et al., 2002; Williams, Blount, & Walker, 2010). Furthermore, not only responses that might worsen child pain experience and disability have been investigated, several studies have also focused on how parents can effectively support their child in coping with the pain. Several studies suggest that parental engagement in coping-promoting behaviour such as distracting the child, using humor, and commands to engage in coping strategies (e.g., deep breathing and relaxation) in response to child pain is associated with less pain and distress and more use of adaptive coping strategies by children (Blount et al., 2008; Cramer-Berness & Friedman, 2005; Gonzalez et al., 1993; MacLaren Chorney et al., 2009; Manimala et al., 2000; Sweet & McGrath, 1998).

Although these findings are relevant for understanding the influence of diverse parental responses upon the child’s pain experience, two issues remain unresolved. First, despite increased involvement of fathers in childcare (Cabrera, Tamis-LeMonda, Bradley, Hofferth, & Lamb, 2000; Lamb, 2004; Paquette, 2004), research within pediatric populations has heavily focused upon mothers with little attention towards the experience of fathers (Phares, Lopez, Fields, Kamboukos, & Duhig, 2005). Consequently, possible differences between mothers’ and fathers’ responses to child pain are largely unexplored. Preliminary evidence suggests similarities (e.g., in parental sensitivity to child pain, pain-attending talk and level of distress; Goubert et al., 2008; Moon, Chambers, & McGrath, 2011) as well as differences in mothers’ and fathers’ responses (e.g., in parental pain ratings, level of sympathy and parental catastrophic thoughts; Goubert et al., 2008; Moon et al., 2008). Furthermore, it is plausible that contextual features as well as child and parental characteristics might differently impact mothers’ and fathers’ responses to child pain (Vervoort, Huguet, Verhoeven, & Crombez, 2011). Second, and more importantly, it
is as yet unclear when and why parents engage in different types of behavioural responses towards their child in pain. In accordance with the well-demonstrated role of affective-motivational processes in explaining responses to own pain, it is likely that an affective-motivational account of pain might also be valuable in explaining parental behaviour in response to child pain.

AN AFFECTIVE-MOTIVATIONAL INTERPERSONAL ACCOUNT OF PAIN

Based upon the evidence within the intrapersonal context of pain, it is likely that child pain elicits fear and distress in parents thereby motivating parent behaviour aimed at reducing, escaping and avoiding child pain (i.e., protective behaviour). Insight in motivation underlying parents’ behavioural strategies when confronted with child pain is essential for a thorough understanding of why parents engage in particular behaviour in response to child pain (Jensen, Nielsen, & Kerns, 2003). In particularly, as any behaviour, parental behaviour in response to child pain may be driven or motivated by multiple goals (Rasmussen, Wrosch, Scheier, & Carver, 2006). Goals can be defined as “internal representations of desired states, directing and energizing activities” (Austin & Vancouver, 1996, p. 338; Rasmussen et al., 2006, p. 1722). Motivational accounts hold the core assumptions that humans pursue multiple goals at one time. Consequently, goals cannot be considered in isolation and it is crucial to understand the interrelationship between different goals (Austin & Vancouver, 1996). Due to a hierarchical organization from abstract goals representing how people want to “be” (e.g., being a good parent) to more concrete goals reflecting things to “do” in order to accomplish the higher order goals (e.g., making time to play with my child), there are different means, or behaviours, to attain a specific goal (Rasmussen et al., 2006; Carver & Scheier, 2001). Moreover, one specific behavioural strategy can also contribute to attaining different higher-level goals (Carver & Scheier, 2001a; Rasmussen et al., 2006; Riediger & Freund, 2004). On the other hand, due to limited resources or incompatible goal attainment strategies, pursuing one goal can also interfere with or impair success in other goals (Riediger & Freund, 2004). In these cases priority has to be given to one of competing goals. The motivational strength or the importance of a goal plays a major role in selecting this principal goal. Goals are not equally important and the level of importance is not a static feature. Specifically, the importance of a specific goal can change and is influenced by multiple factors such as success expectancies, situational demands and individual characteristics (Austin & Vancouver, 1996; Carver & Scheier, 2001a; Karoly, 1993). Applied to the context of
pediatric pain it is reasonable to assume that child pain relief will probably be highly valued and prioritised above other competing goals by most parents, thereby motivating parental engagement in protective behaviour in response to child pain. Moreover, it is likely that these affective-motivational processes would be particularly prevalent in parents who endorse catastrophic thoughts (or a threatening interpretation) about their child’s pain (Leeuw et al., 2007; Vlaeyen & Linton, 2000). Specifically, in line with evidence within the intrapersonal pain context, parents who endorse catastrophic thoughts about child pain may experience child pain as highly distressing and engage more in protective responses motivated by a higher priority to pursue pain relief goals. However, this strong priority for pain relief goals might hinder the pursuit of other important child goals (e.g., engagement in daily activities such as school, social, …; Karoly & Ruehlman, 2007; Massey et al., 2009).

The available research addressing these affective-motivational processes within the interpersonal pain context is scarce, but some indirect evidence is available. In particular, preliminary research has indeed indicated that catastrophizing about the pain of a significant other, e.g. their child or spouse, is related to more feelings of distress in response to the other’s pain (Goubert et al., 2006; 2008; Cano, Leonard, & Franz, 2005). Moreover, evidence indicates that parental catastrophic thoughts about child pain are not only related to negative pain outcomes for the caregiver, but also for the child suffering from pain (Goubert et al., 2006; 2008). Specifically, in healthy school children as well as in children with chronic pain, heightened levels of pain intensity, somatic complaint and functional disability have been found in children of parents with a high level of catastrophic thoughts about their child’s pain (Goubert et al., 2006). Yet, it is unclear why this is the case. Accordingly, investigating the underlying processes that take place when catastrophizing parents are faced with pain in their child is important in understanding pain in children. Differences in behavioural strategies parents endorse in response to child pain and the underlying motivations presumably play an important role in explaining this negative impact of parental catastrophizing upon child functioning.

AIMS AND OUTLINE

This dissertation has four central research objectives. The first objective is to investigate the influence of parental catastrophic thoughts about child pain upon parental feelings of distress in response to child pain. As second objective, this dissertation aims at investigating the influence of parental catastrophic thoughts about child pain upon
parental protective behaviour, such as restricting the child’s pain-inducing activities and pain-attending behaviour (e.g., comforting the child and giving attention to the child’s pain). As a third objective we investigated whether parental feelings of distress mediate the relation between parental catastrophic thoughts and protective behaviour. The last objective concerns the examination of the impact of parental catastrophic thoughts upon parental goal priority when faced with their child in pain. All four research questions are of theoretical as well as clinical importance. In the context of pediatric pain, children highly depend upon their parents for help and care and how parents respond to this pain experience can also have an impact on how the child copes with the pain. Although several studies have indicated that parental protective behaviours are associated with more child disability, it is as yet unclear why and when parents engage in these protective responses. More insight in the influencing factors and underlying motivation of parental responses could be essential when trying to alter parental maladaptive behaviour in response to child pain.

This dissertation describes six studies each investigating a combination of these objectives in various samples and by means of different methodologies. Specifically, the objectives have been investigated in parents of healthy school children as well as in clinical samples, such as parents of a child suffering chronic pain and parents of a child diagnosed with leukemia who frequently undergo painful, invasive medical procedures. Furthermore, questionnaire and observational methods were used to investigate the hypothesis cross-sectionally as well as prospectively. Specifically, in Chapter 1, data are presented on two cross-sectional studies; one in a sample of school children and a second in a sample of children with chronic or recurrent pain. In both samples, parents observed their child performing a pain-inducing task. By means of questionnaires, we investigated the influence of parental catastrophizing upon their level of distress and tendency to stop their child in pain. The mediation of the relationship between parental catastrophizing and tendency to stop their child in pain by parental feelings of distress was also examined. Moreover, child facial pain expressions were coded in order to be able to control for the impact of variability in this child characteristic upon parental responses. Chapter 2 reports on a study investigating an observational in vivo pain paradigm to investigate observers’ psychophysiological emotional responses when anticipating pain in others. The application of this paradigm was first examined in a sample of students before implementation in parent-child dyads (i.e., chapter 3). Chapter 3 proceeds on the results of chapter 1 and used psychophysiological measures to assess parental distress and
observational indices to assess parental pain-attending behaviour in response to child pain. Furthermore, child facial pain expression was coded and pain-related threat was manipulated by means of providing parents either with neutral or threatening information about the pain stimulation. Thereby, we were able to examine whether pain-related threat (i.e., contextual threatening information provided to parents) and child facial pain expression moderates the influence of parental catastrophizing upon parental responses. In Chapter 4, the impact of parental catastrophic thoughts about child pain upon parental level of distress and pain-attending responses was investigated in a clinical context of children with leukemia. Specifically, the interactions between parent and child before and after painful lumbar punctures (LP) or bone marrow aspirations (BMA) were videotaped and coded. This allowed investigation whether parents who catastrophize about their child’s procedural pain report higher levels of distress and engage more in pain-attending behaviour during the pre- and post-procedure phase. Moreover, as in chapter 1, the mediational effect of parental feelings of distress in the relation between parental catastrophizing and pain-attending behaviour was assessed. Chapter 5 extends the results of chapter 4 by means of a prospective analysis of the relation between parental catastrophic thoughts about child procedural pain and parental level of distress and pain-attending behaviour. Specifically, in a subsample of the participants in chapter 4, we investigated the course of child and parental distress and associated parental pain-attending responses to repeated child LP/BMA procedures. Moreover, we examined whether the course of parental responses is influenced by parental catastrophic thoughts about child procedural pain and has an impact on child distress experiences during these invasive, medical procedures. The last chapter, Chapter 6, mainly focuses on the last objective by investigating whether parental catastrophic thoughts are related with a higher parental priority for pain-control goals over other important goals in the child’s life, such as encouraging participation of their child in daily activities. This chapter reports on the findings of a cross-sectional study in parents of healthy school children. By means of a vignette methodology, parents reported, in response to various pain situations, on imagined motivation for two competing strategies: pain control versus encouraging child activity engagement. We investigated the impact of mothers’ and fathers’ catastrophizing on their priority for pain control over activity engagement. Moreover, the moderating influence of situational pain characteristics, such as pain intensity and duration, was explored.
The dissertation closes with a **general discussion** that provides a summary and critical integration of the main findings resulting from the different studies described throughout chapter 1 to 6. This closing chapter also discusses theoretical and clinical implications and addresses limitations of our studies each pointing to new directions for future research.

**REFERENCES**


General introduction


General introduction


General introduction


General introduction


CHAPTER 1

PARENTAL CATASTROPHIZING ABOUT CHILD’S PAIN AND ITS RELATIONSHIP WITH ACTIVITY RESTRICTION: THE MEDIATING ROLE OF PARENTAL DISTRESS

ABSTRACT

Recent research has demonstrated that parental behaviours have an important impact upon child and adolescent pain outcomes. At present, however, we do not know which parents engage in particular behaviours and why. In two studies, the impact of parental catastrophizing about their child’s pain upon parental tendency to stop their child’s pain-inducing activity was investigated. Further, the mediating role of parental distress was explored. In study one, a sample of school children (N = 62; M = 12.48 years; SD = 1.72) took part in a cold-pressor task. In study two, a clinical sample of adolescents with chronic pain (N = 36; M = 15.68 years; SD = 1.85) performed a 2-min walking task designed as a pain-inducing activity. In both studies, the accompanying parent was asked to watch their child performing the pain task. Findings revealed, for both studies, that parents with a high level of catastrophic thinking about their child’s pain experienced more distress and a greater behavioural tendency of wanting to stop their child’s pain-inducing activity. Further, parental feelings of distress mediated the relationship between parental catastrophic thinking and parents’ tendency to restrict their child’s activity. The findings are discussed in light of an affective-motivational conceptualization of pain and pain behaviour.

INTRODUCTION

Pain functions to attract both our own attention (Crombez, Eccleston, Beayens, & Eelen, 1998; Eccleston & Crombez, 2007; Karoly & Reuhlman, 2007; Van Damme, Crombez, & Eccleston, 2004; Van Damme, Legrain, Vogt, & Crombez, 2010) and that of others’ (Chambers, 2003; Cohen, Vowles, & Eccleston, 2010; Eccleston, Crombez, Scotford, Clinch, & Connell, 2004; Jordan, Eccleston, & Osborn, 2007; Leonard & Cano, 2006; Palermo & Eccleston, 2009), whose responses may, in turn, influence sufferers’ pain (Hadjistavropoulos & Craig, 2002). This may be particularly salient in the context of pediatric pain, as children and adolescents are highly dependent on parental care. Moreover, accumulating evidence indicates that parental behaviours may profoundly influence their child’s pain experience (Blount, Devine, Cheng, Simons, & Hayutin, 2008; Chambers, Craig, & Bennet, 2002; Claar, Simons, & Logan, 2008; Connelly et al., 2010; Gauntlett-Gilbert & Eccleston, 2007; Janssens, Oldehinkel, & Rosmalen, 2009; Palermo & Eccleston, 2009; Peterson & Palermo, 2004; Simons, Claar, & Logan, 2008; Walker, Claar, & Garber, 2002; Walker et al., 2006). Because these parental reactions are not always adaptive, it is important to understand which parents engage in particular behaviours in reaction to their child in pain, why, and what the consequences might be.

An understanding of parental behaviour requires a conceptual framework, taking into account the diverse components of parental responses when confronted with their child in pain. A recently formulated model on empathy in the context of pain specifies distinct but related empathic reactions by parents on cognitive (e.g., estimation of child pain), emotional (e.g., distress), and behavioural (e.g., reassurance) levels (Goubert et al., 2005). This model also describes characteristics of the person in pain (e.g., child pain expressions) and characteristics of the observer (e.g., parental beliefs) as having an impact upon empathic responding by the observer. In the context of pediatric pain, preliminary evidence suggests that parental catastrophic thoughts about their child’s pain might be one important construct for understanding parental behaviours, in acute as well as in chronic pain (Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006; Goubert, Vervoort, Cano, & Crombez, 2009). Specifically, previous findings revealed that catastrophizing about their child’s pain is related to heightened pain estimations and stronger feelings of parental distress (or self-oriented emotions) (Goubert et al., 2006; Goubert, Vervoort, Sullivan, & Verhoeven, 2008; Guite, Logan, McCue, Sherry, & Rose, 2009). Further, evidence suggests that parental catastrophizing and feelings of distress are related to worse outcomes for their child, such as increased disability (Goubert et al.,
Parental catastrophizing, distress and activity restriction

2006; Guite et al., 2009), distress, and pain (Guite et al., 2009; Logan, Guite, Sherry, & Rose, 2006; Manimala, Blount, & Cohen, 2000; Palermo & Eccleston, 2009; Penner et al., 2008). In contrast, parental feelings of sympathy (or other-oriented emotions) in response to their child’s pain are associated with less distress and pain (Dix, Gershoff, Meunier, & Miller, 2004; Penner et al., 2008).

To date, it is unclear to what extent parental catastrophizing and associated increased distress translate into specific behavioural responses. Substantial research has indicated that the interruptive function of one’s own pain may become less adaptive when one catastrophizes about pain, particularly when pain has become chronic (Chambers, 2003; Crombez et al., 1998, Goubert et al., 2006; Guite et al., 2009; Karoly & Ruehlman, 2007; Leeuw et al., 2007; Van Damme, Crombez, & Eccleston, 2008; Van Slycke & Walker, 2006; Vlaeyen & Linton, 2000). In these circumstances, pain-related fear may lead to increased avoidance behaviour and thereby strongly interfere with daily functioning (Karoly & Reuhlman, 1996; Leeuw et al., 2007). It is plausible that comparable processes take place within an interpersonal context. In line with an affective-motivational perspective upon pain (Leeuw et al., 2007; Vlaeyen & Linton, 2000), we expect that parents who catastrophize about their child’s pain might primarily feel distressed and strongly engage in avoidance behaviour by restricting their child’s activity engagement.

Two observational studies are reported: one involving a sample of school children (study one) and a second involving a clinical sample of adolescents with chronic pain (study two). For both studies, we hypothesized that: (1) higher levels of parental catastrophizing would be associated with heightened parental distress and a greater parental tendency to stop their child’s pain-inducing activity (i.e., stop tendency), and that (2) the positive association between parental catastrophizing and stop tendency would be explained (i.e., mediated) by increased levels of parental distress. Finally, given the limited data on associations among parental sympathy feelings, catastrophizing and stop tendency, we explored the relationships among these constructs.
STUDY ONE

Method

Participants

The participants for study one were recruited from a large sample of school children and their parents (N = 660) who had participated in a questionnaire study approximately 1 year before the start of the present study (Vervoort et al., 2008). Only those children and parents who had previously given permission to be re-contacted, and who were not already contacted for another previous study (Vervoort et al., 2008a), were considered for participation (N = 343 dyads). Exclusion criteria for this study included: (1) the presence of recurrent or chronic pain (i.e., pain lasting for at least three months), (2) any developmental delay, or (3) the inability of both child and parent to speak and write Dutch. A power analysis indicated that a sample size of 60 participants was sufficient to detect a medium effect (d = .50) with power .80 using a α = .05 2-tailed. Therefore, only a subsample of the 343 dyads was contacted. A weighted random sampling procedure (Herzog, 1996) was used for the selection of participants. This random sampling procedure meant that participants were randomly selected with an equal distribution of gender and age. Ninety-one of the 343 parent-child dyads were contacted, of whom 64 children and parents agreed to participate (i.e., response rate of 70.33%). The main reasons given for non-participation were lack of time, heavy work demands, or having made other plans. Two children were excluded from data analyses because they withdrew their hand before the pain task ended (i.e., 3-minute cold-water task). The final sample consisted of 62 children (32 boys, 30 girls) and one of each of their parents (50 mothers and 12 fathers\(^2\)). The mean age of the children was 12.48 years (SD = 1.72, range = 9.25:15.5 years). Seven children (11.3%) were recruited from the fifth grade, nine (14.5%) from sixth grade, nine (14.5%) from seventh grade, 14 (22.6%) from eighth grade, 13 (21%) from ninth grade, and ten (16.1%) from 10th grade. The mean age of the parents was 42.90 years (SD = 4.33, range = 35:54 years). The majority of the parents (88.3%) were married or cohabiting. About half of the parents (52.5%) had a higher education (beyond the age of 18 years). Most parents were employed (96.60%); others worked in the home (2.55%) or were unemployed (0.85%). All children and parents were Caucasian. Ethical approval was obtained from the Ethics Committee of the Faculty of

\(^2\) The same sample was used for the purpose of another study (Vervoort, Goubert, & Crombez, 2009); however the analyses in this article are based on other data obtained in this same sample.
Parental catastrophizing, distress and activity restriction

Psychology and Educational Sciences of Ghent University, Belgium. A summary of the demographic characteristics can be found in Table 1.

Table 1
Demographic characteristics of study one.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>%</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age child (years)</td>
<td></td>
<td>12.48</td>
<td>1.72</td>
</tr>
<tr>
<td>Gender child (% Females)</td>
<td></td>
<td>48.39</td>
<td></td>
</tr>
<tr>
<td>Pain duration</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Age parents</td>
<td></td>
<td>42.90</td>
<td>4.33</td>
</tr>
<tr>
<td>Gender parents (% Mothers)</td>
<td></td>
<td>80.65</td>
<td></td>
</tr>
<tr>
<td>Higher education parents</td>
<td></td>
<td>52.50</td>
<td></td>
</tr>
</tbody>
</table>

Apparatus
A cold-pressor task (CPT) with a water temperature of 10°C (±1 °C) was used to induce pain in the children. This cold-pressor device has been shown to be suitable for inducing pain comparable to various naturally occurring acute pains in children (Trapanotto et al., 2008). The cold-pressor apparatus consisted of a commercially manufactured electronic cooler measuring 35 cm wide, 60 cm long, and 45 cm high. Children were instructed to lower their left hand through a round opening in the lid (12 cm x 12 cm), hold their hand just above the wrist in the cooled water and maintain this position for 3 minutes. The water in the tank was continuously circulated by a pump to prevent local warming. The cold-pressor apparatus was placed upon a trolley adjustable in height in order to be easily adaptable to the child’s height. For standardization purposes (i.e., comparable skin temperature), children were requested, prior to and after the CPT, to put their left hand in another tank filled with water maintained at 37 °C (±1 °C).

Measures
Child measures

Pain intensity. After the CPT, children were requested to provide a written report on how much pain they had experienced during the CPT. Children rated their pain by means of an 11-point numerical rating scale (NRS) from 0 (“no pain”) to 10 (“a lot of pain”).

Pain expression. The facial pain expression of the children during the CPT was recorded on videotape and coded by means of the Child Facial Coding System (CFCS) (Breau et al., 2001; Chambers, McGrath, Gilbert, & Craig, 1996; Gilbert et al., 1999). The CFCS is an observational rating system of 13 discrete facial actions (brow lowering,
Chapter 1

squint, eye squeeze, nose wrinkle, nasolabial furrow, cheek raiser, upper lip raise, lip corner pull, vertical mouth stretch, horizontal mouth stretch, blink, flared nostril, and open lips). Three of the 13 facial actions (blink, flared nostril, open lips) are coded on presence only; that is, absent (0) or present (1). The remaining ten facial expressions are coded on presence and intensity (0 = no action, 1 = slight action, 2 = distinct/maximal action). All 13 facial actions were coded for every second of the 3-min cold-pressor task by means of a user-friendly software program that was designed to easily view and review each second. One trained coder rated the facial expressions for all participants and a second trained coder independently coded a random sample of 20% of the videotapes in order to determine the inter-rater reliability. Reliability was calculated based on the formula given by Ekman and Friesen (Ekman & Friesen, 1978), which assesses the proportion of agreement on actions recorded by the two coders relative to the total number of actions coded as occurring by each coder. The inter-rater reliabilities were acceptable for overall frequency (.77, range = .64:.94) and for overall intensity (.70; range = .57:.94). A total score, ranging between 0 and 414, for the facial pain expression during the 3-min CPT was obtained by summing the scores of the 13 facial actions for every second.

Parent measures

Catastrophizing about the child’s pain. To assess the parents’ catastrophic thoughts about their child’s pain during the CPT, a state measure of the original Pain Catastrophizing Scale for Parents (PCS-P) was used (Goubert et al., 2006; Goubert et al., 2009). The PCS-P consists of 13 items describing different thoughts and feelings that parents may experience when their child is in pain. Three subscales can be distinguished: rumination, magnification, and helplessness. The PCS-P has been shown to be a reliable and valid instrument in a sample of parents of school children and parents of children with chronic pain (Goubert et al., 2006). In line with previous studies (e.g., Goubert et al., 2009), the state version of the PCS-P was composed of one adapted item from each subscale (PCS-P state; Rumination: “At this moment, to what extent do you keep thinking about how much pain your child will experience during the task?”; Magnification: “At this moment, to what extent do you think that, because of the pain, something serious might happen to your child?”; Helplessness: “At this moment, to what extent do you think, because of the pain of your child, you will not be able to endure the task?”). Prior to the child undergoing the CPT, parents were asked to rate the three items on an 11-point NRS with the endpoints 0 (“not at all”) and 10 (“a lot”). A mean score
of these three items was calculated ranging from 0 to 10. The Cronbach $\alpha$ for the PCS-P state was high (.73).

**Parental pain estimates.** After the cold-pressor task, parents were instructed to provide written ratings of how much pain they thought their child had experienced during the pain task. Parental pain estimates of their child’s pain were assessed using an 11-point NRS with the endpoints labelled “no pain” (0) and “a lot of pain” (10).

**Parental distress and sympathy.** After the cold-pressor task, parents were asked to rate to what extent they had experienced various emotions while watching their child performing the cold-pressor task. All emotional adjectives were rated on an 11-point scale ranging from “not at all” (0) to “extremely” (10). Based on the work of Batson, Fultz, and Schoenrade (1987), the list included four adjectives reflecting self-oriented emotional responses or distress (worried, upset, anxious, sad) and three adjectives reflecting other-oriented emotions or sympathy (understanding, compassionate, sympathizing). Mean parental distress scores and sympathy scores were calculated, yielding two scores ranging from 0 to 10. Higher scores on both scales are indicative of higher levels of parental distress, or sympathy, respectively. The use of emotional adjectives to measure parental emotions has been shown to be a reliable and valid method (Batson et al., 1987; Goubert et al., 2008). Reliability within the present study was also high ($\alpha = .78$ for distress and $\alpha = .91$ for sympathy).

**Parental stop tendency.** After completion of the cold-pressor task, parents were asked to report their tendency to stop their child from further engagement in the CPT (“How much did you want to stop your child from performing the task?”). The item was rated on an 11-point NRS ranging from 0 (“not at all”) to 10 (“a lot”). Higher scores indicated a higher protective tendency of parents to stop their child.

**Procedure**

Parents were contacted by telephone by a research assistant and informed about the study purpose and procedure following a standard script. Both the child and the primary caregiver (described as the person who spent the most time with the child and took care of most of the parental chores) were invited to participate. During this call, the exclusion criteria were addressed. When parents confirmed that their child did not meet any of the exclusion criteria and parent and child agreed to participate, an appointment at the laboratory at Ghent University was made and a letter confirming their appointment was sent home.
Upon arrival at the laboratory, one of two experimenters explained the procedure and the aim of the study in the test room. The cold-pressor apparatus was shown and participants were told that ‘‘... we were interested in how children and their parents think and feel when the child experiences pain.’’ Children were told that they must ‘‘... try to endure the cold-pressor task for 3 minutes.’’ Both parent and child were told that they ‘‘... could withdraw from participation at any time during the experiment for any reason.’’ Written informed parental consent and child assent was obtained.

After explaining the pain procedure, the second experimenter accompanied the parent to the adjacent room where the parent could observe their child. Children knew beforehand that their parent was going to observe them during the pain task. To avoid child reactivity towards parental behaviours, children could not see their parents during the CPT. A video camera, positioned in front of the child, recorded the child’s facial pain expression during the pain procedure and was connected to the television screen in the observation room. The parent was able to see their child’s face during the 3-min cold-pressor task and the 2 minutes of standardization.

Prior to taking part in the cold-pressor task, the child was asked to wash his/her hands and to remove jewellery or watches from the left arm/hand. The procedure, instructions, and reminder of the possibility to withdraw participation were briefly repeated to the child and parent separately. After these instructions the parent was asked to complete the PCS-P state. When the child was ready to begin with the task, the experimenter in the observation room turned the television screen on so the parent could observe their child.

A chronometer was used (1) to precisely time the length of the immersion in the warm and cold water and (2) to communicate to the child and parent the beginning and end of the warm-water phase (first and second beep), and the cold-water phase (third and fourth beep). The experimenter in the test room was seated on a chair behind the child in order to monitor the child’s engagement in the pain task but did not talk or make eye contact with the child during the standardization and CPT phase, to minimize uncontrolled audience effects. The same was true for the experimenter in the observation room, who was positioned on a chair next to the parent. After completion of the CPT, the TV screen was turned off and both parents and children were asked to report on the pain intensity the child had experienced during the CPT. Parents were also asked to complete the questionnaires assessing sympathy, distress, and their stop tendency. After completion
of the questionnaires, parent and child were reunited, debriefed about the purpose of the study, and remunerated 25€ for their participation.

**Data analysis**

Statistical analyses were performed with SPSS statistical software, version 15.0 for Windows (SPSS Inc., Chicago, IL). Descriptive statistics, correlation analyses, and hierarchical linear regression analyses were performed to test the hypotheses two-tailed.

To test for mediation, a distinction has to be made between various effects and their corresponding weights (Figure 1). The total effect of parental catastrophizing on parental stop tendency (weight c) consists of (1) a direct effect of parental catastrophizing on parental stop tendency (weight c’), and (2) an indirect effect of parental catastrophizing on parental stop tendency through a proposed mediator, that is, parental distress (weight ab). The effect of parental catastrophizing on parental distress is represented by weight a, whereas weight b is the effect of parental distress on parental stop tendency, partialling out the effect of parental catastrophizing (Roelofs, Huibers, Peeters, Arntz, & van Os, 2008). To assess this indirect effect, we used a bootstrapping method (i.e., a nonparametric resampling procedure with 5000 bootstrap resamples) following the procedure described by Preacher and Hayes (Goodin et al., 2009; Hayes, 2009; Preacher & Hayes, 2004; Roelofs et al., 2008). The choice for using bootstrapped confidence intervals to test the significance of the indirect effects was based on recent statistical research that suggested that bootstrapping is more appropriate than a normal-theory test (i.e., Sobel’s test) for studies with smaller sample sizes (Hayes, 2009; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Schrout & Bolger, 2002). Specifically, we estimated point-estimates and 90% bias-corrected (BC) bootstrapped confidence intervals. We selected the use of 90% confidence intervals because we had a specific direction in our hypothesis and by using 90% confidence intervals we narrowed down the confidence intervals to avoid type 2 errors. The percentage of the total effect that was mediated was also calculated (Holmbeck, 2002).
Results

**Descriptive statistics**

Mean scores, standard deviations, and correlations between the variables are shown in Table 2. Children reported a moderate level of pain during the CPT ($M = 4.11$, $SD = 2.44$), and parental estimates of their child’s pain ($M = 4.09$, $SD = 2.32$) were comparable with the ratings given by the child ($t(61) = 0.06$, $ns$). Parents reported a rather low level of anticipatory catastrophic thinking about the pain of their child of 2.21 ($SD = 1.48$). This is comparable with the score of the parents in the study of Goubert and colleagues (2009) ($t(113) = 0.10$, $ns$). The mean level of distress and sympathy experienced by parents was 1.49 ($SD = 1.59$) and 6.73 ($SD = 2.17$), respectively. The mean level of the tendency to stop their child during the CPT was 1.25 ($SD = 2.07$). Further, there were no significant correlations with the child’s age (all $r < .13$, $ns$), and independent sample t-tests showed there were also no significant differences between boys and girls on any of the measures included.
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Parental distress</td>
<td>62</td>
<td>1.50</td>
<td>1.59</td>
<td>0-8.25</td>
<td>.32*</td>
<td>.50**</td>
<td>.69**</td>
<td>.19</td>
<td>-.00</td>
</tr>
<tr>
<td>2</td>
<td>Parental sympathy</td>
<td>62</td>
<td>6.73</td>
<td>2.17</td>
<td>1-10</td>
<td>-</td>
<td>.10</td>
<td>.27*</td>
<td>-.01</td>
<td>-.13</td>
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<tr>
<td>3</td>
<td>PCS-P state</td>
<td>62</td>
<td>2.21</td>
<td>1.48</td>
<td>0-7</td>
<td>-</td>
<td>.40**</td>
<td>.08</td>
<td>.08</td>
<td>.29*</td>
</tr>
<tr>
<td>4</td>
<td>Parental stop tendency</td>
<td>62</td>
<td>1.25</td>
<td>2.07</td>
<td>0-10</td>
<td>-</td>
<td>.05</td>
<td>-.17</td>
<td>.22</td>
<td></td>
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<td>5</td>
<td>Child’s facial pain expression</td>
<td>62</td>
<td>24.45</td>
<td>28.20</td>
<td>2.41-193.68</td>
<td>-</td>
<td>.17</td>
<td>.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Child’s experienced pain – child report</td>
<td>62</td>
<td>4.11</td>
<td>2.44</td>
<td>0-9</td>
<td>-</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
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<td>7</td>
<td>Parental pain estimates</td>
<td>62</td>
<td>4.09</td>
<td>2.32</td>
<td>0-8</td>
<td>-</td>
<td></td>
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</tr>
</tbody>
</table>

*p < .05, **p < .01; PCS-P state = state version of Pain Catastrophizing Scale for Parents


**Correlations**

Of particular interest for the present study were the correlations between parental catastrophizing, distress, and stop tendency. An overview of the correlations can be found in Table 2. Correlation analyses indicated that higher levels of parental catastrophic thoughts were significantly positively correlated with parental feelings of distress and tendency to have stopped their child from further engagement in the CPT. The distress experienced by the parents and their stop tendency were also significantly positively correlated with each other. Parental feelings of sympathy were significantly positively correlated with parental feelings of distress, stop tendency, and estimates of their child’s pain. In addition, parental pain estimates were significantly positively related to parental catastrophizing, distress, and stop tendency. There were no significant correlations with the child’s facial pain expression.

**Regression analyses**

Three hierarchical linear regressions were conducted to investigate the contribution of parental catastrophic thoughts in explaining (1) parental distress, (2) sympathy, and (3) parental stop tendency as dependent variables. In each regression analysis, the child’s gender (boys coded as 0 and girls as 1) and age were entered in the first step to control for sociodemographic effects. The child’s facial pain expression score was entered in the second step. Based upon previous evidence showing an association between catastrophizing and heightened pain estimations (Goubert et al., 2009; Sullivan, Martel, Tripp, Savard, & Crombez, 2006), we controlled for parental pain estimates in the third step. In the final step, parental catastrophic thoughts were entered. Results of the regression analyses are presented in Table 3. The variance-inflation factors of all regression analyses were acceptable (range = 1.04:1.23), suggesting that there was no problem of multicollinearity.

*The relationship between parental catastrophizing and parental distress.*

Regression analyses indicated that there was no significant effect of the child’s gender, age, facial expression, and parental pain estimates. Of interest, parental anticipatory catastrophic thinking had a significant positive contribution ($\beta = .45$, $p < .001$), indicating that higher levels of catastrophizing contributed to higher levels of parental distress experienced during the pain of their child. Parental catastrophizing added 18% explained variance.

*The relationship between parental catastrophizing and parental sympathy.*

Regression analyses indicated that there was no significant effect of the child’s gender, age, facial expression, and parental catastrophic thoughts. Only parental pain
estimates had a significant contribution ($\beta = .48$, $p < .01$), indicating that higher estimates of their child’s pain contributed to higher levels of parental sympathy experienced during observation of their child’s pain. Parental pain estimates explained 20% of the variance.

The relationship between parental catastrophizing and parental stop tendency.

The regression analysis with parental stop tendency as a dependent variable indicated that the child’s age, gender, and facial expression, as well as parental pain estimates, had no significant contribution. However, parental catastrophic thinking had a significant positive contribution ($\beta = .37$, $p < .01$) and explained 12% of the total 17% variance; that is, the higher parental catastrophizing, the more they wanted to have stopped their child performing the cold-water task.

Mediation analyses

We further investigated the mediating role of parental distress in the relationship between catastrophic thinking of parents and parental stop tendency (Figure 1). Catastrophizing was positively and significantly associated with parental stop tendency ($c = 0.19$, $SE = 0.06$, $p < .01$) and feelings of distress ($a = 0.71$, $SE = 0.16$, $p < .001$). With respect to the effect of the mediator, analyses showed that parental feelings of distress were positively and significantly related to parental stop tendency ($b = 0.21$, $SE = 0.04$, $p < .001$). The indirect effect ($ab = 0.15$, $SE = 0.07$; i.e., simple mediation) was found to be significant as the BC bootstrapped confidence interval (90% BC CI = 0.07:0.30 with 5000 resamples) excluded zero. Additional support for this mediation emerged in the finding that the direct effect of catastrophizing on parental stop tendency was nonsignificant ($c' = 0.04$, $SE = 0.05$). Parental feelings of distress accounted for 83.33% of the relationship between parental catastrophizing and stop tendency. Bootstrap analyses for sympathy as a mediator were not significant, because zero was included in the confidence interval (90% BC CI = -0.01:0.03 with 5000 resamples).
Table 3
Hierarchical regression analysis explaining parental distress and stop tendency in study one. Standardized betas from the last step in the analyses are displayed.

<table>
<thead>
<tr>
<th>Criterion variable</th>
<th>Step</th>
<th>Predictor</th>
<th>Beta</th>
<th>ΔR²</th>
<th>Adj. R²</th>
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<td>-.01</td>
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<td>.08</td>
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<tr>
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<td>.18**</td>
<td>.26</td>
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<td>.00</td>
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<td></td>
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<td>.20**</td>
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<td>Gender</td>
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<td></td>
<td>4</td>
<td>PCS-P state</td>
<td>.37**</td>
<td>.13**</td>
<td>.10</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01, *** p < .001; PCS-P state = state version of Pain Catastrophizing Scale for Parents

Discussion
In study one, the relationships between parental catastrophizing, distress, sympathy, and tendency to restrict their child’s activity engagement were investigated in a sample of school children and their parents. In line with our expectations, the findings revealed that parents who catastrophized more about the pain their child could experience during the experimental task reported higher distress and also a higher tendency to stop their child’s performing the pain-inducing task, as compared to low-catastrophizing parents. Further, parental feelings of distress were a significant mediator of the relationship between parental catastrophizing and parental stop tendency, indicating that parents who highly catastrophize about the child’s experimental pain have a tendency to
stop their child’s pain activity because they feel highly distressed. Parental
catastrophizing was not related to parental feelings of sympathy.

These results, however, need to be interpreted with caution because the pain
procedure did not elicit high levels of parental catastrophizing, distress, and stop
tendency. This may limit the generalisation of the results to real-life situations, potentially
eliciting more catastrophic thoughts and distress. In addition, as the results of study one
may not generalize to samples other than school children, we decided to execute a second
study in a clinical sample of adolescents with chronic pain to further explore the role of
parental pain catastrophizing in understanding parental emotional and behavioural
reaction when faced with their child’s chronic pain. Moreover, we improved our measure
of parental stop tendency. Instead of relying on parental self-report after the pain
experience, which may be biased by their memory of the experience, we measured actual
parental stop behaviour in study two.

STUDY TWO

Methods

Participants

Adolescents suffering from chronic pain were recruited from an outpatient UK
multidisciplinary Pain Management Clinic. To be eligible for participation, adolescents
had to (1) be able to complete a 2-min walk task (2MWT) alone and unassisted, and (2)
be free from any significant comorbid psychiatric disorder that is contra-indicated for a
Cognitive-Behavioural Therapy (CBT) approach (e.g., psychosis). Psychological distress
associated with chronic pain (e.g., anxiety, depression) or common features of
adolescence (e.g., mild body dysmorphobia) were not exclusion criteria. In addition,
adolescents and parents had to be able to speak and write English. All adolescents were
accompanied by a parent or an adult primary caregiver who adopted the parenting role.

Of the 42 pairs of adolescents and their primary caregiver who were approached, 39
agreed to participate, for a response rate of 92.86%\(^3\). The main reason for non-
participation was reluctance towards videotaping the pain task. Of those who agreed to
participate, one adolescent failed to complete the 2MWT and two parents later withdrew
their participation, as they did not want to see their child in distress. This resulted in a
final sample of 36 adolescents (9 boys, 27 girls) and 36 parents (32 mothers, 4 fathers).

\(^3\) The same sample was recruited for the purpose of another study (Vervoort et al., 2009a);
however the analyses in this article are based on data from this sample that were not previously
reported.
The mean age of the children was 15.68 years ($SD = 1.85$, age range = 10.92:19.08 years), which was significantly older than the sample of school children in study one ($t(96) = -8.64$, $p < .001$, mean difference = -3.20 years). Based on an adolescent chronic pain classification scheme (Malleson & Clinch, 2003), the participating adolescents suffered from hypermobility (25%), chronic back pain (17.9%), reflex sympathetic dystrophy (21.4%), or chronic abdominal pains (14.3%). The mean duration of the pain was 46.61 months ($SD = 39.92$ months, range = 5:157 months). Most of the children were not attending school full time (65.7%).

The mean age of the parents was 45.15 years ($SD = 6.00$, range = 35:59 years). The majority of the parents (83.3%) were married. Approximately one-fifth of the parents had a higher education (beyond the age of 18 years). More than half of the parents were employed at the moment of the study (62.9%). Others worked in the home (28.6%), were full-time caregivers (5.7%), or were unemployed (2.9%). Most of the children and parents were Caucasian (97.1%). A summary of the demographic characteristics can be found in Table 4.

### Table 4
Demographic characteristics of study two.

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
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<tr>
<td>Age child (years)</td>
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<td>1.85</td>
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</tr>
<tr>
<td>Gender child (% Females)</td>
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<td></td>
<td></td>
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<td>Pain duration</td>
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<td>39.92</td>
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<tr>
<td>Age parents</td>
<td>45.15</td>
<td>6.00</td>
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<td>Gender parents (% Mothers)</td>
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</tr>
<tr>
<td>Higher education parents</td>
<td>17.10</td>
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</tr>
</tbody>
</table>

**Pain task**

Adolescents were asked to perform a 2MWT. Walking is a daily task that requires movement that is sufficient to increase pain and elicit pain behaviour in chronic pain adolescents (Prkachin, Schultz, Berkowitz, Hughes, & Hunt, 2002). The 2MWT is suitable for measuring functional exercise capacity (Taqi et al., 2006) and allows examination of the adolescent’s engagement in a variety of pain behaviours. The 2MWT implied that adolescents were requested to walk as fast as possible from one marker to a second marker and back for a period of 2 minutes. The markers were placed on the floor, 10 metres away from each other.
Measures

Adolescents’ measures.

Pain intensity. Pain intensity during the 2MWT was assessed using the same 11-point NRS as in study one. In addition, adolescents in this study were also instructed to complete this scale prior to performing the 2MWT (i.e., “What is your current level of pain?”), which was regarded as the child’s baseline pain level.

Pain behaviour. To be able to code the level of pain behaviour afterwards, the performance of the adolescent was videotaped. A video camera was positioned at a standardized point behind the second floor marker and afforded a view of the entire face and body of the adolescent. It was not possible to make fine-grained codings in this set-up, so we could not use the CFCS as in study one. Therefore, only the key facial pain expressions, as identified in the CFCS (Chambers et al., 1996; Gilbert et al., 1999), were coded. The core facial pain grimace is characterized by the lowering of the brow, wrinkling of the nose, raising of the cheeks, raising of the upper lips, and closing or narrowing of the eyelids (Prkachin & Craig, 1995). The facial pain grimace was coded as slightly (1) or distinctly (2) present if one of these specific facial movements was detected. To control for the difference in distance the adolescents walked, the total score on facial pain expression (summation of all codes), was divided by the number of segments coded (i.e., the number of times the adolescent walked the 10 m distance with his/her face to the camera), resulting in a score ranging from 0 to 2. To determine inter-rater reliability (Ekman & Friesen, 1978), a single trained coder rated pain behaviour for all participants and a second trained coder rated a random sample of 20% of the participants. According to the formula given by Ekman & Friesen (1978), high inter-rater reliability was achieved for pain expression in the current study ($\alpha = .77$).

