Predicting Children’s Response to an Invasive Medical Investigation: The Influence of Effortful Control and Parent Behavior

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Objective: To investigate the relative contributions of effortful control (reflecting the child’s ability to shift and refocus attention) and parental coping- and distress-promoting behaviors to children’s coping and distress during the voiding cystourethrogram (VCUG, X-ray of the kidneys).

Method: Thirty-two children between ages 2 and 7 years were videotaped undergoing the VCUG. Parent and child behaviors were coded according to the CAMPIS-R (Blount et al., 1997), and parents completed a temperament inventory assessing effortful control across a range of everyday situations.

Results: Children manifested relatively high rates of distress and low rates of coping. Their coping attempts were not associated with reduced rates of distress. The most frequent child coping behavior was distraction. Both effortful control and parent coping-promoting behavior (particularly talk about topics other than the VCUG) made independent contributions to child coping behavior. Parent distress-promoting behavior (particularly reassurance) made a strong contribution to child distress behavior.

Conclusions: Factors relating to the child (effortful control) and parent (coping and distress-promoting behaviors) both contribute to children’s response to an aversive medical procedure. Interventions that facilitate parent coping and promoting behavior, reduce their distress-promoting behavior, and compensate for children’s infrequent and ineffective use of coping strategies (such as distraction) may be optimal for young children, particularly those low in effortful control.

Key words: child distress; child coping; parents; emotion regulation; voiding cystourethrogram.
control is associated with the modulation of emotion, including less discomfort, fear, and frustration in infants and less intense negative affect in preschool children (Kochanska, Murray, & Harlan, 2000; Rothbart et al., 2000). Effortful control and children’s coping have not been investigated in the context of a relatively severe real-world stressor, however. The first aim of this study was to investigate the association between effortful control and children’s coping and distress during a stressful and invasive medical procedure, the VCUG (voiding cystourethrogram, X-ray of kidneys). We expected that higher effortful control would be associated with more child coping and less distress during the VCUG.

Children’s coping is influenced also by the context in which it occurs (Eisenberg et al., 1997). Parental presence can be either a positive or a negative influence, depending on the parental behaviors (Frank, Blount, Smith, Manimala, & Martin, 1995; Peterson, Oliver, & Saldana, 1997). Analyses of parent and child behaviors during aversive medical procedures have yielded information about specific parent behaviors that precede children’s distress and coping. Parental prompting of coping behaviors, such as distraction, is associated with increased coping by the child; other parent behaviors, such as empathic comments, criticism, and excessive reassurance, are associated with increased child distress (Manimala, Blount, & Cohen, 2000). The second aim of this study was to investigate the relative contributions of effortful control and parent behaviors in the prediction of children’s coping and distress during the VCUG. We expected that parental encouragement of coping would lead to children’s coping and that parental encouragement of distress would lead to children’s distress. We expected also that effortful control would make a significant contribution to both coping and distress.

Method

Participants

Thirty-two children between 2 and 7 years old (15 boys, 17 girls, M age = 45.47 months, SD = 15.33 months; 24 children were of European descent, 4 of Middle Eastern descent, 3 of Asian descent; one of Pacific Island descent) constituted the final sample; this was 82% of 39 parents contacted to request their and their child’s participation over a 15-month period. All children had been referred to a major inner-city hospital in Sydney, Australia, for a VCUG. Children with significant medical difficulties (e.g., chronic illnesses) were excluded. Eleven children had experienced no prior VCUGs, seven had experienced one, four had experienced two; five had experienced three or more VCUGs; data regarding previous VCUGs were unavailable for five children. Of the parents present, 21 were mothers, 8 were fathers, and in 3 instances both parents were present. Neither the parents nor the children received prior training in coping with the VCUG.

Measures

Children’s Behavior Questionnaire (CBQ) (Rothbart, Ahadi, Hershey, & Fisher, 2001). The CBQ is a parent-report measure of child temperament. Parents are provided with statements about their child’s typical reactions in a number of situations and are asked to rate each on a 7-point scale (1 = “extremely untrue,” 7 = “extremely true”). There is also a “not applicable” response option. The factor structure of the CBQ has been reliably similar in parent-report samples from different sites in the United States, China, and Japan and has shown high levels of temporal stability across a 2-year period. Further, the CBQ has been demonstrated to have moderate to high levels of parent agreement in multiple samples (Rothbart et al., 2000).

