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When "Don't Worry" Communicates Fear: Children's Perceptions of Parental Reassurance and

Distraction during a Painful Medical Procedure

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1. Introduction

Medical procedures (e.g., venipunctures) are a common source of pain in childhood. Parental behaviors demonstrate strong relationships with children's distress when children are in procedural pain [23,37]. A perplexing yet consistent finding in the procedural literature is the counterintuitive relationship between adult reassurance and increased pain and distress in children [34]. In contrast, distraction has been shown to be helpful to children during procedures [40,41].

It is unknown why reassurance is associated with increased child distress [34]. One possibility is that a reciprocal relationship exists [3]. The relationship has also been viewed from an operant perspective [46]. A particularly plausible explanation, consistent with social learning theory [1] and social-communication models of pain [12,13], is that reassurance may serve as a signal of parental anxiety or fear to the child [9,16]. The following quote from a children's novel illustrates this point: "If an adult tells you not to worry and you weren't worried before, you better hurry up and start because you're already running late" [14].

If reassurance signals parental fear, this message could be communicated through a number of channels, including the parent's facial expression, vocal tone (i.e., how the reassurance is spoken) and verbal content (i.e., what is said). As relevant research is limited, little is known about these qualities in spontaneous parent behavior during pediatric pain. Researchers have suggested that parents may display a fearful facial expression when reassuring [25]. Children who observed exaggerated pain faces by their mothers during experimental pain had lower pain thresholds when completing the task themselves [26]. In contrast, facial expressions of fear by mothers were associated with lower infant pain following an injection [30]. Regarding vocal qualities, McMurtry et al. [33] found that 64% of spontaneous verbalizations of reassurance

during immunization were spoken with a falling vocal tone indicating certainty (vs. rising tone indicating uncertainty). Bustos and colleagues [8] found no differences in ratings of the affective quality of distress-promoting (e.g., reassurance, empathy) versus coping -promoting (e.g., humor, distraction; [4]) verbalizations by parents during infant immunizations. Finally, the specific verbal content of reassurance may be influential as vague commands have shown a more consistent relationship with increased child distress than specific commands [15]. No research has documented the verbal content of reassurance.

The present objective was to conduct a systematic examination of children's perceptions of adult emotion during reassurance. This was accomplished through: (a) a video-mediated recall task directly eliciting children's perceptions of parental emotion during spontaneous instances of reassurance/distraction, combined with (b) video vignettes systematically varying parental facial expression, vocal tone, and verbal content. The following hypotheses were tested: 1) Children would rate their parents as more fearful during instances of spontaneous reassurance occurring during their venipunctures compared to distraction. 2) Children's ratings of adult fear in response to the vignettes would differ with the qualities of the utterance: (i) facial expression: fearful > happy; (ii) vocal tone: rising > falling; (iii) verbal content: uninformative reassurance > informative reassurance > distraction.

2. Methods

2.1. Participants

Participants were 100 children (40 boys and 60 girls) between the ages of 5 and 10 years ($M = 8.02$ years; $SD = 1.69$ years) and one of their parents. Participants were recruited from children attending the blood drawing lab of a tertiary pediatric health centre for a venipuncture. Per parental report, 60% of the children had a chronic illness and/or medical condition (e.g.,

Celiac disease, asthma, cancer, peanut allergy) and approximately half (52%) of the children had undergone blood work at least five times. As identified by their parents, the ethnic breakdown of the children was as follows: (a) Euro-Canadian ($n = 69$); (b) African Canadian ($n = 3$); (c) Asian Canadian ($n = 2$) and (d) Other (e.g., "Canadian", biracial; $n = 23$). This information was missing for three of the children. The parents included 85 mothers, 14 fathers, and one long-term female guardian. The adults had a mean age of 37.41 years (range 24-56 years; $SD = 6.68$ years). The ethnic breakdown of the parents was self-identified as follows: (a) Euro-Canadian ($n = 69$); (b) African Canadian ($n = 3$); (c) First Nations ($n = 2$); and (d) Other (e.g., Canadian, European; $n = 25$). One parent did not answer this question. On average, the participating families were of middle social class ($M = 38.52$; $SD = 17.16$; Class 3; Hollingshead Index [35]).