Parent measures.

Catastrophizing about the child’s pain. Prior to watching the video, parental catastrophic thinking was assessed by means of a similar state measure as used in study one but now adapted for specific use in the context of the 2MWT (PCS-P, Goubert et al., 2006; 2009). The reliability of this state PSC-P was good ($\alpha = .71$).

Parental pain estimates. After watching the videotape of the 2MWT, parents were instructed to give written ratings on how much pain they thought their child had experienced during the pain task by means of an 11-point NRS identical to the scale used in study one.

Parental distress and sympathy. After parents had watched the videotaped 2MWT of their child, parents were asked to rate to what extent they had experienced
seven proposed emotions (i.e., the same emotional adjectives as in study one) while watching their child performing the 2MWT on an 8-point scale ranging from “not at all” (0) to “extremely” (7). As in study one, a mean score for distress and sympathy was calculated ranging from zero to seven for both, with higher scores indicating higher levels of parental distress or sympathy. The Cronbach $\alpha$ for these adjectives in this study was high ($\alpha = .88$ for distress and $.91$ for sympathy).

**Parental stop tendency.** To measure parental protective tendency, the parents were instructed to stop the videotape at the first time they would have wanted to tell their child to stop the 2MWT. When parents indicated that they wanted to stop their child, the videotape was stopped, that is, parents did not view the remaining time of the 2MWT. The time that parents watched the video was subtracted from 120 (i.e., the normal time of the videotape was 120 seconds) to compute a new variable, “stop tendency,” with higher scores (i.e., shorter times watching the tape) indicating higher levels of stop tendency.

**Procedure**

Adolescents and parents who entered the pain management program at the Pain Management Clinic at Bath, United Kingdom, were informed about the study and asked to participate approximately one week before the start of their program. The day they arrived at the clinic, an investigator or physiotherapist approached and provided them with an information sheet as a part of the standard assessment. During this standard assessment, a consultation with a pediatric rheumatologist and a clinical psychologist, exclusion criteria were determined by means of history-taking and clinical interview. Parents were informed about the aim of the study (i.e., investigating the impact of the adolescent’s pain upon the experience of parents) and reassured that non-participation would have no influence on their treatment. Both adolescents and parents were also informed that the accompanying parent or primary caregiver would be asked to watch the videotape of the adolescent performing the 2MWT.

When adolescents and parents wished to participate, a written informed consent was obtained from the adolescent as well as from the parent. Performing the 2MWT and completing a battery of self-report questionnaires before entering the program is part of the standard assessment procedure. Videotaping the 2MWT was done only for adolescents participating in the study. Before performing the 2MWT, adolescents were requested to rate their current level of pain and were instructed to walk as fast as possible from one marker on the floor to the other marker 10 metres away. During the 2MWT, the adolescents were given standard instructions to facilitate them to complete the task to
Parental catastrophizing, distress and activity restriction

their maximum capability (at 30 seconds: ‘‘as fast as you can,’’ at 1 minute: ‘‘1 minute
gone, 1 minute to go,’’ at 1 minute 30 seconds: ‘‘only 30 seconds left,’’ and at 2 minutes:
‘‘stop, well done’’). Adolescents were given only minimal information about the pain
behaviours being coded in order to reduce the reactivity of pain behaviour observation.
After the completion of the 2MWT, adolescents were instructed to rate their level of pain
experienced while performing the task.

Shortly after the adolescent had performed the 2MWT, the parent was asked to
watch, in a separate room, the videotape of their child performing the 2MWT. Parents
were also instructed to complete several questions both before (PCS-P) and after (pain
estimation and emotional adjectives) watching the videotape.

Results

Descriptive statistics

Mean scores, standard deviations and correlations between the variables are
shown in Table 5. The mean distance walked by the adolescents was 112.14 metres
($SD = 53.66$, range = 10:200), which was lower in comparison with the performance of
healthy children and adolescents (Geiger et al., 2007). Adolescents reported a significant
increase in pain during the 2MWT ($t(35) = -4.74, p < .001$) in comparison with their pain
reported before the task ($M = 6.72, SD = 1.86$, range = 3:10). The level of pain
adolescents reported during the task was significantly higher than the pain reported by the
school children in study one, who performed the CPT ($t(96) = -7.21, p < .001$). Parent
estimates of their child’s pain during the 2MWT were significantly lower in comparison
with the ratings given by the adolescents ($t(34) = 3.77, p < .001$). The mean level of
parental catastrophic thinking about the pain of their child was 1.92 ($SD = 2.00$). This
level of catastrophizing is comparable with levels of parental catastrophizing obtained in
study one, where parents observed their child performing a CPT ($t(96) = 0.83, ns$) and
with levels of parental catastrophizing in a study of Goubert
and colleagues (2009; $t(87) = -0.65, ns$), where parents viewed their child performing a pressure pain test. The
mean level of distress experienced by parents was 2.28 ($SD = 1.95$). This score is
significantly higher in comparison with study one ($t(96) = -3.99, p < .001$). The mean
level of sympathy experienced by the parents was 3.77 ($SD = 2.23$), which is significantly
lower than the level of sympathy experienced by the parents in study one ($t(96) = 2.48,
$p < .05$). The mean level of stop tendency of the parents was 23.58 ($SD = 36.92$). In
addition, the adolescent’s age was not significantly correlated with any of the measures
(all $r < .22, ns$). Independent sample t tests indicated no significant differences between
boys and girls, except for parental pain estimates \((t(60) = -2.00, p = .05)\), which were significantly higher for girls \((M = 4.68, SD = 2.03)\) than for boys \((M = 3.53, SD = 2.46)\).

**Correlations**

Of interest for the present study are the correlations between parental catastrophizing, distress, and parental tendency to stop their child (Table 5). Correlation analyses indicated that parental catastrophizing about their child’s pain was significantly correlated with parental distress and stop tendency. Specifically, findings indicated that parents with higher levels of catastrophic thoughts experienced higher levels of distress and demonstrated a greater tendency to stop their child in performing the 2MWT. The distress experienced by the parents and stop tendency were also significantly and positively correlated, indicating that parents who experienced higher levels of distress while watching the videotape of their child reported a greater tendency to stop their child in their performance of the 2MWT. Parental feelings of sympathy showed a positive correlation with parental feelings of distress, catastrophic thoughts, stop tendency, and pain estimates. Parental pain estimates showed a significant positive correlation with parental feelings of distress and reported pain by the child.

**Regression analyses**

A series of regression analyses, similar to study one, were performed to investigate the contribution of parental catastrophic thinking about their child’s pain in explaining (1) parental distress, (2) parental sympathy, and (3) parental stop tendency. Specifically, in each analysis, the adolescent’s gender (coded as 0 = boys and 1 = girls) and age were entered in the first step to control for possible sociodemographic effects. In the second step of the analysis, “pain duration” was entered to control for the time the adolescent was suffering from chronic pain. To control for the amount of pain the adolescent expressed during the 2MWT, the facial pain expression of the adolescent was entered in the third step. Parental estimates of their child’s pain were entered in the fourth step. In the final step, parental catastrophizing about their child’s pain was entered. Results of these regression analyses are presented in Table 6. The variance-inflation factors of all the analyses were acceptable (range = 1.16:1.35), suggesting that there was no problem of multicollinearity.

*The relationship between parental catastrophizing and parental distress.*

The regression analysis indicated that there was no significant effect of gender, age, pain duration, and facial expression of the adolescent. An interesting finding was the significant contribution of parental catastrophic thoughts \((\beta = .43, p < .01);\) adding 16%
explained variance) and parental pain estimates ($\beta = .42; p < .05$, accounting for 27% explained variance), indicating that higher levels of parental catastrophizing and pain estimations contributed to higher levels of parental distress.

*The relationship between parental catastrophizing and parental sympathy.*

The analysis indicated that there was no significant effect of adolescent’s gender, age, pain duration, facial expression, or parental catastrophic thoughts. Only the contribution of parental pain estimates was significant ($\beta = .73, p < .001$), indicating that higher estimates of their child’s pain were related to higher levels of parental sympathy. Parental pain estimates explained 54% of the variance.

*The relationship between parental catastrophizing and parental stop tendency.*

In the regression analysis with parental stop tendency as dependent variable, the age, gender, pain duration, facial expression of the adolescent, and parental pain estimates did not contribute significantly in explaining the tendency of parents to stop their child. Parental catastrophic thoughts had a significant positive contribution ($\beta = .46, p < .05$): parents with more catastrophic thoughts showed a higher tendency to stop their child. Parental catastrophic thoughts added 18% explained variance.

*Mediation analyses*

As in study one, we also investigated the mediating role of parental feelings of distress in the relationship between parental catastrophic thinking and stop tendency (Figure 1). Similar results to those in study one were found: (1) catastrophizing showed a positive and significant association with parental stop tendency ($c = 2.73, SE = 0.94, p < .01$) and distress feelings ($a = 0.70, SE = 0.19, p < .001$), (2) parental feelings of distress showed a positive trend with parental stop tendency ($b = 1.58, SE = 0.83, p = .07$), and (3) the indirect effect ($ab = 1.11, SE = 0.89$; i.e., simple mediation) was found to be significant as the BC bootstrapped confidence interval (90% BC CI = .12:3.01 with 5000 resamples) excluded zero. In addition to supporting this mediation, the direct effect of catastrophizing on parental stop tendency was found to be nonsignificant ($c' = 1.62, SE = 1.08$). Parental feelings of distress accounted for 40.81% of the relation between catastrophizing and stop tendency. Bootstrap analyses for sympathy as mediator were not significant, as zero was included in the confidence interval (90% BC CI = -.08:1.94 with 5000 resamples).
Table 5
Means (M), Standard deviations (SD) and Pearson correlation coefficients for all parent measures in study two.

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<th>M</th>
<th>SD</th>
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<th>7</th>
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<td>.48**</td>
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<td>-.26</td>
<td>.06</td>
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<td>2.23</td>
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<td>-</td>
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<td>.43**</td>
<td>.14</td>
<td>-.22</td>
<td>.27</td>
</tr>
<tr>
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<td>PCS-P state</td>
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<td>-</td>
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<td>.08</td>
<td>.08</td>
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<td>-</td>
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<td>-</td>
<td>.54**</td>
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</table>

**p < .01; PCS-P state = state version of Pain Catastrophizing Scale for Parents
Table 6
Hierarchical regression analysis explaining parental distress and stop tendency in Study two. Standardized betas from the last step in the analyses are displayed.

<table>
<thead>
<tr>
<th>Criterion variable</th>
<th>S</th>
<th>Predictor</th>
<th>Beta</th>
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<th>Adj. R²</th>
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<td>Pain duration</td>
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<td>0.05</td>
<td>-0.02</td>
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<td>Child’s facial pain expression</td>
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<td>Parental pain estimates</td>
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<td>0.27**</td>
<td>0.22</td>
</tr>
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<td>PCS-P state</td>
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<td>0.01</td>
<td>-0.05</td>
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<tr>
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<td>2</td>
<td>Pain duration</td>
<td>0.04</td>
<td>0.04</td>
<td>-0.04</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Child’s facial pain expression</td>
<td>-0.01</td>
<td>0.01</td>
<td>-0.07</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Parental pain estimates</td>
<td>0.73***</td>
<td>0.54***</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>PCS-P state</td>
<td>0.21</td>
<td>0.04</td>
<td>0.56</td>
</tr>
<tr>
<td>Parental stop tendency</td>
<td>1</td>
<td>Child’s age</td>
<td>0.04</td>
<td>0.03</td>
<td>-0.03</td>
</tr>
<tr>
<td></td>
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<td>Child’s gender</td>
<td>-0.27</td>
<td></td>
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<tr>
<td></td>
<td>2</td>
<td>Pain duration</td>
<td>-0.08</td>
<td>0.01</td>
<td>-0.05</td>
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<tr>
<td></td>
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<td>Child’s facial pain expression</td>
<td>-0.02</td>
<td>0.00</td>
<td>-0.08</td>
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<tr>
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<td>Parental pain estimates</td>
<td>0.14</td>
<td>0.07</td>
<td>-0.04</td>
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<tr>
<td></td>
<td>5</td>
<td>PCS-P state</td>
<td>0.46*</td>
<td>0.18*</td>
<td>0.14</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01, ***p < .001; PCS-P state = state version of Pain Catastrophizing Scale for Parents
Discussion

In comparison with study one, parents of adolescents with chronic pain reported similar levels of catastrophizing about their child’s experimental pain, but experienced more distress and less feelings of sympathy when observing their child in pain. In addition, the adolescents of study two were significantly older than the school children who participated in study one. Despite these differences, the pattern of results was similar to study one: parental catastrophic thoughts about their child’s pain during the experimental task contributed significantly and positively to their experienced level of distress and tendency to stop their child’s pain-inducing activity. Parental feelings of distress also mediated the relationship between catastrophic thoughts and the tendency to stop their child performing the pain task.

GENERAL DISCUSSION

The pattern of results was comparable for both studies and can be readily summarized. First, parental catastrophic thoughts about their child’s pain during the pain tasks contributed to heightened feelings of parental distress, but not to heightened feelings of sympathy. Second, parental catastrophic thoughts were associated with a higher tendency of parents to stop their child performing the pain-inducing activity. Third, parental feelings of distress mediated the relationship between catastrophic thoughts and parental stop tendency. There was no mediating role for parental feelings of sympathy. Moreover, in both studies, child pain behaviour was not related to parental emotional and behavioural reactions towards their child in pain.

The present findings are consistent with previous research in samples of parents of school children (Goubert et al, 2006; 2008), parents of adolescents with chronic pain (Goubert et al, 2006), and couples (Cano, Leonard, & Franz, 2005; Leonard & Cano, 2006) that show positive associations between catastrophizing about their child or partner’s pain and observer’s feelings of distress. Moreover, the current findings extend the earlier results in several ways. In particular, and to the best of our knowledge, this is the first study that investigated how catastrophic thoughts translate into parental behavioural response tendencies (i.e., heightened tendency to restrict their child’s activity engagement) and which factors influence this relationship (i.e., mediation by heightened levels of parental distress).

The findings of the present study might be interpreted in light of an affective-motivational perspective. Pain has been conceptualized as an urge to escape (Eccleston &
Parental catastrophizing, distress and activity restriction

Crombez, 2007), particularly when pain is perceived as highly threatening (Leeuw et al., 2007; Vlaeyen & Linton, 2000). The present findings suggest that similar processes might be at play in an interpersonal context of pain. In particular, the more threatening parents perceived their child’s experimental pain, the higher their tendency to stop their child’s pain-inducing activity. As previous research suggested that parental activity-restricting behaviours are related to higher distress, somatic complaints, and functional disability in children and adolescents (Chambers et al., 2002; Claar et al., 2008; Connelly et al., 2010; Guite et al., 2009; Janssens et al., 2009; Logan et al., 2006; Palermo & Eccleston, 2009; Peterson & Palermo, 2004; Simons et al. 2008; Walker et al., 2002; 2006), the current findings may have important clinical implications in that they suggest that particularly high-catastrophizing parents might be most likely to engage in behaviours that restrict child activity engagement. Importantly, this response may have adaptive value, as it may protect the child from further harm or pain. However, in chronic pediatric pain, longstanding avoidance of daily activities (e.g., going to school or playing with friends) may contribute to increased disability and maintain or exacerbate the pain problem (Chambers, 2003; Eccleston & Crombez, 1999; Goubert et al., 2006; Guite et al., 2009; Leeuw et al., 2007; Van Slyke & Walker, 2006; Vlaeyen & Linton, 2000).

An affective-motivational understanding of the present findings could be further elaborated with previous research on empathic emotional responses in the context of helping behaviour, which may also provide important pathways for future research. Specifically, it has been shown that feelings of distress towards another person are related to an egotistic or self-oriented motivation of helping the other person in order to reduce their own level of distress. Feelings of sympathy on the other hand are associated with an altruistic or other-oriented motivation, that is, the behavioural tendency to help another person by concern for the other (Batson et al., 1987; Cialdini et al., 1987; Davis, 1983). Furthermore, Yamada & Decety (2009) found that when one observes another in pain, a threat-detection system is automatically initiated; signalling a potential threat in the environment, thereby activating self-orientated emotions and escape tendencies (Yamada & Decety, 2009). An empathy-sharing response is not immediately observed. This suggests that feelings of distress and associated escape and avoidance tendencies may be automatically activated when perceiving someone else in pain, and that feelings of sympathy occur only in a second phase, after adequate regulation of distress (Goubert, Vervoort, & Crombez, 2009a; Yamada & Decety, 2009). In the context of pediatric pain, parental feelings of distress seem to be related to more pain and distress in children and
adolescents; feelings of sympathy have been found to be related to more supportive parenting and better child outcomes (Dix et al., 2004; Logan et al., 2006; Palermo & Eccleston, 2009; Penner et al., 2008). Based on our finding that parental distress and not parental feelings of sympathy mediated the relation between parental catastrophizing about their child’s pain during the task and parents’ tendency to restrict child activity engagement, it is reasonable to assume that parents with catastrophic thoughts have a preference for limiting their child’s pain-inducing activity primarily because it functions as a way to reduce their own feelings of distress. Accordingly, parental activity-restricting tendencies might be considered as a strategy to reduce or escape the distressing experience (i.e., their child’s pain). This would imply that those parents can be taught strategies to regulate their distress when faced with their child in pain in order to allow feelings of sympathy and adaptive helping behaviours (Goubert et al., 2009a; 2008; Van Ryswyk, 2009). This could be particularly important in the context of chronic pain, as we found that parents of adolescents with chronic pain (i.e., parents of study two) experienced more distress than parents of school children (i.e., parents of study one). However, future studies are needed to assess parental motivation (i.e., altruistic or egoistic) to engage in avoidance behaviour by restricting the child’s activity engagement. In addition, as both studies involved a controlled experimental task within a safe experimental context, generalisation of these results to uncontrolled real-time situations may be limited.

A number of limitations to these studies need to be considered, each of which point to new directions for research. First, because the sample size was small in both studies, especially in study two, only large effects could be detected. Also, the pain procedures did not provoke high levels of parental catastrophizing, distress, and stop tendency, which may limit generalisation of the results. Replication of these findings with larger samples and in other settings is necessary. Second, the present findings were based on cross-sectional data, hence, do not indicate causal effects. Longitudinal studies are needed to investigate the direction of the relation between catastrophizing and distress. Third, some of the small differences between studies one and two may be due to differences in the pain induction task as well as the use of a different measure for parental stop tendency. Moreover, in study two, more girls participated, parents were less educated, and the adolescents were significantly older than the participants in study one. In spite of these differences, the results were largely consistent, attesting to the robustness of the findings. Fourth, mothers’ responses may differ from those of fathers (Goubert et
Parental catastrophizing, distress and activity restriction

al., 2008; Moon et al., 2008). Because the majority of participating parents were mothers, the present studies did not allow investigation of mother-father differences and results are limited to maternal responses. Further studies are needed to investigate whether similar patterns are true for fathers. Fifth, we used a state measure of catastrophizing assessing parental catastrophic thoughts related to the experimental situation. Although a recent study showed that state measures of catastrophizing might be more accurate and relevant than dispositional measures (Campbell et al., 2010), generalisation to other pain situations is limited. Nevertheless, as our results are comparable with findings from previous studies investigating catastrophic thoughts about their child’s pain in general (Goubert et al., 2006; 2008), it is reasonable to assume that our state measure of catastrophizing might reflect a more general trait of parents to catastrophize about their child’s pain. Sixth, only action tendencies were measured and not actual behaviours. Accordingly, other methods might be useful, including observational designs (Blount et al., 1997) and ecological momentary assessment (Connelly et al., 2010) to gain further insight into actual parental responses towards their child’s pain. Finally, the observed relationships between parental catastrophizing, distress, and stop tendency might have been affected by moderating variables (e.g., parental history of pain, characteristics of the parent-child relationship; Palermo & Chambers, 2005; Terre & Ghiselli, 1997) not assessed in the present studies. For example, the relationship between catastrophizing, distress, and stop tendency might be particularly strong in parents who are in general overprotective towards their child (Drotar, 1997; Janssens et al., 2009; Logan & Scharff, 2005; Logan et al., 2006) and in parents with a history of chronic pain (Chambers, 2003; Schanberg, Keefe, Lefebvre, Kredich, & Gil, 1998).

Furthermore, motivational theories can help direct further investigation of understanding parental behaviour towards their child in pain. Protecting their child from further harm or pain by restricting the child’s activity engagement might be only one of multiple goals parents have when faced with their child in pain. In fact, motivational theories (Rasmussen, Wrosch, Scheier, & Carver, 2006; Riediger & Freund, 2004; Van Damme et al., 2008; Van Damme, Crombez, Goubert, & Eccleston, 2009) suggest that individuals pursue multiple, potentially conflicting, goals. In the context of chronic pain, it is assumed that disengaging from unattainable pain-relief goals in order to engage in other attainable life-goals, despite the pain, is associated with better well-being (Karoly & Reuhlman, 2007; Massey, Garnefski, & Gebhardt, 2009; McCracken, Gauntlett-Gilbert, & Eccleston, 2009; McCracken, Vowles, & Eccleton, 2004; Rasmussen et al., 2006;
Viane et al., 2006). Attentional processes might be particularly important in understanding the regulation of these multiple goals. Specifically, previous research has shown that when trying to control pain becomes the most important goal, attention to events relevant for this pain-related goal may hinder the pursuit of other important goals (Van Damme et al., 2010; Vogt, De Houwer, Moors, Van Damme, & Crombez, 2010). However, to our knowledge, no studies have investigated the regulation of multiple goals in an interpersonal context. When confronted with their child in pain, parents might be confronted with two types of goals: on the one hand, goals aimed at controlling or avoiding the child’s pain; and on the other, goals related to other domains of the child’s functioning (e.g., social or academic development). It is plausible that effective parenting in the context of pain might be dependent upon successful regulation of these possibly conflicting goals. In future studies, it would be interesting to investigate the influence of parental catastrophic thinking about their child’s pain on their conflicting goals when facing their child in pain, as we could assume that this goal conflict may be especially salient for catastrophizing parents (Karoly & Ruehlman, 1996).

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REFERENCES


Parental catastrophizing, distress and activity restriction


Parental catastrophizing, distress and activity restriction


ABSTRACT

Limited evidence is available about factors influencing observers’ anticipatory emotional responses to another’s pain. We investigated fear and distress towards the threat of pain in others, and the moderating role of observers’ psychopathic traits and catastrophizing about own or other’s pain. Thirty-six dyads of healthy participants were randomly assigned to either the role of observer or observed participant. Both participants were instructed that one coloured slide (blue or yellow) signalled that a pain stimulus could possibly be delivered to the observed participant (= pain signal), whereas no pain stimulus would be delivered when a differently coloured slide was presented (= safety signal). Observers’ self-reported fear, fear-potentiated startle and corrugator EMG activity during pain and safety signals were measured. Furthermore, observers rated the presence of pain after each trial allowing assessment of observers’ perceptual sensitivity to other’s pain. Results indicated that self-reported fear, fear-potentiated startle and corrugator EMG activity were augmented during pain signals compared to safety signals. Moreover, these negative emotional responses were heightened in observers highly catastrophizing about other’s pain, but reduced in observers with heightened psychopathic traits. Psychopathic traits were also related with a diminished perceptual sensitivity to other’s pain. The results are discussed in light of affective-motivational perspectives on pain.

INTRODUCTION

Pain is an alarm signal of bodily harm, and elicits defensive or protective reactions (Auvray, Myin, & Spence, 2010; Chapman, 2005; Eccleston & Crombez, 1999; Sokolov, 1963). Through first-hand experiences, we learn to predict pain, and these signals for pain may in themselves become a source of fear and action (Auvray et al., 2010; Bradley, Silakowski, & Lang, 2008; Eccleston & Crombez, 1999; Van Damme, Crombez, Eccleston, & Koster, 2006). However, pain is rarely a private event as the sufferer’s reactions to pain have the capacity to communicate pain to others (Hadjistavropoulos et al., 2011). According to the communications model of pain, pain may have a profound influence on both the observer and pain sufferer (Hadjistavropoulos et al., 2011). Specifically, learning about pain may also occur indirectly by observing when others experience pain (Craig, 1986; Goubert, Vlaeyen, Crombez, & Craig, 2011; Hermann, 2007; Olsson & Phelps, 2007). This form of learning, also called vicarious conditioning, may change our behaviour when we will be in a similar situation (Craig, 1986; Craig & Lowery, 1969; Craig & Prkachin, 1978; Craig & Wood, 1969). Furthermore, it provides us with information about when others will likely experience pain and suffering. It is no surprise that studies on vicarious conditioning reveal that signals of pain in others elicit fear and anxiety in observers (Hadjistavropoulos et al., 2011; Helsen, Goubert, Peters, & Vlaeyen, 2011; Olsson, Nearing, & Phelps, 2007; Vaughan & Lanzetta, 1980). Several issues however deserve further scrutiny.

There is a large variability in the fear and distress responses of observers (Hadjistavropoulos et al., 2011). In one of the early studies, Lanzetta and colleagues (1989) showed that vicarious fear and distress was markedly lower when the other in pain was disliked (Lanzetta & English, 1989). It may be expected that individual difference variables may also account for the variability (Hadjistavropoulos et al., 2011). One variable that increases fear and distress may well be catastrophizing about pain, defined as an exaggerated negative orientation towards actual or anticipated pain experiences (Sullivan, Bishop, & Pivik, 1995). It is well-documented that pain catastrophizing is related to a more negative experience of pain in the sufferer as well as in the observer. Specifically, individuals’ catastrophizing about their pain report more pain and distress (Sullivan et al., 1995; Sullivan, Rodgers, & Kirsch, 2001). Likewise, observers’ catastrophizing about other’s pain seem to experience another’s painful situation as more distressing (Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006; Goubert, Vervoort, Sullivan, Verhoeven, & Crombez, 2008; Leonard & Cano, 2006). Other individual
difference variables may reduce fear and distress. This may be the case for psychopathic characteristics, such as manipulativeness, insincerity, egocentricity and lack of guilt. Research has revealed that high scores on psychopathic traits reduce empathy for others when experiencing negative consequences such as sadness, fear or disgust (Blair, 2005; Mullin-Nelson, Salekin, & Leistico, 2006). No evidence is yet available about the impact of psychopathic traits in the interpersonal context of pain.

It is largely unknown how individual difference variables such as catastrophizing about own or other’s pain and psychopathic traits affect observers’ fear and distress responses. One hypothesis may be that these individual difference variables affect the early stages of information processing leading to a higher or lesser detection of pain in others (Deyo, Prkachin, & Mercer, 2004; Yamada & Decety, 2009). In line with this idea we would then expect that catastrophizing about own or other’s pain would lead to hypervigilance, and a higher detection of pain in others (Hadjistavropoulos et al., 2011; Sullivan, Martel, Tripp, Savard, & Crombez, 2006) whereas psychopathy would lead to a lower detection of and hyposensitivity for pain in others (Dadds et al., 2006; Marshall & Holtzworth-Munroe, 2010).

In the present study, we used a vicarious conditioning paradigm, in which one participant (observer) watched a differential conditioning procedure in another participant. One visual cue preceded the possible occurrence of pain (pain signal). Another visual cue preceded the non-occurrence of pain (safety signal). We measured fear and distress during these signals in the observer using self-report and psychophysiological indice (e.g., fear-potentiated startle; Davis, Falls, Campeau, & Kim, 1993; Grillon & Baas, 2003; Hamm, Greenwald, Bradley, & Lang, 1993; Lang, Bradley, & Cuthbert, 1990; 1992) and corrugator EMG activity (Dimberg, 2000; Dimberg, Andréasson, & Thunberg, 2011). Observers were also requested to rate the presence of pain after each trial. We expected that signals of pain in others would evoke fear and distress in observers. We further expected that catastrophizing about own or other’s pain would increase these responses, whereas psychopathic traits would decrease these responses. Finally, using signal detection methods, we investigated whether catastrophizing about own or other’s pain is related to an increased perceptual sensitivity to detect pain in others, whereas the reverse pattern was expected for psychopathic traits.
METHODS

Participants
Seventy-two female Caucasian undergraduate students from Ghent University participated. Each student volunteered independently for the experiment in an attempt to maximize the rate of unfamiliarity between participants. Only female students were recruited in order to avoid possible sex differences (Davis, 1980). Participants were tested in pairs: one participant experienced the pain procedure, \( N = 36, M = 18.89 \text{ year}, SD = 2.13 \), while being observed by the other participant \( N = 36, M = 18.81 \text{ year}, SD = 1.65 \). Participants received course credits for participation. This study was approved by the ethical committee of the Faculty of Psychology and Educational Sciences.

Electrocutaneous stimuli
Electrocutaneous stimuli consisted of trains of 2 ms pulses with an internal frequency of 65 Hz delivered by means of a constant current stimulator (Digitimer DS7A 1998; Digitimer, Ltd., Hertfordshire, UK). Two lubricated Fukuda standard Ag/AgCl electrodes, with a diameter of 1 cm, were used to administer the electrocutaneous stimuli at the external side of the right wrist. Before placement of the electrodes, the skin at the electrode sites was abraded with a peeling cream (Nihon Kohden) in order to reduce skin resistance. The electrocutaneous stimuli had an instantaneous rise and fall time and a duration of 300 ms. Tolerance level was established with one calibration cycle starting at an intensity of 0.50 mA and increasing the intensity in steps of 0.25 mA. Participants were instructed to stop at the intensity that was just tolerable. The stimulus at tolerance level \( M = 2.00 \text{ mA}, SD = 1.91, \text{ range} = 0.50:10.50 \) was the intensity used in the pain task. Before the start of the pain task, both participants were asked if they had previously experienced an electrocutaneous pain stimulus.

Psychophysiological measures in observing participants
The fear-potentiated startle was measured as the magnitude of the eye blink modulation to a sudden probe. Ag/AgCl electrodes with a diameter of 0.40 cm were filled with highly conductive gel and placed over the orbicularis oculi muscle of the left eye. After cleaning the skin with alcohol, one electrode was placed just below the left pupil, a second was placed 1 cm laterally. A ground electrode was placed on the forehead (Blumenthal et al., 2005). The acoustic startle probe was a 50 ms burst of white noise (90-100 dB) with instantaneous rise time, which was presented binaurally over headphones.
The EMG response over the Corrugator muscle, responsible for frowning the eyebrow, was registered with Ag/AgCl electrodes with a diameter of 0.40 cm. After filling the electrodes with highly conductive gel and cleaning the skin with alcohol, two electrodes were placed at the corrugator muscle above the left eye (Fridlund & Cacioppo, 1986). The same ground electrode as for the startle reflex was used. The raw electromyographic (EMG) signals of both psychophysiological measures were recorded using an EMG100C Electromyogram Amplifier (BIOPAC Systems MP150; Biopac Systems, Inc., Goleta, USA) with the high pass filter set at 90 Hz and the low pass filter at 500 Hz. EMG responses were sampled at 1000 Hz. Conform with the guidelines specified by Blumenthal and colleagues (2005), the psychophysiological data were integrated and analysed off line, using a semi-automated program for parameter extraction (Psychophysiological Analysis, PSPHA; De Clercq, Verschuere, De Vlieger, & Crombez, 2006).

Self-Report Measures in observing participants

Psychopathic characteristics

Psychopathic characteristics were measured with the Hare Self-Report Psychopathy Scale-III (SRP-III; Paulhus, Neumann, & Hare, in press). The SRP-III assesses core features of psychopathy on four different domains: 1) interpersonal, manipulative behaviour; 2) callous affect; 3) erratic lifestyle and 4) criminal tendencies in psychopathy (Williams, Paulhus, & Hare, 2007). The SRP-III contains 64 items that are scored on a five-point scale ranging from 1 (disagree strongly) to 5 (agree strongly). The SRP-III exhibits good reliability and validity in non-forensic samples (Williams et al., 2007). The authorized Dutch translation, established by following FACIT translation guidelines (2006), was used in the present study (Uzieblo, De Ruiter, Crombez, Paulhus & Hare, 2007). The SRP-III showed a good internal reliability in the current study (Cronbach’s α = .86).

Catastrophic thoughts about own pain

Catastrophic thinking about own pain was assessed with the Dutch version of the Pain Catastrophizing Scale (PCS; Sullivan et al., 1995). This scale contains 13 items describing thoughts and feelings that participants may experience during past painful experiences (e.g. ‘I become afraid that the pain may get worse’). Three subscales can be distinguished: rumination, magnification and helplessness. Participants indicate how frequently they experience each thought or feeling when in pain using a five-point scale, ranging from 0 (not at all) to 4 (always). The Dutch version of the PCS has good reliability and validity in both clinical and non-clinical samples (Van Damme, Crombez,
Bijttebier, Goubert, & Van Houdenhove, 2002). In our sample, Cronbach’s $\alpha$ of the total score was .88.

**Catastrophic thoughts about other’s pain**

Observers also rated their catastrophic thoughts about the observed participant’s pain during the pain task. For this purpose, the Significant Other version of the Pain Catastrophizing Scale (PCS-S; Cano, Leonard, & Franz, 2005) was adapted. The PCS-S measures catastrophic thoughts about the pain of a significant other and has a similar factor structure as the PCS (see above). The PCS-S has shown to be a reliable and valid instrument in undergraduate students and couples with chronic pain (PCS-S; Cano et al., 2005). In line with previous research (Caes, Vervoort, Eccleston, Vandenhende, & Goubert, 2011; Goubert, Vervoort, Cano, & Crombez, 2009a) a state version was developed in order to assess observers’ catastrophic thoughts about the pain the observed participant could experience during the pain task. For each subscale, one item was selected and adapted to the experimental situation. Participants responded on an 11-point numeric rating scale (NRS) with the endpoints 0 (not at all) and 10 (a lot). This new instrument, the PCS-Other-state (PCS-O-state), consisted of the following three items (Rumination: “At this moment, to what extent do you keep thinking about how much pain the other student will experience during the task?”; Magnification: “At this moment, to what extent do you think that, because of the pain, something serious might happen to the other student?”; Helplessness: “At this moment, to what extent do you think, because of the pain of the other student, you will not be able to endure the task?”). In this study, we used the mean score, ranging from 0 to 10. Cronbach’s $\alpha$ for the PCS-O-state was good ($\alpha = .71$).

**Self-reported fear**

After the pain task, observers rated to what extent they experienced fear during the pain signals and safety signals, using an 11-point numeric rating scale ranging from 0 (not at all) to 10 (a lot). The items rated by the observers were: 1) How anxious/fearful were you during the presentation of the pain signal? and 2) How anxious/fearful were you during the presentation of the safety signal? These items reflect observers’ general fear when anticipating other’s pain.

**Self-report measures in participants being observed**

**Pain experience**

After the pain task, the observed participant rated how much pain she had experienced when receiving electrocutaneous stimuli. Specifically, the observed
participant rated 1) “how much pain she had experienced on average” and 2) “how painful the worst pain was she had experienced”. Both ratings were obtained by using an 11-point numerical rating scale (NRS) from 0 (no pain) to 10 (a lot of pain).

**Impact of being observed upon pain expression**

To assess the potential impact of being observed, the observed participant rated, after the pain task, the following questions by means of an 11-point rating scale ranging from 0 (not at all) to 10 (a lot): 1) “Did you respond spontaneously to the electocutaneous stimuli, even when you knew the other student was observing you?” and 2) “Has knowledge of being observed by another student influenced your reactions to the electocutaneous stimuli?”.

**Self-report measures in both participants**

How familiar participants were with each other was assessed by asking both participants the following question: “Have you met the other student before?” If they indicated “yes” to this question, they were requested to rate the question: “How well do you know the other student?” by means of an 11-point NRS (ranging from 0 = ‘not at all’ to 10 = ‘very well’).

**Procedure**

**Preparation phase**

First, participants were informed about the aim and procedure of the study (i.e., how observers cope with pain in others) and signed an informed consent. Participants were randomly assigned to one of the two roles by tossing a coin. The observer was asked to complete the SRP-III and the PCS. Subsequently, she took place in an adjacent room, where electrodes were attached. By means of a television screen, the observer was able to observe how pain tolerance level of the observed participant was determined. Before the start of the pain task, the observer completed the PCS-O-state.

**Pain task**

The pain task consisted of several trials of blue and yellow coloured screens. These screens signalled that an electocutaneous stimulus could possibly be delivered to the observed participant when the coloured screen disappeared (i.e., pain signal) or that no electocutaneous stimulus would follow (i.e., safety signal). The coloured screens were controlled and presented by Inquisit (Millisecond Software; Inquisit, 2006) on a Dell Dimension 5000 connected to a 17” flat panel monitor. Before the start of the pain task, both participants were informed which colour (i.e., blue or yellow) was the pain signal. The other colour represented the safety signal. The colours were counterbalanced across
participants. The pain task consisted of 48 trials, with 50% safe trials, divided in two blocks. Each trial started with the presentation of a fixation cross for 5000 ms followed by a pain or safety signal for 8000 ms. The latter was followed by a white screen for 5000 ms. After 25% ($N = 6$) of the pain signals, an electrocutaneous stimulus (300 ms) was delivered to the observed participant as soon as the pain signal disappeared. In order to prevent habituation, the administration of the pain stimulation was randomized and well spread so that several pain and safety signals were presented between the pain stimuli. Each trial ended with an orange screen that indicated a rating period of 10000 ms. During this rating period, observers were instructed to indicate whether the observed participant had received a pain stimulus or not. These ratings were used to calculate observers’ perceptual sensitivity for the other’s pain.

Throughout the entire pain task, the observer was instructed to watch the facial expressions of the observed participant on a television screen. The observer was only provided with video display showing the face of the observed participant; no auditory information was provided. Within the visual field of the observer, a computer screen was additionally placed on which pain and safety signals were presented. These signals were simultaneously presented to the observed participant and the observer. The observed participant could not see or hear the observer during the pain task.

We used the eye blink modulation and corrugator EMG response as an indication of a negative emotions elicited in the observer (Dimberg, 2000; Dimberg et al., 2011; Grillon & Baas, 2003; Hamm et al., 1993). To prevent the development of expectancy of the startle probe, startle probes were administered on different time points. Startle probes occurred 1) during pain and safety signals at 3000 ms or 6000 ms after signal onset, 2) after pain and safety signals at 1000ms after the signal offset, or 3) halfway the period between offset of the orange coloured screen and signal onset, which varied between 5000-7000 ms. After the pain task, all sensors were removed. The observer was then requested to rate her experienced fear during pain and safety signals. The observed participant was asked to rate her experienced pain. The entire experiment took approximately 2 h.

**Data reduction and analysis**

PSPHA (De Clercq et al., 2006) was used to analyse the psychophysiological data offline. Eye blink modulation was defined as a baseline-to-peak difference. We calculated the magnitude of the eye blink modulation by subtracting the mean rectified baseline value (0–20 ms after probe onset) from the rectified peak value in the 21-200 ms
interval after probe onset. Trials with a baseline EMG-activity of at least 2.5 $SD$s above the mean baseline were signalled by PSPHA as a potential artefact. These potential artefacts were visually inspected and were rejected when it regarded 1) a bad signal to noise ratio or 2) a too early eye blink onset. The absolute magnitude and variability of their eye blink responses may considerably differ between individuals. Therefore, in accordance with previous research (Benning, Patrick, & Iacono, 2005; Levenston, Patrick, Bradley, & Lang, 2000; Patrick, Bradley, & Lang, 1993), the eye blink magnitudes were z-transformed across trials within individuals. Thereby, a common metric system is created before performing the statistical analyses concerning the eye blink modulation (Benning et al., 2005; Levenston et al., 2000; Patrick et al., 1993). The impact of outliers was reduced by substituting z-scores smaller than -3 or greater than 3, by -3 or 3, respectively (Patrick et al., 1993). As we were primarily interested in the anticipatory reactions of observers, we only used the reaction to startle probes presented during the signals (i.e., at 3000 ms and 6000 ms after signal onset) in our analyses. The results using the average eye blink modulation after signal onset (i.e. a Pain versus Safety Signal repeated measure ANOVA) were comparable with analyses using a 2 (Signal: Pain versus Safety Signal) x 2 (Time: 3000 ms versus 6000 ms) repeated measure design. Therefore, we decided to use the average eye blink modulation in the analyses.

To control for interference of the eye blink modulation, only trials in which no startle probe was present during the signal were used in analyses of the corrugator EMG activity. For each observer, a baseline value was established by calculating the mean corrugator EMG response 1000 ms before the onset of the signal. In a second step, the baseline-corrected activity was calculated for every second of the 8000 ms during signals. The first second of the signal was not included in the analyses in order to avoid interference from orientating reactions (Dimberg, 2000; Dimberg & Karlsson, 1997; McIntosch, Reichmann-Decker, Winkielman, & Wilbarger, 2006). Finally, we averaged this baseline-corrected activity for safety and pain signals separately.

To investigate observers’ reaction to signals of pain in others, a Repeated Measure ANOVA (Pain versus Safety Signals) was performed with eye blink modulation or corrugator EMG response as dependent variable. We calculated the effect-size Cohen’s $d$ for these analyses to quantify the difference between pain and safety signals. To examine the moderating role of catastrophizing about own or other’s pain and psychopathic traits, the scores on the self-report measures were included as covariates. For these analyses, partial eta squared ($\eta^2_p$) was calculated. This gives us an estimation of
the proportion of total variability attributable to a specific variable (Olejnik & Algina, 2000). Statistically significant interactions were investigated by plotting and testing the significance of the regression lines of the continuous moderator variables for responses during pain signals and safety signals (Aiken & West, 1991; Holmbeck, 2002).