The effortful control (self-regulation) factor is associated with the child’s voluntary and willful regulation of attention and behavior (Rothbart et al., 2000). This factor includes 47 of the total 195 items and is defined by the scales of Inhibitory Control (capacity to plan and to suppress inappropriate action); Attentional Focusing (tendency to maintain attention on tasks); Perceptual Sensitivity (detection of slight or low intensity stimuli from the external environment); and Low-Intensity Pleasure (pleasure derived from situations involving low-intensity stimuli). Effortful control has relationships with behavioral (e.g., ability to focus attention, lower voice, slow down motor activity, delay gratification; and less violation of maternal prohibitions) and socioemotional (e.g., modulation of emotions such as anger, fear, and joy, internalization of rules) variables. These variables have in common the requirement that the child use attention to suppress a dominant emotional or behavioral re-
crying equating to approximately one child verbal utterance). Nine (28%) of the videotapes, selected randomly, were coded independently by two raters. Cohen’s kappa for judgments of child and adult verbalizations across the 9 participants was .87.

Rates of child coping and distress behavior and parent coping- and distress-promoting behaviors were calculated as (number of instances of each behavior) / (duration of the procedure in minutes). For example, the rate of child coping behavior was calculated as number of instances of child coping (summed across coping categories) divided by the duration of the procedure in minutes. Proportions of total behavior comprised by child coping and distress behavior and parent coping- and distress-promoting behavior were calculated as (number of instances of each behavior) / (total number of behaviors, summed across coping, distress, and neutral categories). For example, the proportion of total child behavior constituted by child coping was calculated as the number of instances of child coping (summed across coping categories) divided by the total number of child behaviors.

**Procedure**

Ethical approval had been received from both the hospital and university ethics committees. Prior to the VCUG, parents were sent written information about the study and this was followed by a telephone call to clarify questions. Only those children who had written parental consent participated. At the time of the VCUG, the parent who was present was provided with the CBQ and asked to complete and return the questionnaire after the procedure; a stamped addressed envelope was provided. Twenty-eight (of 32) questionnaires were returned. The time delay between the CBQ completion and the VCUG procedure ranged between 1 week and 2 months; we did not regard this as problematic because, as noted earlier, the CBQ has been shown to have stability across time and to have moderate to high levels of parental agreement (Rothbart et al., 2000).

Videotaping of the VCUG commenced when the child was brought into the examination room and continued until the procedure was complete. Videotapes of child and parent verbal behavior during the VCUG were transcribed and coded according to the criteria recommended by Blount et al. (1997), with the exception that behaviors were coded across the entire procedure rather than for each phase. This alteration was made for two reasons. First, we wished to reduce the variables included in analyses because of constraints on statistical power imposed by the small sample. Second, other research findings show relatively high levels of distress across all phases of the VCUG (Zelikovksy, Rodrigue, Gidycz, & Davis, 2000), in part because, once triggered, distress tends to continue (Manimala et al., 2000). Where both parents were present, behavior was coded for each and combined. As crying is continuous rather than discrete, we adjusted the coding of crying such that longer episodes were awarded a greater number of occurrences than shorter episodes, (one occurrence of crying equating to approximately one child verbal utterance). Nine (28%) of the videotapes, selected randomly, were coded independently by two raters. Cohen’s kappa for judgments of child and adult verbalizations across the 9 participants was .87.

Rates of child coping and distress behavior and parent coping- and distress-promoting behaviors were calculated as (number of instances of each behavior) / (duration of the procedure in minutes). For example, the rate of child coping behavior was calculated as number of instances of child coping (summed across coping categories) divided by the duration of the procedure in minutes. Proportions of total behavior comprised by child coping and distress behavior and parent coping- and distress-promoting behavior were calculated as (number of instances of each behavior) / (total number of behaviors, summed across coping, distress, and neutral categories). For example, the proportion of total child behavior constituted by child coping was calculated as the number of instances of child coping (summed across coping categories) divided by the total number of child behaviors.

**Child-Adult Medical Procedure Interaction Scale-Revised (CAMPIS-R; Blount et al., 1997).** This is a standardized rating scale developed to code verbal interactions in the pediatric treatment room. Child vocalizations during the medical procedure are coded into three superordinate categories (child coping, child distress, child neutral). As neutral child behaviors were not included in the hypotheses and were not the focus of analyses, these are not described here. *Child coping* behaviors are verbal coping (nonprocedural talk, humor by child, making coping statements) and audible deep breathing. *Child distress* behaviors are apprehensive distress (seeking emotional support, information seeking, and verbal fear) and demonstrative distress (crying, screaming, expressing verbal emotion, verbal pain, and verbal resistance). Adult vocalizations are also coded into three categories (coping-promoting, distress-promoting, neutral). As neutral adult behaviors were not included in the hypotheses and were not the focus of analyses, these are not described here. *Coping-promoting* behaviors are nonprocedural talk to child, humor to child, command to use coping strategy. *Distress-promoting* behaviors are reassuring comments, criticism, apology, giving control to child, empathy. The CAMPIS-R has strong concurrent validity relating to subjective and objective measures of children’s fear, distress, pain, and approach/avoidance (Blount et al., 1997).
through the urethra and into the bladder. Dye was infused into the bladder and the child was requested to urinate on the table while X-ray pictures were taken. The catheter came out during urination or was removed. The mean duration was 24.09 minutes ($SD = 9.45$ minutes).