In order to participate in the study, children had to be between 5 and 10 years old, having their blood drawn in the hospital's outpatient blood lab, and be accompanied by a parent who would be present in the procedure room during the venipuncture. In addition, the family had to be able to stay for one hour following the procedure to complete the study tasks. One hundred and five families met the inclusion criteria and enrolled in the study. Three families withdrew because they decided they could not stay following the procedure. The data from two other children were excluded: one child had already participated in the study and the other child did not pass the emotion-screening task. Thus, data from the 100 families described above were analyzed. The study was approved by the hospital Research Ethics Board. Data for this paper were collected as part of a larger project (McMurtry, unpublished dissertation) which examined two conceptually distinct research questions that are reported in two separate papers. Specifically, the data reported in this paper examine children's perceptions of parental emotion during reassurance and distraction using a video-mediated recall task and a vignette task.

Parents' self-reported perceptions of reassurance and distraction and the relationships between these perceptions and their behavior during venipuncture are reported in a separate paper McMurtry et al. (in preparation).

2.2. Measures

2.2.1. Child-Adult Medical Procedure Interaction Scale Revised (CAMPIS-R)

The CAMPIS-R is an observational scale that measures adult (parent and health care provider) and child behavior during medical procedures [2,4]. Specifically, the 35 individual codes of the original CAMPIS (including adult reassurance and adult nonprocedural talk, herein referred to as distraction) were combined into six broad categories in the CAMPIS-R [4]: child distress, child coping, child neutral, adult distress promoting, adult coping promoting, and adult neutral. In the validation study of the CAMPIS-R [2], the interrater reliability for each of the six categories ranged from kappas of .65 to .92 representing good to excellent levels of agreement [21]. In addition, the CAMPIS-R demonstrated concurrent validity with both observational and self-report measures [2].

In the present study, there was a primary CAMPIS coder and a second coder for reliability. Kappa for the parent codes was .88 (standard error of .01), and .92 (standard error of .01) for the child codes representing excellent agreement [21]. These measures were used to verify the previously well-reported [3,6,7,9,11,16,32] and expected relationships in the current study between: 1) greater proportion of parental reassurance and increased child distress behavior, $r(100) = .59$, $p < .001$ and 2) greater proportion of parental distraction and increased child coping behavior, $r(100) = .25$, $p < .05$.

2.2.2. Emotional intensity scale

Children were asked to rate the intensity of adults' fear and happiness. Ratings were

performed using a Likert-type scale with stars increasing in number and deepening in color to indicate greater intensity as well as both written and orally presented labels [42,44]. The categories and respective numerical values for analyses were as follows: "not at all" (=0), "a little" (=1), "sort of" (=2), "very much" (=3), and "very very much" (=4). This scale was a revised version of a scales used to obtain 3 to 8 year old children's ratings of emotional intensity [42,44]. This scale was used for children's ratings of: 1) their parents' happiness and fear in the video-mediated recall task of instances of reassurance and distraction from the venipuncture; and 2) the vignette parent's happiness and fear.

2.3 Stimuli

2.3.1 Video clips of spontaneous parental reassurance and distraction during venipuncture

Using a video-mediated recall task, children were asked to watch and respond to selected clips of their parents' spontaneous reassurance and distraction that occurred during their venipuncture. These utterances were chosen by research assistants according to the CAMPIS definitions: 1) reassurance is defined as "procedure-related comments that are directed toward the child with the intent of reassuring the child about his/her condition, or the course of the procedure" and 2) distraction/nonprocedural talk is defined as "talk that does not pertain to the treatment procedure or about the child's illness" [3]. Given the brevity of the stimuli, each clip was presented twice in a mini-movie format using Windows Movie Maker (Version 5.1). After each clip, children were asked if the parent was feeling happy and/or feeling scared and to rate the intensity of an endorsed emotion with the emotional intensity scale.

Participating children were played up to two instances each of their parent's reassurance and distraction behaviors but data analyses were limited to one clip of each behavior. To be included in data analysis, the content of the clip had to be: 1) confirmed as reassurance or

distraction/nonprocedural talk by the CAMPIS coding and 2) the child had to understand it (i.e., if the child could not correctly identify what the parent said after watching the mini-movie two times, the clip was not used). The clips were also preferentially selected based on when they occurred during the venipuncture (i.e., *during* the needle, then *before*, and finally *after* the needle). If a given participant had two reassurance or distraction clips to choose from based on this selection process, the primary CAMPIS coder was asked to choose the most prototypical utterance based on the content only. This process resulted in a maximum of one reassurance clip and one distraction clip for each child.