Furthermore, signal detection analyses were performed to investigate observers’ perceptual sensitivity. Perceptual sensitivity was defined as the ability to detect pain in the observed participant. Three observers made errors in rating the 48 trials, making it impossible to retrieve the specific trials they had rated. Therefore, these analyses were performed on a subsample of 33 observers. Hit rates, defined as correctly identifying a pain stimulus, and false alarm rates, defined as identifying a no pain trial as a pain trial, were calculated for each observer. These scores were used to construct the Receiver-Operating-Characteristic. Sensitivity for other’s pain was assessed by calculating A’ (Snodgrass & Corwin, 1988), which represents the area under the operating characteristic. A’ values vary from 0 to 1.0. A value of 0.5 indicates a ‘chance performance’ or lack of ability to discriminate pain trials from non-pain trials. In order to investigate the influence of catastrophizing about own or other’s pain and psychopathic characteristics upon perceptual sensitivity to the expressed pain, correlations were calculated between A’ and the scores on the PCS, PCS-O state and SRP-III. All analyses were conducted with SPSS 15.0.

RESULTS
Sample criteria
Several possible interfering factors (i.e., previous experiences with the pain stimulation, whether participants were familiar with each other, and whether the observed participant’s pain expression was influenced by being observed) were investigated before conducting the analyses. First, one observer and two observed participants indicated that they had experienced painful electrocutaneous stimulation before. However, analyses with and without these participants indicated that this previous experience with the electrocutaneous pain stimulation did not impact the results. Second, only 5 couples indicated they had met each other before. The mean score for how well they knew each other was 2.33 (SD = 3.39, range = 0:8) for the observed participants and 1.71 (SD = 2.75, range = 0:7) for the observers. As the mean scores were rather low, we could conclude that in general participants were unfamiliar with each other. Moreover, results stayed the same when excluding couples that have met each other before. Lastly, overall
the observed participants indicated that they reacted spontaneously to the electrocutaneous stimuli ($M = 7.67$, $SD = 2.08$, range $= 3:10$) and that their response to the pain stimulus was little influenced by being observed ($M = 2.58$, $SD = 2.21$, range $= 0:7$). Moreover, excluding the four observed participants who indicated on both questions that they were highly influenced by being observed by the other revealed similar results compared to the results with those participants included. Therefore, based upon the examination of these three criteria, we decided to retain all participants within the final sample ($N = 36$).

**Self-report data**

The mean level of average and worst pain reported by the observed participants was 5.31 ($SD = 1.89$, range $= 0:9$) and 6.17 ($SD = 1.99$, range $= 0:10$), respectively. Observers’ level of catastrophizing about own pain (PCS: $M = 17.57$, $SD = 7.29$, range $= 3:31$) was comparable with catastrophizing scores of a previous study in a Dutch student population ($M = 16.56$, $SD = 7.78$, $t(584) = .80$, $ns$, Van Damme et al., 2002). Observers’ mean score for catastrophic thoughts about the pain of the other participant (PCS-O state) was 3.79 ($SD = 1.69$, range $= 0.67:7.67$). A positive, but non-significant correlation ($r = .21$, $ns$) was found between PCS and PCS-O state. Scores for psychopathic characteristics ranged from 110 to 188, with a mean score of 141.56 ($SD = 21.09$). These scores are comparable with the mean scores for female undergraduates ($M = 139.6$, $SD = 25.4$, $t(128) = .05$, $ns$) observed by Paulhus and colleagues (Paulhus et al., in press). Paired samples t-test indicated that observers reported more fear during pain signals ($M = 5.11$, $SD = 2.46$) than during safety signals ($M = 2.14$, $SD = 2.09$, $t(35) = 5.91$, $p < .01$).

Pearson correlations revealed that higher levels of observer’s psychopathic characteristics (SRP-III) were significantly negatively correlated with catastrophic thoughts about the other’s pain (PCS-O-state, $r = -.40$, $p < .05$). No significant correlation was found between psychopathic characteristics and catastrophizing about own pain (PCS, $r = .08$, $ns$). Furthermore, observers’ catastrophic thoughts about the other’s pain (PCS-O-state) was significantly positively correlated with observers’ fear during pain signals ($r = .39$, $p < .05$). There was no significant correlation between catastrophizing about own pain or psychopathic characteristics and fear of pain during pain signals (PCS: $r = .27$, $ns$, SRP-III: $r = -.23$, $ns$). In addition, no significant correlation was found between the individual difference variables (i.e., catastrophizing about own pain,
catastrophizing about other’s pain and psychopathic traits) and observers’ self-reported
fear during safety signals (all \( r < .23 \)).

**Observers’ eye blink modulation and corrugator EMG response during pain and
safety signals**

A repeated measures ANOVA (Pain versus Safety signal) revealed a main effect
of Signal on eye blink modulation (\( F(1,35) = 10.32, p < .01 \)). As expected, the eye blink
modulation was augmented during pain signals (\( M = 0.11, SD = 0.26 \)) compared to safety
signals (\( M = -0.07, SD = 0.16, t(35) = 3.21, p < .01, d = 0.84 \)). Furthermore, repeated
measures ANOVA revealed that corrugator EMG response during pain signals (\( M = 0.83, SD = 1.82 \)) was more pronounced than during safety signals (\( M = -0.05, SD = 0.53, F(1,35) = 8.75, p < .01, d = 0.62 \)).

**The moderating role of observer characteristics**

**Eye blink modulation**

Observers’ catastrophic thoughts about own or other’s pain (PCS: \( F(1,33) = 0.92, ns \), PCS-O-state: \( F(1,34) = 0.19, ns \)) nor psychopathic characteristics (\( F(1,34) = 3.47, ns \)) had a main effect on observers’ eye blink modulation. In addition, observers’ catastrophic
thoughts about own or other’s pain did not moderate the effect of Signal on eye blink
modulation (PCS: \( F(1,33) = 0.02, ns \), PCS-O-state: \( F(1,34) = 1.91, ns \)). However,
psychopathic characteristics significantly moderated the effect of Signal upon eye blink
modulation (\( F(1,34) = 4.59, p < .05, \eta^2_p = 0.13 \)). To illustrate the pattern reflected in this
statistically significant interaction term, we plotted regression lines of psychopathic
characteristics on eye blink modulation during pain and safety signals (see Figure 1). In
line with our expectations, higher scores for psychopathic characteristics were related to a
smaller eye blink modulation during pain signals, \( \beta = -.39, p < .05 \). The level of
psychopathic traits was, however, not related to eye blink modulation during safety
signals, \( \beta = .13, ns \).

**Corrugator EMG response**

Psychopathic characteristics and observers’ catastrophic thoughts about own pain
(PCS) did not moderate the effects of Signal on corrugator EMG (SRP-III: 
\( F(1,34) = 2.08, ns \), PCS: \( F(1,33) = 0.78, ns \)), nor did they show a main effect on the
corrugator EMG response (SRP-III: \( F(1,34) = 0.42, ns \), PCS: \( F(1,33) = 1.30, ns \)).
Observers’ catastrophizing about the other’s pain (PCS-O-state), however, showed a
significant main effect on corrugator EMG (\( F(1,34) = 7.23, p < .05 \)), indicating that
observers with a high level of catastrophic thoughts about the pain of the other generally
Negative emotional response in anticipation of another’s pain showed a stronger corrugator EMG response. Furthermore, observers’ catastrophizing about the other’s pain (PCS-O-state) moderated the effects of Signal on corrugator EMG ($F(1,34) = 7.69, p < .01, \eta_p^2 = 0.18$). Regression lines were plotted of observers’ catastrophizing about the other’s pain for corrugator EMG activity during pain and safety signals (see Figure 2). The results indicated that observers who catastrophized more about the other participants’ pain exhibited a stronger corrugator EMG response during pain signals (PCS-O-state: $\beta = .44, p < .05$).

**Figure 1.** The influence of observers’ psychopathic characteristics on eye blink modulation during pain and safety signals. Standardized beta’s are presented. * $p < .05$; ** $p < .01$

**Figure 2.** The influence of observers’ catastrophic thoughts about the other’s pain (PCS-O-state) on corrugator activity during pain and safety signals. Standardized beta’s are presented. * $p < .05$; ** $p < .01$
Observers’ perceptual sensitivity for other’s pain

The mean sensitivity score $A'$ was $0.83$ ($SD = 0.13$), indicating that observers were good at discriminating trials in which the observed participant received an electrocutaneous stimulus (i.e., pain trials) from non-pain trials (i.e., pain signals not followed by a pain stimulus). Furthermore, participants with more psychopathic characteristics showed less perceptual sensitivity to pain expressed by the observed participants ($r = -0.38; p < .05$). No significant correlation between observers’ perceptual sensitivity and catastrophic thoughts about own or other’s pain were found (PCS: $r = -0.20$, $ns$; PCS-O-state: $r = -0.04$, $ns$).

DISCUSSION

This study investigated 1) observers’ negatively-valenced emotional responses to impending pain in others, 2) observers’ ability to detect other’s pain, and 3) the moderating influence of catastrophizing about own or other’s pain and psychopathic traits. Overall, findings were partially in line with our expectations. First, findings suggest that anticipating another’s pain elicits aversive responses in observers. Specifically, observers reported more fear, demonstrated augmented fear-potentiated startle and increased corrugator EMG activity during signals of pain in others compared with safety signals. Second, individual difference variables moderated emotional responses to impending pain in another. Specifically, observers with more psychopathic characteristics demonstrated a lower fear-potentiated startle during pain signals. Observers highly catastrophizing about other’s pain showed more pronounced corrugator EMG activity and reported more fear during pain signals. No significant influences were found for observers’ catastrophic thinking about own pain. Third, although observers were overall able to accurately detect when the other experienced pain, this ability was reduced with increasing levels of psychopathic traits.

The present findings corroborate previous findings on vicarious fear conditioning in humans (Craig & Lowery, 1969; Craig & Prkachin, 1978; Craig & Wood, 1969; Helsen et al., 2011; Olsson et al., 2007; Vachon-Presseau et al., 2011; Vaughan & Lanzetta, 1980) and suggest that seeing others in pain has a profound influence on observers (Hadjistavropoulos et al., 2011). Specifically, findings indicate that other’s pain can serve as a sign of threat, resulting into fearful responses towards previously neutral stimuli. The present study extends previous research by investigating observers’ reactions in a more salient interpersonal context. Specifically, instead of using pictures, videotaped models/confederates or avatars (Cheetham, Pedroni, Antley, Slater, & Jancke, 2009;
Negative emotional response in anticipation of another’s pain

Craig & Lowery, 1969; Craig & Prkachin, 1978; Vachon-Presseau et al., 2011; Vaughan & Lanzetta, 1980; Yamada & Decety, 2009), observers watched a real-life participant undergoing painful stimulation. Additionally, individual difference variables and related processes were taken into account allowing more precise conclusions about moderators of observers’ response.

Our results indicate that impending pain in another triggers fear and distress in observers. The heightened corrugator EMG response and fear-potentiated startle suggest the activation of a self-oriented, aversive system (Dimberg, 2000; Dimberg & Karlsson, 1997; Grillon & Baas, 2003; Lang et al., 1990; 1992). Supporting this idea, the amygdala, a key structure implied in fear responses, plays a critical role in the evocation of the fear-potentiated startle reflex (Davis & Whalen, 2001; Grillon & Baas, 2003; Lang, 1995; Olsson et al., 2007; Olsson & Phelps, 2007). Furthermore, research on personal pain experience has consistently shown that participants display a fear-potentiated startle when experiencing or anticipating pain (Dichter, Tomarken, & Baucon, 2002; Grillon, Ameli, Wood, Merikangas, & Davis, 1991; Hamm et al., 1993; Lang et al., 1990), particularly when pain is perceived as highly threatening (Bradley et al., 2008). The present findings suggest that similar processes are likely involved when observing another in pain. Moreover, results demonstrated that situation-specific catastrophic thinking about other’s pain plays a more important role in explaining observers’ emotional responses than general tendencies to catastrophize about own pain. This attests to the importance of measurement compatibility (Cali & Stanley, 1975). Further, this is in line with the growing evidence that situational measures of pain catastrophizing have, in comparison with dispositional measures, more predictive value in explaining responses to pain (Campbell et al., 2010). Yet, findings indicate that the moderation by catastrophizing about other’s pain only holds for observers’ corrugator EMG response and self-reported fear, not for the fear-potentiated startle. Although it is unclear why this is the case, it is plausible that increased corrugator EMG response in high catastrophizing individuals reflects increased empathizing with another in pain. Such an account is in line with earlier findings indicating that catastrophizing about other’s pain is associated with increased attention to and more accurate estimations of other’s pain (Goubert et al., 2009; Sullivan et al., 2006) and with recent evidence indicating that the ability to empathize with another is strengthened by one’s tendency to react in accordance with the emotional expression of the other (Dimberg et al., 2011).
Observers’ distress towards pain signals in others likely serves a protective function of preparing observers for dealing with impending threat (Hadjistavropoulos et al., 2011). Specifically, observers’ distress responses may instigate avoid/escape tendencies (Vachon-Presseau et al., 2011; Yamada & Decety, 2009). Such defensive tendencies seem to be in conflict with the often-observed emergence of other-oriented emotions (e.g., sympathy) and associated approach tendencies when viewing others in pain (Goubert, Vervoort, & Crombez, 2009b). To date, it is unclear how other-oriented feelings and related approach tendencies overcome initial self-oriented emotions and related avoidance. A potential key process might be the ability to regulate this self-oriented distress elicited by viewing another’s pain (Caes et al., 2011; Goubert et al., 2009a; 2008). In the present study, observers’ distress is likely an automatic response to another’s pain, which in later stages may be regulated by contextual and individual difference variables (Goubert, Craig, & Buysse, 2009; Goubert et al., 2009b), enabling other-oriented emotions to prevail (Decety, 2009; Eisenberg et al., 1994; Goubert et al., 2009b; Vachon-Presseau et al., 2011; Van Ryswyk, 2009). Distress regulation may become difficult with increasing levels of threat, for example in high catastrophizers. Specifically, the present and previous studies (Caes et al., 2011; Goubert et al., 2008; Leonard & Cano, 2006) indicated that individuals with high levels of catastrophic thoughts about other’s pain experience more distress when faced with another in pain. These increased levels of distress may have important implications for caregiving behaviour. Preliminary evidence suggests that distress mediates the association between catastrophizing and tendencies to restrict the pain sufferer’s activity (Caes et al., 2011). Although further research is needed, it is plausible that feeling distressed may motivate behaviour aimed at reducing own distress (e.g., by escaping or reducing other’s pain), instead of engagement in behaviour attuned to the needs of the pain sufferer (Batson, Fultz, & Schoenrade, 1987).

Future research concerning this approach/avoidance conflict may also benefit from investigating attentional processing of another’s pain. Our results indicate that signals predicting other’s pain can attract observers’ attention, allowing them to indicate when the other experienced pain. Attentional processes are mostly investigated to own pain, showing that heightened attention to pain is related to more fear and escape/avoidance tendencies (Eccleston & Crombez, 1999; Leeuw et al., 2007; Van Damme, Legrain, Vogt, & Crombez, 2010). Preliminary evidence also emphasised the importance of attention within the interpersonal pain context. Particularly, findings
suggest that, for individuals highly catastrophizing about other’s pain, automatic orienting to pain faces may instigate escape/avoidance tendencies (Vervoort et al., 2011), but this may only be successful for low pain expression. With increasing facial pain display, catastrophizers’ avoidance tendencies may conflict with the increased difficulty of disengaging from pain (Van Damme, Crombez, & Eccleston, 2004). As this avoidance tendency might reflect a strategy to alleviate distress, it may not prevail in persons perceiving another’s pain as only slightly threatening, possibly because they can maintain or swiftly alleviate their self-oriented emotional reactions within a tolerable range (Eisenberg et al., 1994; Vachon-Presseau et al., 2011). As we did not find an association between catastrophizing about own or other’s pain and observers’ perceptual sensitivity, further research is needed to disentangle the role of attention in observers’ responses to other’s pain.

Of further interest, findings indicated that observers with higher levels of psychopathic traits were less perceptually sensitive for another’s pain and showed a diminished fear-potentiated startle when anticipating others’ pain. This is in line with previous research in criminal and non-criminal samples showing deviant fear conditioning (Birbaumer et al., 2005) and reduced fear-potentiated startle towards threatening pictures in individuals with psychopathic characteristics (Benning et al., 2005; Levenston et al., 2000; Patrick et al., 1993; Patrick, Bradley, & Lang, 1994). Moreover, this reduced emotional response seems unrelated to their overt emotional expression, as no moderation of corrugator activity was found (Levenston et al., 2000). But, due to reduced perceptual sensitivity to other’s pain, diminished distress may not entail higher levels of other-oriented feelings, such as sympathy (Deyo et al., 2004; Marshall & Holtzworth-Munroe, 2010; Mullin-Nelson et al., 2006; Uzieblo, Verschuere, van den Bussche, & Crombez, 2010). Although most research has focused on criminal samples, varying levels of psychopathic characteristics may be found among all community groups (Benning et al., 2005), even in females (Rogstad & Rogers, 2008) and high achievers (Salekin, Trobst, & Krioukova, 2011). Therefore our findings are important to fully understand various, possibly maladaptive, responses to other’s pain manifesting in daily life and professional pain treatment (Hadjistavropoulos et al., 2011). As people with more psychopathic traits are less able to detect other’s pain, they may be less capable in providing adequate care. Future research is warranted investigating how reduced aversive emotional responses and diminished perceptual sensitivity translates in behavioural responses.
The current study is not without limitations. First, due to our small sample size, we might have been unable to detect small effects (i.e., $d's > 0.62$; $\eta_p^2 > 0.13$). Additionally, male participants were not included. The research was conducted in female pain-free undergraduate students using experimental pain stimuli. Replication of the results in larger, other non-clinical and clinical samples also including males, is needed. Second, mean levels of psychopathic characteristics and catastrophizing about own/other’s pain were low, but comparable to other student populations. Further research is needed to investigate whether our findings generalize to clinical levels of these individual difference variables. Third, most participants were unfamiliar to each other. As previous research has shown that the level of familiarity with another influences empathic responses (Leibenluft, Gobbini, Harrison, & Haxby, 2004), it would be interesting to replicate the findings in participants with a close relationship, e.g. couples or parent-child dyads. Fourth, our measure of perceptual sensitivity may not specifically reflect detection of pain, but detection of a negative event experienced by the other. We can not rule out that observers also relied on other negative emotional expression than pain expressions to judge the presence of pain. Fifth, we did not control for possible influences of attention and arousal on the psychophysiological responses. Further research may incorporate a control condition involving a non-aversive event, such as a tactile stimulus, as an unconditioned stimulus. However, it is unlikely that the observed startle facilitation is owing to attention because attention is known to result in startle inhibition instead of startle facilitation (Lang et al., 1990). Lastly, fear and pain were only measured after and not during the pain task. Accordingly, we do not know whether experience of pain changed over time and whether habituation occurred.

In spite of these limitations, this study demonstrated that anticipating pain in another is an aversive experience, particularly when observers catastrophize about other’s pain. In contrast, observers’ aversive responses and perceptual sensitivity for another’s pain are diminished in persons with higher levels of psychopathic characteristics.

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Negative emotional response in anticipation of another’s pain

REFERENCES


Negative emotional response in anticipation of another’s pain


Negative emotional response in anticipation of another’s pain


Negative emotional response in anticipation of another’s pain 93


Chapter 3

The Impact of Parental Catastrophizing and Contextual Threat on Parents’ Emotional and Behavioural Responses to Their Child’s Pain

Abstract

Limited research has addressed processes underlying parents’ empathic responses to their child’s pain. The present study investigated the effects of parental catastrophizing, threatening information about the child’s pain, and child pain expression upon parental emotional and behavioural responses to their child’s pain. Fifty-six school children participated in a heat pain task consisting of 48 trials while being observed by one of their parents. Trials were preceded by a blue or yellow circle, signalling possible pain stimulation (i.e., pain signal) or no pain stimulation (i.e., safety signal). Parents received either neutral or threatening information regarding the heat stimulus. Parents’ negative emotional responses when anticipating their child’s pain were assessed using psychophysiological measures — i.e., fear-potentiated startle and corrugator EMG activity. Parental behavioural response to their child’s pain (i.e., pain-attending talk) was assessed during a 3-minute parent-child interaction that followed the pain task. The Child Facial Coding System (CFCS) was used to assess children’s facial pain expression during the pain task. Results indicated that receiving threatening information was associated with a stronger parental corrugator EMG activity during pain signals in comparison with safety signals. The same pattern was found for parental fear-potentiated startle reflex, particularly when the child’s facial pain expression was high. In addition, parents who reported high levels of catastrophizing thought about their child’s pain engaged, in comparison with low catastrophizing parents, in more pain-attending talk when they received threatening information. The findings are discussed in the context of affective-motivational theories of pain.

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**INTRODUCTION**

Pain is a common complaint in children (Perquin et al., 2000) and parental factors are known to play a central role in the child’s pain experience (Chambers, 2003; Hadjistavropoulos et al., 2011). Specifically, parental responses may have adaptive as well as maladaptive influences upon their child’s pain (Chambers, 2003; Claar, Simons, & Logan, 2008; Janssens, Oldehinkel, & Rosmalen, 2009; Palermo & Chambers, 2005; Vowles, Cohen, McCracken, & Eccleston, 2010; Walker, Claar, & Garber 2002; Walker et al., 2006). For example, in response to pain, parental “pain-attending” behaviours, such as reassuring, giving attention to child pain and limiting the child’s activities, are generally related to more disability in the child (Dix, Gershoff, Meunier, & Miller, 2004; Logan & Scharff, 2005; Palermo & Eccleston, 2009; Sieberg, Williams, & Simons, 2011). To date, it is still largely unknown why and when parents engage in particular patterns of behaviour in response to child pain (Jordan, Eccleston, McCracken, Connell, & Clinch, 2008; Palermo & Eccleston, 2009).

Research has suggested that parental pain catastrophizing (i.e., misinterpreting and exaggerating the threat value of their child’s pain) and associated emotional distress may impact parental behaviour in response to child pain (Caes, Vervoort, Eccleston, Vandenhende, & Goubert, 2011; Sieberg et al, 2011). Specifically, high catastrophizing parents are more likely to experience elevated distress when faced with their child in pain (Caes et al., 2011; Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006; Goubert, Vervoort, Sullivan, & Verhoeven, 2008) and are more inclined to engage in pain-attending behaviours (Caes et al., 2011; Sieberg et al., 2011). However, research on how heightened parental catastrophizing translates into parental distress and specific behaviour towards child pain is currently limited to self-report studies, which may not be a valid index of actual parental responses (Cohen, Manimala, & Blount, 2000). Therefore, the current study sought to investigate the influence of parental catastrophizing upon psychophysiological indices of parental distress and observed parental pain-attending behaviour.

However, not all pain situations children encounter are alike. There is reason to believe that, in addition to parental characteristics (e.g., catastrophizing), contextual variables such as additional information concerning the situation (Leventhal, Brown, Shacham, & Engquist, 1979; Vlaeyen et al., 2004) and child characteristics, such as facial pain expression (Hadjistavropoulos et al., 2011; Williams, 2002) may be important in explaining variations in parental responses to child pain. These variables may augment
The role of catastrophizing and contextual threat

The threat value parents assign to the child’s pain experience (i.e., contextual threat), thereby enhancing parental distress and possibly pain-attending responses (Blount et al., 1989; Blount, Landolf-Fritsche, Powers, & Sturges, 1991; Crombez & Eccleston, 1998; Preston & de Waal, 2002; Sweet & McGrath, 1998; Williams, 2002). Accordingly, the present study additionally examined whether contextual information or child pain expression interacts with parental catastrophizing to impact parental emotional and behavioural responses to their child’s pain.

Parents observed their children undergo a heat pain task, which was followed by a 3-minute interaction between parent and child. Prior to observing their child in pain, parents received either neutral or threatening information about the pain stimulus. The fear-potentiated startle reflex (Davis, Falls, Campeau, & Kim, 1993; Grillon & Baas, 2003; Hamm, Greenwald, Bradley, & Lang, 1993; Lang, Bradley, & Cuthberth, 1990; Lang, Bradley, & Cuthberth, 1992) and EMG activity over the corrugator muscle (Dimberg, 2000; Dimberg & Karlsson, 1997) served as psychophysiological indices of parental distress while anticipating pain in their child. Both indices have been shown to reflect an aversive emotional response to negative events, such as pain, happening to the self as well as to others (Bradley, Codispoti, Cuthberth, & Lang, 2001; Bradley, Silakowski, & Lang, 2008; Dimberg, 2000; Dimberg & Karlsson, 1997; Grillon, Ameli, Wood, Merikangas, & Davis, 1991; Hamm et al., 1993; Lanzetta & English, 1989; Patrick, Bradley, & Lang, 1993; Vaughan & Lanzetta, 1980). Subsequently, parental behavioural response to their child’s pain was assessed during the parent-child interaction period. Specifically, we measured parental pain-attending talk as an index of parental pain-attending behaviour (Walker et al., 2006). We expected that higher levels of parental catastrophizing, threatening information, and child pain expression would be associated with elevated levels of parental distress and pain-controlling behaviour (i.e., pain-attending talk). In addition, we expected the influence of parental catastrophizing to be enhanced when contextual threat was high due to threatening information and/or child pain expression.

METHODS
Participants

Participants were recruited from a sample of school children (N = 403) from grades six through nine and their parents who had participated approximately two years earlier in a questionnaire study. Only children and parents who had given consent to be
re-contacted and who were not invited to participate in another study were approached \( (N = 280) \). Children and their parents were eligible to participate if the child did not suffer from chronic illness, including recurrent or chronic pain, or a developmental disorder. The child and parent were required to speak and write Dutch. A weighted random sampling procedure was used (Herzog, 1996) to ensure an equal proportion of boys and girls and equal age distribution. Of the 280 parent-child dyads that had consented to be re-contacted, 133 dyads were randomly selected and contacted. Of those contacted, 1.50% \( (N = 2) \) met the exclusion criteria and 58.02% \( (N = 76) \), of the remaining 131 dyads, agreed to participate. Ten parent-child dyads later withdrew their consent to participate because of child illness or family responsibilities. In addition, one child withdrew participation before the pain task concluded and two parent-child dyads could not take part due to failure of the pain induction equipment. This resulted in a final sample of 63 parent-child dyads (32 boys, 31 girls and 49 mothers, 14 fathers) who participated in the entire experimental protocol.

Children ranged in age from 11 to 15 years \( (M = 13.08 \text{ years}, SD = 1.34) \). Parents ranged in age from 34 to 55 years \( (M = 44.25 \text{ years}, SD = 4.71) \). Most parents (61.9%) were married or co-habiting. The majority of the parents (73%) had had education beyond the age of 18 years. All participating children and parents were Caucasian. Participants were compensated 35€ for participating in this study. The study was approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of Ghent University, Belgium. The sample described below has been examined in two prior studies addressing parental detection and attentional processing of child pain (Vervoort et al., 2011; Vervoort, Caes, Trost, & Goubert, in press).

**Pain task**

Children participated in a heat pain task consisting of 48 trials while being observed by one of their parents from an adjacent room. Parents could observe their child by means of a television screen displaying their child’s face. Each trial of the pain task was preceded by presentation of either a yellow or blue circle. One colour signaled a possible pain trial (“pain signal”) indicating to parents that a heat stimulus at tolerance level could potentially be delivered to the child following appearance of the coloured circle. The other colour signaled a non-pain trial (“safety signal”) indicating that no heat stimulus would follow. Whether a yellow or blue circle signaled pain or safety was counterbalanced across participants. Prior to the pain task, parent and child were informed which colour (i.e., blue or yellow) represented a pain or safety signal. These
coloured circles were synchronically presented to the child and their parent on respective computer screens by means of Inquisit (Millisecond Software; Inquisit, 2006). The pain task consisted of 48 trials in total, preceded by 24 pain signals and 24 safety signals (see Figure 1 for an overview of an individual trial). Each trial started with a fixation cross, displayed in the centre of the computer screen for one second, followed by the presentation of a pain or safety signal (i.e., blue or yellow circle) for eight seconds. After the presentation of the pain/safety signal, a white screen appeared for seven-nine seconds. On presentation of the white screen, the child received a painful heat stimulus following 25% \((N = 6)\) of the pain signals. No pain stimulation followed any of the 24 safety signals. At the end of each trial, the computer screen turned beige for ten seconds.

![Figure 1. Schematic overview of one trial.](image)

**Heat stimuli**

The Contact Heat Evoked Potentials Stimulator (CHEPS) of the Medoc Neuro Sensory Analyzer, Model TSA-II (Medoc Ltd. Advanced Medical Systems, Ramat, Yishai, Israel) with a thermode contact area of 572.5 mm\(^2\) was used for heat stimulation. The entire thermode-stimulating surface was placed in contact with the skin testing side and secured by a Velcro strap. Heat stimuli were delivered with an accelerated velocity of 50 °C/s and a cooling rate of 40 °C/s. Thermal stimuli were delivered at tolerance level to the inside of the right wrist for 1500 ms. Pain tolerance level was individually determined before the start of the pain task by increasing the temperature of the heat stimuli in an ascending sequence until children’s tolerance level. Specifically, starting with baseline temperature of 32 °C, temperature was increased by 1 °C for 1500 ms and returned to baseline upon stimulus termination. Children then indicated if they wanted to stop at this temperature or to increase the temperature further by 1 °C. For safety purposes, the Medoc software limited the maximum temperature of the 1500 ms heat stimuli to 50 °C. Upon reaching their tolerance level, children were asked to rate how painful this heat stimulus was on a numerical rating scale (NRS) ranging from 0 (‘no pain’) to 10 (‘a lot of pain’). This specific heat pain task is an ethically approved and safe pain task that has
been used in previous studies in comparable age groups (see e.g., Hermann, Hohmeister, Demirakça, Zohsel, & Flor, 2006; Zohsel, Hohmeister, Flor, & Hermann, 2008).

**Threat manipulation**

Parents were randomly assigned to either a group receiving neutral information or a group receiving threatening information. Parents receiving neutral information regarding the heat stimulus their child could experience following a pain signal were provided with the following information: “During this task, your child will receive several heat stimuli of different intensities. Our experience with the heat stimuli used in this study indicates that children might experience some of the heat stimuli as slightly unpleasant. Therefore, it is possible that some of the heat stimuli are also slightly unpleasant for your child”. In parents who received threatening information, the threat value of the heat stimulus was enhanced by providing the parents with threatening information about the pain experience of their child (“During this task, your child will receive several heat stimuli of different intensities, with some of them being possibly painful. Our experience with the heat stimulus used in this study indicates that children might experience some of the heat stimuli as painful and have difficulty dealing with them. Therefore, it is possible that some of the heat stimuli may also be painful and barely tolerable for your child”). In addition to the above information, parents were shown photographs as visual examples of how children generally cope with the heat stimuli. These photographs were selected from video material of previous child pain studies. Parents receiving neutral information were shown photographs of children displaying low pain expression. Parents receiving threatening information were shown images of children expressing high pain. For purposes of standardization, the neutral/threatening information and photographs were presented using Office PowerPoint.

To assess the effectiveness of the threat manipulation, we measured parents’ state catastrophic thought about their child’s heat pain both prior to and following the child pain task. For this purpose, a state measure of the original Pain Catastrophizing Scale for Parents was used (PCS-P; Goubert et al., 2006, see below). In line with previous studies (Caes et al., 2011; Goubert, Vervoort, Cano, & Crombez, 2009), the PCS-P-state comprised one adapted item from each PCS-P subscale (Rumination: “At this moment, to what extent do you keep thinking/did you keep thinking about how painful the heat stimuli are/were for your child?”; Magnification: “At this moment, to what extent do/did you keep thinking something serious might happen to your child during administration of the heat stimuli?”; Helplessness: “At this moment, to what extent do/did you think you
The role of catastrophizing and contextual threat

would not be able to endure the administration of the heat stimuli?”). Parents rated the three items on an 11-point NRS with the endpoints 0 (not at all) and 10 (a lot). A mean score of these three items was calculated ranging from 0 to 10. The Cronbach’s α’s for the PCS-P-state measure were .62 and .53, respectively, for PCS-P-state before and the PCS-P-state after the pain task.

**Psychophysiological recordings**

We used the fear-potentiated startle reflex and EMG activity over the corrugator muscle as indicators of parental negative emotional response in anticipation of pain in their child (i.e., during pain and safety signals; Dimberg, 2000; Hamm et al., 1993). Although heightened levels of both measures suggest the activation of a self-oriented, aversive system (Dimberg, 2000; Dimberg & Karlsson, 1997; Lang et al., 1990; 1992) they seem to reflect different aspects of the negative emotional response. Specifically, the fear-potentiated startle is a sympathetic reflex indicating the activation of a defensive-motivational circuit, while the corrugator EMG activity assesses the facial muscle activity associated with processing negative events (Bradley et al., 2001; Dimberg, 2000; Grillon & Baas, 2003).

The fear-potentiated startle reflex was measured as the magnitude of the eye blink modulation to a sudden probe. Three Ag/AgCl electrodes with a diameter of 0.4 cm were filled with highly conductive gel and placed over the orbicularis oculi muscle of the left eye. After cleaning the skin with alcohol, one electrode was placed just below the left pupil, the second was placed 1 cm laterally. The ground electrode was placed on the forehead (see Blumenthal et al., 2005). The acoustic startle probe was a 50 ms burst of white noise (90-100 dB) with instantaneous rise time, presented binaurally over headphones. To prevent parental habituation to the startle probe, startle probes were administered at different time points during the pain and safety signals (i.e., at 3 seconds or at 6 seconds after pain/safety signal onset).

The EMG response over the corrugator muscle was registered with two Ag/AgCl electrodes with a diameter of 0.40 cm, filled with conductive gel. After cleaning the skin with alcohol, these electrodes were placed at the corrugator muscle above the left eye. The same forehead ground electrode as for the startle reflex was used (see Fridlund & Caciappo, 1986). For both psychophysiological measures, an EMG 100C Electromyogram Amplifier was used to record the raw electromyographic (EMG) signals with the high pass filter set at 90 Hz, and the low pass filter at 500 Hz. All psychophysiological responses were sampled at 1000 Hz. In line with guidelines
specified by Blumenthal and colleagues (2005), the psychophysiological data were integrated and analysed off-line using Psychophysiological Analysis (PSPHA; De Clercq, Verschuere, De Vlieger, & Crombez, 2006).

**Child facial pain expression**

Children’s facial pain expression during the pain task was video recorded and coded by means of the Child Facial Coding System (CFCS; Breau et al., 2001; Chambers, McGrath, Gilbert, & Craig, 1996; Gilbert et al., 1999). The CFCS is an observational rating system of 13 discrete facial actions (brow lowering, squint, eye squeeze, nose wrinkle, nasolabial furrow, cheek raiser, upper lip raise, lip corner pull, vertical mouth stretch, horizontal mouth stretch, blink, flared nostril and open lips). The facial actions blink, flared nostril, open lips are coded for presence only (0 or 1) while the remaining ten facial expressions are coded for both presence and intensity (0 = no action, 1 = slight action, 2 = distinct/maximal action). Child facial pain expression was coded for the six trials in which a pain stimulus followed the presentation of a pain signal. Specifically, the facial pain expression was coded during the 20-second time interval preceding presentation of the beige screen. Each second of the 20-second interval was coded using a software program enabling the rater to view and review each second at normal rate and at a rate of 1/10 of a second. For each time interval, a mean score per second for each of the 13 facial actions was calculated. A total score ranging between 0 and 138 was calculated by summing these mean scores. One trained coder rated the facial expressions for all participants. A second trained coder independently coded a random sample (20%) of the videotapes in order to determine the inter-rater reliability according to the formula provided by Ekman & Friesen (1978). The inter-rater reliabilities were acceptable for overall frequency (.80; range = .70:.93) and for overall intensity (.77; range = .67:.93) of child pain expression.

**Parental catastrophizing about their child’s pain**

Parental catastrophic thinking about their child’s pain was assessed with the Dutch version of the Pain Catastrophizing Scale for Parents (PCS-P; Goubert et al., 2006). This instrument 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). The PCS-P consists of 13 items describing different thoughts and feelings that parents may experience when their child is in pain. Parents rate how frequently they experience each of the thoughts and feelings when their child is in pain using a 5-point scale (0 = ‘not at all’, 4 = ‘extremely’). The PCS-P yields a total score that
The role of catastrophizing and contextual threat can range from 0 to 52, and three subscale scores for rumination, magnification and helplessness. The PCS-P has been shown to be reliable and valid (Goubert et al., 2006). The Cronbach’s alpha in this study was \( \alpha = .89 \).

**Parent-child interaction**

Following the pain task, parents and children were reunited and left alone for 3 minutes in order to videotape their interaction. A transcript of the utterances of parent and child during this interaction was made. The coding system used in the present study was based upon the coding procedure developed by Walker et al. (2006). Accordingly, mutually exclusive codes were assigned to parental utterances: (1) Pain-attending talk, defined as any talk by the parent that focuses upon the child’s pain experience (e.g., 'Did it hurt a lot?'; 'Are you still in pain now?'), (2) Non-pain attending talk, defined as parent utterances that did not focus upon the child's pain experience (e.g., 'Are you seeing your friends this evening?'; 'I am wondering what we will have for dinner tonight.') and (3) Other, which included parent's inaudible utterances and statements about technical aspects of the pain task. The same procedure was used to assign mutually exclusive codes ('Pain talk', ‘Non-pain talk’ and ‘Other’) to child utterances. A primary coder assigned codes to all utterances. Reliability was assessed by having a second independent coder complete the same coding procedure for 25% of the transcripts and compute the intra-class correlations (Bakeman, 2000). Reliability coefficients indicated good reliability (ranging from .71 to .91) for all coding categories. As we were primarily interested in the relative portion of parental pain-attending utterances, we calculated the proportion score of Parental pain-attending talk by dividing the number of parent utterances coded as pain-attending talk by the total number of parent utterances. Similarly, a proportion score of Child pain talk (i.e., number of child utterances coded as pain talk divided by the total number of child utterances) was computed.

**Procedure**

All participants were invited by phone and received standardized information about the study. When parent and child provided verbal consent, they were invited to the laboratory at Ghent University. A letter confirming their appointment was sent to them. Upon arrival at the lab, one of two experimenters accompanied the parent and child to the test-room.

Participants were told that we were interested in “how parents and children think and feel about the pain that children experience”. The pain procedure was described, and the thermal heat stimulator was shown. After obtaining written parental consent and child
assent, experimenter one stayed with the child in the test-room while experimenter two acompañied the parent to an adjacent room. During assessment of the child’s pain tolerance level, parents completed a socio-demographic questionnaire and the PCS-P. Parents did not observe assessment of their child’s heat tolerance level and were not informed that heat stimuli would be delivered at tolerance level. Parents then completed a dot-probe task (Vervoort et al., 2011) and the sensors for physiological recording were attached. When all the sensors were attached, parents (but not the children) received either neutral or threatening information concerning the pain task by means of a power-point presentation and completed the PCS-P state.

Parents were instructed to observe the pain and safety signals on the computer screen and their child’s face on a television screen throughout the pain task. The television screen was positioned next to the computer screen on which the signals were presented. The child could not see the parent throughout the duration of the pain task. Parents were only provided video display of their child and therefore could not hear their child’s utterances during the pain task. Providing auditory information to parents was not possible as the startle probes were presented to parents by means of a headphone. Moreover, this set-up is in line with previous research investigating parental responses to child pain using a similar experimental set-up (Caes et al., 2011; Goubert et al., 2009). Additionally, this set-up (of video display only) provides a pure measure of facial pain expression, which is not contaminated by child verbal pain behaviours. After the pain task, all sensors were removed and parents performed an additional computer task, which is beyond the scope of the current investigation (Vervoort et al., in press). After this task, parents and children were reunited in the test-room and were left alone for 3 minutes. During this 3-min interval, parent-child interaction was videotaped. Parent and child were not informed about the video recording in order to capture spontaneous behaviours. After 3 minutes an experimenter returned to the test-room to fully debrief parents and children about the purpose of the study and additional written parental consent and child assent for the use of the video data was obtained.

Data reduction and analysis

By using Psychophysiologival Analysis (PSPHA; De Clercq et al., 2006) the magnitude of the eye blink modulation was calculated by subtracting the mean rectified baseline value (0-20 ms after startle probe onset) from the rectified peak value in the 21-200 ms interval after probe onset. Trials with a baseline EMG-activity of at least 2.5 SDs above the mean baseline were visually inspected and rejected when regarded as a bad
signal to noise ratio, or as “too-early” startle blink onset. The eye blink magnitude of the remaining trials was z-transformed across trials, within individuals. The impact of outliers was reduced by substituting z-scores smaller than -3 or greater than 3 by -3 or 3, respectively (Patrick et al., 1993).

To account for interference of the eye blink modulation, only trials in which no startle probe was present during the signal were used in analyses of corrugator EMG activity. The baseline value of corrugator EMG activity was defined as the mean corrugator EMG activity 1000 ms before the onset of the signal. In a second step, the baseline-corrected activity was calculated for every second of the 8000 ms during signals, with exception of the first second, in order to avoid interference from orientating reactions (Dimberg & Karlsson, 1997; McIntosh, Reichmann-Decker, Winkielman, & Wilbarger, 2006). Finally, the baseline-corrected activity was averaged for safety and pain signals separately.