**Results**

Preliminary correlational analyses showed that the number of prior VCUGs was not associated with the rate of child coping ($r[27] = .09$, $p > .1$) or child distress ($r[27] = -.21$, $p > .1$). Accordingly, the number of prior VCUGs was excluded from analyses. Because our sample included equal numbers of boys and girls whereas a higher rate of urinary tract infections is typically reported in girls (Zelikovsky et al., 2000), we conducted preliminary ANOVAs to establish whether child and parent behaviors during the VCUG were influenced by child gender. There were no significant differences in rates of child coping and distress behaviors and parent coping- and distress-promoting behaviors, all $Fs < .57$, all $ps > .38$.

**Child and Parent Behaviors**

Table I shows the mean rates and proportions (and standard deviations) of child and parent behaviors during the VCUG. Child distress behaviors constituted a high proportion of all child behaviors (summed across coping, distress, and neutral) and occurred at the greatest rate per minute. Crying constituted approximately half of all child distress behaviors ($M = .56$, $SD = .29$). Child coping behaviors constituted a relatively small proportion of all child behaviors and occurred at a relatively low rate per minute. Nonprocedural talk (i.e., talk about topics other than the VCUG) constituted a high proportion of child coping behavior ($M = .91$, $SD = .20$). Both parent distress- and parent coping-promoting behaviors constituted a relatively small proportion of parent behaviors and occurred at similar rates per minute. Reassuring comments constituted a high proportion of all parent distress-promoting behaviors ($M = .88$, $SD = .16$). Nonprocedural talk to the child constituted a high proportion of all parent coping-promoting behaviors ($M = .73$, $SD = .23$).

**Correlations Among Predictor Variables**

The predictor variables of interest were age, effortful control, and rates of parent coping- and distress-promoting behaviors. A positive correlation was obtained between age and effortful control ($r[28] = .42$, $p < .05$); 28 (of 32) children were included in this analysis due to missing CBQ data for 4 children. Older rather than younger children were higher in effortful control. A positive correlation was found between the rates of parent coping- and distress-promoting behavior ($r[32] = .54$, $p < .01$). Parents who engaged in higher rates of distress-promoting behavior also engaged in higher rates of coping-promoting behavior. There were no other significant correlations, all $ps > .1$.

Correlations between the predictor and the two criterion variables (rate of child coping and distress behavior) were established. Child coping behavior was correlated positively with effortful control, ($r[28] = .43$, $p < .05$) and with parent coping-promoting behavior ($r[32] = .59$, $p < .01$). Child distress behavior was correlated positively with parent distress-promoting behavior ($r[32] = .76$, $p < .01$). Child distress behavior was correlated negatively with age ($r[32] = -.35$, $p < .05$), indicating that younger rather than older children engaged in

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1One-way ANOVAs, conducted to investigate the influence of parent gender (excluding the three instances when both parents were present) on the rates of child coping and distress behaviors and parent coping- and distress-promoting behaviors revealed no significant differences, all $Fs < 1.03$, all $ps > .32$. To establish whether the presence of both parents, rather than one, influenced the pattern of findings, we reran the regression analyses excluding the three children for whom both parents were present. The pattern of findings was not altered; that is, rate of child coping was significantly predicted by effortful control, ($\beta = .48$, $p < .01$), and rate of child distress was significantly predicted by parent distress-promoting behavior ($\beta = .79$, $p = .00$).
higher rates of distress behavior. Child distress behavior was not correlated significantly with effortful control ($r_{[28]} = -0.20, p > .1$). Further, rates of child coping and distress behavior were not correlated with each other ($r_{[32]} = -0.02, p > .1$).

**Prediction of Children's Rates of Coping and Distress**

To delineate the variables that predict child coping and distress behavior, two hierarchical multiple regression analyses were conducted (see Table II). These analyses were exploratory because of the small number of participants; 28 (of 32) participants were included in each analysis due to missing CBQ data for 4 children. With respect to the prediction of the rate of child coping, age was entered at Step 1, effortful control at Step 2, and rate of parent coping-promoting behavior at Step 3. Age was not significant at Step 1, but effortful control was significant at Step 2, accounting for an additional 18% of the variance. Effortful control remained significant when parent coping-promoting behavior was included at Step 3, accounting for an additional 24% of the variance. With respect to the prediction of child distress, neither age nor effortful control was significant at Steps 1 and 2. At Step 3, rate of parent distress-promoting behavior was significant, accounting for an additional 58% of the variance. At Step 3, also, with the influence of parent distress-promoting behavior and age controlled, the influence of effortful control approached significance ($p < .051$).