2.3.2. Vignettes

Twelve videotaped vignettes (Table 1) were created containing both reassurance and distraction/nonprocedural talk as defined by the CAMPIS [3]. The vignettes allowed careful control of three variables of interest in reassurance: facial expression, vocal tone, and verbal content. The systematic variation of these variables permitted specific conclusions regarding their effect on children's perceptions of adult emotion. Vignettes have been successfully used in both the developmental [27,36] and pediatric pain literature [28,39]. Eight of the videotaped vignettes contained a systematic manipulation of three qualities of reassurance: accompanying facial expression (fearful, happy), vocal tone (rising, falling), and content (uninformative, informative). Four vignettes varying distraction through accompanying facial expression (fearful, happy) and vocal tone (rising, falling) were used to contrast with children's impressions of reassurance. Each vignette depicted the same mother interacting with her child (off-screen) while the child was undergoing venipuncture. The vignettes were filmed in the same procedure room in which the child's venipuncture was performed from the perspective of the child in the procedure chair. The vignettes were formatted like the video clips of the spontaneous parental behaviors.

For the manipulation of facial expression, the actor used two different expressions: happiness and fear/anxiety. The actor was trained to make these facial expressions using the description of the muscles involved from the Facial Action Coding System [17,31]. For tone, the manipulation contrasted verbalizations spoken with a rising tone, thought to denote uncertainty, with verbalizations spoken with a falling tone indicative of certainty [10,24,29]. In a previous study we found that 64% of spontaneous reassuring verbalizations were spoken with a falling tone [33]. Although research has focused on reassurance as a unitary construct, the broad definitions employed allow a heterogeneous group of utterances to be captured in the category. In previous research, vague commands (e.g., "get ready") were positively associated with increased child distress whereas more specific commands (e.g., "roll your sleeve up") did not show a consistent relationship with child distress [15]. Thus, for the verbal content manipulation, informative versus uninformative verbalizations were chosen for the reassuring utterances. Reassurance signaling the end of the procedure (e.g., "almost done") seems much more informative to the child compared with uninformative reassurance that appears to be delivered almost automatically (e.g., "it's okay"). This manipulation was an initial step in determining whether there might be subtypes of reassurance that show differential relationships with child outcome.

As a manipulation check of the facial expressions, coders blind to the study protocol were asked to indicate which emotion the actor in the vignette (played without sound) was depicting based on her facial expression. The coders were first asked what emotion the actor was depicting in an open-ended format followed by a forced-choice procedure in which they chose among three possibilities (happy, fearful, neutral). The best twelve vignette takes as indicated by all three coders selecting the correct emotion portrayed by the actor's facial expression were chosen.

Facial Action Coding was not employed because an overall/global judgment of emotion was desired for the manipulation check. To verify that the appropriate intonation was achieved, the target verbalizations from the 12 vignettes chosen above were entered into Praat [5], a computer phonetics program that yields, among other parameters, pitch contours which coders can use to identify rising versus falling tonal contours from digital audio. A coder, blind to the attempted manipulation for each vignette, was given the audio portions of the vignettes and asked to identify rise versus fall in Praat and achieved 100% accuracy.

2.4 Procedure

Families were approached in the waiting room of the outpatient blood laboratory of a tertiary care pediatric health center. The families were briefed about the nature of the study. If the parents and children were willing and eligible to participate, parental consent and child assent was then obtained. The venipuncture procedure itself was provided as usual except that the parents and the children were filmed and the parents wore a clip-on microphone during the procedure. In addition, a researcher was present in the room to perform live coding of instances of reassurance and distraction. The video recording and instances of reassurance and distraction were transferred to a research center using a shared drive on the hospital server. In the research center, a "video editor" was responsible for reviewing the video file, isolating instances of reassurance and distraction, and creating video clips using Windows Movie Maker for the video-mediated recall task.

Following their venipuncture, children and parents were escorted to the research center where the rest of the study took place. First, children were required to pass an emotion-screening/familiarization task (i.e., choose an emotion to match each of three verbally presented vignettes) before completing the study tasks. Children were then taught to use the emotional

intensity scale. Next, the children were asked to complete the video-mediated recall task in which they watched and responded to selected digital clips of their parents' reassurance and distraction that occurred during venipuncture. For each clip, children were asked to rate the amount of happiness and fear their parents were feeling using the emotional intensity scale.