Statistical analyses were performed with SPSS statistical software, version 15.0. To investigate parental psychophysiological distress responses to their child’s pain, a 2 (Signal: Pain vs. Safety) x 2 (Type of information: neutral vs. threatening information) mixed repeated measure ANOVA was performed on parents’ corrugator EMG activity and eye blink modulation as the dependent variables. Child facial pain expression and parental catastrophic thought about their child’s pain (PCS-P) were entered as covariates in all analyses. We calculated the effect-size Cohen’s d to quantify the difference between pain and safety signals, with \( d = 0.20-0.30 \) indicating a small, \( d = 0.50 \) indicating a medium, and \( d = 0.80 \) indicating a large effect (Cohen, 1988). Moreover, partial eta squared \( (\eta_p^2) \) as calculated to have an estimation of the proportion of total variability attributable to a specific variable (with \( \eta_p^2 = 0.01 \) indicating a small, \( \eta_p^2 = 0.06 \) indicating a medium, and \( \eta_p^2 = 0.14 \) indicating a large effect; Cohen, 1988; Olejnik & Algina, 2000).

A hierarchical linear regression was conducted to investigate the influence of parental catastrophic thought, threatening information and child facial pain expression on parental pain-attending talk. As previous studies have revealed a bidirectional relationship between child responses and parental behaviour in response to child pain (see e.g., Blount et al., 1987; 1991; Claar et al., 2008; Walker et al., 2002; Williams, Blount, & Walker, 2011), we controlled for child pain talk when examining parental pain-attending talk. Child pain talk, Child facial pain expression, Type of information (neutral vs. threatening), and Parental catastrophic thought (PCS-P) were entered in the first step. In
the second step, the two-way interactions between Type of information, Parental catastrophic thought and Child facial pain were entered. The variance-inflation factors were acceptable (range = 1.07:2.42), suggesting that there was no problem of multicollinearity.

Statistically significant two-way interactions were investigated by plotting and testing the significance of the regression lines for high (+1 SD above the mean) and low (-1 SD below the mean) values of the moderator variable (i.e., Type of information or Child facial pain expression). For significant three-way interactions, similar regression lines were plotted separately for the two groups (i.e., neutral vs. threatening information) (Aiken & West, 1991; Holmbeck, 2002). To reduce the effects of multicollinearity, continuous variables were centred (Aiken & West, 1991).

**RESULTS**

**Descriptives and manipulation check**

Seven parent-child dyads were excluded from analyses due to technical problems with the equipment registering the psychophysiological measures (N = 4) or the video-recording equipment (N = 3). Therefore, final analyses were performed on 56 parent-child dyads. Power analysis indicated that this sample size was sufficient to detect a medium effect (d = 0.50) with power .80 using α = .05 two-tailed. Overall mean scores, standard deviations and correlations between all variables for the entire sample are shown in Table 1.

Children’s mean tolerance level for the heat stimulus was 48.30 °C (SD = 2.36 °C), and reported mean pain intensity at tolerance level was 7.09 (SD = 2.03). Parents’ mean level of catastrophizing about their child’s pain (PCS-P, M = 17.43, SD = 8.12) was comparable with previous research (e.g., Goubert et al., 2006; t(259) = .18, ns). Parental catastrophic thought about child pain showed a significant negative association with parental pain-attending talk (r = -.32, p < .05). No significant associations between parental catastrophic thought and parental psychophysiological responses in anticipation of their child’s pain were found.

To assess the effectiveness of our threat manipulation in parents (i.e., neutral versus threatening information), independent sample t-tests were performed on parental state catastrophic thought about their child’s heat pain. Results indicated that the threat manipulation was effective. Specifically, in comparison to parents who received neutral information (N = 26), parents who received threatening information (N = 30) reported
significantly higher state catastrophic thought concerning their child’s pain both before \( (M = 2.33, SD = 1.76 \text{ vs. } M = 1.59, SD = 0.95) \) and after \( (M = 1.46, SD = 1.51 \text{ vs. } M = 0.77, SD = 0.73) \) the pain task (both \( t(54) \geq 2.00, p < .05 \)).

**Parental psychophysiological responses during anticipation of child’s pain**

**Parental corrugator EMG activity**

Analyses with corrugator EMG activity as dependent variable revealed no significant main or interaction effect of parental catastrophic thought (PCS-P) and child facial pain expression (all \( F \)'s < 3.20, ns). While a significant main effect of Signal was observed \( (F(1,49) = 4.92, p < .05, d = 0.55) \), the Signal x Type of information interaction also reached significance \( (F(1,49) = 4.80, p < .05) \). Independent sample t-tests showed that parents receiving threatening information \( (M = 0.39, SD = 0.67) \) demonstrated more corrugator EMG activity during pain signals than parents receiving neutral information \( (M = -0.04, SD = 0.83, t(54) = 2.15, p < .05, d = 0.57, \text{ see Figure 2}) \). There was no significant difference between the two types of information provided to parents for corrugator EMG activity during safety signals \( (M(\text{low threat}) = 0.01, SD = 0.88; M(\text{high threat}) = -0.21, SD = 0.67; t(54) = 1.05, \text{ ns}) \). Additional paired sample t-tests, performed for each group separately, revealed that the difference in corrugator EMG activity during pain vs. safety signals was only significant for parents who received threatening information \( (t = 3.18, p < .01) \). In contrast, no difference in corrugator EMG activity during pain vs. safety signals was found for parents who received neutral information \( (t = -0.22, \text{ ns}) \). This suggests that, for corrugator EMG activity, the effect of signal was dependent upon type of information provided to parents prior to the pain task, with parents receiving threatening information showing more corrugator EMG activity during pain signals than during safety signal in comparison to parents who received neutral information (see Figure 2).
Table 1

Overall means (M), standard deviations (SD) and Pearson correlation coefficient for all parents (N = 56)

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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</thead>
<tbody>
<tr>
<td>1. PCS-P</td>
<td>17.43</td>
<td>8.12</td>
<td>-.08</td>
<td>.01</td>
<td>.19</td>
<td>-.32*</td>
<td>-.10</td>
<td>-.23</td>
<td></td>
</tr>
<tr>
<td>2. Corrugator EMG during safety signals</td>
<td>-0.11</td>
<td>0.77</td>
<td>-0.04</td>
<td>-0.06</td>
<td>-.31*</td>
<td>-.08</td>
<td>-.04</td>
<td>-.02</td>
<td></td>
</tr>
<tr>
<td>3. Corrugator EMG during pain signals</td>
<td>0.19</td>
<td>0.77</td>
<td>--</td>
<td>-.09</td>
<td>.23</td>
<td>.18</td>
<td>.02</td>
<td>.18</td>
<td></td>
</tr>
<tr>
<td>4. Eye blink modulation during safety signals</td>
<td>-0.05</td>
<td>0.16</td>
<td>--</td>
<td>-.14</td>
<td>.19</td>
<td>-.14</td>
<td>.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Eye blink modulation during pain signals</td>
<td>-0.04</td>
<td>0.17</td>
<td>--</td>
<td>-.18</td>
<td>.08</td>
<td>-.19</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6. Parental pain-attending talk</td>
<td>0.56</td>
<td>0.22</td>
<td>-</td>
<td>-.09</td>
<td>.82**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Child’s facial pain expression</td>
<td>7.74</td>
<td>4.88</td>
<td>-</td>
<td>-.09</td>
<td>.00</td>
<td></td>
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<tr>
<td>8. Child’s pain talk</td>
<td>0.58</td>
<td>0.21</td>
<td>-</td>
<td>-</td>
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*p < .05; ** p < .001; PCS-P = Pain Catastrophizing Scale for Parents, EMG = Electromyography
Parental eye blink modulation

Similar analyses were performed with parental eye blink modulation (indexing parental fear-potentiated startle) as dependent variable. The Signal x Type of information x Child’s facial pain expression interaction reached significance ($F(1,49) = 8.84, p < .01, \eta_p^2 = 0.15$). No other significant main or interaction effects were observed (all $F < 2.98, \text{ns}$).

Following up on the interaction effect, analyses for each group separately revealed that the interaction between Signal and Child facial pain expression during actual pain induction was only significant for the parents receiving threatening information ($F(1,28) = 7.58, p < .05$). To illustrate the pattern, we analysed the regression lines of children showing low vs. high facial pain expression for parents who received threatening information. Significance tests indicated that, in the case of high child facial expression, parents provided with threatening information showed augmented eye blink modulation (i.e., fear-potentiated startle) during pain signals compared with safety signals ($F(1,28) = 5.57, p < .05$; for the purpose of clarity, Figure 3 depicts a bar chart containing the mean values of parental eye blink modulation for high and low child facial pain expression). As apparent in Figure 3, parental eye blink modulation was unaffected by threatening information when children expressed low pain ($F(1,28) = 2.71, \text{ns}$).
Chapter 3

Figure 3. The influence of Signal and Child facial pain expression on parental fear-potentiated startle for parents assigned to the high threat group. * p < .05; ** p < .01

Parental pain-attending talk in response to their child’s pain

In the analysis with parental pain-attending talk as the dependent variable, no significant main effect or interactions with child’s facial pain expression were found (all $\beta < |.20|$, ns). Although parental catastrophic thought showed a main effect upon parental pain-attending talk ($\beta = -.38, t = -3.39, p < .01$), the interaction between parental catastrophizing (PCS-P) and the Type of information also reached significance ($\beta = .29, t = 2.67, p < .05$). This indicated that the influence of parental catastrophizing was conditional upon the information provided to parents prior to the pain task. To illustrate this pattern, we plotted separate regression lines for the parents who received neutral information and the parents who received threatening information (see Figure 4). The slope for the parents who received threatening information did not reach significance ($\beta = .01$, ns); parents provided with threatening information engaged in equal levels of pain talk independently of their level of catastrophic thought about their child’s pain. In contrast, the slope for the parents who received neutral information was significant ($\beta = -.42, p < .001$), indicating that high catastrophizing parents talked significantly less about their child’s pain than low catastrophizing parents when parents received neutral information. However, in line with our expectations, additional between-group analyses indicated that high, but not low catastrophizing parents, were sensitive to threatening information; i.e. high catastrophizing parents receiving threatening information talked significantly more about their child’s pain than high catastrophizing parents receiving neutral information ($\beta = .28, p < .01$; see Figure 4). No such difference was found for low
The role of catastrophizing and contextual threat

catastrophizing parents ($\beta = -.07$, ns). Finally, child pain talk showed a significant main effect on parental pain-attending talk ($\beta = .80$, $t = 10.86$, $p < .001$), indicating that parents engaged in more pain talk if their child talked more about their pain.

![Figure 4: The moderation of threatening contextual information upon the relation between parental catastrophic thought (PCS-P) and parental pain-attending talk. * $p < .05$; ** $p < .01$](image)

DISCUSSION

The present study examined the influence of parental catastrophic thought about child pain on parental experience of distress in anticipation of child pain and behavioural responses following pain induction. The moderating influence of contextual threat (threatening information and child pain expression) was also investigated. School children performed a pain task while observed by one of their parents. During the pain task, trials were preceded by a blue or yellow circle, signalling possible pain stimulation (pain signal) or no pain stimulation (safety signal). Prior to the pain task, parents received either neutral or threatening information regarding the pain stimulus. Parental distress was measured by psychophysiological indices. Parental “pain-attending behaviour” was assessed during a 3-min interaction between parent and child after the pain task. We expected that higher levels of parental catastrophizing, threatening information, and child pain expression would be associated with elevated levels of parental distress and pain-attending talk. Additionally, we expected that the influence of parental catastrophizing would be enhanced in a threatening context due to threatening information and/or child pain expression.
Chapter 3

The results can be summarized as follows. In terms of parental distress, parents who received threatening information about the pain task showed more corrugator EMG activity when anticipating pain in their child than parents receiving neutral information. Moreover, greater corrugator EMG activity in response to pain vs. safety signals was only apparent for parents receiving threatening information. Similarly, parents receiving threatening information showed a heightened fear-potentiated startle during pain signals compared to safety signals, but only if their child showed high pain expression. No significant impact of parental catastrophizing upon parental psychophysiological distress responses was observed. In contrast, parental catastrophizing significantly impacted parental behaviour when contextual threat was high. Specifically, high catastrophizing parents engaged in more pain-attending talk when provided with threatening rather than neutral information regarding the child’s pain experience. Moreover, when contextual threat was low (i.e., when receiving neutral information) high catastrophizing parents talked significantly less about child pain compared with low catastrophizing parents.

The current findings corroborate and extend previous self-report literature regarding parental distress (Caes et al., 2011; Goubert et al., 2009; 2008; Sieberg et al., 2011) by using psychophysiological indices of parental emotional reactions. Generally, the results indicate that parents experience automatic aversive emotional reactions in response to observing their child in pain and support the importance of contextual threat in parental reactions. In terms of parental distress, the present findings suggest that contextual threat may play a more important role than the overall tendency of parents to endorse catastrophic thought about child pain. At first sight, these findings stand in contrast with prior research highlighting pain catastrophizing as an important construct in understanding parental responses (Goubert et al., 2006; 2008). However, our findings corroborate recent evidence showing that the specific level of threat persons attach to a situation has higher predictive value in explaining their response to pain than their general tendency to interpret pain as threatening (i.e., catastrophizing; Caes et al., 2011; Campbell et al., 2010). Future research is needed to shed more light upon the relative importance of parental trait versus state catastrophic thought in explaining parental responses to child pain.

In terms of contemporary theories of empathy (Goubert et al., 2005), our findings demonstrate the individual and combined impact of contextual variables on parental emotional responses in anticipation of child pain. Specifically, threatening information was “sufficient” to induce a general aversive state/expression in parents, as evidenced by
heightened corrugator EMG activity. However, heightened fear-potentiated startle was observed only in the context of both threatening information and high child pain expression. The latter observation is in line with findings that the level of corrugator EMG activity is primarily influenced by the aversive content of the situation, while the arousal level of the situation affects the potentiation of the fear-potentiated startle. Therefore, in the absence of additional arousing features (such as heightened child pain expression) threatening information may not create a sufficiently arousing situation to produce elevated fear-potentiated startle (Bradley et al., 2001; Cuthbert, Bradley, & Lang, 1996). Furthermore, evidence suggesting that the two psychophysiological indices may tap into slightly different aspects of emotional responses may account for differential findings in the present study. Specifically, the fear-potentiated startle may reflect a sympathetic defensive-motivational reflex in parents, while the corrugator EMG activity primarily assesses parental facial activity when processing the negative circumstance of anticipating pain in their child (Bradley et al., 2001; Grillon & Baas, 2003). As psychophysiological measurement is a relatively new methodology to investigate parental emotional responses to child pain, further research is needed.

Heightened contextual threat, in combination with parental catastrophic thought, also significantly influenced parental “pain-attending behaviour”. Specifically, high catastrophizing parents attended more to the pain situation during interaction with their child (i.e., engaged in more pain-attending talk) when provided with threatening as opposed to neutral information. However, in the context of low contextual threat, high catastrophizing parents engaged in less pain-attending talk than did low catastrophizing parents. In contrast, low catastrophizing parents engaged in comparable pain-attending behaviour regardless of the information provided. The differential impact of contextual threat for high vs. low catastrophizing parents is consistent with an affective-motivational account of pain, conceptualizing pain as a source of distress, both drawing attention and associated with an urge to escape (Auvray, Myin, & Spence, 2010; Eccleston & Crombez, 1998; Van Damme, Legrain, Vogt, & Crombez, 2010), particularly when perceived as highly threatening (Leeuw et al., 2007; Vlaeyen & Linton, 2000). In the interpersonal context, pain-attending talk can be seen as a behavioural indicator of attention capture by pain, or reflect behavioural efforts at distress modulation caused by someone else’s pain experience. Accordingly, it is possible that, in the context of low threat, high catastrophizing parents’ lessened pain-attending talk reflects an avoidance response (i.e., avoiding information regarding the child’s pain experience). However, in the context of
high threat, high catastrophizing parents’ increased pain-attending talk may reflect either greater attention toward pain or failure of avoidant strategy. In contrast, low catastrophizing parents may be better able to regulate distress associated with child pain, thus attenuating induced threat (Goubert, Craig, & Buysse, 2009). Related to this finding, the results obtained with the dot-probe paradigm in a preceding part of the study indicated that only low catastrophizing parents selectively attended to faces expressing low facial expression, while higher catastrophizing parents increasingly attended away from low pain faces (Vervoort et al., 2011). It is possible that the avoidance tendencies of parents with heightened catastrophic thought may conflict with or be compromised by increased difficulty disengaging from pain in highly threatening or distressing situations (Cisler & Koster, 2010; Crombez, Eccleston, Baeyens, & Eelen, 1998a; Goubert, Vervoort, & Crombez, 2009b; Van Damme, Crombez, & Eccleston, 2004).

The above findings have clear clinical implications as they suggest that the type of information provided to parents about anticipated child pain (e.g., by a physician prior to a painful procedure) could influence parental emotional and behavioural response to child pain. However, more research is needed to disentangle the relative impact of various contextual variables, such as pain expression, contextual information and the parent-child relationship, upon parental pain-attending responses (Hadjistavropoulos et al., 2011). Additionally, further research is needed to investigate how heightened parental distress may influence a range of parental behaviours, and in turn impacts child functioning in distinct clinical contexts. For example, in the context of acute child pain, giving attention to the pain and searching for a cause and related solution may be an adaptive response fostering pain relief. However, in the context of chronic pain, disengaging from unattainable pain-relief goals in order to engage in other attainable life-goals despite the pain is associated with better well-being (Eccleston & Crombez, 2007; Massey, Garnefski, Gebhardt, 2009; McCracken, Gauntlett-Gilbert, & Eccleston, 2009; McCracken, Vowles, & Eccleston, 2004). Parental level of distress in response to child pain and how parents manage such distress may be important in understanding why parents keep focusing on reducing child pain despite several failed attempts (Eccleston & Crombez, 2007). Although further research is needed, it is possible that parents who can attenuate the contextual threat and associated distress may be able to adapt their behaviour in accordance with the needs of their child instead of having the urge to avoid or diminish the pain in order to reduce their feelings of distress (Batson, Fultz, & Schoenrade, 1987; Eisenberg et al., 1994; Goubert et al., 2009b).
A number of limitations need to be considered, each pointing to new directions for research. First, because the sample size was rather small, only medium to large effects could be detected. Second, the sample consisted of school children and their parents participating in a pain task within a safe experimental environment. Further research is needed to establish if similar pattern of results can be found in real-life situations and in parents of children with chronic or recurrent pain. Third, although parental state catastrophic thought increased due to experimental threat manipulation, the manipulation did not provoke high levels of catastrophizing or distress. Moreover, the heat stimuli provoked rather low levels of child facial pain display. Generalisation of the results may therefore be limited. Fourth, the majority of participating parents were mothers. As mothers’ responses may differ from those of fathers (Goubert et al., 2008; Lamb & Tamis-Lemonda, 2004; Moon, Chambers, & McGrath, 2011; Vervoort, Huguet, Verhoeven, & Goubert, 2011), future studies are needed to investigate whether similar patterns are true for fathers. Fifth, the coding system we used was limited to verbal behaviour. Non-verbal behaviour, however, is also an important feature of parent–child communication (Hadjistavropoulos et al., 2011; Williams, 2002). Therefore, future research could benefit from investigating if the same findings account for non-verbal parental behaviour.

Despite these limitations, the results add to our understanding of child pain within a social context by showing that parental catastrophizing thoughts about child pain, as well as contextual threat-inducing variables, have an impact upon parental emotional and behavioural reactions to child pain.

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Vervoort, T., Caes, L., Trost, Z., & Goubert, L. (in press) Parental attention to their child’s pain is modulated by threat-value of pain. *Health Psychology*.


Abstract

Treatment for child leukemia requires frequent lumbar punctures (LP) and bone marrow aspirations (BMA), which are often described by children as more painful and distressing than leukemia itself. Preliminary evidence indicates that these procedures also induce distress in parents, which is likely to impact their behaviour in response to child pain, reflected by increased protective, pain-attending behaviour. However, in the context of LP/BMA procedures, it is largely unknown which factors contribute to parents’ distress experience and how parents’ distress translates into parental behavioural responses. The present study aimed at investigating whether parental catastrophic thoughts about child procedural pain are associated with heightened parental feelings of distress and how parental distress, in turn, translates into parental behaviour. Participants were forty-six parents of children with leukemia who underwent a LP/BMA procedure at the University Hospital Ghent. Parental catastrophic thoughts about child procedural pain were assessed before the LP/BMA procedure. Parental distress was assessed afterwards. Parent-child interaction before and after the procedure was videotaped allowing coding of parental behaviour on the occurrence of pain-attending behaviours. Findings indicated that parents endorsing high levels of catastrophic thoughts about child procedural pain reported, in comparison with low catastrophizing parents, increased distress during LP/BMA procedures. Furthermore, findings indicated that higher levels of parental catastrophizing were associated with less pain-attending behaviour before the LP/BMA procedure. A reverse pattern was observed during the post-procedure phase in which the increased distress feelings in high catastrophizing parents contributed to an increased engagement in pain-attending behaviour. Theoretical and clinical implications of the findings are discussed.

INTRODUCTION

Treatment of pediatric cancer, with leukemia as the most common form, requires frequent painful, invasive medical procedures. These are major stressors for the child as well as their parents, whose responses may, in turn, impact the child’s adjustment to the treatment (Ljungman, Gordh, Sörensen, & Krueger, 1999; Patenaude & Kupst, 2005; Patterson, Holm, & Gurney, 2004; Pöder, Ljungman, & von Essen, 2010). Specifically, for diagnostic and/or therapeutic purposes, children with leukemia frequently undergo lumbar punctures (LP) and bone marrow aspirations (BMA), which involve an insertion of a needle into the child’s spinal column, respectively their hipbone (Kuppenheimer & Brown, 2000). Most children and parents describe these LP/BMA procedures as more painful and distressing than the cancer itself (Conte, Walco, Sterling, Engel, & Kuppenheimer, 1999; Jay, Ozolins, Elliot, & Cadwell, 1983; Kazak et al., 1995; Kuppenheimer & Brown, 2002). However, within the context of child leukemia, it is largely unknown which factors might contribute to a pronounced experience of distress in parents during these invasive medical procedures and how parental distress translates into behavioural responses to child pain.

Preliminary evidence suggests that parental catastrophic thoughts about child pain, defined as misinterpreting and exaggerating the threat value of their child’s pain and adopting a helpless attitude in dealing with child pain, is important in understanding parental emotional and behavioural responses to child pain (Caes, Vervoort, Eccleston, Vandenbende, & Goubert, 2011; Caes, Vervoort, Trost, & Goubert, 2012). In particular, studies in healthy school children as well as in children suffering from chronic pain indicate that parents endorsing high levels of catastrophic thoughts experience more distress, which, in turn, translates into higher tendencies to engage in protective, pain-attending responses, such as reassuring the child or restricting their child’s pain-inducing activity (Caes et al., 2011; Goubert, Vervoort, De Ruddere, & Crombez, in press; Goubert, Vervoort, Sullivan, & Verhoeven, 2008; Hechler et al., 2011; Sieberg, Williams, & Simons, 2011). This may have important implications for the child’s experience of these mandatory procedures, as evidence within the context of various needle procedures (e.g., immunization injections, LP/BMA procedures) indicated that parental protective, pain-attending behaviour is associated with more pain and distress experienced by children (Blount et al., 1989; Blount, Sturges, & Powers, 1990; Dahlquist, Power, Cox, & Fernabach, 1994; McMurtry, McGrath, Asp, & Chambers, 2007; Spagrud et al., 2008). Questions remain whether parental catastrophic thoughts about child pain have a similar
Impact on parental emotional responses and associated behaviour in the context of highly threatening medical procedures such as bone marrow aspirations and lumbar punctures.

The current study investigated, in a sample of parents of a child in treatment for leukemia, the influence of parental catastrophic thoughts about child pain during LP/BMA procedures on parental feelings of distress and pain-attending behaviour in response to a LP/BMA procedure. Parents accompanied their child in the pre- and post-procedure phase, but were not present during the actual LP/BMA procedure. Parents reported on their level of catastrophic thoughts about child procedural pain before the procedure and on their feelings of distress after the LP/BMA procedure. Parental pain-attending behaviour was assessed by coding the parent-child interaction in the pre- and post-procedure phase. We hypothesized that parents endorsing high levels of catastrophic thoughts about child pain during LP/BMA procedures would 1) experience heightened levels of distress and 2) engage more in pain-attending behaviour in response to child pain. We also explored whether parental feelings of distress mediate the association between parental catastrophic thoughts about child procedural pain and pain-attending behaviour.

**Method**

**Participants**

The present study is part of the “Ghent - Pain in Child Leukemia– study” (“G-PICL study”). Ethical approval for this study was obtained from the Ethics Committee of the University Hospital Ghent. Participants were families of children diagnosed with leukemia undergoing a lumbar puncture and/or bone marrow aspiration at the University Hospital Ghent, Belgium. Parents of children in different stages of the treatment process were recruited: parents of recently diagnosed children (i.e., induction phase) as well as parents of children diagnosed several months ago but still receiving intensive treatment (i.e., consolidation phase) or less intense maintenance treatment (i.e., maintenance phase) were eligible to participate. Exclusion criteria for this study included: 1) any developmental delay in the child, or 2) the inability of the parent to speak and write Dutch. Of the 52 families who were invited to participate, only four families refused participation (response rate: 92.31%). Main reason for non-participation was being overwhelmed with the diagnosis. In addition, two parents did not complete the questionnaires. The final sample consisted of 46 children (27 boys and 19 girls) and one of their parents (11 fathers, 35 mothers; see Figure 1 for a flowchart of the recruitment
The majority of the children were diagnosed with acute lymphoblastic leukemia (ALL; \( N = 37 \)). Eight children were diagnosed with acute myelogenous leukemia (AML; \( N = 8 \)) and one child was diagnosed with chronic myelogenous leukemia (CML). The mean duration since diagnosis was 5.76 months (\( SD = 8.57 \), range = 0:26). The mean age of the children was 6.88 years (\( SD = 4.31 \), range = 0:15). The majority of the children (70%) were, due to the treatment, currently not able to attend school. Half of the children underwent a lumbar puncture (\( N = 23 \), 50%), 15 children (32.6%) underwent a bone marrow aspiration and 8 children (17.4%) underwent both procedures. Parental mean age was 37.80 years (\( SD = 6.29 \), range: 22-50). Most parents were married or co-habiting (86.7%) and had received education beyond the age of 18 years (60.5%). All participating children and parents were Caucasian.

**Study overview**

Parental cognitive, emotional and behavioural reactions in response to one of their child’s LP/BMA procedures was assessed during different phases of the procedure. Before the LP/BMA procedure took place, parents were requested to report on their level of catastrophic thoughts about their child’s procedural pain. Then, parents accompanied their child to the treatment room where the LP/BMA procedure was going to take place. Parents were allowed to be present during preparations (i.e., pre-procedure phase) and during aftercare (i.e., post-procedure phase). Standard protocol used at University Hospital Ghent does not allow parents to be present during the LP/BMA procedure. Parent-child interactions occurring during the pre- and post-procedure phase were videotaped. After the procedure, parents returned to the child’s room and were asked to report on their level of distress they had experienced while their child underwent the LP/BMA procedure.
Invited families meeting inclusion criteria (N = 52)

N = 4 families refused participation

N = 48 families consented to participate
   boys = 28, girls = 20

N = 2 incomplete data

Final sample: N = 46
   boys = 27, girls = 19
   mothers = 35
   fathers = 11

Figure 1. Flowchart of recruitment procedure.
Measures

Catastrophizing about their child’s procedural pain

Parents’ catastrophic thoughts about their child’s procedural pain were assessed with a state measure of the Pain Catastrophizing Scale for Parents (PCS-P; Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006). In line with previous studies (see e.g. Caes et al., 2011; Goubert, Vervoort, Cano, & Crombez, 2009a), the state version of the PCS-P comprised one adapted item from each subscale (PCS-P state; Rumination: “During the LP/BMA procedure, to what extent did you keep thinking about how painful the LP/BMA procedure is for your child?”; Magnification: “During the LP/BMA procedure, to what extent did you think that, because of the pain, something serious might happen to your child?”; Helplessness: “During the LP/BMA procedure, to what extent did you think, that because of the pain of your child, you would not be able to endure the LP/BMA procedure?”). By means of an 11-point numeric rating scale (0 = not at all; 10 = a lot), parents were instructed to indicate to what extent they had experienced these thoughts during their child’s previous LP/BMA procedure. Parents completed the PCS-P-state prior to the LP/BMA procedure. A mean score of these three items was calculated ranging from 0 to 10. Cronbach’s $\alpha$ for the PCS-P-state was high (.86).

Parental distress during the LP/BMA procedure

After the LP/BMA procedure, parents indicated to what extent they had experienced various emotions while their child underwent the LP/BMA procedure. All emotion adjectives were rated on an 11-point scale ranging from ‘not at all’ (0) to ‘extremely’ (10). Based on the work of Batson, Fultz, & Schoenrade (1987), the list included four adjectives reflecting self-oriented emotional responses or distress (i.e., worried, upset, anxious, sad). A mean score of parental distress, ranging from 0 to 10, was calculated with higher scores indicating higher levels of parental distress. Reliability within the present study was high ($\alpha = .90$).

Parental behaviour

Parent-child interaction during the pre- and post-procedure phase was videotaped in order to code parent and child behaviour. Specifically, during the pre-procedure phase recording started when parent and child entered the treatment room and stopped when the parent left the room to wait outside. During the post-procedure phase, parent-child interactions were again recorded from the moment parents were called back in the treatment room when the LP/BMA procedure was over until parent and child left the treatment room. The coding system used in the present study was based upon the coding procedure developed by Walker and colleagues (2006). Within the present study, one
Parental distress and behaviour during LP/BMA procedures

Refinement was made to the original coding procedure of Walker and colleagues (2006), by also coding parent/child non-verbal behaviour in addition to parent/child verbal utterances. Our coding procedure comprised the following codes for parents’ behaviour: (1) verbal/non-verbal pain-attending behaviour, defined as any behaviour by the parent that focuses upon the child’s pain experience (e.g., ‘Did it hurt a lot?’; ‘Are you still in pain now?’; holding the child’s hand; stroking or patting the child), (2) verbal/non-verbal non-pain attending behaviour, defined as parent behaviour that did not focus upon the child's pain experience (e.g., smiling; making a joke; coping statement; praising the child by saying for example “You are doing great” or by showing the child a thumbs up) and (3) Other, which included parent's inaudible utterances, statements about technical aspects of the LP/BMA procedure and non-verbal behaviour or utterances directed to the medical staff. Codes for children’s behaviour included: (1) child verbal/non-verbal pain behaviour, defined as behaviour relating to the pain experience (e.g., “I don’t want to do this, I’m scared”, “It hurts a lot”, crying, screaming, resisting); (2) child verbal/non-verbal non-pain behaviour, defined as child behaviour not focused upon the pain experience (e.g., talking about something else, playing with a toy, …); and (3) Other, defined as all other child utterances and behaviour. A 5 s interval recording system was used during which all parent and child behaviour codes were rated as occurring (coded 1) or not occurring (coded 0) (see Blount, Devine, Cheng, Simons, & Hayutin, 2008). A primary coder assigned codes to all tapes. A second independent coder completed the same coding procedure for 25% of the tapes in order to compute Kappa reliability coefficients. Kappa reliability coefficients indicated good reliability (ranging from .74 to .90) for all coding categories (Fleiss, 1981).

For the present study, we were primarily interested in the occurrence of parental pain-attending behaviour. To control for the varying time length of the LP/BMA procedure, the total score for parental verbal and non-verbal pain-attending behaviour, was divided by the total amount of time intervals and multiplied by 100. The score for child verbal and non-verbal pain behaviour was calculated in a similar vein (i.e., number of child behaviour coded as verbal, respectively, non-verbal pain behaviour divided by the total amount of time intervals and multiplied by 100).

Procedure

Children who were hospitalized for a LP/BMA procedure and their parents were invited to participate. Parents were informed about the aim of the study (i.e., investigating the impact of the child’s pain during LP/BMA procedures upon parental experience of
these procedures) and informed that non-participation would have no influence on their treatment in the clinic. When children and parents agreed to participate, a written informed consent was obtained from the parents and children older than 12 years. After providing consent for participation, parents were asked to complete the measure on catastrophic thoughts about child procedural pain. As part of standard pain management, EMLA® (a topical anaesthetic cream) was applied to the child’s skin approximately one hour before the LP/BMA procedure (Young, Schwartz, & Sheridan, 1996). Moreover, during the LP/BMA procedure, children received Kalinox®, which is a colourless gas that tranquillises but not anesthetises the child (Reinoso-Barbero et al., 2011). The first author (LC) or a research assistant supervised by the first author was present in the treatment room the whole time (pre, during and post-procedure phase) in order to videotape parent-child interaction during the pre- and post-procedure phase. Additionally, she recorded the duration of the LP/BMA procedure in minutes. Importantly, she did not interact with the staff, parents or child during the different phases of the procedure. After completion of the procedure parents returned to the child’s room and were requested to report on their level of distress experienced during the procedure.

**Data analysis**

Statistical analyses were performed with SPSS statistical software, version 19.0 for windows. Descriptive statistics, correlation analyses and hierarchical linear regression analyses were performed to test the hypotheses two-tailed at \( p < .05 \). In the first step of the hierarchical linear regressions, child’s gender (boys coded as 0 and girls as 1) and age were entered to control for socio-demographic effects. Duration since diagnosis was entered in the second step. In the final step, PCS-P-state was entered. In the analyses examining parental pain-attending behaviour, we additionally controlled for child pain behaviour. As analyses revealed similar results for parental verbal and non-verbal pain-attending behaviour, we created a composite score reflecting parental pain-attending behaviour by summing both proportion scores separately for the pre- and post-procedure phase. The same strategy was used to create a composite score for child verbal and non-verbal behaviour during pre- and post-procedure phase. Variance-inflation factors of all regression analyses were acceptable (range = 1.05:2.20) suggesting that there was no problem of multicollinearity.

Bootstrapping was used to test whether parental distress mediated the effect of parental catastrophizing on parental behaviour (Preacher & Hayes, 2004; see Figure 2; weight ab). The effect of parental catastrophizing on parental distress is represented by
weight $a$, whereas weight $b$ is the effect of parental distress on parental behaviour, partialling out the effect of parental catastrophizing (Roelofs, Huibers, Peeters, Arntz, & van Os, 2008). The indirect effect (weight $ab$) was assessed by estimating the 95% bias-corrected bootstrapping confidence intervals (with 5000 bootstrap resamples). Recent statistical research suggested that bootstrapping is more appropriate than a normal-theory test (i.e., Sobel’s test) for studies with smaller sample sizes (Hayes, 2009; MacKinnon, Lockwood, Koffman, West, & Sheets, 2002; Shrout & Bolger, 2002). Discussion exists whether the direct effect (weight $c'$) is required to be significant for mediation (McKinnon et al., 2002). For the purpose of clarity, we will only refer to a “mediation effect” if the direct association between parental catastrophic thoughts and pain-attending behaviour was found to be significant and mediated by parental feelings of distress. When the direct effect between parental catastrophizing and pain-attending behaviour was not significant, but the indirect effect through feelings of distress was found to be significant, we will use the term “indirect effect”.

![Figure 2. Graphic representation of the mediation model. Note. The total effect (weight $c$) consists of a direct effect (weight $c'$) and the indirect effect (ab weight).](image-url)
RESULTS

Descriptive statistics and correlations

Mean scores, standard deviations and correlations for all parent data are presented in Table 1. Mothers ($M = 4.96, SD = 2.74$) reported significantly more feelings of distress during the LP/BMA procedure compared to fathers ($M = 2.18, SD = 1.79$, $t(44) = 3.14$, $p < .01$). Parental state catastrophizing showed a significant positive correlation with parental distress during the LP/BMA procedure (PCS-P state: $r = .55$, $p < .01$). Parental pain-attending behaviour in the post-procedure phase, but not during the pre-procedure phase, was positively associated with parental distress experienced during the LP/BMA procedure ($r = .35$, $p < .05$). Child gender (all $t < |1.56|$), diagnosis (all $t < |1.58|$), type of LP/BMA procedure (all $t < |1.64|$), and duration of the LP/BMA procedure (all $r < |.17|$) were not associated with any of the parent variables. However, child age was significantly negatively correlated with parental pain-attending behaviour in the pre-procedure phase ($r = -.47$, $p < .01$) and post-procedure phase ($r = -.35$, $p < .05$), as well as with child pain behaviour pre-procedure ($r = -.41$, $p < .01$) and post-procedure ($r = -.60$, $p < .01$). Moreover, duration since diagnosis was significantly negatively correlated with child pain behaviour during the post-procedure phase ($r = -.35$, $p < .05$). Consequently, we controlled for the impact of these variables in the subsequent regression analyses.

Regression Analyses

The relationship between parental catastrophizing and parental distress

A hierarchical linear regression was conducted to investigate the contribution of parental state catastrophic thoughts in explaining parental distress during LP/BMA procedures. Results of the regression analyses are presented in Table 2. Results indicated no significant effects of child’s gender, age, and duration since diagnosis. Of interest, parental state catastrophic thinking had a significant positive contribution ($\beta = .65$, $p < .001$, explaining 35% of the variance), indicating that higher levels of parental catastrophic thoughts about child’s procedural pain contributed to higher levels of parental distress during the LP/BMA procedure (see Table 2).

The relationship between parental catastrophizing and parental pain-attending behaviour

Similar hierarchical regression analyses were performed to investigate the influence of parental state catastrophic thoughts on parental 1) pain-attending behaviour pre-procedure and 2) pain-attending behaviour post-procedure.
Parental distress and behaviour during LP/BMA procedures

Parental pain-attending behaviour pre-procedure. No significant influence was found of child age and gender and duration since diagnosis. However, the child’s pain behaviour during the pre-procedure phase ($\beta = .76$, $p < .001$) was significantly related with more parental pain-attending behaviour in the pre-procedure phase. Furthermore, parental state catastrophic thoughts about child procedural pain showed a significant negative association with parental pain-attending behaviour ($\beta = -.23; p < .05$; explaining 4% of the variance; see Table 2), indicating that higher levels of parental catastrophizing are associated with lower levels of pain-attending behaviour during preparations (i.e., pre-procedure phase).

Parental pain-attending behaviour post-procedure. The analyses with parental pain-attending behaviour during the post-procedure phase showed that child pain behaviour post-procedure was positively associated with parental pain-attending behaviour in the post-procedure phase ($\beta = .42$, $p < .05$; see Table 2). No other variables were found to be significant (all $t$’s < 0.72, ns).

Mediation by parental feelings of distress

Using bootstrapping, we investigated the indirect relationship between state catastrophic thinking of parents and parental post-procedural pain-attending behaviour by parental distress during the LP/BMA procedure (see Figure 2). The direct effect between parental catastrophic thoughts and parental post-procedural pain-attending behaviour was not significant ($c’ = 1.00$, $SE = 1.80$; ns). However, analyses showed that parental feelings of distress during the LP/BMA procedure were positively and significantly related to parental pain-attending behaviour in the post-procedure phase ($b = 4.24$, $SE = 2.10$, $p = .05$). Moreover, the indirect effect ($ab = 2.39$, $SE = 1.49$) was also found to be significant as the 95% bias corrected (BC) bootstrapped confidence interval (CI: 0.53 to 7.51 with 5000 resamples) excluded zero. This suggests an indirect relationship, through feelings of distress, between parental catastrophizing about pain and pain-attending behaviour in the post procedure. Specifically, increased distress in high catastrophizing parents contributed to increased engagement in pain-attending behaviour.
Table 1
Means (M), Standard deviations (SD) and Pearson correlation coefficients for all parent measures.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PCS-P state</td>
<td>46</td>
<td>4.21</td>
<td>2.72</td>
<td>0-10</td>
<td>.55***</td>
<td>-.04</td>
<td>.10</td>
<td>.23</td>
<td>.04</td>
</tr>
<tr>
<td>2. Parental distress</td>
<td>46</td>
<td>4.29</td>
<td>2.79</td>
<td>0-10</td>
<td>-</td>
<td>.10</td>
<td>.36*</td>
<td>.22</td>
<td>.19</td>
</tr>
<tr>
<td>3. Parental pain-attending behaviour pre-procedure</td>
<td>43</td>
<td>34.15</td>
<td>42.93</td>
<td>0-151.92</td>
<td>-</td>
<td>.44**</td>
<td>.78***</td>
<td>.70***</td>
<td></td>
</tr>
<tr>
<td>4. Parental pain-attending behaviour post-procedure</td>
<td>43</td>
<td>31.76</td>
<td>36.78</td>
<td>0-117.39</td>
<td>-</td>
<td>.40**</td>
<td>.52***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Child pain behaviour pre-procedure</td>
<td>44</td>
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<td>6. Child pain behaviour post-procedure</td>
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<td>17.31</td>
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* p < .05, ** p < .01, *** p < .001; PCS-P state = state version of Pain Catastrophizing Scale for Parents
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* p < .05; ** p < .01; *** p < .001; PCS-P state = state version of the Pain Catastrophizing Scale for Parents
DISCUSSION

The present study investigated, in a sample of parents caring for a child diagnosed with leukemia, the influence of parental catastrophic thoughts about child procedural pain on parental distress and behaviour in response to LP/BMA procedures. The findings demonstrated the importance of parental catastrophic thoughts about their child’s pain during invasive medical procedures, such as LP/BMA procedures, in understanding parental emotional and behavioural reactions. In particular, we found that parental level of catastrophizing, measured prior to the procedure, was associated with more intense feelings of distress during the LP/BMA procedure. Moreover, higher levels of parental catastrophizing were associated with less pain-attending behaviour before the LP/BMA procedure. However, a reverse pattern was observed during the post-procedure phase. Specifically, no direct effect was found of parental catastrophic thinking, but the heightened experience of distress in high catastrophizing parents contributed to increased engagement in pain-attending behaviour within the post-procedure phase.