**Discussion**

Children with higher scores on effortful control demonstrated a higher rate and a greater proportion of coping behavior during the VCUG. Whereas age had no significant influence, effortful control predicted the rate of children's coping. The most frequently occurring coping behavior was distraction in the form of talk about topics other than the VCUG. This finding is consistent with the proposal of Derryberry and Rothbart (1997) that children higher in effortful control, rather than lower, are more able to disengage their attention from threat. More generally, theorists of children's coping have highlighted the role of the effortful management of
attention (e.g., attention shifting and focusing, distraction) as a means of achieving emotion regulation (Eisenberg, Fabes, Guthrie, & Reiser, 2000).

Nonetheless, children’s coping attempts were few and bore no consistent relation to their level of distress; this highlights the distinction between a coping response and its outcome (Rudolph et al., 1995). Further, the association between effortful control and children’s distress was modest and occurred only in the context of parent distress-promoting behaviors. According to Kochanska et al. (2000), effortful control is evident as a system of temperament at the end of the first year of life, is increasingly coherent during early childhood, and later becomes a salient personality variable. It is possible that, when confronted with a prolonged, invasive, and severe stressor, children as young as those in this study, even when higher in effortful control, are limited developmentally in their ability to use attention to regulate their emotional response (Eisenberg et al., 1997).

Parental factors were also associated with children’s response to the VCUG. Effortful control and parent coping-promoting behavior made independent contributions to children’s coping. In other words, effortful control influenced children’s coping behavior, particularly their use of distraction, which was influenced also by (and possibly influenced) parent coping-promoting behavior, particularly talk about topics other than the VCUG. The association between children’s distress and parent behavior was especially marked; however, the addition of parent distress-promoting behaviors added almost 60% of explained variance to the influence of age and effortful control. The greatest proportion of parental distress-promoting behavior was reassurance. Across a range of medical procedures, research findings show that parental reassurance is associated with either the maintenance of or an increase in children’s distress (Gonzales, Routh, & Armstrong, 1993; Kleiber & McCarthy, 1999; Manimala et al., 2000; Sweet & McGrath, 1998).

The practical implications of our findings are twofold. First, they highlight that young children require help to use distraction, which is a key strategy for preschoolers, given their difficulty mastering the skills involved in muscle relaxation, imagery, and self-talk (Blount, Schaan, & Cohen, 1999; Dahlquist, 1999). Providing a compelling distractor during an aversive procedure may help to compensate for children’s limitations (Blount et al., 1999). Various examples of distractors have been reported (e.g., a party blower, toys, a cartoon video), although their relative efficacy and interaction with other components of intervention (e.g., provision of information, role-playing, modeling) have not yet been tested (Cohen, Blount, & Panapolous, 1997; Manimala et al., 2000; Zelikovsky et al., 2000). The effortful control factor of the CBQ may be useful in identifying children needing particular help in this area. The findings also underscore the importance of interventions that facilitate parental coping-promoting behaviors, particularly in light of the low spontaneous rates in this study. In other words, although the parents and children in our study engaged spontaneously in few coping and coping-promoting behaviors, reduced distress and increased coping would likely be found with appropriate training. Cohen et al. (1997) reported, for example, that, during immunization, staff training to prompt the child’s attending to a cartoon video distraction was associated with enhanced child coping, reduced distress, and increased parent coping-promoting behavior. Interventions such as these, that compensate for the developmental limitations of young children and facilitate constructive parent behaviors, are likely to be effective.

Our study was exploratory, particularly given the relatively small numbers of participants. With greater numbers in future research, it may be possible to investigate the associations between effortful control and children’s coping and distress during the distinct phases of the VCUG and the influence of parent gender on children’s response. Another useful focus of future research may be the association between children’s coping and distress response to the VCUG and the nature of their prior VCUG experiences; we suspect that this, rather than the number of previous VCUGs, is likely to have a stronger association with children’s coping and distress (see also Chen, Zeltzer, Craske, & Katz, 1999; Zelikovsky et al., 2000). Further, we obtained limited information about the participants who refused to take part in the study, and this limits the generalizability of our results. Nonetheless, we believe that the findings underscore the important interactions between parent and child in a stressful medical situation and provide clear guidance for systematic research into the developmental and contextual factors that mediate optimal coping in response to childhood stressors.
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