After watching and responding to clips of their own parents' behaviors during their venipunctures, the children were played the 12 digital video vignettes one at a time using the same procedure.[1] The presentation order of the vignettes was counterbalanced using a partial Latin square and the orders randomly assigned to the participants using a random numbers table.

2.5 Data analysis

Wilcoxon Signed-Rank (within-subjects) and Mann-Whitney (between-subjects) tests were used to test for differences between children's ratings of parental emotion (happiness and fear) for spontaneous instances of reassurance and distraction during venipuncture. Corresponding effect sizes were computed by hand according to formulas used by Field [20]. A series of within-subjects ANOVAs were computed to explore the impact of verbal content, vocal tone, and facial expressions on children's perceptions of adult happiness and fear in response to the vignettes. Two-way interactions were examined using paired-sample *t*-tests. Effect sizes for ANOVA main effects were calculated by hand using Field's formula for deriving omega squared, ω^2 [20]. Effect sizes for the *t*-tests were calculated using G*Power [18].

3. Results

3.1.1. Spontaneous reassurance and distraction from venipuncture

The breakdown of participants providing intensity ratings for fear and happiness in response to parent behaviors occurring during the venipuncture was as follows (the full process of the clip selection was described previously). Sixty out of the 100 children responded to a clip

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[1] A study manual with the exact order and phrasing of questions is available from the first author upon request.

of reassurance and 52 responded to a clip of distraction. Specifically, 27 children solely

responded to a reassurance clip, 19 children solely responded to a distraction clip, and only 33 of

100 participants responded to both reassurance and distraction. For these 33 children, on a scale

from 0 to 4, the median ratings of parental fear were 0.00 ($M = 0.48$, $SD = 1.00$; range 0-4) for

reassurance and 0.00 ($M = 0.24$, $SD = 0.79$; range 0-4) for distraction. A Wilcoxon Signed-Rank

test revealed no significant difference in ratings of parental fear for reassurance versus

distraction, $T = 7.50$, $p > .05$, representing a small effect ($r = .26$) for higher ratings of fear for

reassurance.

For reassurance, the median happiness rating was 2.00 ($M = 1.91$, $SD = 1.59$; range 0-4)

and for distraction, the median happiness rating was 2.00 ($M = 2.15$, $SD = 1.44$; range 0-4). No

difference was found in ratings of parental happiness for reassurance versus distraction, $T = $

94.00, $p > .05$, representing a small effect ($r = .13$) for higher ratings of happiness for distraction.

3.1.2. Supplementary analysis with increased sample size

Given that so few participants had intensity ratings for both reassurance and distraction (n

$= 33$), a between-subjects analysis of the self-clip data was pursued. Sixty of the 100 participants

responded to a reassurance clip whereas 52 responded to a clip of distraction. The median rating

of parental fear for reassurance was 0.00 ($M = 0.53$, $SD = 0.91$; range 0-4) and also 0.00 ($M = $

0.33, $SD = 0.94$; range 0-4) for distraction. A Mann-Whitney test for independent samples on

ratings of parental fear showed a significant difference between reassurance and distraction, U

$=1278.00$, $p < .05$ in the predicted direction of higher fear ratings for reassurance. This difference

represents a small effect ($r = .21$).

The median rating of parental happiness for reassurance was 2.00 ($M = 1.92$, $SD = 1.46$;

range 0-4) and also 2.00 ($M = 2.33$, $SD = 1.48$; range 0-4) for distraction. A Mann-Whitney test

for independent samples on ratings of parental happiness showed no difference between reassurance and distraction, $U = 1313.50$, $p > .05$. For ratings of parental happiness, a small effect (r = .14) indicated higher happiness ratings for parental distraction.

3.2. Vignettes

3.2.1. Children's ratings of fear

A 2 (facial expression: fearful or happy) by 2 (tone: rising or falling) by 3 (content of utterance: informative reassurance, uninformative reassurance, or distraction) within-subjects ANOVA was performed on the dependent variable of fearful intensity (range 0-4). This overall ANOVA revealed main effects of both face, $F(1, 99) = 259.96$, $p < .001$ and content, $F(2, 198) = 12.49$, $p < .001$ as well as two-way interactions between tone and content, $F(2, 198) = 10.42$, $p < .001$ and facial expression and content, $F(2, 198) = 7.31$, $p < .01$. The three-way interaction between tone, facial expression, and content was significant, $F(2, 198) = 13.26$, $p < .001$. All other effects were nonsignificant with p's $> .05$.