The current findings are in line with previous findings in parents of healthy school children and children suffering from chronic pain on the role of parental catastrophic thoughts about child pain in understanding parental emotional-behavioural responses to child pain (Caes et al., 2011; 2012; Goubert et al., 2006; 2008; in press). In addition, the present study extends previous research by indicating similar processes generalize to more severe child pain incidences. At present, preliminary evidence has shown that LP/BMA procedures elicit distress in parents (Kazak et al., 2005; Jay et al., 1983). Our findings indicated that especially parents who catastrophize about child pain during LP/BMA-procedures experience these procedures as highly distressing, resulting in different behavioural patterns according to the specific procedure-phase.

An affective-motivational perspective upon pain may account for the current findings. In particular, an affective-motivational perspective conceptualizes pain as a source of distress that draws attention and motivates escape or avoidance behaviours (Eccleston & Crombez, 1999; Van Damme, Legrain, Vogt, & Crombez, 2010), particularly when pain is perceived as highly threatening (Leeuw et al., 2007; Vlaeyen & Linton, 2000). Our finding of heightened distress in parents who interpret child pain due to invasive medical procedures as threatening (i.e., parents who catastrophize about child procedural pain) suggests an affective-motivational perspective is particularly valuable for understanding interpersonal features of pain. Notably, however, the translation of parents’ catastrophic thoughts and associated distress into parental behaviour in response
to child pain is not as straightforward as one might expect. Specifically, compared with low catastrophizers, parents endorsing high levels of catastrophic thoughts about child procedural pain engaged in less pain-attending behaviour during preparations (i.e., pre-procedure phase). However, intense feelings of distress led high catastrophizers to engage in the reverse pattern, i.e., more pain-attending behaviour, once reunited with their child in the post-procedure phase. Although unexpected, these results are in line with previous findings showing different child and parent behaviour across the different phases of medical procedures (Blount et al., 1990; Cline et al., 2006; Vance & Eiser, 2004), and may reflect adjustment in parental strategies due to varying demands of the different procedure-phases (Blount et al., 1990).

A number of explanations may account for the differential findings concerning parental behaviour depending on the procedure-phase. In this regard both an affective-motivational perspective as well as contemporary theoretical views upon empathy in the context of pain are informative (see e.g., Goubert et al., 2005; Goubert, Craig, & Buyse, 2009). A recently formulated pain-related empathy model defines empathy as “the sense of knowing the experience of the other”, with inter-related cognitive, emotional and behavioural components (Goubert et al., 2005). Particularly important with regard to the current findings is the assumption that an empathic distress reaction in response to another in need is associated with an egoistic motivation to help the other in order to reduce the own engendered feelings of distress (Batson et al., 1987; Eisenberger & Miller, 1987; Goubert et al., 2009). This egoistic motivation is therefore, when possible, expressed as behavioural tendencies of escaping or avoiding the threatening situation. Consequently, applied to our findings, it is possible that the low engagement in pain-attending behaviour during preparations by parents endorsing catastrophic thoughts about child procedural pain may reflect a strategy to regulate their anticipated distress experience by attentional avoidance of child pain (Bebko, Franconeri, Ochsner, & Chiao, 2011; Blount et al., 1987; Caes et al., 2011; Gross & John, 2003; Vervoort et al., 2011). However, as there are various potential routes to parental behaviour, alternative explanations are plausible. For instance, it is also likely that parents’ behaviour is influenced by their beliefs regarding the appropriateness of specific responses and the consequences of their responses for their child. Therefore, parents’ reduced pain-attending behaviour in response to pain displays may also represent their active attempt to model well behaviour towards their child (i.e. not to exaggerate or “fuss” about pain). Notably, however, in the post-procedure phase, the reversed pattern was observed.
Specifically, high catastrophizing parents’ behavioural strategy changed due to heightened experience of distress such that increased distress in parents who catastrophize about child procedural pain contributed to increased engagement in pain-attending behaviours (e.g., asking information about child pain and comforting the child). This may indicate that high catastrophizing parents’ attempts to avoid child pain fail in the face of increasing levels of distress. Specifically, during the post-procedure phase, parents who endorse catastrophic thoughts about child procedural pain might experience increased difficulty to disengage their attention from the pain situation, thereby compromising their avoidant strategy (Goubert, Vervoort, & Crombez, 2009b; Van Damme, Crombez, & Eccleston, 2004; Vervoort et al., 2011). Consequently, the pain-attending response may reflect an ultimate attempt to reduce the full-blown experience of distress, due to failed avoidance, by trying to reduce child pain (Gross & Thompson, 2007). Although more research is needed addressing changes in parental distress and associated behaviour along the course of medical procedures, it is plausible that the threat level of the LP/BMA procedure might be important in explaining increased difficulties to avoid child pain in the post-procedure phase (Caes et al., 2012; Vervoort et al., 2011). In particular, it is plausible that the threat level parents attach to the LP/BMA procedure increases while their child undergoes the procedure. Moreover, especially parents who highly catastrophize about child procedural pain may be prone to extensive processing of this heightened threat (Caes et al., 2012, Vervoort et al., 2011), thereby compromising their ability to disengage their attention from the pain situation (Crombez, Eccleston, Baeyens, & Eelen, 1998; Van Damme et al., 2004; Vervoort et al., 2011). However, heightened pain-attending responses may be less appropriate and negatively impact child pain experiences to deal with the invasive medical procedure (Blount et al., 1989; 1990; Chambers, Craig, & Bennet, 2002; Dahlquist et al., 1994; McMurtry et al., 2007; Spagrud et al., 2008; Vervoort, Huguet, Verhoeven, & Goubert, 2011).

Accordingly, the current findings have important implications as they suggest that especially parents endorsing catastrophic thoughts about child pain experience these procedures as highly distressing, which in turn leads to higher engagement in pain-attending behaviours when reunited with their child in the post-procedure phase. This further underscores the importance of clinical interventions preparing children as well as parents for invasive medical procedures. Although interventions instructing children and parents on how to cope with medical procedures obtain positive results, these interventions are rarely standard practice in clinics (Chambers, 2003). The absence of a
Parental distress and behaviour during LP/BMA procedures

direct effect between parental catastrophic thinking and pain-attending behaviour in the post-procedure phase in the current study suggests that pain-attending responses likely reflects only one possible strategy of high catastrophizers to cope with induced distress during LP/BMA procedures. Specifically, it is reasonable to assume that other emotion regulation strategies might co-occur (Gross & Thompson, 2007), thereby cancelling out the direct impact of catastrophic thoughts on pain-attending behaviour (McKinnon et al., 2002). In particular, it is possible that parents endorsing catastrophic thoughts about child procedural pain have also developed, or been provided with (by e.g. staff members), other strategies to handle distressing, invasive medical procedures such as cognitive reappraisal or distraction techniques (Gross & Thompson, 2007). Consequently, it may not be necessary to alter catastrophic thoughts about child pain, but rather the way in which parents deal with their catastrophic thinking and associated heightened experience of distress (Connelly et al., in press; Dahlquist et al., 2001). In particular, it may prove functional to provide high catastrophizers with more adequate strategies to attenuate their feelings of distress in the context of invasive, medical procedures.

The results need to be interpreted in light of some limitations. First, as all families were recruited in only one hospital, generalisation of the results might be limited. Second, parents were not allowed to stay with their children during the procedure. Thus, our data is limited to the parental behaviour in the pre- and post-procedure phase, and we do not know how parents would actually behave when being present during LP/BMA procedures. Third, although parental gender was taken into account, mostly mothers attended their child’s LP/BMA procedures. Previous studies indicated that fathers’ responses might differ from mothers’ responses (Goubert et al., 2008; Hechler et al., 2011; Vervoort et al., 2011). Therefore, future studies would benefit from including more fathers in order to make more precise conclusions about differences between mothers and fathers in their response to child procedure-related pain. Fourth, the sample was not entirely homogeneous, as the participating children differed on a number of illness-related factors. Specifically, children recently diagnosed and thereby undergoing one of their first LP/BMA procedures, as well as children already in treatment for several months participated. Moreover, also children who had relapsed and children who already received bone marrow transplantation were included. Although the time since diagnosis did not show a significant association with parental responses in the current study, previous research indicated that the stage of treatment has an impact upon parental emotional experiences (Brown et al. 1992). Finally, due to the cross-sectional nature of
the study it is unclear whether the findings remain stable over the course of the treatment. A longitudinal approach, which is incorporated in the G-PICL study of which the current study represents the cross-sectional part, is needed to gain a more thorough understanding of how parental responses to child pain during LP/BMA procedures evolves over time.

Despite these limitations, the results further add to our understanding of parental experiences and responses to invasive and painful medical procedures in their child. Findings indicated that parents who catastrophize about child procedure-related pain experience these invasive medical procedures as highly distressing. Moreover, during preparations, high catastrophizing parents engage in avoidance strategies to deal with the painful procedures, whereas an inverse pattern was observed during aftercare in which increased distress in high catastrophizing parents contributed to increased engagement in pain-attending behaviour.

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REFERENCES


Parental distress and behaviour during LP/BM procedures


Parental distress and behaviour during LP/BMA procedures


Chapter 4


ABSTRACT

Children with leukemia frequently undergo invasive and painful medical procedures, such as lumbar punctures (LP) and bone marrow aspirations (BMA). These LP/BMA procedures are distressing aspects of the treatment for both the child as well as their parents. Preliminary evidence indicates that these invasive medical procedures continue to elicit distress over the course of child treatment. However, no research has investigated how child and parental distress, and associated parental behaviour, actually evolve over the course of consecutive LP/BMA procedures. Moreover, little is known about the impact of parental distress during LP/BMA procedures on child distress and which factors contribute to persistent distress experience in parents. By means of prospective analyses, the current study aimed at investigating 1) how child and parental feelings of distress and parental pain-attending behaviour evolve over the course of consecutive LP/BMA procedures, 2) how parent emotional and behavioural response impact child distress experience and 3) whether parental distress and pain-attending behaviour is most pronounced in high catastrophizing parents. We expected that the experience of distress and associated pain-attending behaviour would remain high, particularly in those parents who endorse high levels of catastrophic thoughts about child pain. Further, we expected enhanced parent distress and pain-attending behaviour to be associated with increased child distress. Participants were 25 children recently diagnosed with leukemia and their parents. Parents reported on their level of catastrophic thoughts about child procedural pain before the first LP/BMA procedure included in the study. After each LP/BMA procedure, parents reported on their feelings of distress and pain-attending tendencies during the LP/BMA procedure. Results indicated that parents who endorse high levels of catastrophic thoughts about child procedural pain reported an increase in their distress response, while low catastrophizing parents’ distress level decreased after repeated exposure to LP/BMA procedures. Parental tendency to engage pain-attending behaviour was positively associated with parental catastrophic thoughts about child procedural pain, but did not change over time. Moreover, child distress during these procedures increased over time and was positively related with parental distress response, but not with parental pain-attending tendencies. Theoretical and clinical implications and further research directions are discussed.

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7 Caes, L., Vervoort, T., Devos, P., Verlooy, J., Benoit, Y., & Goubert, L. (in preparation). Parental catastrophic thoughts about child pain predict an increase in parental distress over the course of child lumbar and bone marrow aspirations.
INTRODUCTION

Childhood cancer, with leukemia as the most common form, is a major health problem, which not only affects the child, but also places a burden on their parents (Patenaude & Kupst, 2005). Specifically, evidence is accumulating showing that most families exhibit high levels of acute stress symptoms immediately after the diagnosis of child cancer (Kazak, 2005; Phipps, Long, Hudson, & Rai, 2005). However, not only the child’s cancer diagnosis, but also the subsequent treatment process is characterized by multiple sources of stress and uncertainty (Patterson, Holm, & Gurney, 2004; Pöder, Ljungman, & von Essen, 2010). Specifically, repeated painful invasive procedures, such as lumbar punctures (LP) and bone marrow aspirations (BMA), have been acknowledged as a major stressor associated with the treatment of pediatric cancer (Conte, Walco, Sterling, Engel, & Kuppenheimer, 1999; Kuppenheimer & Brown, 2002; Ljungman, Gordh, Sörensen, & Krueger, 2000). Notably, symptom burden, such as procedure-related pain, and general stress responses tend to diminish towards the end of treatment (Kazak, 2005; Ljungman et al., 2000; Pöder et al, 2010), yet the experience of distress associated with LP/BMA procedures does not seem to remit substantially (Jay, Ozolins, Elliot, & Cadwell, 1983; Kazak et al., 1995; Katz, Kellerman, & Siegel, 1980). A prolonged distress experience (both in child and parents) in response to invasive medical procedures could have a negative impact on their adjustment to the treatment process (Pöder et al., 2010). Moreover, given the interpersonal context of pediatric pain (Hadjistavropoulos et al., 2011), parents’ distress response may also negatively impact child experiences of and adaptation to these mandatory aspects of the treatment (Penner et al., 2008).

However, various questions remain. First, previous studies only assessed possible changes in parent and child distress response by taking into account the duration since diagnosis (Katz et al., 1980; Kazak et al., 1995) or the number of previous LP/BMA procedures (Jay et al., 1983). To the best of our knowledge, no research has investigated how child and parental LP/BMA procedure-related distress actually evolves over the course of consecutive LP/BMA procedures that are part of the child’s treatment. Moreover, little research has addressed whether the child’s distress level during LP/BMA procedures depends upon parents’ own distress response (Penner et al., 2008). Parental distress and associated behavioural responses are likely to impact child distress in the context of pain (Hadjistavropoulos et al., 2011; Palermo & Eccleston, 2009). Specifically, previous research indicated that parents who experience child pain as distressing engage more in protective, pain-attending behaviour (e.g., comforting child, giving attention to
Course of parental responses during LP/BMA procedures over time

child pain) in response to child pain (Caes, Vervoort, Eccleston, Vandenhende, & Goubert, 2011; Sieberg, Williams, & Simons, 2011), which in turn may negatively impact child pain experiences (Sieberg et al., 2011). In particular, within the context of less invasive needle procedures (e.g., immunization injections), considerable research has indicated that parental protective, pain-attending behaviour is associated with more child pain and distress (Blount, Devine, Cheng, Simons, & Hayutin, 2008; Manne, Bakeman, Jacobsen, Gorfinkle, & Redd, 1994; McMurtry, McGrath, Asp, & Chambers, 2007; Spagrud et al., 2008). However, few research is available addressing parents’ distress and associated pain-attending behaviour in response to invasive, medical procedures and how parents’ emotional experience and parental behavioural response impact the child’s pain experience (Blount et al., 1989; Blount, Sturges, & Powers, 1990; Dahlquist et al., 1994; Jay et al., 1983; Kazak et al., 1995, Penner et al., 2008).

Furthermore, it is unclear which factors contribute to parents’ distress experience during these invasive, medical procedures. It is reasonable to assume that parents’ perceived threat of these LP/BMA procedures (i.e., catastrophic thoughts) may have a profound impact on how parental emotional and behavioural response to LP/BMA procedures evolve over time. In line with this assumption, previous research in parents of healthy school children and children suffering from chronic pain has indicated that parental catastrophic thoughts about child pain are related to heightened feelings of distress, which in turn translates into more protective, parental pain-attending behaviour (Caes et al., 2011; Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006; Goubert, Vervoort, De Ruddere, & Crombez, in press; Hechler et al., 2011; Sieberg et al., 2011), especially in a highly threatening context (Caes, Vervoort, Trost, & Goubert, 2012).

Using a prospective design, the current study addressed the above issues and investigated, within a sample of children diagnosed with leukemia and their parents, (1) the course of child and parental distress and associated parental behaviour in response to consecutive LP/BMA procedures throughout the child’s treatment, (2) the interrelationship between child and parent distress and (3) the moderating role of parental catastrophic thoughts about child procedural pain upon the course of parental distress and pain-attending behaviour during LP/BMA procedures. Specifically, this study addressed the following three hypotheses. First, we expected that child and parental distress and associated pain-attending behaviour, (e.g., comforting child, asking child about pain, the desire to be present) would remain fairly stable over the course of consecutive child LP/BMA procedures. Second, we hypothesized that higher levels of parental distress and
pain-attending behaviour would be associated with more distress experienced by the child. Third, we expected that parental distress and pain-attending behaviour would remain particularly high throughout treatment in those parents who endorse high catastrophic thoughts about child pain.

**METHOD**

**Participants**

The present study represents the longitudinal part of the “Ghent - Pain in Child Leukemia - study ” (“G-PICL study”) for which ethical approval was obtained from the Ethics Committee of the University Hospital Ghent (see Figure 1 for a flowchart). Participants were children recently diagnosed with leukemia and their parents. All children and parents were recruited at University Hospital Ghent. Families were excluded 1) if they did not speak and write Dutch, 2) if their child had any pre-existing developmental delay or 3) if their child had relapsed. Additionally, when children received bone marrow transplantation during their treatment, they were excluded from further participation. Of the 31 families invited to participate in this longitudinal part of the G-PICL - study, only four families refused participation (response rate: 87.10%). Main reason for non-participation was being overwhelmed with the diagnosis. Further, one parent did not complete the questionnaires and for one participating child the LP/BMA procedures were not performed in accordance with standard protocol (i.e. the child was sedated during the LP/BMA procedures). Therefore, these two families were excluded, which resulted in a final sample of 25 participating families (15 boys, 10 girls). Most children were diagnosed with acute lymphoblastic leukemia (ALL, N = 20). Five participating children suffered from acute myelogenous leukemia (AML). For most families (N = 18) both parents participated in the study. For the remainder of the children (N = 7) only the mother participated. Mean age of the children was 6.63 years (SD = 4.21, range = 0:15). Due to their illness and intensive treatment, none of the children were able to attend school during the period of the study. Mothers’ mean age was 36.12 years (SD = 6.04, range = 23:47). Mean age of the participating fathers was 39.92 years (SD = 5.79; range = 32:50). Most parents were married or co-habiting (84%) and had received education beyond the age of 18 years (60%). All participating children and parents were Caucasian of which 96% had the Belgian and 4% had the Dutch nationality.
Figure 1. Flowchart of recruitment procedure.
Study overview

Each LP/BMA procedure the child must undergo, as part of its intensive treatment protocol (i.e., induction and consolidation phase in which the child receives intensive chemotherapy requiring frequent hospitalization), was consecutively included in the study. LP/BMA procedures the child underwent to determine the diagnosis were excluded. Additionally, LP/BMA procedures performed during the maintenance part of the child’s treatment (i.e., involving less intense chemotherapy and less frequent hospitalizations) were also not included. Within the standard clinical protocol of University Hospital Ghent, parents were allowed in the treatment room during pre- and post-procedure phase but were asked to wait outside during the actual LP/BMA procedure. During the LP/BMA procedure, approximately three staff members were present: 1) a physician, 2) a nurse, and 3) an educational staff member who takes special care of the child during the LP/BMA procedures by means of distracting the child or giving information about the procedure to the child. All participating parents reported on their catastrophic thoughts about child procedural pain at one time point, namely before the first treatment-related LP/BMA procedure. This first treatment-related LP/BMA procedure was also the first LP/BMA procedure included in the study. For each LP/BMA procedure, the duration of the procedure, i.e., the time the parent needed to wait outside, as well as the type of procedure the child underwent (lumbar puncture, bone marrow aspiration or both) was recorded. After each LP/BMA procedure, once returned to the child’s room, the attending parent was asked to report on his/her feelings of distress and behavioural tendencies. In most circumstances only one of the parents attended the LP/BMA procedure. Accordingly, for most procedures we obtained data from either the mother or the father. Specifically, on average mothers attended 72% of the LP/BMA procedure, fathers 14% and in 6% of the procedures both parents attended the procedure. Furthermore, as the majority of the children in the current sample were too young to provide own ratings, the educational staff member was asked to rate the child’s distress during each LP/BMA procedure.

Measures

Child distress during the LP/BMA procedures.

After each LP/BMA procedure, the educational staff member present during the LP/BMA procedure, rated the child’s distress (“Specify how anxious you think the child was during the LP/BMA procedure”), on an 11-point rating scale ranging from 0 (not at all) to 10 (a lot).
Parental catastrophizing about their child’s procedural pain.

Parents’ catastrophic thoughts about their child’s procedural pain were assessed with a state measure of the Pain Catastrophizing Scale for Parents (PCS-P; Goubert et al., 2006). In line with previous studies (see e.g., Caes et al., 2011; Goubert, Vervoort, Cano, & Crombez, 2009a), the state version of the PCS-P comprised one adapted item from each subscale (PCS-P state; Rumination: “During the LP/BMA procedure, to what extent did you keep thinking about how painful the LP/BMA procedure is for your child?”; Magnification: “During the LP/BMA procedure, to what extent did you thought that, because of the pain, something serious might happen to your child?”; Helplessness: “During the LP/BMA procedure, to what extent did you thought that, because of the pain of your child, you would not be able to endure the LP/BMA procedure?”). By means of an 11-point numerical rating scale (0 = not at all; 10 = a lot), parents were instructed to indicate to what extent they had experienced these thoughts during their child’s previous LP/BMA procedure (i.e., diagnostic LP/BMA procedure). A mean score of these three items was calculated, ranging from 0 to 10. Cronbach’s alpha of the PCS-P-state was .82 for mothers and .90 for fathers.

Parental distress during LP/BMA procedures.

After each LP/BMA procedure, parents were asked to indicate their level of distress experienced during the LP/BMA procedure by means of emotional adjectives. All emotion adjectives were rated on an 11-point scale ranging from ‘not at all’ (0) to ‘extremely’ (10). Based on the work of Batson, Fultz, & Schoenrade (1987), the list included four adjectives reflecting self-oriented emotional responses or distress (i.e., worried, upset, anxious, sad). A mean score of parental distress scores, ranging from 0 to 10, was calculated with higher scores indicating higher levels of parental distress. Cronbach’s alpha was very good (α = .90).

Parental pain-attending behaviour.

To assess parental desire to be present during the actual LP/BMA procedure, parents rated, by means of an 11-point NRS (0 = “not at all” to 10 = “a lot”), to what extent they wanted to stay with their child in the treatment room during the LP/BMA procedure (“To what extent did you want to be with your child during the LP/BMA procedure?”). Additionally, parents rated to what extent they would engage in pain-attending behaviours if they would be present during the LP/BMA procedure (further referred to as “pain-attending tendencies”). Based upon the CAMPIS-R (Blount et al., 1997), the
Inventory of Parent/Caregiver Responses to Children’s Pain Experience (IRPEDNA; Huguet, Miro, & Nieto, 2008) and the Adult Responses to Children’s Symptoms (ARCS; Van Slyke & Walker, 2006), the following five items were created to assess parental pain-attending tendencies: 1) comforting your child when he/she experiences pain by rubbing his/her hair or using soothing words; 2) asking your child if he/she has pain; 3) asking your child if there is anything you can do to reduce the pain; 4) reassuring your child by telling that the pain will soon be gone; 5) showing your child you sympathize with his/her pain. Each item was rated by means of an 11-point numerical rating scale ranging from 0 (= not at all) to 10 (= a lot). A mean score was calculated which ranged from 0 to 10, with higher scores indicating higher tendency of parents to engage in pain-attending responses. Cronbach’s alpha was good ($\alpha = .74$).

**Procedure**

Families who met the inclusion criteria and who were at least three days post first diagnosis were consecutively invited to participate. Invitation to participate took place before the first treatment-related LP/BMA procedure, which occurs on day eight of the treatment. Consequently, children who entered the present study had only received prior LP/BMA procedures for diagnostic purposes. Families were informed about the aim of the study (i.e., investigating how parents’ and child responses during LP/BMA procedures evolve over the course of their treatment) and reassured that non-participation would have no influence on their treatment in the clinic. It was also emphasised that they were able to withdraw participation at any time. When children and parents agreed to participate, a written informed consent was obtained from the parent as well as from children older than 12 years. Each LP/BMA procedure the child underwent as part of their intensive treatment protocol (i.e., induction and consolidation phase) was consecutively included in the study. LP/BMA procedures performed during the maintenance part of the child’s treatment were excluded. Children received Kalinox® - a colourless gas that tranquillises but not anesthetises the child - during each LP/BMA procedure (Reinoso-Barbero et al., 2011). Additionally, EMLA® (a topical anaesthetic cream) was applied to the child’s skin approximately one hour before each LP/BMA procedure (Young, Schwartz, & Sheridan, 1996).

**Data analysis**

The data of the present study are hierarchically nested or, in other words, consist of a multilevel data structure. Specifically, parental distress or pain-attending behaviours during each LP/BMA procedure (level one) are nested within individuals (parents; level
two), which are in turn nested within couples (mother and father of a particular child; level three). Similarly, child distress levels during each LP/BMA procedure (level one) are nested within individuals (i.e., child, level two). Therefore, the data was analysed by means of multilevel modeling (HLM version 6.01, Raudenbush, Bryk, & Congdon, 2004) as this method explicitly accounts for the dependency of the individual observations (due to repeated measurements over time and couple data) allowing more precise parameter estimates (Dai, Labarthe, Grunbaum, Harrist, & Mueller, 2002; Kenny, Kashy, & Cook, 2006; Nezlek, 2001). Moreover, multilevel analysis has the ability to handle missing data, as an equal number of observations is not mandatory. Consequently, all cases can remain in our analyses although we do not have data of both parents for all LP/BMA procedures (Hox, 2010). A series of multilevel regression analyses were run with categorical variables entered uncentred into the equations (e.g., parent gender: 0 = father, 1 = mother; child gender: 0 = boy, 1 = girl; diagnosis: 0 = ALL, 1 = AML) and continuous variables entered standardized and grand mean centred. This allows comparison across parents and more coherent interpretations of the coefficients.

The following set of analyses was performed with 1) parental distress, 2) parental desire to be present, and 3) parental pain-attending tendencies as dependent variables. In a first step, the baseline model, without any predictors except for “time” (i.e., the number of the LP/BMA procedure, e.g., the first = 0, second = 1, third = 2, ...), was run to calculate the level of variance in the dependent variables between dyads (level three) and within dyads (level two and level one). In the second step, we controlled for child distress and duration of the LP/BMA procedure by including these variables in the first level. As a third step, parent gender, PCS-P state and the interaction between both (level two) were entered into the model to investigate the impact of parent gender and catastrophic thoughts on the dependent variables. Moreover, we examined whether possible changes in the dependent variables over time was dependent upon the effects of parent gender and catastrophizing. In order to control for the impact of child age, gender and type of diagnosis (AML or ALL), these variables were added to the third level in the last step. As dyads do not have enough lower-level units to allow the slopes to vary from dyad to dyad, the slopes for the effect of the first and second level variables were fixed on the third level (Kenny et al., 2006).

A similar set of analyses, with child distress as dependent variable, was run to examine the course of child distress and the influence of parental distress and pain-attending tendencies. First, the baseline model only including “time” was run to calculate
the level of variance in child distress between children (level two) and within children (level one). Second, we controlled for the duration of the LP/BMA procedure by adding this variable at the first level. Additionally, in this second step we also included parental distress and pain-attending tendencies as well as the interaction between parental distress, respectively pain-attending tendencies and “time” in the first level of the model. Finally, we controlled for the effects of child age, gender and type of diagnosis (AML or ALL) by entering these variables in the last step.

For all analyses, full maximum likelihood estimation was used and we fixed the random error term of first level variables if the random error term of the particular variable was non-significant ($p < .10$; Nezlek, 2011). Moreover, the effect size $r$ ($r = .10$ a small effect, $r = .30$ a medium effect and $r = .50$ a large effect) was calculated (Cohen, 1988; Kenny et al., 2006).

**RESULTS**

**Descriptives**

Mean levels of all variables are shown in Table 1. The most frequent procedure children underwent was a lumbar puncture (64.2%), followed by a bone marrow aspiration (28%) and both procedures consecutively (6.9%). On average, children underwent nine LP/BMA procedures ($M = 9.76$, $SD = 2.70$; range = 4:14) over the course of their intensive treatment and LP/BMA procedures took on average 8.37 minutes to complete ($SD = 6.32$, range = 1.58:36). The mean level of parental catastrophic thoughts about child procedural pain (PCS-P-state) was 4.79 ($SD = 2.71$, range = 0:10, $M_{fathers} = 5.16$, $SD_{fathers} = 2.45$, $M_{mothers} = 4.51$, $SD_{mothers} = 2.91$). Mothers and fathers did not show significant differences on any of the variables (all $t < |1.26|$).

**Table 1**

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PCS-P state</td>
<td>4.79</td>
<td>2.71</td>
<td>0-10</td>
</tr>
<tr>
<td>2. Parental distress</td>
<td>4.31</td>
<td>2.64</td>
<td>0-10</td>
</tr>
<tr>
<td>3. Parental pain-attending tendencies</td>
<td>6.85</td>
<td>1.81</td>
<td>1.20-10</td>
</tr>
<tr>
<td>4. Parental desire to stay with their child</td>
<td>7.17</td>
<td>2.74</td>
<td>1-10</td>
</tr>
<tr>
<td>5. Child distress as rated by the educational staff member</td>
<td>4.17</td>
<td>2.46</td>
<td>0-10</td>
</tr>
</tbody>
</table>

PCS-P state = state version of the Pain Catastrophizing Scale for Parents
The course of parental distress and the influence of parental catastrophic thinking

By means of multilevel analyses, we investigated whether parental distress during LP/BMA procedures changed over time (level one), depending on parent gender and parental catastrophic thinking about their child’s pain during LP/BMA procedures (level two), when controlling for child distress, duration of the LP/BMA procedure (level one) and child age, gender and diagnosis (level three). The intercept model indicated that 22% of the variance in parental distress was on the third level (between couples), 45% of variance was found on the second level (between parents) and 33% on the first level (within parents). No significant main effect of time was found ($\gamma_{100} = -0.06$, $t(41) = -0.78$, ns, $r = .09$). However, results showed that the interaction between time and parental state catastrophizing was significant ($\gamma_{120} = 0.10$, $t(41) = 2.69$, $p < .05$, $r = .29$), indicating that changes in parental distress over time differ according to the level of catastrophic thoughts parents endorse about their child’s pain during LP/BMA procedures. Specifically, parents with high levels of catastrophic thoughts about child procedural pain reported an increase in feelings of distress over time, while parents with low levels of catastrophic thoughts showed a slight decrease in their levels of distress over time (see Figure 2). Furthermore, the type of diagnosis ($\gamma_{002} = 2.34$, $t(21) = 3.08$, $p < .01$, $r = .42$) made a significant contribution in explaining parental distress during LP/BMA procedures, indicating that parents reported more distress during LP/BMA procedures when their child is diagnosed with AML, compared with parents of children diagnosed with ALL. Results for the final model are presented in Table 2.
Table 2

Final hierarchical linear model assessing changes in parental distress, pain-attending tendencies and desire to be present, over time, depending upon the impact parental gender and catastrophizing about their child’s pain, when controlling for child’s distress, age, gender and diagnosis and duration of the LP/BMA procedure.

<table>
<thead>
<tr>
<th></th>
<th>Parental distress</th>
<th>Parental desire to be present</th>
<th>Parental pain-attending tendencies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff. SE T r</td>
<td>Coeff. SE T r</td>
<td>Coeff. SE T r</td>
</tr>
<tr>
<td>Intercept ($\gamma_{000}$)</td>
<td>4.24 .68 6.24***</td>
<td>7.61 .89 8.53***</td>
<td>7.02 .35 20.30***</td>
</tr>
<tr>
<td>Time ($\gamma_{100}$)</td>
<td>-0.06 .08 -0.78 .09</td>
<td>-0.09 .09 -1.10 .06</td>
<td>-0.03 .04 -0.57 .03</td>
</tr>
<tr>
<td>Duration of LP/BMA procedure ($\gamma_{200}$)</td>
<td>-0.18 .17 -1.03 .11</td>
<td>0.38 .16 2.43* .14</td>
<td>-0.04 .08 -0.57 .03</td>
</tr>
<tr>
<td>Child distress ($\gamma_{300}$)</td>
<td>0.26 .17 1.55 .17</td>
<td>0.03 .16 0.16 .01</td>
<td>-0.09 .09 -1.03 .06</td>
</tr>
<tr>
<td>Parental gender ($\gamma_{400}$)</td>
<td>0.31 .75 0.41 .05</td>
<td>-0.37 .85 -0.43 .05</td>
<td>-0.09 .40 -0.22 .03</td>
</tr>
<tr>
<td>PCS-P state ($\gamma_{500}$)</td>
<td>0.67 .48 1.39 .16</td>
<td>-0.63 .55 -1.14 .15</td>
<td>1.02 .24 4.24*** .45</td>
</tr>
<tr>
<td>Parental gender*PCS-P($\gamma_{600}$)</td>
<td>0.68 .55 1.25 .14</td>
<td>1.08 .59 1.82 .23</td>
<td>-0.46 .31 -1.49 .18</td>
</tr>
<tr>
<td>Time*Parental gender ($\gamma_{710}$)</td>
<td>0.04 .08 0.48 .06</td>
<td>0.13 .10 1.27 .07</td>
<td>0.03 .06 0.51 .03</td>
</tr>
<tr>
<td>Time*PCS-P state ($\gamma_{720}$)</td>
<td>0.10 .04 2.69* .29</td>
<td>0.12 .05 2.70** .16</td>
<td>-0.01 .02 -0.40 .03</td>
</tr>
<tr>
<td>Child’s gender ($\gamma_{800}$)</td>
<td>-0.72 .43 -1.68 .26</td>
<td>0.17 .84 0.20 .04</td>
<td>-0.54 .60 -0.89 .14</td>
</tr>
<tr>
<td>Child diagnosis ($\gamma_{902}$)</td>
<td>2.35 .76 3.08** .42</td>
<td>-1.87 1.38 -1.35 .23</td>
<td>1.36 .62 2.17* .32</td>
</tr>
<tr>
<td>Child age ($\gamma_{903}$)</td>
<td>-0.38 .26 -1.49 .23</td>
<td>0.10 .49 0.21 .04</td>
<td>-0.22 .20 -1.12 .18</td>
</tr>
</tbody>
</table>

Note. Coeff. = Coefficient; PCS-P state = state version of the Pain Catastrophizing Scale for Parents; LP = lumbar puncture, BMA = bone marrow aspiration; * p < .05; ** p < .01; *** p < .001

Model for parental distress: $Y_{it} = \gamma_{000} + \gamma_{001}(child’s gender) + \gamma_{002}(child’s diagnosis) + \gamma_{003}(child’s age) + \gamma_{010}(parent gender) + \gamma_{011}(parental catastrophizing) + \gamma_{020}(parent gender*parental catastrophizing) + \gamma_{030}(time) + \gamma_{100}(parent’s gender x time) + \gamma_{110}(parental catastrophizing x time) + \gamma_{200}(duration of LP/BMA procedure) + \gamma_{300}(child distress) + \gamma_{400}(child age) + \gamma_{500}(child’s gender) + \gamma_{600}(child’s diagnosis) + \gamma_{700}(parent gender) + \gamma_{800}(parental catastrophizing) + \gamma_{900}(parent gender*parental catastrophizing) + \gamma_{901}(time) + \gamma_{902}(parent’s gender x time) + \gamma_{903}(parental catastrophizing x time) + \gamma_{904}(duration of LP/BMA procedure) + \epsilon_{it}$

Model for parental pain-attending behaviour & desire to be present: $Y_{t} = \gamma_{000} + \gamma_{001}(child’s gender) + \gamma_{002}(child’s diagnosis) + \gamma_{003}(child’s age) + \gamma_{010}(parent gender) + \gamma_{011}(parental catastrophizing) + \gamma_{030}(time) + \gamma_{110}(parent’s gender x time) + \gamma_{200}(duration of LP/BMA procedure) + \epsilon_{i}$

For all independent variables, it was found that the model including the level 1, level 2 and level 3 variables fitted the data better than the model including no predictors (parental distress: $\chi^2(19) = 113.59, p < .0001$; parental pain-attending tendency: $\chi^2(10) = 76.65, p < .0001$; parental desire to be present: $\chi^2(10) = 93.30, p < .0001$).
Course of parental responses during LP/BMA procedures over time

Figure 2. The impact of time and parental catastrophic thoughts about child procedural pain (PCS-P-state) on parental distress during lumbar punctures and/or bone marrow aspirations.

The course of parental pain-attending behaviour and the influence of parental catastrophic thinking

Parental desire to be present

Analyses indicated that 40% of the variance in parental desire to be present was on the third level (between couples), 29% on the second level (between parents) and 31% on the first level (within parents). No significant main effect of time and parental level of catastrophic thoughts about child procedural pain was found (all t’s < 1.14). However, analyses indicated that the interaction between time and parental catastrophic thoughts about child procedural pain was significant ($\gamma_{120} = 0.12$, $t(203) = 2.70$, $p < .01$, $r = .15$). Specifically, parents endorsing high levels of catastrophic thoughts about child procedural pain during LP/BMA procedures showed an increase over time in their desire to be present during LP/BMA procedures, while low catastrophizing parents reported a decrease (see Figure 3). Moreover, the duration of the LP/BMA procedures showed a significant influence on parental desire to be present ($\gamma_{200} = 0.38$, $t(203) = 2.43$, $p < .05$, $r = .11$). Specifically, the longer a LP/BMA procedure took, the more parents indicated they wanted to be present. Results of the final model are presented in Table 2.
160

Parental pain-attending tendencies

Analyses indicated that 21% of the variance in parental pain-attending tendencies was on the third level (between couples), 36% on the second level (between parents) and 43% on the first level (within parents). No significant change over time in parental tendency to engage in pain-attending behaviour was found ($\gamma_{100} = -0.03$, $t(204) = -0.57$, $ns, r = .03$). Also, the interaction between time and parental catastrophizing about child pain was not significant. Interestingly, we found that parents with a high level of catastrophic thoughts about child procedural pain reported a higher tendency to engage in pain-attending behaviour ($\gamma_{020} = 1.02$, $t(40) = 4.24$, $p < .001, r = .45$) compared with low catastrophizing parents. Moreover, child diagnosis had a significant contribution in explaining differences in parental pain-attending tendencies ($\gamma_{002} = 1.36$, $t(21) = 2.17$, $p < .05, r = .32$). This finding indicates that parents of a child with AML have a higher tendency to engage in pain-attending behaviour during LP/BMA procedures, compared with parents of child diagnosed with ALL. Results of the final model are presented in Table 2.

The course of child distress and the influence of parental responses

Analyses indicated that 15% of the variance in child distress during LP/BMA procedures was on the second level (between children) and 85% of variance was found on the first level (within children). We found a significant main effect of time ($\gamma_{10} =0.23$, $t(24) = 3.11$, $p < .01, r = .49$), indicating increasing levels of child distress during LP/BMA procedures (as reported by the educational staff member) with a growing
number of procedures undergone. Moreover, parental distress had a significant impact on the child’s distress experience ($\gamma_{30} = 1.30$, $t(24) = 3.35$, $p < .01$, $r = .52$). Specifically, heightened parental feelings of distress during LP/BMA procedures were associated with more distress in the child. Parental pain-attending tendencies did not show a significant influence on child level of distress during LP/BMA procedures, nor did the influence of parental distress and pain-attending tendencies on child distress vary with time. Results of the final model are presented in Table 3.

Table 3

Final hierarchical linear model assessing the evolution over time of child distress depending upon the impact of parental distress or pain-attending tendencies, when controlling for child’s age, gender and diagnosis and duration of the LP/BMA procedure.

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>SE</th>
<th>$T$</th>
<th>$R$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept ($\gamma_{00}$)</td>
<td>2.54</td>
<td>.50</td>
<td>5.12**</td>
</tr>
<tr>
<td>Time ($\gamma_{10}$)</td>
<td>0.22</td>
<td>.07</td>
<td>3.11**</td>
</tr>
<tr>
<td>Duration of LP/BMA procedure ($\gamma_{20}$)</td>
<td>-0.60</td>
<td>.55</td>
<td>-1.09</td>
</tr>
<tr>
<td>Parental distress ($\gamma_{30}$)</td>
<td>1.30</td>
<td>.39</td>
<td>3.35**</td>
</tr>
<tr>
<td>Parental pain-attending tendency ($\gamma_{40}$)</td>
<td>-0.68</td>
<td>.46</td>
<td>-1.49</td>
</tr>
<tr>
<td>Time*Parental distress ($\gamma_{50}$)</td>
<td>-0.07</td>
<td>.06</td>
<td>-1.12</td>
</tr>
<tr>
<td>Time*Parental pain-attending tendency ($\gamma_{60}$)</td>
<td>0.16</td>
<td>.09</td>
<td>1.85</td>
</tr>
<tr>
<td>Child’s gender ($\gamma_{01}$)</td>
<td>-0.59</td>
<td>.55</td>
<td>-1.08</td>
</tr>
<tr>
<td>Child diagnosis ($\gamma_{02}$)</td>
<td>1.12</td>
<td>.64</td>
<td>1.75</td>
</tr>
<tr>
<td>Child age ($\gamma_{03}$)</td>
<td>0.20</td>
<td>.28</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Note. LP = lumbar puncture; BMA = bone marrow aspiration; * $p < .05$; ** $p < .01$; *** $p < .001$.

$Y_{ij} = \gamma_{00} + \gamma_{01}(\text{child’s gender}) + \gamma_{02}(\text{child’s diagnosis}) + \gamma_{03}(\text{child’s age}) + \gamma_{10}(\text{time}) + \gamma_{20}(\text{duration of LP/BMA procedure}) + \gamma_{30}(\text{parental distress}) + \gamma_{40}(\text{parental pain-attending tendency}) + \gamma_{50}(\text{time*parental distress}) + \gamma_{60}(\text{time*parental pain-attending tendency}) + u_{0j} + u_{1j}(\text{time}) + u_{2j}(\text{duration of LP/BMA procedure}) + u_{3j}(\text{parental distress}) + u_{4j}(\text{parental pain-attending behaviour}) + u_{5j}(\text{time*parental distress}) + u_{6j}(\text{time*parental behaviour}) + \epsilon_{ij}$

It was found that the model including the level 1 and 2 variables fitted the data better than the model including no predictors ($\chi^2(7) = 161.29$, $p < .0001$).

**DISCUSSION**

The present study investigated, in a sample of children with leukemia and their parents, whether child and parental distress and associated pain-attending responses during LP/BMA procedures remain stable when being repeatedly confronted with these invasive medical procedures throughout the treatment. Moreover, we examined whether children of parents who experience LP/BMA procedures as highly distressing and/or engage in pain-attending tendencies are more anxious or distressed during LP/BMA procedures. Furthermore, we expected that the persistence of parental distress and pain-attending responses would be particularly pronounced in parents who endorse
catastrophic thoughts about child procedural pain. The results of the present study were partially in line with expectations and can be summarized as follows. First, with respect to the course of parental distress, findings indicated that parental feelings of distress in response to LP/BMA procedures gradually declined over time, but only for parents with low levels of catastrophic thoughts about child procedural pain. In contrast, a slight increase in parental distress was observed for parents endorsing high levels of catastrophic thoughts about child procedural pain. A similar pattern was found for parental desire to be present during LP/BMA procedures. Second, parental tendency to engage in pain-attending behaviour in response to child pain was higher in parents with catastrophic thoughts about child procedural pain compared with low catastrophizing parents. Lastly, child distress (as reported by the educational staff member) increased over the course of multiple LP/BMA procedures and was positively associated with parental distress, but not with parental pain-attending tendencies during LP/BMA.

The present findings attest to the value of an affective-motivational account, and in particular the role of catastrophic thoughts, in understanding interpersonal dimensions of pain. An affective-motivational account of pain proposes that pain, as a signal of threat, elicits feelings of distress and an associated urge to reduce, escape or avoid pain, particularly when pain is perceived as highly threatening (i.e., in individuals endorsing high catastrophic thoughts about pain; Eccleston & Crombez, 1999; Leeuw et al., 2007; Vlaeyen & Linton, 2000). The current study supports and extends prior research in parents of healthy school children and chronic pain samples (Caes et al., 2011; Goubert et al., in press; Hechler et al., 2011; Sieberg et al., 2011), by showing that parental catastrophic thoughts about child procedural pain also significantly influence how parents adapt to frequent invasive, painful medical procedures in their child. Specifically, LP/BMA procedures become, with repeated exposure, increasingly distressing for parents who endorse high catastrophic thoughts about child procedural pain. Moreover, findings indicated that high catastrophizing parents’ desire to be present was initially low but increased significantly after repeated LP/BMA procedures. However, these highly catastrophizing parents reported a persistently high tendency to engage in protective, pain-attending behaviour if they would be present. These findings may reflect avoidant tendencies in high catastrophizing parents, which may fail, however, with repeated procedures or in the face of their child’s actual pain experience (i.e., when parents imagine being present during LP/BMA procedures). Specifically, the initial low desire to be present during LP/BMA procedures - as observed in high catastrophizing parents -
may serve as a strategy to prevent augmentation of distress induced by the invasive procedures (Batson et al., 1987; Goubert, Craig, & Buysse, 2009; Gross & Johnston, 2007). The role of attentional avoidance as a regulatory strategy has been well documented across a variety of domains, including personal pain in which it has been associated with decreased pain aversiveness and increased pain tolerance (Elommaa, Williams, & Kalso, 2009; Malloy & Milling, 2010). Although further research is needed, failure of this initial avoidant tendency may reflect failure of initial emotion regulation strategies intended to manage parental distress induced by these invasive medical procedures. Specifically, increased parental distress and desire to be present when repeatedly confronted with these procedures suggests that initial avoidant tendencies as a way of regulating aversive emotions may become compromised over time in parents who endorse catastrophic thoughts about child pain. Although more research is needed to examine evolutions in parental threat perception of LP/BMA procedures, it is possible that the threat level of these procedures may increase over time in highly catastrophizing parents, thereby compromising their ability to disengage attention from child pain. This account is consistent with recent findings indicating that high catastrophizing parents are able to attentionally avoid child pain but only when the threat value is low enough (e.g., low facial pain expression, Vervoort et al., 2011). Moreover, child pain embedded within a threatening context has been found to be associated with more feelings of distress in anticipation of child pain (Caes et al., 2012). Consequently, when actual avoidance or escape is no longer possible, the heightened report of pain-attending behaviour -which may serve the goal of child pain relief - might also reflect an ultimate attempt of high catastrophizers to regulate own aversive feelings when earlier efforts (e.g., avoidance) have failed (Bradley et al., 1987; Caes et al., 2011; 2012; Goubert et al., 2009; Goubert, Vervoort, & Crombez, 2009b). Supporting this notion are recent findings indicating that parental distress plays an important role in the relation between parental catastrophic thinking about child pain and a heightened tendency to limit child pain-inducing activities (Caes et al., 2011).

However, perseverance of pain-attending strategies may have maladaptive consequences, as it may lead to more distress in the child as well as the parent (Blount et al., 1989; 1990; Eccleston & Crombez, 2007; Leeuw et al., 2007; McMurtry et al., 2007; Vlaeyen & Linton, 2000). The results of the present study suggest that parents endorsing catastrophic thoughts about child procedural pain could get “stuck” in a vicious circle of heightened experience of distress and difficulties to behaviourally disengage from child
pain, which, in turn, might further increases child’s and parents’ distress (Blount et al., 1989; 1990; Dahlquist et al., 1994; McMurtry et al., 2007; Spagrud et al., 2008). In contrast, decreased levels of parental distress in low catastrophizing parents may indicate an adaptation to the LP/BMA procedures over the course of the treatment. Possibly, these parents adopt adequate strategies to regulate feelings of distress in response to these invasive procedures (e.g., attentional avoidance), which may in turn explain their lower tendency to engage in pain-attending responses.

The present findings also support preliminary evidence indicating that parental distress in response to LP/BMA procedures impacts the child’s pain experience (Jay et al., 1983; Penner et al., 2008). Several possible pathways may account for the impact of parents’ experience of distress on their child’s level of distress during LP/BMA procedures. First, it is likely that observing high levels of distress in their parents might increase the level of threat children attach to these procedures, thereby inducing more anxiety or distress in the child (Goubert, Vlaeyen, Crombez, & Craig, 2011; Penner et al., 2008). Alternatively, but not mutually exclusive, parental feelings of distress may impact how parents respond to child pain, which may in turn influence child experiences (Sieberg et al., 2011). Specifically, due to the heightened experience of distress, parents might engage more in protective behaviour in response to child pain (Caes et al., 2011; Sieberg et al., 2011), which has been found to be associated with higher levels of child distress (Blount, 1989; 1990; 2008; McMurtry et al., 2007). Although parental distress and pain-attending tendencies were significantly positively associated, in contrast with previous evidence (Blount, 1989; 1990; 2008; McMurtry et al., 2007), parental pain-attending tendencies did not impact child distress in the current study. This discrepancy could be due to the nature of our assessment of parental behaviour. While several previous studies used observational designs (Blount et al., 1989; 1990; 2008; McMurtry et al., 2007), we assessed parental behaviour by means of self-report. Self-report might not be the most valid index of parental behavioural responses (Cohen, Manimala & Blount, 2000) and does - contrary to observational measures - not capture subtle nuances in the expression of parental behavioural, such as the underlying vocal tone (McMurtry et al., 2007). Moreover, parents reported on behavioural tendencies and not on actual behaviours. Previous research has indicated that the correspondence between parents’ perception on what they do and their actual behavioural responses is rather low (Cohen et al., 2010). Interestingly, our findings also indicate that, independent of parental responses, children do not habituate to the distressing experience of LP/BMA procedure, but in
contrast, get more anxious over time. This is in line with previous studies (Katz et al., 1980; Kazak et al., 1995) indicating that child anxiety and discomfort do not spontaneous diminish with repeated exposure. However, the course of parental distress throughout the treatment process did not significantly impact how child distress evolves over time. Further research is needed to disentangle the impact of parental as well child characteristics on how children adjust to repeated painful, invasive medical procedure.

In terms of clinical implications, the present findings emphasise the importance of targeting parent and child distress in early stages of treatment. To date, a lot of progress has been made in pharmacological as well as non-pharmacological interventions to reduce child pain and fear during these procedures (Blount et al., 2009; Conte et al., 1999). It is less clear when parents need assistance to cope effectively with invasive medical procedures and how they can be assisted (Chambers, 2003). Our findings suggest that interventions preparing parents for invasive medical procedures might be especially advised for parents who endorse higher levels of catastrophic thoughts about child procedural pain. Specifically, targeting catastrophic thoughts related to child procedural pain might prevent development of severe parental distress over time (Dahlquist et al., 1994; Kazak, 2005) and might be necessary to alter parental maladaptive behavioural responses to child pain. Alternatively, instead of altering catastrophic thinking, it may also prove functional to focus on how parents manage their catastrophic thoughts and associated distress response. In particular, providing parents with adequate strategies to attenuate the induced distress, such as cognitive reappraisal or distraction techniques (Bebko, Franconeri, Ochsner, & Chiao, 2011; Gross & John, 2003), might be promising in attenuating parental distress response. Moreover, as we found that parental distress impacted child anxiety, interventions aimed at reducing parental distress experience might also be beneficial for how children cope with these invasive procedures. Additionally, questions remain about whether parental presence or absence is most beneficial. To date, evidence about the beneficial effects of parental attendance on child as well as parents’ anxiety is mixed (Chambers, 2003; Jacobsen et al., 1990; Pirra, Sugiura, Champion, Donnelly, & Cole, 2005). Specifically, while some studies report reduced child and parent anxiety when parents are present, other studies found heightened levels of anxiety in children or no significant impact on child and parent anxiety of parental presence (Chambers, 2003; Pirra et al., 2005). More research is needed to disentangle factors that explain when parental presence is most adaptive and hence preferred. It is likely that beneficial effects of parental presence may depend upon child
and parental characteristics, parental behaviour and the type of procedure (e.g., less invasive procedures such as immunization injections versus invasive procedures such as LP/BMA procedures, Chambers, 2003). Specifically, although high catastrophizers show an increasing desire to be present, this may, when being allowed to be present, further fuel distress and associated tendency to engage in protective tendencies, which may in turn negatively impact child pain experience (Blount et al., 1989; 1990; Chambers, 2003; Jay et al., 1983; McMurtry et al., 2007; Penner et al., 2008; Sieberg et al., 2011).

Interestingly, results also indicated that parents of children diagnosed with AML experience lumbar punctures and bone marrow aspirations as more distressing and have a higher tendency to engage in pain-attending behaviour compared with parents of a child being treated for ALL. As this difference was not the primary goal of our investigation we have no specific supporting theory, but several differences between both diagnoses could account for the results. First, lumbar punctures and bone marrow aspirations were more often combined in children with AML (36.6% of the procedures compared with 2.3% of the procedures in children with ALL). Second, children with AML have lower survival rates (Goldman, 1987; Smith et al., 2010) and receive a more intensive treatment protocol (Chessels et al., 2002). It is likely that both aspects associated with a diagnosis of AML might induce more distress and pain-attending tendencies in parents. Moreover, as children with AML generally undergo less LP/BMA procedures ($M_{AML} = 6$ versus $M_{ALL} = 11$), parents of children with AML might have less opportunity to adapt to these procedures and develop adequate (behavioural) strategies to attenuate the induced feelings of distress.

The present study is not without limitations. First, the study sample was small and recruited in only one hospital. Consequently, we may not have been able to detect small effects and generalisation of the results might be limited. Replication of these findings with larger samples and in other settings is necessary. Second, results are based upon parent self-report measures. Observational designs (Blount et al., 1997) are needed to gain further insight into actual parental responses towards their child’s pain. Third, as many children were too young to provide self-reports, a staff member provided the ratings on child distress. Future research is needed to investigate whether similar associations can be found when using direct measures of child distress, such as child self-report or observation of child distress.

Despite these limitations, the findings indicate that parental characteristics, such as parents’ catastrophic thinking about child procedural pain, have a significant impact on
the course of parents’ distress and associated pain-attending responses to repeated painful, invasive medical procedures in their child. Moreover, parental experience of distress in response to the LP/BMA procedure has a profound influence upon child distress. Consequently, addressing parental catastrophic thinking about child procedural pain and associated feelings of distress in early stages of the treatment process may be beneficial for both parents’ and child adjustment to these invasive procedures.

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REFERENCES


Course of parental responses during LP/BMA procedures over time


Course of parental responses during LP/BMA procedures over time


Parents who catastrophize about their child’s pain prioritize attempts to control pain.

Abstract

How parents respond to their child in pain is critically important to how both parent and child attempt to cope with pain. We examined the influence of parental catastrophic thinking about child pain on their prioritisation for pain control. Using a vignette methodology parents reported, in response to different pain scenarios, on their imagined motivation for two competing goals: to control their child’s pain (i.e., pain control) or to encourage their child’s participation in daily activities (i.e., activity engagement). The effects of parent gender, pain intensity and duration on parental goal priority were also explored. Findings indicated that higher levels of parental catastrophic thoughts were associated with the parents prioritizing child pain control over activity engagement. This effect was significantly moderated by pain duration. Specifically, pain control was more of a priority for those high in catastrophic thinking when the pain was more acute. In contrast, parental catastrophic thoughts had no effect on the pain control strategy favoured by parents in situations with longer lasting pain. Furthermore, independently of parental catastrophic thoughts, heightened priority for pain control was observed in highly intense and chronic pain situations. Moreover, in high intense pain, priority for pain control was stronger for mothers compared with fathers. Theoretical and clinical implications and directions for future research are discussed.

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INTRODUCTION

How children behave when they are in pain is influenced by how parents respond to their pain (Chambers, 2003; Palermo & Chambers, 2005; Palermo & Eccleston, 2009). Parental responses may vary from ignoring and discouraging to protecting and comforting (Blount, Devine, Cheng, Simons, & Hayutin, 2008; Chambers, Craig, & Bennet, 2002; Lynch-Jordan, Kashikar-Zuck, & Goldschneider, 2010). Although the efficacy of any particular parental strategy should be understood in its particular clinical context, a general finding has emerged that parental attention to pain, typically operationalized as solicitousness, overprotectiveness, or reassurance, has a negative effect on child coping (Claar, Guite, Kaczynski, & Logan, 2010; Merlijn et al., 2006; Peterson & Palermo, 2004; Vervoort, Huguet, Verhoeven, & Goubert, 2011; Walker et al., 2006). In contrast, parental behaviour that encourages coping by directing children to distract or introducing new strategies is related to less child distress and pain (Blount et al., 2008; Chambers et al., 2002).

Understanding and altering parent behaviour requires an understanding of why some parental strategies dominate (Jensen, Nielson, & Kerns, 2003). Motivational theories are useful in this regard. They hold the core assumption that humans pursue multiple goals simultaneously and shift their priorities between goals (Austin & Vancouver, 1996; Rasmussen, Wrosch, Scheier, & Carver, 2006). In pediatric pain, parents consider their child’s pain as a threat, thereby endorsing a high relative value, which, for reasons of brevity, we will refer to as “prioritisation”, to child pain-control strategies, such as reducing pain, above all other goals. Giving priority to controlling child pain, however, might hinder the pursuit of other goals, such as promoting engagement of their child in daily activities (i.e., activity engagement goal, Rasmussen et al., 2006). The dynamic interplay of different parental goals likely depends upon specific features of the pain situation, such as pain intensity and duration (Eccleston & Crombez, 1999; Goubert, Vervoort, Sullivan, & Verhoeven, 2008), as well as on parental characteristics (Austin & Vancouver, 1996).

Catastrophic thinking about one’s child’s pain has recently been discovered to be important in understanding parental responses (Goubert et al., 2008; Hechler et al., 2011). Catastrophic thinking is the habitual misinterpretation of normal threat as awful and impossible to cope with (Sullivan, Bishop, & Pivik, 1995). It is thought to narrow response options to the promotion of avoidance and escape from pain (Eccleston & Crombez, 2007). In a multiple goal environment, it follows that parents who catastrophize
Parental catastrophic thinking and their goal priority

about child pain are likely to prioritise child pain control and escape from their own anxiety over any attempt to engage the child in other daily activities. Supporting this idea, recent findings demonstrate that parents who display high catastrophic thinking about child pain act quickly to reduce child exposure to pain (Caes, Vervoort, Eccleston, Vandenhende, & Goubert, 2011; Sieberg, Williams, & Simons, 2011).

Questions, however, remain as to what motivates parents to adopt pain-control strategies, and whether mothers and fathers differ. Mothers, for example, report higher levels of catastrophic thoughts about child pain, compared to fathers (Goubert et al., 2008; Hechler et al., 2011). It is likely that mothers’ and fathers’ goal priorities also differ depending on the extent of their catastrophic thinking.

In this study, we used a vignette methodology to investigate the influence of parental catastrophic thinking upon parental goal prioritisation. Parents reported on motivation for two competing strategies: pain control and activity engagement, in response to various pain situations. We hypothesized 1) that parents high in catastrophizing about child pain would prioritise pain control over activity engagement; and (2) that the impact of parental catastrophizing on goal selection would be enhanced for highly intense or chronic pain. Further, (3) we explored the hypothesis that parent gender would influence goal prioritisation.

**METHOD**

**Participants**

The study is part of the 'Parental Responses to Child Pain - study' (PARCHIP-study) performed between November 2010 and February 2011. The PARCHIP-study was approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of Ghent University, Belgium. Thirteen Dutch-speaking schools from grades 4 to 9 were contacted of which eight agreed to participate in the study. Parents (*N* = 1320) were recruited for this study indirectly via their children in school. The children were recruited as participants for an independent part of the PARCHIP-study not reported here. Of the 1320 approached parents, 722 parents gave their informed consent for participation (response rate = 55%). Due to sickness or absence of children on the day the questionnaires were distributed, we were able to provide 660 parents with the questionnaires via their children. Two hundred and seventy-six complete questionnaires of at least one of the parents (data for 268 mothers and 216 fathers) were returned. No data were available on the non-responders, including reasons for non-participation. For 98
of 141 boys and 110 of 135 girls, we received complete data of both parents resulting in a final sample of 208 mothers and fathers entering analyses (see Figure 1 for an overview of the data collection). The mean age of the mothers and fathers was respectively, 41.67 years ($SD = 4.07$, range = 28:52) and 44.01 years ($SD = 5.39$, range = 33:72). Most of the parents were married or cohabiting (87.4%) and had a higher education (mothers: 62.3%, fathers: 72.8%). The mean age of the children was 11.74 years ($SD = 1.73$, range = 9:15).

**Parental catastrophizing about their child’s pain**

Parental catastrophic thinking about their child’s pain was assessed with the Dutch version of the Pain Catastrophizing Scale for Parents (PCS-P; Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006), which is an adaptation of the adult Pain Catastrophizing Scale (PCS; Sullivan et al., 1995). The PCS-P consists of 13 items describing different thoughts and feelings that parents may experience when their child is in pain. Parents rate how frequently they experience each of the thoughts and feelings when their child is in pain using a 5-point scale (0 = ‘not at all’, 4 = ‘extremely’). The PCS-P yields a total score between 0 and 52, and three subscale scores for rumination (e.g. “When my child is in pain, I can’t keep it out of my mind”), magnification (e.g. “When my child is in pain, I become afraid that the pain will get worse”) and helplessness (e.g. “When my child is in pain, there is nothing I can do to stop the pain”). The PCS-P has been shown to be reliable and valid in parents of school children (Goubert et al., 2006). The cronbach’s alpha in this study was $\alpha = .93$ for mothers and $\alpha = .91$ for fathers.

**Vignettes**

Parents were presented with four vignettes describing hypothetical painful situations a child might experience. Pain characteristics were manipulated in a 2 (pain intensity: low vs. high intensity) x 2 (pain duration: acute vs. chronic) design. With respect to the characteristic ‘pain duration’, acute pain was operationalized as pain present for several days, while chronic pain was defined as pain persisting for more than three months, and operationalized as “pain experienced daily for about four months”. Parents were asked to imagine each situation as vividly as possible. Within each vignette questionnaire, four different pain symptoms were used (i.e., headache, abdominal pain, back pain and muscle pain) to ensure that the results would not be attributable to one specific type/location of pain. Furthermore, across parents, each combination of pain intensity and duration was combined with all four pain locations, resulting in four versions of the vignette questionnaire. For example, headache was combined with low
Parental catastrophic thinking and their goal priority

Figure 1. An overview of the data collection.

Contacting schools
\((N = 13)\)

Spreading invitations to children
\((N = 1320)\)
in participating schools
\((N = 8)\)

Receiving parental informed consent
for own participation and assent for
child participation
\((N = 722)\)

Children complete questionnaires
during school hours
\((N = 660; \tilde{\tau} = 339, \sigma^2 = 321)\)
&
receive parent questionnaires

Parents return questionnaire by mail
\((N = 276; \tilde{\tau} = 135, \sigma^2 = 141)\)
\(\uparrow\) \(N = 208\) completed by both parents
\(N = 60\) completed by mother only
\(N = 8\) completed by father only
intense and chronic pain in version one, but with low intense and acute pain in version two, etc. Additionally, the order of the four vignettes was randomized across the four versions of the vignette questionnaire. The four versions were randomly administered in equal numbers to the participating parents. Example vignettes are provided in Appendix A. To ensure comprehension and feasibility of the vignettes and related questions, the vignettes were pilot-tested in a convenience sample of eight parents.

**Parental motivations when faced with their child’s pain**

In each vignette, parental motivations when confronted with child pain were assessed by adapting the subscales “Pain willingness” and “Activity engagement” of the Chronic Pain Acceptance Questionnaire (CPAQ-8; Fish, McGuire, Hogan, Morrison, & Stewart, 2010). The CPAQ-8 is a short form of the original Chronic Pain Acceptance Questionnaire (CPAQ; McCracken, Vowles, & Eccleston, 2004). The items of the CPAQ-8 subscale “pain willingness” are reverse scored and reflect the absence of attempts to avoid or control their pain in chronic pain patients (e.g., “I avoid putting myself in situations where my pain might increase”). Activity engagement, as measured by the CPAQ-8, refers to the level of participation by the chronic pain patient in regular daily activities despite their pain (e.g., “I am getting on with the business of living no matter what my level of pain is”, Fish et al., 2010).

**Parental motivation for child pain control** was assessed by means of three questions adapted from the pain willingness scale of the CPAQ-8 (Fish et al., 2010). The items were adapted to be applicable for parents of healthy children imagining their child experiencing the pain described in the vignettes. Specifically, “my pain” was replaced with “my child’s pain”. Additionally, the items were reworded to reflect what parents find important in response to child pain instead of reflecting what people find important when they themselves experience pain. For example “I avoid…” was reworded as “I find it important that my child avoids…” This resulted into three items: “I find it important to go to the doctor as soon as possible with my child”, “I find it important that my child avoids situations that increase the pain today” and “Reducing my child’s pain is my first priority today”. For each vignette, parents indicated, by means of an 11-point numeric rating scale ranging from 0 (= not at all important) to 10 (= extremely important), how important each statement would be for them if their child was to be in that particular situation. A mean score of the three items was calculated ranging from 0 to 10. In contrast to the CPAQ-8 scoring procedure, we did not reverse score the items so that higher scores
indicated a heightened motivation of parents to control their child’s pain. Cronbach’s alpha for mothers and fathers was .94 and .95 respectively.

*Parental motivation for encouraging child activity engagement* (i.e., activity engagement) was measured with four items adapted from the “Activity Engagement” subscale of the CPAQ-8 (Fish et al., 2010). The items were adapted in a similar way as the items of the pain willingness scale of the CPAQ-8 to reflect parental motivation in response to child pain. In addition, rather than using the general statements of the CPAQ-8 (i.e., “I am getting on with the business of living”, “I am living a normal life”, “I lead a full life” and “I can still take care of my responsibilities”) the items were adapted to reflect more specific activities regarding various life domains of a child. Based upon several review studies (Massey, Garnefski, & Gebhardt, 2009; Salmela-Aro, Aunola, & Nurmi, 2007; Schwartz & Drotar, 2009), four important domains of a child’s life were included, i.e., education, hobbies, family and friendship. This resulted in four different types of daily activities presented to parents, i.e. finishing homework, attending a birthday party of a classmate, participating in hobbies (e.g., music or sport class) and making family trips. For each vignette, parents indicated on an 11-point scale (0 = “not at all important”, 10 = “extremely important”) how important they considered the engagement of their child in the described activity hypothetically planned for that day if their child was to be in that situation. For each vignette, a mean score, from 0 to 10, was calculated with higher scores indicating higher parental focus on activity engagement despite the child’s pain. Cronbach’s alpha was .89 for mothers and .91 for fathers.

**Procedure**

Parents were recruited via their children. For participating schools, teachers sent a letter home with children inviting parent participation. Written informed parental consent was collected by the teacher. Questionnaires and instructions for consenting parents were distributed to the children. Parents were requested to complete the PCS-P before responding to the vignettes. Parents returned completed materials direct to the research team by mail.

**Data reduction and analysis**

For all pain situations, except for the situation of intense acute pain ($r = -.09, n.s.$), parents’ motivation for pain control and activity engagement were significantly negative correlated (ranging from $r = -.12, p < .05$ to $r = -.17, p < .01$). A ‘goal priority index’ was calculated by subtracting parental average level of motivation for activity engagement from parental average level of motivation for child pain control. As such, this goal priority index reflects the importance of pain-control goals relative to activity
engagement. Positive values on this parental goal priority index reflect parental prioritisation of pain control over activity engagement. In other words, the goal of pain control received higher ratings of importance than the goal of activity engagement. In contrast, negative values suggest parental prioritisation of activity engagement over pain control, or higher ratings of importance for activity engagement. These data are composed of a multilevel (or hierarchically nested) data structure. Specifically, parental goal priority of both parents in response to the four different vignettes (level 1) are nested within individuals (parents; level 2), which are in turn nested within couples (mother and father of a particular child; level 3). Instead of using ordinary least-squares (OLS) methods, such as repeated measures ANOVAs with separate regression equations for mothers and fathers, the data were analysed with multilevel modeling using HLM (Version 6.01, Raudenbush, Bryk, & Congdon, 2004). The traditional two-regression models approaches do not take into account the dependency of the individual observations of mothers and fathers, while the dependency of these couple-level observations is an integral component of multilevel models. Therefore, better parameter estimates are obtained with multilevel modeling (Barnett, 1993; Kenny, Kashy, & Cook, 2006; Nezlek, 2001).

A series of multilevel regression analyses were run with the categorical variables (pain intensity and duration, parent gender and child gender) dummy coded and entered uncentred into the equations (pain intensity: 0 = low intense, 1 = high intense; pain duration: 0 = acute pain, 1 = chronic pain; parent gender: 0 = father, 1 = mother; child gender: 0 = boy, 1 = girl). Parental pain catastrophizing and the interaction between parental catastrophic thoughts and parent gender were standardized and grand mean centred. This allows for comparison across parents and clearer interpretation of the coefficients.

The following set of analyses was performed. In a first step, the baseline model, without any predictors, was run to calculate the level of variance in parental goal prioritisation that is due to variation between couples (Level 3) and within couples (Level 2 and level 1). In the second step, the level 1 variables (i.e., pain intensity and duration) were entered into the model in order to investigate the effects of specific pain characteristics. As a third step, parent gender, parental catastrophizing and the interaction between both (Level 2) were entered into the model to investigate the impact of parent gender and catastrophic thoughts on parental goal prioritisation. Moreover, we examined whether the effect of parent gender and catastrophizing differed across the level of pain...
intensity and duration. In order to control for the impact of child gender, child gender was added to the model in the last step (Level 3). As dyads do not have enough lower-level units to allow the slopes to vary from dyad to dyad, the slopes for the effect of the first and second level variables were fixed on the third level, i.e. constrained to be equal across all dyads (Kenny et al., 2006). Full maximum likelihood estimation was used for all analyses. We calculated effect sizes \( r \) (Kenny et al., 2006), with \( r = .10 \) indicating a small, \( r = .30 \) a medium and \( r = .50 \) a large effect (Cohen, 1988).

**RESULTS**

**Descriptives and correlations**

Mothers’ and fathers’ levels of catastrophic thoughts were similar to levels of parental catastrophizing obtained in previous studies with parents of school children (Goubert et al., 2006; mothers: \( M = 13.89, SD = 9.56, range = 0:52, t(411) = 1.85, ns \), fathers: \( M = 13.82, SD = 8.64, range: 0:43, t(411) = 2.02, ns \)). Findings indicated that the majority of the parents rated one goal as more important compared to the other goal, i.e., only 7% of the participating mothers and 10% of the fathers had a score of 0 on their goal priority index indicating that they rated the goals as equally important. Overall, when confronted with child pain, parents indicated goal prioritisation of pain control over activity engagement (\( M_{mothers} = 2.96, SD_{mothers} = 2.77, range_{mothers} = -5:10, M_{fathers} = 2.53, SD_{fathers} = 2.73, range_{fathers} = -7:10 \)). In general, prioritisation of pain control did not differ between mothers and fathers (\( t(204) = 1.74, ns \)). However, mothers reported a higher prioritisation of pain control, compared to fathers, in highly intense (mothers: \( M = 3.85, SD = 2.94 \) and fathers: \( M = 3.14, SD = 3.00, t(203) = 2.82, p < .01 \)) and chronic pain situations (mothers: \( M = 3.73, SD = 3.09 \) and fathers: \( M = 3.12, SD = 3.17, t(201) = 2.25, p < .05 \)). Contrary to previous findings indicating higher levels of catastrophic thoughts in mothers (Goubert et al., 2008; Hechler et al., 2011), we found no significant difference in parental catastrophic thoughts between mothers and fathers (\( t(202) = .05, ns \)). Catastrophic thoughts in mothers, but not in fathers, were correlated with a higher prioritisation of pain control over activity engagement (\( r = .19, p < .01 \); fathers: \( r = .12, ns \)). Finally, parental catastrophic thoughts about child pain and goal prioritisation did not differ significantly according to child gender (all \( t < 1.45 \)) and did not correlate significantly with child age (all \( r < .13 \)).
The influence of parental catastrophizing on their goal prioritisation in response to child pain

By means of multilevel analyses, we investigated the impact of pain intensity, pain duration (level 1), parent gender and parental catastrophizing about their child’s pain (level 2), when controlling for child gender (level 3) on parental goal prioritisation. Thirteen percent of the variance in parental goal prioritisation of pain control was due to variation between couples (level 3), 29% to variation within couples (level 2) and 58% to variation within parents (level 1). Examining the effect of pain characteristics (level 1) indicated that parents’ prioritisation of pain control was more pronounced in highly intense ($\gamma_{100} = 1.52; t(403) = 9.99; p < .0001; r = .20$) or chronic ($\gamma_{200} = 1.38, t(403) = 8.43, p < .0001, r = .19$) pain situations in comparison with low intense or acute pain.

Second, the impact of parental gender and catastrophizing (level 2) was examined. Parents with high levels of catastrophic thoughts about child pain reported a higher prioritisation of pain control over activity engagement ($\gamma_{020} = 0.56, t(400) = 2.13, p < .05, r = .12$). Moreover, the interaction between pain duration and parental catastrophizing was significant ($\gamma_{220} = -0.33, t(401) = -2.43, p < .05, r = .14$), indicating that the impact of parental catastrophizing is most evident in acute pain situations. Specifically, when imagining their child in acute pain, parents with high levels of catastrophic thoughts reported pain control to be a greater priority than did low catastrophizing parents. On the other hand, in chronic pain situations parental goal prioritisation of pain control was equally high for low and high catastrophizing parents in acute pain, (see Figure 2). Furthermore, the interaction between pain intensity and parental gender reached significance ($\gamma_{110} = 0.62, t(401) = 2.35, p < .05, r = .16$), showing that mothers prioritised pain control more than fathers in the case of high intense but not low intense pain (see Figure 3).

In the last step, we controlled for the impact of child gender. Child gender did not make a significant contribution in explaining parental goal priority ($\gamma_{001} = 1.12, t(200) = 4.03, ns, r = .08$). Results for the final model are presented in Table 1.
Table 1

Final hierarchical linear model assessing the evolution of parental distress and pain-attending behaviour during punctures over time, depending upon the impact of child’s age, gender and diagnose, parental gender and catastrophizing about their child’s pain and the type and duration of the puncture.

<table>
<thead>
<tr>
<th>Parental goal priority</th>
<th>Coefficient</th>
<th>SE</th>
<th>T</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept ($\gamma_{000}$)</td>
<td>1.12</td>
<td>.26</td>
<td>4.30***</td>
<td></td>
</tr>
<tr>
<td>Pain intensity ($\gamma_{100}$)</td>
<td>1.21</td>
<td>.18</td>
<td>6.87***</td>
<td>.14</td>
</tr>
<tr>
<td>Pain duration ($\gamma_{200}$)</td>
<td>1.15</td>
<td>.18</td>
<td>6.34***</td>
<td>.13</td>
</tr>
<tr>
<td>Parental gender ($\gamma_{010}$)</td>
<td>-0.14</td>
<td>.29</td>
<td>-0.48</td>
<td>.03</td>
</tr>
<tr>
<td>PCS-P ($\gamma_{020}$)</td>
<td>0.47</td>
<td>.21</td>
<td>2.22*</td>
<td>.12</td>
</tr>
<tr>
<td>Pain intensity*Parental gender ($\gamma_{110}$)</td>
<td>0.62</td>
<td>.22</td>
<td>2.85***</td>
<td>.16</td>
</tr>
<tr>
<td>Pain duration*Parental gender ($\gamma_{210}$)</td>
<td>-0.13</td>
<td>.13</td>
<td>-0.96</td>
<td>.05</td>
</tr>
<tr>
<td>Pain intensity*PCS-P ($\gamma_{120}$)</td>
<td>0.47</td>
<td>.24</td>
<td>1.92</td>
<td>.11</td>
</tr>
<tr>
<td>Pain duration*PCS-P ($\gamma_{220}$)</td>
<td>-0.33</td>
<td>.13</td>
<td>-2.59*</td>
<td>.14</td>
</tr>
<tr>
<td>Child’s gender ($\gamma_{001}$)</td>
<td>0.44</td>
<td>.29</td>
<td>1.51</td>
<td>.08</td>
</tr>
</tbody>
</table>

Note. PCS-P = Pain Catastrophizing Scale for Parents; *p < .05; **p < .01; ***p < .001

$$Y_{ij} = \gamma_{000} + \gamma_{001}(\text{child’s gender}) + \gamma_{010}(\text{parent gender}) + \gamma_{020}(\text{parental catastrophizing}) + \gamma_{030}(\text{parent gender*parental catastrophizing}) + \gamma_{100}(\text{intensity}) + \gamma_{110}(\text{parent’s gender x intensity}) + \gamma_{200}(\text{duration}) + \gamma_{210}(\text{parent’s gender x duration}) + \gamma_{220}(\text{parental catastrophizing x duration}) + u_{00j} + \epsilon_{ij}$$

It was found that the model including the level 1, level 2 and level 3 variables fitted the data better than the model including no predictors: $$\chi^2(15) = 322.74, p < .0001$$
Figure 2. The impact of pain duration and parental catastrophic thoughts about child pain on parental goal priority for reducing child pain at the expense of encouraging participation of their child in other activities.
* $p < .05$

Figure 3. The impact of pain intensity and parent gender on goal priority for reducing child pain at the expense of encouraging participation of their child in other activities. * $p < .05$
DISCUSSION

By using vignettes, we examined the influence of parental catastrophic thinking about child pain on their prioritisation (i.e., the relative value of importance) for pain control. The extent to which parents endorse catastrophic thoughts about child pain was associated with a greater prioritisation of pain control over activity engagement. Pain characteristics also impacted parental goal prioritisation independently of parental catastrophic thoughts. In particular, parental prioritisation of pain control was more pronounced in highly intense or chronic pain situations compared with low intense or acute pain. Furthermore, the influence of parental catastrophic thinking was significantly moderated by pain duration but not by pain intensity. Specifically, in acute pain situations parents high in catastrophic thinking about child pain prioritised pain control more than low catastrophizing parents. In contrast, in chronic pain situations, parents high and low in catastrophic thinking reported equally high levels of priority for child pain control. Finally, in highly intense pain situations, mothers reported a higher priority for child pain control than fathers.

By investigating parental motivations, this study allows a better understanding of why parents engage in particular behavior toward their child in pain. Although most situations activate multiple goals, often priority must be given to one of the competing goals due to limited resources or goal incompatibility (Riediger & Freund, 2004). The value of a goal plays a major role in selecting the principal goal (Austin & Vancouver, 1996; Karoly, 1993). Pain is a signal of threat eliciting escape and avoidance (Eccleston & Crombez, 1999); therefore controlling pain will probably be highly valued by most pain sufferers. The relative value or prioritisation of this pain-control goal over other important aspirations may be adaptive, and foster pain relief when confronted with acute pain. However, perseverance in pursuing pain control may become dysfunctional (Crombez, Eccleston, Van Damme, Vlaeyen, & Karoly, in press; Eccleston & Crombez, 2007). Specifically, in the context of chronic pain, re-orienting priority away from controlling one’s pain to engagement in other valued life activities despite pain might be difficult to achieve, but is associated with better well-being (Karsdorp & Vlaeyen, 2011; McCracken, Gauntlett-Gilbert, & Eccleston, 2009; McCracken & Vowles, 2008; Schwartz & Drotar, 2009; Wrosch, Scheier, Miller, Schultz, & Carver, 2003). In particular, people perceiving their pain as highly threatening consider pain control a priority and necessary to pursue life activities in a normal manner (Crombez, Eccleston, Van Hamme, & De Vlieger, 2008; De Vlieger, Van den Bussche, Eccleston, & Crombez, 2007).
Accordingly, disengagement from pain control might prove extremely difficult for high pain catastrophizers (Karoly & Reuhlman, 2007; Massey et al., 2009; Van Damme, Crombez, & Eccleston, 2008).

In extending literature on personal pain experience we suggest that pain-related threat may also increase prioritisation of controlling another’s pain. Specifically, the present findings indicated that parental catastrophic thought about child pain affects the relative value attached to pain control versus activity engagement. To some extent, these findings are in line with recent research in children experiencing chronic pain, indicating that higher levels of parental catastrophizing were related to lower beliefs by parents that their child is willing to abandon attempts to control pain (Simons, Sieberg, & Kaczynski, 2011). Furthermore, our findings indicated that prioritisation of pain control is particularly prevalent in highly intense or chronic pain. Situations of intense or prolonged pain could enhance the threat value parents assign to the situation (Caes, Vervoort, Trost, & Goubert, 2012; Jordan, Eccleston, McCracken, Connell, & Clinch, 2008), thereby eliciting a heightened priority for child pain control. This prioritisation of pain control in a highly threatening context may reflect an adaptive initial reaction of parents towards intense or chronic child pain. Although perseverance in giving priority to control pain may become maladaptive over time, the vignettes did not provide background on possible earlier (successful or failed) attempts to control child pain (i.e., administering pain medications). Therefore, it is not clear whether parental responses to chronic pain situations reflect perseverance of pain control or not. It is plausible that the relative value of parental goals might differ when confronted with chronic pain in their child and accumulating failed pain-controlling attempts. We could expect that in these circumstances it may become more likely that parents adjust their initial pain control priority and instead focus upon attaining other important goals in their child’s life, despite the pain. This reorientation of parental goal priorities may be beneficial for the child’s daily functioning. Moreover, as we found that highly catastrophizing parents already demonstrated a heightened prioritisation of pain control in low threatening situations (e.g., acute pain), we might expect that high catastrophizing parents are less flexible in adjusting their goals (Karoly & Reuhlman, 2007). Specifically, while low as well as high catastrophizing parents attached a high relative value to pain control when imagining their child in chronic pain, the prioritisation of pain control was only considerably reduced in parents with low levels of catastrophic thinking when imagining situations of acute pain. This finding suggests that the threshold to prioritise pain control over activity
Parental catastrophic thinking and their goal priority

engagement is lower in parents with catastrophic thoughts. However, prioritisation of pain control even in low threatening situations might interfere with attaining goals in other important aspects of a child’s life (Karoly & Reuhlman, 2007; Massey et al., 2009), and could explain the association found between parental catastrophic thoughts and heightened child functional disability (Goubert et al., 2006; Sieberg et al., 2011). In further support, several studies found maladaptive influences of parental protective behaviour in response to child pain (Claar et al., 2010; Merlijn et al., 2006; Peterson & Palermo, 2004; Vervoort et al., 2011; Walker et al., 2006), which seem especially prevalent in parents who catastrophize about child pain (Caes et al., 2011; Sieberg et al., 2011).

Further, parental gender differences are also interesting. Specifically, high pain intensity was related to greater prioritisation of pain control in mothers compared with fathers. These differences were not the primary goal of our investigation so are not supportive of any specific theory. However, we can speculate that mothers in general are more exposed to children than fathers, including the time spent expressing pain. Moreover, mothers are more likely to be involved in child pain control and child comforting (Lamb & Tamis-Lemonda, 2004; Paquette, 2004). These gender role differences may account for greater determination of mothers to seek direct solutions for the pain, especially in situations of high threat. Alternatively, the difference may be due to habitual gender differences in coping with pain. When confronted with pain, men tend to use more distraction and less problem-focused strategies than women (Fillingim, King, Ribeiro-Dasilva, Rahim-Williams, & Riley, 2009; Keefe et al., 2004). These coping strategies for own pain might extend to how parents respond to child pain (Fillingim et al., 2009; Hechler et al., 2011; Keefe et al., 2004). However, this is in contrast with evidence indicating that, in general, men have a great bias toward problem-focused strategies relative to emotion-focused strategies (Keefe et al., 2000; Oláh, 1995). More empirical investigation is needed to go beyond speculation.

Further research is needed to explore how parental goals when faced with their child in pain translate into different parental behaviours. Parental behaviours to child pain, as any behaviour, may be driven by multiple goals (Rasmussen et al., 2006). In particular, controlling child pain and encouraging the child to participate in daily activities despite the pain might be two prominent, possible conflicting, goals elicited in parents when faced with their child’s pain. We can assume that pain control has a high relative value for parents when confronted with child pain. Pain control can be attained by
different parental responses, such as comforting or distracting their child or neglecting child pain (Carver & Scheier, 2001; Rasmussen et al., 2006). However, the adaptive or maladaptive impact of parental behaviour upon child functioning might depend on whether this parental goal for pain control is pursued at the expense of other important goals in the child’s life. Specifically, the use of coping strategies, such as distraction or engaging in pleasant activities despite pain, could be motivated by the goal of pain control without interfering with other important goals. In contrast, parental protective responses, such as allowing the child to stay home from school, may reflect a strong prioritisation of pain control even if this substantially worsens child daily functioning. More knowledge concerning parental motivations underlying parental responses may have important clinical implications. Particularly, it may prove more functional to alter parental goal prioritisation and its determinants, instead of focusing upon parental behavior in response to child pain (Äsenlöf, Denison, & Lindberg, 2006; Wicksell, Olsson, & Hayes, 2011). More research is needed to assess whether aiming at a flexible goal pursuit in parents when confronted with child pain is efficient in changing parental behaviours.

The results should be interpreted in the light of several limitations. First, the sample contained parents of school children imagining several child pain situations. Although a vignette methodology is a valid way of measuring responses according to different situations, real-life responses may be different. Moreover, effect sizes were, warranting cautious interpretations of the findings. Other variables, such as child catastrophic thinking, may account for additional variance in parental goal priority. Therefore, observational studies are needed as well as replication with clinical samples of children suffering chronic pain. Furthermore, other methods, including ecological momentary assessment such as diaries (Connelly et al., 2010), might provide further insight into parents’ daily management of goals in response to child pain. Second, complete data was obtained for only 208 of the 1320 invited families, so generalisation of the results to the population from which we intended to sample may be limited due to selection bias. Third, the goal priority index was calculated post-hoc as we did not directly assess facilitation and interference between pain-control and activity engagement goals. Consequently, it is possible that parents did not view both goals as contradictory. Fourth, bidirectional influences between mothers and fathers were not investigated. It is possible that a heightened prioritisation of pain control in one parent could heighten this priority in the other parent and therefore have combined rather than unique influences.
upon child functioning (Lamb & Tamis-Lemonda, 2004). Despite these limitations, our findings suggest that parental characteristics, such as gender and catastrophic thoughts, as well as the threatening context of the pain play an important role in regulating parental prioritisation of pain control.

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APPENDIX A

Example vignette 1 (low intensity; acute pain):
“My child gets up this morning and suffers from back pain. He/she indicates that the pain is quite mild. My child has been suffering from this back pain for the last few days.”

Example vignette 2 (low intensity, chronic pain):
“My child gets up this morning and once again suffers from a headache. He/she indicates that the headache is quite mild. My child has been suffering from this headache nearly daily for the last four months.”

Example vignette 3 (high intensity, acute pain):
“My child gets up this morning and suffers from a bellyache. He/she indicates that it hurts badly. My child has been suffering from this bellyache for the last few days.”

Example vignette 4 (high intensity, chronic pain):
“My child gets up this morning and once again suffers from pain in the muscles. He/she indicates that it hurts badly. My child has been suffering from these muscle pains nearly daily for the last few months.”
REFERENCES


Parental catastrophic thinking and their goal priority


Parental catastrophic thinking and their goal priority


GENERAL DISCUSSION

Preface

Pain is a common complaint in children and adolescents (Perquin et al., 2000), which not only influences the child’s functioning, but also affects their parents (Hunfeld et al., 2001; 2002; Lipani & Walker, 2006; Palermo, 2000; Palermo & Eccleston, 2009), whose responses may, in turn, impact the child’s pain experience. Several studies have indicated that parental behavioural response to child pain can have maladaptive as well as adaptive influences on child pain experiences (Blount, Devine, Cheng, Simons, & Hayutin, 2008; Gonzalez, Routh, & Armstrong, 1993; MacLaren Chorney et al., 2009; Peterson & Palermo, 2004; Simons, Claar, & Logan, 2008; Sweet & McGrath, 1998; Walker, Claar, & Garber, 2002). However, little is known about when and why parents engage in particular behaviour towards their child in pain.

Within this dissertation, it was proposed that parents’ emotional experience of child pain is key to understanding parent behaviour and that several factors (e.g., child and parent characteristics, contextual factors) might impact both parental emotional and behavioural responses to child pain (Goubert et al., 2005). In particular, previous studies have indicated that catastrophizing about own pain, defined as “an exaggerated negative orientation towards actual or anticipated pain experiences” (Sullivan, Bishop, & Pivik, 1995), is a robust factor in explaining deleterious pain outcomes in adults (Sullivan et al., 2001) as well as in children (Vervoort, Goubert, Eccleston, Bijnnebier, & Crombez, 2006). Pain catastrophizing, however, may not only be important within an intrapersonal context, but also within the interpersonal context of pain. Preliminary evidence has indicated that catastrophizing about someone else’s pain may be important in understanding negative pain outcomes, not only for the caregiver, but also for the sufferer in pain (Goubert, Eccleston, Vervoort, Jordan, & Crombez 2006; Goubert, Vervoort, Sullivan, Verhoeven, & Crombez, 2008). However, it is as yet unclear why this is the case.

The main focus of this dissertation was on determinants of the emotional experience of parents when they face their child in pain and its implications for how parents respond to the pain situation of their child. Specifically, this dissertation aimed at investigating the impact of parental catastrophic thoughts about child pain on their
emotional experience and associated behavioural responses when faced with pain in their child. In accordance with an affective-motivational perspective upon pain (Leeuw et al., 2007; Vlaeyen & Linton, 2000), we expected that parents who catastrophize about their child’s pain would primarily feel distressed and strongly engage in protective behaviour aimed at reducing, escaping or avoiding child pain. Four central research objectives were formulated. As a first objective we investigated the influence of parental catastrophic thoughts about child pain upon parental feelings of distress in response to child pain. The second objective aimed at examining the influence of parental catastrophic thoughts about child pain upon parental protective behaviour (e.g., limiting child activities or giving attention to child pain). As a third objective we investigated whether parental feelings of distress mediate the relation between parental catastrophic thoughts and protective behaviour. As a final objective within this dissertation we examined the impact of parental catastrophic thoughts upon parental goal priority when faced with their child in pain. These four objectives were investigated by means of six studies comprising various participant samples and using different research methods.

This general discussion will first provide an overview of the main results. Next, theoretical implications for the application of an affective-motivational perspective upon pain to the interpersonal context of pain are discussed. Subsequently, we highlight the clinical relevance of the findings. The discussion will close with limitations of the studies and recommendations for future research.

**MAIN FINDINGS**

Chapter 1 reports on two observational, cross-sectional studies investigating the relation between parental catastrophic thoughts about child pain, parental distress and parental tendency to stop their child from engaging in a pain-inducing activity. One study was conducted in a sample of school children ($N = 62$), whereas the second study was conducted in a clinical sample of adolescents suffering from chronic or recurrent pain ($N = 36$). In both samples, parents observed their child performing a pain-inducing task. The results indicated that parental catastrophic thoughts about their child’s pain during the pain tasks were associated with heightened feelings of parental distress and a higher tendency of parents to stop their child in performing the pain-inducing activity. Moreover, we found evidence for the hypothesized mediation by feelings of distress in the relation between parental catastrophic thoughts and their stop tendency. However, parental emotional and behavioural responses were measured by means of self-report,
which may not be a valid index of actual parental responses (Cohen, Manimala, & Blount, 2000). Therefore, Chapter 2 and 3 proceeded on the findings of the first chapter by investigating the influence of parental catastrophic thoughts about child pain upon psychophysiological indices of parental distress and observed parental behaviour in response to child pain.

Specifically, Chapter 2 describes the results of a pilot study in students ($N = 36$ pairs) in which we investigated whether anticipating pain in another evokes an automatic negative emotional response in observers. We used an in vivo pain observation paradigm in which participants were randomly assigned to either the role of observer or observed participant. Observers’ distress response was measured by self-report and psychophysiological indices, such as the fear-potentiated startle reflex (Hamm, Greenwald, Bradley, & Lang, 1993) and corrugator EMG activity (Dimberg & Karlsson, 1997). Findings confirmed our hypothesis that anticipating pain in another elicits an aversive emotional response in observers. Specifically, anticipating another’s pain evoked more fear, an augmented fear-potentiated startle and increased corrugator EMG activity in observers compared with anticipating a safe situation in which the other would not experience pain. Moreover, as evidenced by a pronounced corrugator EMG activity and higher self-report of fear, observers endorsing high levels of catastrophic thoughts about other’s pain experienced the situation of anticipating pain in another as more distressing than low catastrophizing observers. In Chapter 3 we applied this in vivo pain observation paradigm in parent-child dyads ($N = 56$) in which healthy school children participated in a heat pain task while being observed by one of their parents. In addition to chapter 2, the relation between parental catastrophizing and parental behavioural responses to child pain was investigated by assessing parental pain-attending talk during a 3-minute parent-child interaction that followed the pain task. Furthermore, as not all pain situations are alike we also explored whether variables that may augment the threat value of the situation, such as contextual features (i.e., additional information concerning the situation) and child characteristics (i.e., facial pain expression), moderated the impact of parental catastrophizing on parental emotional and behavioural responses to their child’s pain. Findings indicated that, with respect to parental feelings of distress, contextual threat might play a more important role than the general tendency of parents to endorse catastrophic thought about child pain. Specifically, in high threatening situations (due to receiving threatening information and/or heightened child facial pain expression) parents showed more corrugator EMG activity and a pronounced fear-potentiated startle when
anticipating pain in their child compared to anticipating a safe situation. Moreover, parents who received threatening information about their child’s pain showed more corrugator EMG activity when anticipating pain in their child than parents receiving neutral information. In contrast, parental pain-attending behaviour was influenced by the combination of contextual threat and parental general tendency to catastrophize about child pain. Specifically, in a threatening context, as opposed to a low threatening context, high catastrophizing parents attended more to their child’s pain during the interaction with their child (i.e., engaged in more pain-attending talk). Moreover, in the context of low threat, high catastrophizing parents engaged in less pain-attending talk than did low catastrophizing parents. However, the sample comprised parents of healthy school children taking part in a safe, experimental pain task. Consequently, we do not know whether findings can be generalized to real-life threatening, painful situations such as invasive medical procedures.

Consequently, in Chapter 4, we investigated the hypothesis within a sample of parents caring for a child with leukemia ($N = 46$) who frequently undergo painful medical procedures such as lumbar punctures (LP) and bone marrow aspirations (BMA). Specifically, we investigated whether parental catastrophic cognitions about their child’s pain during LP/BMA procedures are associated with heightened parental feelings of distress and how these, in turn, translate into parental pain-attending behaviour. Parents accompanied their child in the pre- and post-procedure phase, but were requested to wait outside the treatment room during the actual LP/BMA procedure. Parental distress during LP/BMA procedures was measured by self-report, while parental behaviour (verbal and non-verbal) was assessed by coding parent-child interaction in the pre- and post-procedure phase. Results indicated that parents endorsing high levels of catastrophic thoughts about child procedural pain experienced these procedures as more distressing than low catastrophizing parents. Moreover, parental catastrophic thoughts about child procedural pain and associated distress translated into different parental behavioural responses according to the phase of the LP/BMA procedure. Specifically, in the pre-procedure phase less pain-attending behaviour was observed in highly catastrophizing parents. In contrast, in the post-procedure phase, the reverse pattern was observed. Increased distress in high catastrophizing parents contributed to increased engagement in pain-attending behaviour. The cross-sectional design of this study, however, did not allow inferences on how parental responses to child pain evolve when confronted with multiple LP/BMA procedures over the course of their child’s treatment. Hence, Chapter 5
proceeded on the results of chapter 4 by exploring the course of child and parents’ emotional experience and parental behavioural response to LP/BMA procedures when repeatedly confronted with these invasive, medical procedures. Additionally, we investigated whether parental catastrophic thoughts about child procedural pain contributed to the persistent experience of parental distress and engagement in pain-attending responses and whether child experiences of distress depended on parental emotional and behavioural responses. A sample of 25 parents took part in this prospective study whereby each LP/BMA procedure the child underwent as part of the intensive treatment was included. After each LP/BMA procedure, parents reported on their feelings of distress and pain-attending tendencies during the LP/BMA procedure. A staff member rated the extent to which children were distressed during the LP/BMA procedure. Findings suggested that parents endorsing high levels of catastrophic thoughts about child procedural pain report an increase in their feelings of distress, while low catastrophizing parents reported less feelings of distress after repeated exposures to LP/BMA procedures. Parents with high levels of catastrophic thoughts about child procedural pain also reported a higher tendency to engage in pain-attending behaviours. Although pain-attending tendencies of high catastrophizers were independent of the number of LP/BMA procedures parents already faced, their desire to be present during LP/BMA procedures increased over time, while low catastrophizing parents reported a decrease in this desire to be present. Moreover, parental distress had a major influence on child distress experience and, according to the reporting staff member, children experienced LP/BMA procedures as more distressing over time.

In sum, the previous chapters indicated that parents who catastrophize about child pain engage more in protective behaviour, which is mediated by their heightened feelings of distress. However, little is known about the motivations or goals of high catastrophizing parents to engage in these protective responses. The final chapter, Chapter 6, reports on a questionnaire study in parents of school children \( N = 208 \) investigating parental motivation to engage in particular behaviour towards their child in pain. In particular, we examined the influence of parental catastrophic thinking about child pain on their prioritisation for pain control. By means of vignette methodology parents reported, in response to different pain scenarios, on their imagined motivation for two competing goals: to control their child’s pain or to encourage their child’s participation in daily activities despite pain. Findings indicated that parents with high levels of catastrophic thoughts about child pain, compared with low catastrophizing
parents, had a higher priority for pain control over activity engagement. Moreover, this was dependent upon the pain duration such that, in chronic pain situations, pain control was a priority for all parents, whereas only for high catastrophizing parents pain control was also a priority in acute pain situations. Furthermore, independently of parental catastrophic thoughts, heightened priority for pain control was observed in highly intense and chronic pain situations. Moreover, in high intense pain situations, mothers demonstrated a stronger priority for pain control than fathers.

**THEORETICAL IMPLICATIONS**

The value of an affective-motivational perspective for understanding parents’ emotional and behavioural responses to child pain.

The findings of this dissertation support the assumptions of the socio-communications model and a recently formulated model on empathy in the context of pain, emphasizing the importance of taking into account bottom-up (i.e., child characteristics, such as facial pain expressions), top-down (i.e., parental characteristics such as pain catastrophizing) and contextual influences (such as contextual information) in understanding parental emotional and behavioural responses to child pain (Goubert et al., 2005). In particular, based upon an affective-motivational perspective, this dissertation mainly stressed the important influence of the top-down factor “parental catastrophic thoughts about child pain” upon parental feelings of distress and parental engagement in goal-directed behaviour aimed at reducing, escaping or avoiding child pain (i.e., protective behaviour). An affective-motivational perspective upon pain implies that pain is a signal of threat, which interrupts attention, imposes a priority to escape pain and is difficult to disengage from (Eccleston & Crombez, 1999). These processes are especially prevalent if people interpret their pain as threatening, i.e., catastrophize about their pain, thereby initiating a vicious circle. Particularly, evidence indicates that people who catastrophize about their pain are more hypervigilant for pain signals (Crombez, Eccleston, Baeyens, & Eelen, 1998), experience more pain-related fear or distress (Leeuw et al., 2007), and are more motivated to diminish the pain (Eccleston & Crombez, 2007; Leeuw et al., 2007). However when attempts at pain relief fail, heightened engagement in behaviour aimed at diminishing, escaping or avoiding pain may lead to more disability and pain thereby, in turn, amplify catastrophic thoughts and strengthen motivation to persevere in pain relief strategies (Eccleston & Crombez, 2007; Leeuw et al., 2007; Vlaeyen & Linton, 2000). The findings of this dissertation suggest that similar processes might be at play in the interpersonal context of pain.
The association between parental catastrophic thinking and parental feelings of distress

The results of chapter 1 to 5 extend and further corroborate preliminary findings indicating that parents who endorse catastrophic thoughts about their child’s pain experience child pain as more distressing than low catastrophizing parents (Goubert et al., 2006; 2008). Moreover, by using psychophysiological measurements of distress (chapter 2 & 3), the results indicate that the experience of distress in parents is an automatic aversive emotional response when confronted with their child in pain or when anticipating potential future pain in their child. This is in line with recent studies suggesting that observing another in pain automatically initiates a threat-detection system which signals a potential threat in the environment to observers and thereby activate self-orientated emotions of distress. In contrast with general belief, the results of these previous studies suggested that observing another in pain does not automatically trigger other-orientated responses, such as feelings of sympathy (Cheetham, Pedroni, Antley, Slater, & Jäncke, 2009; Yamada & Decety, 2009). Our results further suggest that feelings of own distress may be automatically activated when parents observe their child in pain, especially when the situation is experienced as highly threatening. Although further research is needed, it is possible that feelings of sympathy might only occur in a second phase, after adequate regulation of distress (Decety & Jackson, 2006; Eisenberg & Eggum, 2009; Goubert, Vervoort, & Crombez, 2009b, Vachon-Presseau et al., 2011; Yamada & Decety, 2009). Heightened levels of distress in parents endorsing catastrophic thoughts about child pain might reflect difficulties in regulating the induced feelings of distress when confronted with child pain. The results of our prospective study (chapter 5) even suggest that this heightened distress response in parents who catastrophize about child pain does not automatically attenuate when being repeatedly confronted with a threatening, painful experience in their child. On the contrary, the experience of distress might persist or even get worse. This may have important implications for the child’s pain experience as parental feelings of distress have been found to be related to more pain and distress in children and adolescents, while in contrast feelings of sympathy were associated with better child outcomes (Darlington et al., 2012; Dix, Gershoff, Meunier, & Miller, 2004; Jay, Ozolins, Elliot, & Cadwell, 1983; Logan & Scharff, 2005; Penner et al., 2008; Sieberg, Williams, & Simons, 2011; Taft, Ballou, & Keefer, in press). In accordance with these previous findings, the results of chapter 5 indeed indicated that parental level of distress plays an important role in explaining child distress experience during painful, invasive medical procedures. Moreover, as parents’ distress in high
catastrophizers does not decrease, but rather increases, over time, children of high catastrophizing parents might also be at risk for experiencing painful medical procedures as highly distressing.

Furthermore, the findings of chapter 2 & 3 corroborate recent evidence showing that the specific level of threat that persons attach to a situation might have higher predictive value in explaining parental distress response to pain than their general tendency to interpret pain as threatening (i.e., catastrophizing; Campbell et al., 2010). More research is needed to disentangle the relation between situational and dispositional measures of pain catastrophizing (Quartana, Campbell, & Edwards, 2009), but the findings suggest that although catastrophizing about (child) pain is generally, conceptualized as a trait-like variable (Sullivan et al., 2001), the strength of catastrophic thoughts can vary according to the specific painful situation. Interestingly, the results of chapter 3 also indicated that the tendency of parents to interpret child pain as threatening is context-dependent. Specifically, findings showed that contextual threatening information has the potential to elevate parental catastrophic thoughts about child pain and the associated automatic distress response, particularly when accompanied with heightened facial pain expression by their child. These results attest to the importance of considering multiple, combined influences on parents’ emotional experiences of child pain. Furthermore, these findings underline that facial pain expression is critical in determining the threat value of the pain situation, which has, in turn, a powerful impact on empathic emotional responses to another’s pain (Goubert et al., 2005; Hadjistavropoulos et al., 2011; Williams, 2002). Moreover, in line with previous findings indicating heightened propensity to rely on sufferer’s pain expression in high catastrophizers (Goubert, Vervoort, Cano, & Crombez, 2009a; Sullivan, Martel, Tripp, Savard, & Crombez, 2006; Vervoort, Goubert, & Crombez, 2009), our findings suggest that heightened facial pain expression might be of particular importance for parents interpreting child pain as highly threatening.

The influence of parental catastrophic thinking and associated distress on parental behavioural response to child pain

Parental initial distress response towards pain in their child likely serves a protective function as it prepares the parent for dealing with the impending threat (Hadjistavropoulos et al., 2011). Indeed, in line with an affective-motivational perspective upon pain and contemporary empathy models, the findings of chapter 1, 3, 4 & 6 indicated that endorsing catastrophic thoughts about child pain and associated feelings of distress have important implications for caregiving behaviour. Specifically,
the findings within these chapters indicated that parents who catastrophize about their child’s pain engage more in protective behaviour reflected by increasingly restricting the child’s pain-inducing activities, comforting the child and giving attention to the child’s pain. In accordance with an affective-motivational perspective upon pain ( Eccleston & Crombez, 1999; Leeuw et al., 2007; Van Damme, Legrain, Vogt, & Crombez, 2010; Vlaeyen & Linton, 2000), these parental protective behavioural responses in parents endorsing catastrophic thoughts about child pain probably reflect a heightened tendency to reduce, escape or avoid child pain ( Vachon-Presseau et al., 2011; Yamada & Decety, 2009). These findings corroborate recent studies in parents of healthy school children and children suffering from chronic pain, indicating that parents who highly catastrophize about child pain report a higher engagement in protective behaviour in response to their child’s pain experience ( Goubert, Vervoort, De Ruddere, & Crombez, in press; Hechler et al., 2011; Sieberg et al., 2011). Our findings not only extend these preliminary results by using observational indices of parental behaviour, but also show that parental distress plays an important role in explaining the relation between parental catastrophic thinking and protective behaviour ( chapter 1 & 4). Therefore, it is reasonable to assume that parents endorsing catastrophic thoughts about child pain have a preference for protective behaviour primarily because it functions as a way to alleviate their own overwhelming feelings of distress.

Research considering associations between empathic emotional responding and prosocial behaviour, defined as acts that are, as assumed to one’s social group, beneficial to other people ( Penner, Dovidio, Piliavin, & Schroeder, 2005), is also informative in this regard. Theoretical conceptualizations on prosocial behaviour state that affect is a fundamental element in understanding observers’ responses in potential helping situations ( Penner et al., 2005). Specifically, it has been shown that feelings of distress towards another person in need are related to an egoistic motivation to engage in prosocial behaviour in order to reduce their own level of distress. Feelings of sympathy on the other hand are associated with altruistic motivated prosocial behaviour, i.e. the behavioural tendency to help another person by concern for the other ( Batson, Fultz, & Schoenrade, 1987; Cialdini et al., 1987; Eisenberger & Miller, 1987). Consequently, prosocial responding motivated by an egoistic motivation is more easily achieved by escaping the aversive situation when possible, resulting only in helping behaviour when escape is not possible. In contrast, people who primarily experience feelings of sympathy will engage in behaviour attuned to the needs of the other, even if escape is easy ( Batson et al., 1987;
Eisenberg et al., 1989). As children highly depend upon adults, primarily their parents, for help and care, pediatric pain can be considered as a specific helping situation. In the pediatric pain context, evidence indeed indicated that feelings of sympathy are associated with more supportive parenting (Dix et al., 2004; Penner et al., 2008). Our findings further support the application of these assumptions within the context of pediatric pain by demonstrating that parental distress is associated with parental avoidance of child pain and pain-inducing activities as well as with pain-attending strategies in parents. Accordingly, these protective tendencies, especially engaged in by parents endorsing catastrophic thoughts about child pain, might both reflect parental efforts to regulate their own feelings of distress by trying to reduce or escaping the distressing experience (i.e. their child’s pain; Goubert et al., 2009b; Goubert, Craig, & Buysse, 2009; Van Ryswyk, 2009). In line with assumptions about the impact of contextual features on the type of prosocial behaviour in people who primarily experience empathic distress (Batson et al., 1987; Penner et al., 2005), parents’ distress experience was, depending upon the specific situation, either related with avoidance of child pain or pain-attending strategies. Specifically, results of chapter 3 & 4 reveal that parents with catastrophic thoughts about child pain adopt a pain-avoidant strategy (i.e., less pain-attending behaviour) in low threatening situations. However, in high threatening situations, parents endorsing catastrophic thoughts about child pain tend to engage in more pain-attending behaviour, which could reflect behavioural efforts to modulate their distress in the failure of avoidance of child pain (Gross & John, 2003). Pain-related attentional processes are mostly investigated with regard to own pain, showing that heightened attention to pain is related to more fear and escape/avoidance tendencies (Eccleston & Crombez, 1999; Leeuw et al., 2007; Van Damme et al., 2010). Evidence also indicated that people interpreting pain as highly threatening have more difficulty to disengage from pain (Crombez et al., 1998; Van Damme, Crombez, & Eccleston, 2004). Moreover, preliminary evidence within the interpersonal context of pain, suggests that parents who interpret child pain as highly threatening might be successful in attentional avoidance of child pain under relatively mild threat conditions. However, with increasing levels of threat this avoidance tendency may conflict with an increased difficulty of disengaging from pain (Van Damme et al., 2004; Vervoort et al., 2011; Vervoort, Caes, Trost, & Goubert, in press). Taken together, it is reasonable to assume that, when faced with pain in their child, parents endorsing high levels of catastrophic thoughts about child pain have a general tendency to escape or avoid child pain as a way to alleviate the induced feelings
of distress. In highly threatening situations (e.g., invasive medical procedures), however, they may not be able to maintain this avoidant strategy due to increased difficulty to disengage their attention from pain. Consequently, in these threatening situations, high catastrophizers engage in pain-attending behaviour probably as an ultimate aim to reduce their distress by trying to relief child pain. Effective regulation of self-oriented feelings of distress may be a key process in facilitating other-oriented feelings of sympathy (Decety & Jackson, 2006; Eisenberg & Eggum, 2009), thereby enabling flexible, effective care attuned to the needs of the sufferer in pain (Goubert et al., 2008; Goubert et al., 2009b).

**The influence of parental catastrophic thoughts on parental goal priority**

The findings of chapter 6 extend previously obtained findings by directly assessing parental motivations to engage in particular behavioural responses. The results of the study described in chapter 6 provide preliminary evidence that parents who catastrophize about child pain attach more importance to pain-control goals at the expense of promoting engagement of their child in daily activities such as academic, social, recreational, … activities (i.e., activity engagement goals). Interestingly, this priority for pain control was not only triggered in chronic pain situations, but also in the context of acute pain. This may suggest that parents endorsing catastrophic thoughts about child pain have a lower threshold to prioritise pain control over activity engagement compared with low catastrophizing parents. Prioritisation of pain control may be adaptive in acute pain situations by fostering pain relief. However, due to their low threshold for prioritisation of pain control, highly catastrophizing parents may give too often priority at pain control over activity engagement (e.g., even in mild, low threatening acute pain situations), which might interfere with child engagement in normal daily activities (Goubert et al., 2006; Logan, Simons, & Carpino, 2012). Furthermore, in the context of failed attempts to reduce pain (i.e., chronic pain), perseverance in pursuing the goal of pain control may become dysfunctional (Crombez, Eccleston, Van Damme, Vlaeyen, & Karoly, in press; Eccleston & Crombez, 2007). In the context of chronic pediatric pain, it may be more beneficial for child daily functioning if parents find a flexible balance between pain-control and other important goals, by adjusting their goals and goal priorities (Karsdorp & Vlaeyen, 2011; McCracken & Gauntlett-Gilbert, 2011; McCracken & Vowles, 2008; Schwartz & Drotar, 2009; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Two central processes by which goal adjustment can take place, goal disengagement and goal reengagement, have been identified. Goal disengagement can be defined as withdrawing effort and commitment from an unattainable goal, while goal reengagement has been described as identifying and committing to new, alternative and
valued goals (Wrosch et al., 2003). Applied to the interpersonal context of pain, it may prove more beneficial for parents of children suffering from persistent pain to abstain from unattainable pain-control goals and reengage their energy in other valuable and attainable goals in their child’s life despite the pain (Crombez et al., in press; Eccleston & Crombez, 2007; McCracken, Vowles, & Eccleston, 2004; Van Damme, Crombez, & Eccleston, 2008). In support of this, evidence is accumulating indicating a positive influence of flexible goal adjustment when confronted with pain on well-being and functioning in people suffering from chronic or recurrent pain (Massey, Garnefski, & Gebhardt, 2009; McCracken, Gauntlett-Gilbert, & Eccleston, 2009; Karsdorp & Vlaeyen, 2009; Swartz & Drotar, 2009; Wrosch et al., 2003). However, in line with adjustment to own pain, our findings of a low threshold in catastrophizing parents to prioritise pain control suggest that these parents view pain control as a necessity to be able to lead a ‘normal’ life (Crombez, Eccleston, Van Hamme, & De Vlieger, 2008; De Vlieger, Van den Bussche, Eccleston, & Crombez, 2006). Consequently, re-orienting priority away from controlling pain to engagement in other valued life activities despite pain might be particularly difficult to achieve when parent perceive child pain as highly threatening (Karoly & Reuhlman, 2007; Massey et al., 2009; Van Damme et al., 2008). Moreover, in line with our findings concerning parental behavioural responses and theories on prosocial behaviour, parental feelings of distress might have an important impact on goal priorities of high catastrophizers. Although more research is needed, we could expect that parental feelings of distress will be associated with giving priority to child pain control or reduction over other important child aspirations in order to alleviate own evoked feelings of distress. In contrast, parents mainly experiencing sympathy in response to child pain could be more flexible in the pursuit of pain control goals and attune or integrate this more effectively with other needs of their child, such as academic or social goals.

**Parental catastrophic thoughts: adaptive or maladaptive?**

Previous research indicated that parental distress and related protective, pain-attending behaviours are related to higher levels of pain, distress, somatic complaints and functional disability in children and adolescents (Jay, Ozolins, Elliot, & Cadwell, 1983; Logan et al., 2012; Logan & Scharff, 2005; Penner et al., 2008; Peterson & Palermo, 2004; Sieberg et al., 2011; Simons et al., 2008; Walker et al., 2002). The current findings are important in that they suggest that particularly high catastrophizing parents might be most likely to experience child pain as distressing and engage in maladaptive behavioural responses to child pain. Moreover, preliminary evidence indicates that parental catastrophic thinking is associated with more functional disability in the child (Goubert et
al., 2006; Logan et al., 2012; Sieberg et al., 2011), and that parental protective behaviour may play an important role in this association (Logan et al., 2012; Sieberg et al., 2011). However, the efficacy of any particular parental strategy should be understood in its particular clinical context. It is reasonable to assume that parental protective tendencies may have adaptive value in acute pain situations as it may protect the child from further harm or pain. However, in chronic pediatric pain, longstanding avoidance of daily activities, (e.g. avoiding going to school or playing with friends), and focus on pain control may contribute to increased disability and maintain or exacerbate the pain problem (Chambers, 2003; Eccleston & Crombez, 2007; Goubert et al., 2006; 2009; Leeuw et al., 2007; Logan, Guite, Sherry, & Rose, 2006; Vlaeyen & Linton, 2000).

Moreover, independent of the specific pain situation, it is plausible that a certain level of catastrophic thoughts might be adaptive as it urges parents to engage in behaviours aimed at relieving child pain. Although further research is needed, the impact of parents’ catastrophic thinking about child pain on child functioning could be curvilinear. Specifically, the absence of threat perception in parents when confronted with child pain can be considered abnormal (Aldrich, Eccleston, & Crombez, 2000). On the other hand, persistent heightened levels of catastrophic thoughts about child pain and associated priority for pain control might be maladaptive as it may interfere with attaining goals in other important aspects of a child’s life (Karoly & Reuhlman, 2007; Massey et al., 2009). This reasoning is in line with conceptualization concerning worrying, which can be considered as one aspect of catastrophic thinking about pain (i.e., rumination). Worrying has been defined as “A chain of thoughts and images, negatively affect laden and relatively uncontrollable” (Borkovec, 1994, p.7). Normal worry is beneficial as it promotes successful problem solving and anxiety reduction, while chronic or pathological worrying tends to be associated with an exacerbation of the problem, resulting in a perseverence loop in which the failure to find a solution amplifies worry and unsuccessful problem-solving attempts (Eccleston & Crombez, 2007; Davey, 1994). Consequently, reframing the pain situation as less threatening might engender adequate, moderate levels of worrying, distress and associated problem-solving tendencies (Davey, 1994; Eccleston & Crombez, 2007), but not at the cost of other important (child) life goals, i.e., attuned to the needs of child in pain.
Different processes for mothers and fathers?

In contrast with previous research (Goubert et al., 2008; Hechler et al., 2011), but in line with a recent study (Goubert et al., in press), we did not find significant differences between mothers and fathers in their level of catastrophic thoughts about child pain. Specifically, the study by Goubert and colleagues (2008) and Hechler and colleagues (2011) revealed that mothers had more catastrophic thoughts about child pain in comparison with fathers. Furthermore, parental catastrophizing had a differential impact upon maternal and parental behaviour (Goubert et al., in press; Hechler et al., 2011). Although more research is needed to robustly identify similarities and differences in mothers’ and fathers’ responses to child pain, the distinct findings may be due to dissimilarities in sample composition. A particular strength of the studies in this dissertation (chapter 5 & 6) was the inclusion of both parents, which allowed us to take into account the dependency of maternal and paternal data by treating these data as couple-data. Overall, independent of parental catastrophizing, we only found differences between mothers’ and fathers’ emotional and behavioural responses to child pain when specific features of the pain situation were taken into account. Specifically, our findings suggest that the characteristics of the specific situation, such as the level of pain intensity, may have a differential impact on mothers and fathers resulting into different goal priorities for mothers and fathers in high intense pain situations.

Although we did not address whether similar responses in mothers and fathers also had the same impact on child functioning, evidence to date suggest that the influence of mothers and fathers on child development show more similarities than differences (Lamb, 2004; Moon, Chambers, & McGrath, 2011). However, although mothers and fathers may have an equivalent influence on the child’s well being, they each seem to have a unique contribution (Paquette, 2004). In particular, mothers mainly take up caretaking roles, while fathers are assumed to be more involved in play and recreational activities (Lamb, 2004; Paquette, 2004). Our findings suggest that differences between mothers’ and fathers’ responses may depend upon specific aspects of the situation. Consequently, contextual features might also be important in explaining similarities and differences in how mothers’ and fathers’ responses impact child functioning. Gathering more knowledge about similarities as well differences in maternal and paternal responses to child pain and how this influences child pain experience is important as paternal involvement and care giving responsibilities increases, in healthy as well as in chronic ill children (Lamb, 2004; Wolff, Pak, Meeske, Worden, & Katz, 2011). Moreover, research
indicated that the involvement of fathers has a protective role in pediatric injuries (Swebel & Brezausek, 2010) and is related to better adjustment in families with chronic ill children (Gavin & Wysocki, 2006).

**CLINICAL IMPLICATIONS**

The findings of this dissertation further underscore the importance of involving parents when managing child pain. In particular, research indicated that parental responses to child pain have a major influence upon the child’s pain experience (Palermo & Chambers, 2005; Palermo & Eccleston, 2009). Our finding that parental catastrophizing about child pain is associated with more parental distress and increased engagement in protective behaviours indicates that, in clinical practice, it may be important to target parental catastrophic thoughts about child pain. For example, in the context of invasive medical procedures, the current findings suggest that preparing parents for these procedures might be equally important as preparing children. A lot of progress has been made in pharmacological as well as non-pharmacological interventions to reduce child pain and fear during painful procedures (Blount et al., 2009; Conte, Walco, Sterling, Engel, & Kuppenheimer, 1999). However, little attention has been paid on how to assist parents to effectively cope with invasive medical procedures. Interventions instructing children and parents on how to cope with medical procedures are likely to improve both child and parent adjustment to pain, yet these are rarely standard practice (Chambers, 2003). Additionally, the findings with respect to the evolution of parental responses over time emphasise that, in the context of recurrent exposure to painful procedures, it may be important to alter parental catastrophic thoughts about child procedural pain already early on to prevent development of severe distress responses. Moreover, as we found that parental distress has a profound influence on child distress, targeting parental catastrophic thoughts may not only alleviate parental distress, but could also be of benefit for the child’s pain experience. Benefit for the child is likely to be achieved through modification of parental protective behaviours. Specifically, although it is as yet unclear how catastrophizing and associated distress impacts child pain experience, previous evidence as well as evidence obtained throughout this dissertation suggests that parental catastrophic thinking and associated feelings of distress may impacts child functioning by the heightened engagement in protective behaviour in response to child pain (Logan et al., 2012; Sieberg et al. 2011). Accordingly, targeting and altering catastrophizing may not only decrease parental distress, but may also
diminish protective tendencies, and as such, potentially lead to better child adjustment to pain.

Alternatively, to the extent that parental protective behaviour serves as a strategy to reduce their own feelings of distress, it may not be necessary to alter catastrophizing per se, but instead, provide high catastrophizers with effective emotion regulation strategies to alter the negative impact of parental catastrophic thinking upon parent as well as child outcomes (Connelly et al., in press; Kazak, 2005; Goubert et al., 2009). Emotion regulation strategies may include, for instance, attention modification or cognitive re-appraisal (Gross & Thompson, 2007). Although further research is needed, it is possible that parents who can attenuate the threat they attach to the situation and associated distress may be able to adapt their behaviour in accordance with the needs of their child instead of having the urge to avoid or diminish the pain in order to reduce their feelings of distress (Batson et al., 1987; Goubert et al., 2009b). Moreover, teaching these parents how to effectively regulate their feelings of distress might prevent development of severe feelings of distress in parents as well as in their child (Dahlquist, Power, Cox, & Fernabach, 1994). Furthermore, the results of chapter 3 also indicated that the type of information provided to parents about the painful procedure might have an important influence on and alter parents’ experience of child pain, stressing the importance of appropriate, but honest, communication between staff members and parents (Cescuti-Butler & Galvin, 2003; Pantell, Stewart, Dias, Wells, & Ross, 1982).

In addition to providing adequate emotion regulation strategies, it may also prove functional to alter high catastrophizing parents’ prioritisation for pain control. Although our evidence is preliminary and requires further validation, targeting parental motivations underlying their behavioural response to child pain might change parental responses in a more fundamental way compared with interventions merely focusing on parental behavioural tendencies (Åsenlöf, Denison, & Lindberg, 2006; Wicksell, Olsson, & Hayes, 2011). Specifically, giving priority to pain control could be an adaptive first response when confronted with child pain. However, pursuing pain control in any pain situation and at any cost has the potential to interfere with attaining other important goals in the child’s life. It may be more beneficial for parents to find a balance between pain control goals and other important child aspirations (Karsdorp & Vlaeyen, 2011; McCracken et al., 2009; McCracken & Vowles, 2008; Schwartz & Drotar, 2009; Wrosch et al., 2003). Consequently, in clinical practice, it may be important, especially in parents endorsing catastrophic thoughts about child pain, to stimulate a shift in perspective from
pain control to a valued life despite the pain (Wicksell et al., 2011). Identifying distress and associated protective tendencies as substantially contributing to child disability and realizing that engagement in important, daily activities is possible and worthwhile despite the pain might be crucial in this regard (Wicksell et al., 2011).

**LIMITATIONS**

The findings of this dissertation need to be considered in light of some limitations. First, we used two different operationalisations to assess parental catastrophic thoughts about their child’s pain. In chapter 3 and 6 we used the Pain Catastrophizing Scale for Parents (PCS-P), which assesses parental general tendency to endorse catastrophic thoughts about child pain without a specification of a specific situation. This might entail that the referent pain events in the trait measure are too distal from the specific pain situation in order to adequately capture parental catastrophic thoughts about the specific type of child pain assessed in the pain task or described in the vignettes (Quartana et al., 2009). Moreover, although more research is needed to have a better understanding of the relation between trait and state measures of pain catastrophizing (Quartana et al., 2009), recent research indicates that state measures of catastrophizing might be more accurate and relevant compared with dispositional measures (Campbell et al., 2010). Therefore, in chapter 1, 2, 4, and 5, we used a situational-specific version of the PCS-P (PCS-P-state) to assess parental catastrophic thoughts about child pain, which is more compatible with the specific pain task or LP/BMA procedure. Although using a state measure might limit generalisation of the results to other pain situations, results with both operationalisations point in the same directions, attesting that the situation-specific measure may be a reflection of a more general tendency of parents to endorse catastrophic thoughts about child pain. Nevertheless, using two different operationalisations of parental catastrophizing might limit comparison between the different studies. Additionally, the situation specific measure of the PCS-P has the potential to overlap with affective components of pain, such as parental distress (Quartana et al., 2009). We prevented this overlap by assessing parental distress by means of emotional adjectives, which clearly reflect the affective component, and carefully selected items for the PCS-P-state assessing cognitive components of the pain experience.

Second, the use of different pain induction methods (i.e., cold pressor task, heat pain, 2-minute-walking-task) and diverse assessments of parental feelings of distress and protective behaviour could make comparison across the studies difficult. However, the
use of different pain induction methodologies reflects real-life experiences in which not all pain situations a child encounters are alike. Furthermore, the similar pattern of results in various pain situations and with different operationalisation of parental distress and behaviour attests to the robustness of the findings.

Third, with the exception of the last chapter, the studies entail small sample sizes, which might limit the power of the studies. In most studies the effect sizes were low to moderate. Consequently, other factors, such as child characteristics and pain-related responses (e.g., child catastrophizing), characteristics of the parent-child relation (e.g., warm versus cold relation) and contextual influences (e.g., parental history of pain or pain in another family member), may account for additional variance in parental emotional and behavioural reactions to child pain.

Fourth, in the last two studies (chapter 5 & 6) we were able to include enough fathers allowing comparison between mothers’ and fathers’ responses to child pain. Unfortunately, not all studies included a sufficient number of fathers to assess potential differences and similarities between mothers and fathers. As previous research indicated similarities as well as differences between mothers’ and fathers’ responses to child pain and the impact on child pain experience (Goubert et al., 2008; Moon et al., 2011; Vervoort, Huguet, Verhoeven, & Goubert 2011a), further research is needed to investigate whether identical processes apply for mothers’ and fathers’ responses to child pain. Additionally, although we controlled for interdependence of mothers’ and fathers’ responses, bidirectional influences between mothers and fathers were not explored. It is plausible that mothers and fathers might have an impact on each other’s responses and thereby have a combined, rather than a unique, effect on child functioning. Future studies are needed to explore bi-directional influences between mothers’ and fathers’, for example in their level of catastrophic thinking, and how this impacts their emotional and behavioural responses to child pain. In particular, application of Actor-Partner-Interdependence models to the context of pediatric pain might be suitable for investigating bidirectional influences between mothers and fathers (Cook & Kenny, 2005).

Fifth, prospective analyses were only performed in a sample of children with leukemia who frequently undergo painful, invasive medical procedures. As the painful procedures these children undergo are imbedded in a specific, threatening context of child cancer, more research is needed to establish whether similar longitudinal associations can be found in other, less threatening clinical contexts (e.g., immunization injections).
particular, ecological momentary assessment, such as a diary methodology (Connely et al., 2010), might be useful to gain further insight into parents’ daily management of child (chronic) pain and evolutions of parental responses over time.

Sixth, parental goal-related processes were only investigated in parents of healthy school children by means of vignettes describing various pain situations. It is reasonable to assume that parental goals could be different when confronted with actual chronic pain and the experience of failed attempts to control child pain. Consequently, replication of the results in parents caring for a child with chronic pain as well as further exploration of parental goal-related processes in response to child pain is needed.

Finally, the age range in the different studies varied. Specifically, in the clinical sample of parents caring for a child with leukemia children ranged between 0 and 15 years of age, while in most studies including school children their age ranges between 8 and 16 years. As most children with leukemia are between 4 to 6 years, we decided to lower the age range for the samples of the studies described within chapter 4 and 5. Therefore, in all studies, we controlled for child age in the analyses and in most cases child age did not reveal significant results.

**Future research directions**

**Parental emotion regulation strategies and the role of attentional processes**

Although experiencing other-orientated emotions, such as sympathy, in response to child pain might be important to be able to provide effective care (Dix et al., 2004; Goubert et al., 2009; Penner et al., 2005; 2008), our results indicate that being confronted with child pain automatically elicits distress in parents, especially if parents experience child pain as threatening. However, to date it is unclear how other-oriented feelings and related approach tendencies arise and prevail. As suggested several times throughout the discussion, a potential key process might be the ability of parents to regulate this self-oriented distress response elicited by viewing their child in pain (Goubert et al., 2009; 2009b). Regulation of emotions can be achieved through a number of strategies, with cognitive re-appraisal and expressive suppression as the two most common strategies (Bebko, Franconeri, Ochsner, & Chiao, 2011; Gross & John, 2003). In the pediatric pain context, it is likely that observed avoidance of child pain and pain-inducing activities as well as pain-attending strategies in high catastrophizers both represent parental efforts to regulate the distress engendered by observing their child in pain. Yet, they might differ in that avoidance might function as an early regulatory strategy preventing a full-blown
emotional response, whereas pain-attending behavioural responses may function as a strategy to regulate a fully generated distress response when earlier efforts have failed (Goubert et al., 2005; 2009b; Gross, 1998). The role of attention deployment (i.e., attentional engagement and attentional avoidance) as an emotion-regulation strategy is well demonstrated, also in the context of own pain experiences (Bebko, et al., 2011; Gross, 1998; Johnson, 2009). In particular, research has shown that modifying attention to pain using distraction leads to diminished pain aversiveness and increased tolerance (Elommaa, Williams, & Kalso, 2009; Malloy & Milling, 2010). However, to our knowledge, no research is available on attentional strategies adopted by parents to regulate the induced feelings of distress when confronted with their child in pain. Moreover, no research addressed the impact of individual differences variables (e.g., pain catastrophizing) on the type and success of the emotion regulation strategy adopted by parents. Given the role of pain-related threat for both observers’ attentional processing (Crombez et al., 1998; Vervoort et al., 2011; in press) and emotional responses to other’s pain, regulation of distress through attention modification is likely to be compromised with increasing levels of threat (i.e. increasing levels of observers’ catastrophizing cognitions and sufferer’s pain display; Goubert et al., 2008; Mohammadi et al., 2012; Vervoort et al., 2011). Increased understanding of the interrelationship between attentional and emotional observer responses, and the role of moderating variables such as observers’ catastrophic thoughts about pain and sufferer’s pain expressive behaviours, is not only theoretically relevant, but may also contribute to the optimization of clinical interventions aimed at enhancing parental coping with pediatric (chronic) pain. Specifically, despite some contradicting findings (Van Bockstaele, Verschuere, Koster, Tibboel, De Houwer, & Crombez, 2011), attention modification training might be promising in clinical practice to alter parental feelings of distress in response to child pain (Hadjistavropoulos et al., 2011; Liossi, 2012).

**Parental goals in the context of child pain and translation to parental behaviour**

Although the findings of chapter 6 provide preliminary evidence for the importance of parental goals to understand parental responses, more research is needed to explore parental goal-related processes when faced with child (chronic) pain and how parental goals translate into different parental behaviours. Investigation of parental motivations allows for a better understanding of why parents engage in a particular behaviour toward their child in pain. When confronted with child pain, the goal of controlling child pain will probably be highly valued by most parents, which will be
reflected in their behavioural responses. As any goal, the goal of controlling pain can be attained by different parental responses, such as comforting or distracting their child or neglecting child pain (Carver & Scheier, 2001; Rasmussen, Wrosch, Scheier, & Carver, 2006; Riediger & Freund, 2004). The adaptive or maladaptive impact of different parental behaviours upon child functioning might depend on the extent to which behaviour is primarily and inflexibly driven by the parental goal for pain control at the expense of other important aspects/goals in their child’s life. Specifically, although the use of coping strategies, such as distraction, could be motivated by the goal of controlling child pain, engaging in distraction may also reflect parental attention for other aspects of child functioning despite the pain. This could explain the positive influence of this coping-promoting strategy on child functioning (Blount et al., 2008; Gonzalez et al., 1993; MacLaren Chorney et al., 2009; Sweet & McGrath, 1998). In contrast, parental protective responses, such as allowing the child to stay home from school, may reflect a strong priority of parents to reduce pain even if this negatively impacts their child’s daily functioning substantially. Further research is needed to investigate how parents flexibly attune between child pain needs (i.e., pain control) and non-pain needs and how this translates into behaviour. In line with the importance of parents’ emotional experience in understanding parental behaviour (Sieberg et al., 2011), it is plausible that emotions and emotional regulatory strategies, such as cognitive re-appraisal, might also have an important role in obtaining flexible goal pursuit in the context of chronic child pain.

Influence of parental catastrophic thoughts on child responses, pain and disability

Preliminary research has indicated a maladaptive influence of parental catastrophic thoughts on child functioning and the important role of parental protective responses in this association (Goubert et al., 2006; Logan et al., 2012; Sieberg et al., 2011). However, more research is needed to investigate mechanisms underlying the influence of parental catastrophizing about child pain and associated responses on how children experience and respond to their pain. Specifically, intergenerational transmission of pain catastrophizing could be an important mechanism that, to our knowledge, has not yet received research attention within the context of pediatric pain. Intergenerational transmission can be described as the process through which an earlier generation psychologically influences the attitudes and behaviour of the next generation by observational learning, coaching and other cognitive processes, such as mental representations (Van Ijzerdoorn, 1992). Considerable research has supported the mechanism of intergenerational transmission of aggressive behaviour, attachment style
and parenting (Bretherton, 1990; Douman, Margalin, & John, 1994; Van Ijzerdoorn, 1992). It plausible that this process is also applicable to the context of pediatric pain. Preliminary evidence has indeed revealed the importance of observational learning as a source of pain-related fear and behavioural responding (Goodman & McGrath, 2003; Goubert, Vlaeyen, Crombez, & Craig 2011; Helsen, Goubert, Peeters, & Vlaeyen, 2011; Olsson, Nearing, & Phelps, 2007). Although interesting from a theoretical perspective as well as for clinical practice no research is available on the intergenerational transmission, for example through observational learning, of parental pain catastrophizing and the conditions under which this takes place (Goubert et al., 2011). It is reasonable to assume that children who are exposed to parents displaying catastrophizing about pain might also be more likely to endorse catastrophic thoughts about pain. This process may then further explain and contribute to the maladaptive influence of parental catastrophic thoughts upon child functioning. Related to this issue, future studies are needed investigating how child characteristics and contextual features moderate the impact of parental catastrophizing on child functioning. In particular, although studies have, in general, indicated that protective tendencies, which parents catastrophizing about pain primarily engage in, are related with poorer child outcomes, some studies did not find evidence supporting this association (Guite, Logan, McCue, Sherry, & Rose, 2009; Jellesma, Rieffe, Terwogt, & Westenberg, 2008; Reid, McGrath, & Lang, 2005). It is reasonable to assume that the impact of protective tendencies depend upon specific aspects of the pain situation (i.e., clinical context, type of medical procedure, intensity and duration of pain) as well as upon the child’s vulnerability to these responses. The child’s vulnerability to parental responses is likely to be influenced by individual child characteristics, such as the tendency of children to endorse catastrophic thoughts about their pain (Claar, Simmons, & Logan, 2008; Walker et al., 2002; Williams, Blount, & Walker, 2010).

Relational context

Although the results of this dissertation and previous research underscored the importance of parental and child characteristics in understanding parental responses (Claar et al., 2008; Sieberg et al., 2011; Williams et al., 2010), the impact of specific aspects of the parent–child relationship are largely unexplored (Palermo & Chambers, 2005). Family system theories emphasise the importance of family functioning in understanding individual family members’ behaviour, such as parental responses to child pain (Lewandowski, Palermo, Stinson, Handley, & Chambers, 2010; Palermo & Chambers, 2005). However, little research has explored the influence of family
functioning and communication style on parental responses and child functioning (Palermo & Chambers, 2005). In particular, family cohesion and adaptability (or flexibility) have been identified as two important aspects of family functioning, especially when confronted with a stressor (e.g., chronic pain; Olsson & Gorall, 2003). Family cohesion represents the emotional bond between family members, which can range from disconnected (i.e., extremely low cohesion) to enmeshed (i.e., extremely high cohesion), while family flexibility has been described as the capability of a family system to change when required and can range from rigid/inflexible to chaotic or overly flexible. Extreme low or high levels of both dimensions (i.e., unbalanced or dysfunctional patterns of family interactions) can be problematic for individual as well as family functioning (Clark & Shields, 1997; Masselam, Marcus, & Stukard, 1990). Balanced families (i.e., moderate scores on both dimensions) will generally function more adequately than unbalanced types (Kasani, Allan, Dahlmeier, Reziani, & Reid, 1992; Lewis & Khaw, 1982; Olsson, 2000). Communication style is key to understand dynamics underlying family functioning, such as cohesion and adaptability (Clark & Shields, 1997; Olsson & Gorall, 2003). Specifically, while positive, open communication is often found in balanced families, unbalanced families are often characterized by negative, problematic communication patterns which could further fuel dysfunctional family interactions (Masselam et al., 1990; Olsson & Gorall, 2003). Within the context of pediatric pain, we might expect that balanced families respond more adequately to child pain and are more flexible in adapting to the context of pediatric chronic pain. In contrast, parents of unbalanced families might engage more in maladaptive responses and communication patterns to child pain. Consequently, children living in an unbalanced family may experience more pain and disability. With increased attention for the role of family functioning in pediatric pain, progress can be made in developing and optimizing family treatments for pediatric pain by targeting dysfunctional family patterns more effectively (Palermo & Eccleston, 2005).

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NEDERLANDSTALIGE SAMENVATTING

INLEIDING


Een biomedisch kader blijkt echter onvoldoende om de ervaren hinder en ontreddering bij kinderen en hun ouders te begrijpen. Naast biologische factoren, zoals de ernst en intensiteit van de pijn, spelen ook psychologische en sociale factoren een belangrijke rol in het verklaren van de pijnervaring. Tegenwoordig wordt pijn dan ook vaak bestudeerd vanuit een biopsychosociaal perspectief, dat pijn beschrijft als een interactie tussen biologische, psychologische en sociale factoren (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). In het bijzonder leent een affectief-motivationeel perspectief op pijn zich goed in het verklaren van psychologische en sociale invloeden op de pijnervaring. Vanuit een affectief-motivationele visie wordt pijn beschouwd als een signaal van dreiging dat de aandacht onderbreekt, vrees induceert en motiveert tot gedrag gericht op het verminderen, vermijden en ontsnappen aan pijn (Eccleston & Crombez,
Deze affectief-motivationele processen dienen een adaptieve, beschermende functie in het vermijden van letsel en het verlichten van de pijn (Aufray et al., 2010; Williams, 2002). Cognitief-affectieve factoren kunnen deze processen echter beïnvloeden en aanleiding geven tot minder gunstige reacties. Catastroferen over pijn is in deze context reeds vaak onderzocht. Catastroferen over pijn wordt gedefinieerd als een cognitieve reactie waarbij aan pijn een overmatig negatieve of bedreigende interpretatie gegeven wordt (Sullivan, Bishop, & Pivik, 1995). Onderzoek toont aan dat individuen met catastrofale gedachten over hun eigen pijn moeilijk hun aandacht kunnen losmaken van de pijn, hypervigilant zijn voor pijn, meer vrees ervaren en een sterke motivatie vertonen om hun pijn te verminderen ten koste van andere belangrijke doelen (Crombez, Eccleston, Baeyens, & Eelen, 1998; Van Damme, Crombez, & Eccleston, 2002;2004; Eccleston & Crombez, 2007; Leeuw et al., 2007; Vlaeyen & Linton, 2000). Prioriteren van pijnreductie ten koste van andere doelgerichte handelingen is wellicht adaptief in het geval van acute pijn, maar een blijven zoeken naar een uitweg voor pijn kan evenwel als maladaptief beschouwd worden als pijn chronisch is, en er geen onmiddellijke oplossing voor handen is (Eccleston & Crombez, 2007). Ter ondersteuning hiervan vonden tal van studies, in klinische en niet-klinische populaties, dat catastrofale gedachten over eigen pijn één van de belangrijkste en meest robuuste psychologische constructen is ter verklaring van negatieve pijnuitkomsten zoals verhoogde pijn, functionele beperking en emotionele hinder, dit zowel bij volwassenen (Sullivan et al., 2001) als kinderen (Vervoort, Goubert, Eccleston, Bijttebier, & Crombez, 2006).

Pijn is echter zelden een private aangelegenheid en het is dan ook aannemelijk dat catastroferen niet alleen belangrijk is voor de eigen pijnbeleving, maar ook voor de interpersoonlijke ervaring van pijn (= beleving als men anderen met pijn observeert). Onderzoek naar de wederzijdse beïnvloeding tussen diegene die pijn ervaart en belangrijke anderen is schaars. De sociale dimensie van pijn is nochtans belangrijk, vooral bij kinderen. Zij zijn sterk afhankelijk van volwassenen, voornamelijk hun ouders, voor hulp en verzorging (Palermo & Chambers, 2005). Pijn bij anderen herkennen en hierop adequaat reageren kan belangrijke implicaties hebben voor het herstel van de persoon in pijn, maar ook voor observatoren door het identificeren en ontwijken van mogelijke gevaren in de omgeving (Williams, 2002). Het socio-communicatief model van pijn biedt een heuristiek kader voor een beter begrip van de complexe sociale interacties tussen kinderen met pijn en hun verzorgers (Hadjistavropoulos & Craig, 2002; Prkachin...
Het socio-communicatief model beschrijft de communicatie van pijn in drie stappen waarbij de interne ervaring van pijn (= stap A) vaak gepaard gaat met observeerbare pijnexpressies (bijv., faciale pijn expressie, pijn verbalisaties, … = stap B) die door observatoren gedecodeerd kunnen worden en op basis hiervan inschattingen maken omtrent de pijnervaring (= stap C; Hadjistavropoulos et al., 2011). De gedragsmatige reactie van de observator, op basis van de inschattingen, kunnen op hun beurt een invloed hebben op de interne pijn ervaring en geassocieerde pijnexpressies van de persoon in pijn (Hadjistavropoulos et al., 2011). Een recent geformuleerd empathiemodel in de context van pijn maakt een fijner onderscheid in de reactie van observatoren (Goubert et al., 2005). Empathie wordt gedefinieerd als “het gevoel hebben de ervaring van de ander te begrijpen” met zowel cognitieve (bijv. pijninschattingen), emotionele (bijv., gevoelens van distress of sympathie) als gedragsmatige componenten (bijv. kind gerust stellen of afleiden). Bovendien erkent het model, net als het socio-communicatieve model, dat de empathische reactie bij het zien van een ander in pijn door tal van factoren beïnvloed wordt. Specifiek wordt een onderscheid gemaakt tussen “bottom-up” karakteristieken (kenmerken van kind: bijv. faciale expressie van kind), “top-down” karakteristieken (kenmerken van ouder: bijv. opvattingen van ouders over de pijn van hun kind) en contextuele elementen (informatie omtrent de situatie, karakteristieken van de pijnervaring zoals intensiteit en duur van de pijn).

Met betrekking tot de empathische emotionele respons worden binnen het empathiemodel twee soorten respnsen onderscheiden: 1) emotionele responsen gericht op de ander die een uitdrukking zijn van bezorgdheid en inleven in de situatie (sympathie) en 2) emotionele responsen gericht op zichzelf, namelijk zich oncomfortabel en angstig voelen tijdens observatie van een ander die pijn ervaart (distress). Beide kunnen samen voorkomen maar motiveren gedrag op een verschillende manier. Onderzoek omtrent empathische emotionele reacties in de context van prosociaal gedrag suggereert dat sympathie aanleiding geeft tot het helpen van anderen afgestemd op de noden van de ander, terwijl distress zou motiveren tot het aanpakken van de eigen distress ervaring (Batson, Fultz, & Schoenrade, 1987, Eisenberg & Eggum, 2009). De ervaring van empathische distress gaat dan ook vaak gepaard met ontsnappings- of vermijdingsgedrag en is niet noodzakelijk effectief in het helpen reduceren van de pijn bij de ander (bijv., hun kind; Batson et al., 1987; Davis, 1983; Eisenberg & Miller, 1987). Preliminaire evidentie toont echter aan dat het observeren van een ander met pijn...
automatisch aanleiding geeft tot de ervaring van distress en niet tot gevoelens van sympathie (Cheetham, Pedroni, Antly, Slater, & Jäncke, 2009; Yamada & Decety, 2009).

Ouderlijk gedrag als reactie op de pijnervaring bij hun kind is reeds vaak onderzocht binnen een operant perspectief, waarbij voornamelijk onderzocht wordt in welke mate gedrag van de ouders het pijngedrag van kinderen al of niet bekrachtigt (Fordyce, 1976; Newton-John, 2002). Voornamelijk ouderlijke beschermende reacties (zoals aandacht geven, beperken van pijninducerende activiteiten, geruststellen, troosten, …) worden gezien als een belangrijke bekrachtiger van pijngedrag van kinderen, wat kan resulteren in meer pijn, hinder en pijngedrag bij kinderen (Blount, Devine, Cheng, Simons, & Hayutin, 2008; Claar, Simons, & Logan, 2008; Peterson & Palermo, 2004; Walker, Claar & Garber, 2002). Hoewel deze bevindingen theoretisch relevant zijn en hun klinische implicaties hebben, wordt voorbijgegaan aan de vragen wanneer en waarom ouders bepaalde gedragingen stellen als reactie op het zien van pijn bij hun kind.

Hoewel deze bevindingen theoretisch relevant zijn en hun klinische implicaties hebben, wordt voorbijgegaan aan de vragen wanneer en waarom ouders bepaalde gedragingen stellen als reactie op het zien van pijn bij hun kind.

In lijn met evidentie omtrent de eigen pijnbeleving, spelen affectief-motivationele processen wellicht ook een belangrijke rol binnen de interpersoonlijke context van pijn.

In het bijzonder wordt de rol van ouderlijke catastrofale gedachten centraal gesteld binnen dit doctoraat. In lijn met een affectief-motivationele visie op pijn (Eccleston & Crombez, 1999; Leeuw et al., 2007; Sullivan et al., 2001) kunnen we veronderstellen dat ouders met catastrofale gedachten over de pijn bij hun kind (1) meer “distress” zullen ervaren en (2) meer beschermend gedrag zullen stellen. Bovendien veronderstellen we dat beschermend gedrag van ouders wellicht gemotiveerd wordt door de prioriteit van ouders voor doelen gericht op het verminderen van de pijn van hun kind ten koste van andere belangrijke doelen (Eccleston & Crombez, 2007; Leeuw et al., 2007). Er is reeds preliminaire evidentie dat ouderlijke catastrofale gedachten over de pijn van hun kind een impact hebben op zowel de ervaring van ouders als de pijnervaring van het kind: een hoge mate van catastrofale gedachten bij ouders over de pijn van hun kind is gerelateerd aan meer ouderlijke “distress”, en meer hinder bij het kind (Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006; Goubert, Vervoort, Sullivan, Verhoeven, & Crombez, 2008). Het is echter nog onduidelijk waarom dit het geval is. Onderzoek naar de onderliggende processen die plaatsgrijpen wanneer ouders met catastrofale gedachten over de pijn van hun kind geconfronteerd worden met pijn bij hun kind is dan ook belangrijk om een beter zicht te krijgen op de effecten ervan op de pijnervaring bij kinderen. Verschillen in ouderlijke gedragsmatige responsen en de onderliggende
motivatie van deze responsen speelt wellicht een belangrijke rol in het verklaren van de negatieve invloed van ouderlijke catastrofale gedachten.

**DOELSTELLING**

Het doctoraat heeft als doelstelling om meer inzicht te krijgen in de ervaring van ouders bij het zien van hun kind in pijn en de implicatie hiervan voor de wijze waarop ouders omgaan met hun kind. Specifiek zochten we een antwoord op de vraag waarom en wanneer ouders bepaalde gedragingen stellen als reactie op de pijn bij hun kind. Hierbij werd de invloed van ouderlijke catastrofale gedachten over de pijn van hun kind centraal geacht. Het doctoraat heeft vier centrale onderzoeksdoelstellingen. Ten eerste gingen we de relatie na tussen ouderlijke catastrofale gedachten en gevoelens van distress bij ouders. Ten tweede onderzochten we de associatie tussen ouderlijke catastrofale gedachten en beschermend gedrag van ouders als reactie op de pijn van hun kind (bijv., pijn-inducerende activiteiten beperken, pijn vermijden, hun kind troosten, aandacht geven aan de pijn,…). Ten derde bestudeerden we of ouderlijke gevoelens van distress een mediërende invloed hadden in de relatie tussen ouderlijke catastrofale gedachten over de pijn van hun kind en beschermend gedrag van ouders. Tenslotte onderzochten we in welke mate ouderlijke catastrofale gedachten over de pijn van hun kind geassocieerd zijn met de prioriteit van ouders om doelen gericht op het reduceren van de pijn na te streven ten koste van andere belangrijke doelen voor hun kind. Deze vier onderzoeksdoelstellingen werden onderzocht aan de hand van verschillende onderzoeksmethodes in variërende steekproeven. Het doctoraat bevat zes studies die elk een combinatie van de vier onderzoeksdoelstellingen heeft getoetst.

**RESULTATEN**

In hoofdstuk 1 onderzochten we de relatie tussen ouderlijk catastroferen, de ervaring van distress bij ouders en de tendens van ouders om pijn-inducerende activiteiten bij hun kind te beperken. Het hoofdstuk bespreekt de resultaten van twee studies, één uitgevoerd bij gezonde schoolkinderen ($N = 62$) en een tweede bij adolescenten met chronische of terugkerende pijn ($N = 36$). In beide steekproeven werden de ouders gevraagd om hun kind te observeren tijdens het uitvoeren van een pijntaak. De resultaten toonden aan dat ouders met een hoge mate van catastrofale gedachten meer distress ervaarden bij het observeren van hun kind in pijn en een grotere neiging rapporteerden om hun kind te stoppen bij het uitvoeren van de pijntaak. Bovendien vonden we evidentie
voor de mediërende rol van ouderlijke distress ervaring in de relatie tussen ouderlijke catastrofale gedachten en hun stopptendens. Ouderlijke gevoelens en gedrag ten opzichte van hun kind in pijn werden echter enkel gemeten aan de hand van zelfrapportage. Zelfrapportage is niet noodzakelijkerwijs geassocieerd met werkelijke ouderlijke reacties (Cohen, Manimala, & Blount, 2000). Daarom werd in hoofdstuk 2 en 3 gebruik gemaakt van psychofysiologische maten voor distress en observeerbaar ouderlijk gedrag.

**Hoofdstuk 2** beschrijft de resultaten van een pilootstudie bij studenten ($N = 36$ paren) waarbij de relatie tussen catastrofale gedachten over de pijn bij de ander en de automatische negatieve emotionele reactie bij observatoren onderzocht werd. Hiervoor werd gebruik gemaakt van een in vivo observatie paradigma waarbij de studenten op toevallige wijze de rol van observator of geobserveerde deelnemer werd toegekend. De mate waarin observatoren distress ervaren bij het anticiperen van pijn bij de andere student werd gemeten aan de hand van zelfrapportage, alsook met behulp van psychofysiologische maten zoals de oogknipperreflex (Hamm, Greenwald, Bradley, & Lang, 1993) en de corrugator EMG activiteit (Dimberg & Karlsson, 1997). De resultaten waren in lijn met de verwachting en toonden aan dat het anticiperen van pijn bij een ander een negatieve emotionele reactie (bijv., distress) uitlokt bij observatoren. Meer bepaald vonden we dat observatoren tijdens de anticipatie van pijn bij de andere student meer vrees rapporteerden alsook een grotere oogknipperreflex en corrugator EMG activiteit vertoonden in vergelijking met het anticiperen van een veilige, pijnloze situatie. Bovendien vonden we dat observatoren die catastroferen over de pijn van de andere student meer vrees rapporteerden en een sterkere corrugator EMG activiteit vertoonden in anticipatie op pijn bij de andere student in vergelijking met laag catastroferende observatoren. In **hoofdstuk 3** werd dit in vivo pijn observatie paradigma toegepast bij een steekproef van gezonde schoolkinderen ($N = 56$) die tijdens het uitvoeren van een pijntaak werden geobserveerd door één van hun ouders. Naast de relatie tussen ouderlijk catastroferen en de ervaring van distress, onderzochten we ook de relatie tussen ouderlijke catastrofale gedachten over de pijn van hun kind en het gedrag die ouders stellen als reactie op de pijnervaring bij hun kind. Hiertoe werden ouders en kinderen na de pijntaak herenigd en 3 minuten alleen gelaten. Tijdens deze 3 minuten werd de interactie tussen ouder en kind gefilmd met het oog op het coderen van ouderlijke uitspraken waarbij aandacht gegeven wordt aan de pijn (bijv., vragen stellen over de pijn). Bovendien, omdat de context waarin kinderen pijn ervaren sterk kan variëren, onderzochten we exploratief de invloed van pijnlijke gezichtexpressies van het kind en
bedreigende informatie omtrent de pijn op de ouderlijke reacties. Hiertoe kregen ouders neutrale informatie of bedreigende informatie omtrent de pijnlijke warmteprikkel die hun kind zou ervaren tijdens de pijntaak. De resultaten toonden aan dat de mate waarin ouders distress ervaarden bij het zien van hun kind in pijn sterker samenhangt met de contextuele dreigwaarde (bedreigende informatie of een hoge mate van pijnlijke gezichtsexpressie bij het kind) dan met de algemene neiging van ouders om pijn bij hun kind als bedreigend te interpreteren. Specifiek vonden we in situaties met een hoge dreigwaarde meer corrugator EMG activiteit en een sterkere oogknipperreflex bij ouders tijdens anticipatie van mogelijke pijn bij hun kind in vergelijking met een veilige situatie. Bovendien was de corrugator EMG activiteit in anticipatie op pijn bij hun kind sterker bij ouders die bedreigende informatie kregen over de pijn in vergelijking met ouders die neutrale informatie kregen. Met betrekking tot ouderlijk gedrag observeerden we, in een situatie met een hoge dreigwaarde (door het verkrijgen van bedreigende informatie), bij ouders met catastrofale gedachten over de pijn van hun kind meer uitspraken waarbij aandacht geschonken wordt aan de pijn van hun kind dan bij ouders die een lage mate van catastrofale gedachten rapporteerden. Bij een lage contextuele dreigwaarde observeerden we, in vergelijking met laag catastroferende ouders, echter minder uitspraken waarbij aandacht geschonken wordt aan de pijn van hun kind bij hoog catastroferende ouders. Aangezien de steekproef gezonde schoolkinderen en hun ouders betrof is het niet zeker of deze resultaten te veralgemenen zijn naar een reële bedreigende situatie zoals invasieve medische procedures.

In hoofdstuk 4 komen we tegemoet aan deze tekortkoming van hoofdstuk 3 door de onderzoeksvragen te bestuderen bij kinderen met leukemie en hun ouders ($N = 46$) die een lumbaal- of beenmerg punctie (LP/BMA procedure) ondergaan in het Universitair Ziekenhuis Gent. Meer bepaald onderzochten we in deze steekproef of ouderlijke catastrofale gedachten over de procedurele pijn van hun kind (= de pijn die hun kind kan ervaren tijdens LP/BMA procedures) gerelateerd zijn aan gevoelens van distress bij ouders tijdens deze procedure. Verder gingen we ook na of deze gevoelens van distress op hun beurt een associatie vertonen met gedrag van ouders waarbij men aandacht schenkt aan de pijn van hun kind (bijv., vragen stellen over de pijn, kind troosten, geruststellen, …). Ouders konden bij hun kind aanwezig zijn tijdens de voorbereiding (pre-procedure fase) en tijdens de naverzorging (post-procedure fase), maar werden gevraagd om tijdens de LP/BMA procedure de onderzoeksruiemte te verlaten. De interactie tussen ouders en kind tijdens de pre- en post-procedure fase werd gefilmd met
als doel om gedrag van ouders waarbij aandacht geschonken wordt aan de pijn van hun kind later te coderen. Ouderlijke gevoelens van distress tijdens de procedure werden gemeten aan de hand van zelfrapportage na afloop van de LP/BMA procedure. De resultaten gaven aan dat ouders die catastroferen over de procedurele pijn bij hun kind meer distress ervaarden tijdens de LP/BMA procedure. Bovendien vonden we dat hoog catastroferende ouders tijdens de voorbereidingen (pre-procedure fase) minder gedrag stelden waarbij aandacht gegeven wordt aan de pijn van hun kind. In tegenstelling hiermee vonden we in de post-procedure fase het omgekeerde effect: de hoge mate van distress in ouders met catastrofale gedachten over de procedurele pijn van hun kind droeg ertoe bij dat deze hoog catastroferende ouders na de procedure meer gedrag stelden waarbij aandacht geschonken wordt aan de pijn van hun kind. De cross-sectionele opzet van deze studie liet echter niet toe om na te gaan hoe ouderlijke reacties ten aanzien van de pijn van hun kind evolueren wanneer ouders herhaaldelijk geconfronteerd worden met deze LP/BMA procedures gedurende de behandeling.

Zodoende bouwde hoofdstuk 5 verder op de resultaten van hoofdstuk 4 door na te gaan hoe de gevoelens van distress bij ouders en kinderen en ouderlijke gedragingen ten aanzien van LP/BMA procedures evolueren doorheen het verloop van de behandeling, die gekenmerkt wordt door frequente LP/BMA procedures. Bovendien onderzochten we de relatie tussen ouderlijke emotionele en gedragsmatige reacties en de mate van angst bij kinderen. Tenslotte werd ook de invloed van ouderlijke catastrofale gedachten op de evolutie in ouderlijke reacties ten aanzien van deze procedures nagegaan. Hiertoe werd bij een deel van de gezinnen die deelnamen in hoofdstuk 4 (N = 25) elke LP/BMA procedure die het kind diende te ondergaan als onderdeel van de intensieve behandeling fase opgevolgd. Ouders rapporteerden, voor de eerste therapiegerelateerde LP/BMA procedure, over hun mate van catastrofale gedachten over de pijn van hun kind tijdens LP/BMA procedures. Na elke LP/BMA procedure werd aan ouders gevraagd om te rapporteren over hun gevoelens van distress tijdens de procedure en in welke mate men gedrag gericht op de pijn zou stellen indien men aanwezig zou zijn tijdens de LP/BMA procedure. De pedagogisch medewerker, die aanwezig blijft tijdens de LP/BMA procedure en zich voornamelijk focust op de noden van het kind tijdens de procedure, rapporteerde de mate van angst die het kind ervaren had tijdens de procedures. De resultaten toonden aan dat ouders die catastroferen over de pijn in toenemende mate distress ervaarden tijdens LP/BMA procedures. Laag catastroferende ouders daarentegen vertoonden een daling in hun mate van distress ervaring. Bovendien rapporteerden hoog
catastroferende ouders een sterkere neiging om gedrag te stellen waarbij aandacht gegeven wordt aan de pijn van hun kind, onafhankelijk van het aantal LP/BMA procedures die ouders reeds hadden meegemaakt. De mate van ouderlijke distress tijdens LP/BMA procedures was ook in sterke mate gerelateerd aan de mate waarin hun kind angst ervarade tijdens deze procedures. Verder bleken kinderen, volgens de pedagogisch medewerkers, deze LP/BMA procedures in toenemende mate beangstigend te vinden.

Samengevat suggereren de resultaten van de eerste vijf hoofdstukken dat de mate van ouderlijke distress een belangrijke rol speelt in het begrijpen van de relatie tussen ouderlijke catastrofale gedachten en ouderlijk gedrag ten aanzien van hun kind in pijn. Er is echter nog geen kennis voorhanden omtrent de motivatie (of doelen) van ouders om een bepaald gedrag te stellen wanneer men geconfronteerd wordt met pijn bij hun kind. In het laatste hoofdstuk, hoofdstuk 6, werd daarom de relatie tussen ouderlijke catastrofale gedachten over de pijn bij hun kind en de prioriteit van ouders om doelen gericht op pijnreductie na te streven ten koste van andere belangrijke doelen (bijv., academische, sociale en vrije tijd doelen) onderzocht. Aan beide ouders van gezonde schoolkinderen (N = 208) werden verschillende vignetten of verhalen voorgelegd die varieerden in de mate van pijnintensiteit en duur van de pijn. Na het lezen van elk verhaal rapporteerden ouders hun motivatie voor doelen gericht op het verminderen of controleren van de pijn van hun kind en doelen gericht op het aanmoedigen van hun kind om deel te nemen aan alledaagse activiteiten ondanks de pijn. De resultaten toonden aan dat ouders die catastroferen over de pijn van hun kind meer prioriteit gaven aan doelen gericht op pijnvermindering, ten koste van andere belangrijke doelen. Bovendien was dit afhankelijk van de duur van de pijn: in chronische pijn situaties was pijnvermindering een prioriteit voor alle ouders, maar bij acute pijn gaven enkel hoog catastroferende ouders aan dat men pijnvermindering zou prioriteren ten koste van andere doelen. Verder vonden we dat, onafhankelijk van ouderlijke catastrofale gedachten, pijnvermindering een prioriteit was in situaties van intense of chronische pijn. Bovendien was, in intense pijn situaties, de prioriteit voor pijnvermindering sterker aanwezig bij moeders in vergelijking met vaders.

**DISCUSSIE**

De bevindingen ondersteunen de assumpties van het socio-communicatief model (Hadjistavropoulos et al., 2011) en het empathiemodel in de context van pijn (Goubert et al., 2005) die veronderstellen dat verschillende factoren (kindkarakteristieken, ouderkarakteristieken alsook contextuele factoren) een invloed hebben op de gevoelens
en gedragingen van ouders bij het zien van hun kind in pijn. In lijn met een affectiefmotivatie perspectief op pijn, benadrukken de resultaten het belang van ouderlijke catastrofale gedachten over de pijn van hun kind. In overeenstemming met bevindingen rond eigen pijnbeleving, vonden we dat ouders met catastrofale gedachten over de pijn van hun kind 1) meer distress ervaren bij het zien van hun kind in pijn, 2) meer beschermend gedrag stellen (bijv., limiteren van pijninducerende activiteiten, vermijden van pijn en aandacht schenken aan pijn) en 3) meer prioriteit geven aan doelen gericht op het verminderen van de pijn van hun kind ten koste van andere belangrijke doelen. Bovendien geven de resultaten aan dat gevoelens van distress automatisch worden uitgelokt bij ouders als men geconfronteerd wordt met pijn bij hun kind. In lijn met voorgaande studies (Cheetham et al., 2009; Yamada & Decety, 2009) kan dit erop wijzen dat pijn bij kinderen automatisch leidt tot distress bij ouders, voornamelijk in situaties met een hoge dreigwaarde, en dat gevoelens van sympathie pas de bovenhand nemen na adequate regulatie van de uitgelokte gevoelens van distress (Decety & Jackson, 2006; Eisenberg & Eggum, 2009; Goubert, Vervoort, & Crombez, 2009). De hoge mate van distress bij ouders met catastrofale gedachten over de pijn van hun kind doet vermoeden dat deze ouders problemen ervaren met het reguleren van distress, waardoor het ervaring van distress sterk aanwezig blijft, zelfs na herhaalde confrontatie met een pijnlijke medische procedure (Hoofdstuk 5).

De hoge mate van distress bij ouders met catastrofale gedachten over de pijn van hun kind had ook een invloed op het gedrag dat ouders stellen ten aanzien van de pijn bij hun kind. In overeenstemming met bevindingen die het belang aantonen van emoties in het begrijpen van prosociaal gedrag, was ouderlijke distress, afhankelijk van de dreigwaarde van de situatie, enerzijds gerelateerd aan vermijding van de pijn van hun kind (bijv. minder aandacht schenken aan de pijn of pijninducerende activiteiten beperken) en anderzijds aan gedrag waarbij aandacht gegeven wordt aan de pijnervaring van hun kind. In het bijzonder suggereren de resultaten dat in situaties waarbij de pijn weinig bedreigend is catastroferende ouders de neiging hebben om minder aandacht te schenken aan de pijn. Deze verminderde aandacht voor pijn kan een uiting zijn van een vermijdingsstrategie die catastroferende ouders hanteren, mogelijk als een manier om hun gevoelens van distress te reguleren (Gross & Thompson, 2007). Wanneer de pijn echter te bedreigend wordt lijkt het erop dat deze ouders niet meer in staat zijn om hun aandacht van de pijn af te wenden, wat ook het vermijden van de pijn bemoeilijkt (Van Damme et al., 2004; Vervoort et al., 2011). Gedrag waarbij aandacht gegeven wordt aan de pijn,
zoals troosten en vragen stellen over de pijn, kan in deze bedreigende situaties waarbij vermijden van pijn moeilijk is, een ultieme poging zijn van ouders om hun gevoelens van distress te reguleren door de pijn van hun kind te reduceren (Gross & Thompson, 2007).

De resultaten van hoofdstuk 6 geven een verder inzicht in de motivatie van catastroferende ouders om beschermend gedrag te stellen als reactie op de pijn bij hun kind. De bevindingen suggereren dat ouders die catastroferen over de pijn van hun kind een sterkere neiging hebben om doelen gericht op pijnvermindering te prioriteren ten koste van andere belangrijke doelen voor hun kind. Interessant was de bevinding dat pijnreductie prioritair was voor alle ouders in chronische pijn situaties, maar dat enkel ouders met een hoge mate van catastrofale gedachten over de pijn van hun kind ook in acute pijn situaties prioriteit gaven aan pijnreductie. Pijnreductie prioriteren kan adaptief zijn binnen een acute context aangezien het aanleiding kan geven tot het oplossen van het probleem en op die manier leiden tot pijnvermindering (Eccleston & Crombez, 2007). Echter, de lage drempel van catastroferende ouders om pijnreductie centraal te stellen kan ervoor zorgen dat deze ouders pijnreductie te vaak prioriteren ten koste van andere belangrijke doelen en op deze manier het dagdagelijkse functioneren van hun kind negatief beïnvloeden (Goubert et al., 2006; Logan, Simons, & Carpino, 2012; Sieberg, Williams, & Simons, 2011). Verder is het mogelijk dat binnen de context van chronische pijn, waarbij geen oplossing is voor het pijnprobleem, een blijven nastreven van pijnreductie kan leiden tot een sterke interferentie met het dagdagelijkse functioneren (Eccleston & Crombez, 1999). In lijn met resultaten omtrent het flexibel omgaan met eigen pijnervaringen (McCracken & Gauntlettt-Gilbert, 2011; Schwartz & Drotar, 2009; Wrosch, Scheier, Miller, Schulz, & Carver, 2003), kan het in de context van chronische pijn, gekenmerkt door aanhoudende niet-geslaagde pogingen om pijn te verminderen, gunstiger zijn dat ouders een balans vinden tussen het nastreven van pijnreductie doelen en andere doelen die belangrijk zijn voor hun kind.

**KLINISCHE IMPLICATIES**

De resultaten benadrukken het belang van zowel kinderen als ouders voor te bereiden op pijnlijke, medische ingrepen bij kinderen. Er is al veel vooruitgang geboekt in het reduceren van pijn en angst bij kinderen tijdens medische procedures (Blount et al., 2009), maar er is slechts weinig aandacht voor het begeleiden van ouders om op een adequate manier om te gaan met de pijnervaring bij hun kind. Onze bevindingen geven aan dat vooral ouders met catastrofale gedachten over de pijn van hun kind baat kunnen
hebben bij een interventie gericht op hun catastrofale gedachten en hoe ze omgaan met de uitgelokte gevoelens van distress. Het reduceren van ouderlijke catastrofale gedachten en geassocieerde ervaring van distress is mogelijk niet alleen bevorderlijk voor ouders, maar kan ook een gunstige invloed uitoefenen op hoe hun kind omgaat met de pijnervaring.

**Referenties**


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Line