To follow up on the three-way interaction, the vignettes were split by content (informative reassurance, uninformative reassurance, and distraction) and three separate within-subjects ANOVAs for facial expression and tone on ratings of parental fear were performed. The first ANOVA for informative reassurance revealed main effects for both tone, $F(1, 99) = 10.01$, $p < .01$, and facial expression, $F(1, 99) = 180.30$, $p < .001$, as well as a tone by face interaction, $F(1, 99) = 9.66$, $p < .01$. A paired samples *t*-test indicated that children endorsed a higher intensity of fear for informative reassurance accompanied by a fearful facial expression and a rising tone ($M = 2.15$) than a falling tone ($M = 1.58$), $t(99) = 3.46$, $p < .01$, representing a small effect ($d = .35$). When informative reassurance was accompanied by a happy facial expression, tone had no impact on ratings of parental fear, $t(99) = 0.39$, $p > .05$ (Figure 1).

A second within-subjects ANOVA on uninformative reassurance revealed a main effect for facial expression only, $F(1, 99) = 183.64$, $p < .001$. Parental fear was rated as higher when uninformative reassurance was accompanied by a fearful facial expression ($M = 2.02$) than a happy facial expression ($M = 0.19$), representing a large effect ($\omega^2 = .51$).

The final within-subjects ANOVA on distraction revealed significant main effects for both tone, $F(1, 99) = 8.86$, $p < .01$, and facial expression, $F(1, 99) = 125.81$, $p < .001$ as well as an interaction of tone and facial expression, $F(1, 99) = 13.46$, $p < .001$. A paired samples t-test revealed that tone only had an impact on fear ratings when distraction was accompanied by a fearful facial expression, $t(99) = 3.51$, $p < .01$. Specifically, children rated the parent as more fearful when distraction with a fearful face was accompanied by a falling tone ($M = 1.73$) than a rising tone ($M = 1.17$), representing a small effect ($d = .35$). Tone had no impact on ratings of parental fear when distraction was accompanied by a happy facial expression, $t(99) = 1.75$, $p > .05$. Refer to Figure 2.

As the above analyses did not explicitly compare intensity ratings for uninformative and informative reassurance, a 2x2x2 within-subjects ANOVA on scared intensity was performed. While the main effect of content did not reach significance, there was trend in the predicted direction with higher ratings of fear for uninformative ($M = 1.11$) versus informative reassurance ($M = 1.00$), $F(1, 99) = 3.394$, $p = .07$. Similarly, there was also a non-significant trend toward a tone by content interaction, $F(1, 99) = 3.00$, p = .09. Interactions involving verbal content failed to reach significance.

3.2.2. Children's ratings of happiness

A parallel 2 (facial expression: fearful or happy) by 2 (tone: rising or falling) by 3 (content of utterance: informative reassurance, uninformative reassurance, or distraction) within-

subjects ANOVA was also performed on the dependent variable of happy intensity (range 0-4). There was a main effect of facial expression, $F(1, 98) = 318.51$, $p < .001$. This main effect was superseded by two higher order interactions between face and content, $F(2, 196) = 9.62$, $p < .001$ as well as a three-way interaction between tone, face, and content, $F(2, 196) = 9.25$, $p < .001$. All other effects were nonsignificant with p's $> .05$.

In order to follow up on the three-way interaction, the vignettes were split by content (informative reassurance, uninformative reassurance, and distraction) and three separate within-subjects ANOVAs on facial expression and tone were performed. The first ANOVA on informative reassurance revealed a main effect for face only, $F(1, 99) = 223.38$, $p < .001$. Inspection of the means indicated that parental happiness was rated as higher when informative reassurance was accompanied by a happy facial expression ($M = 2.90$) than a fearful facial expression ($M = 0.70$). This difference represents a large effect ($\omega^2 = .58$).

A second within-subjects ANOVA on uninformative reassurance revealed a similar main effect for facial expression, $F(1, 98) = 284.16$, $p < .001$. Interpretation of this main effect showed that uninformative reassurance accompanied by a happy facial expression ($M = 2.90$) resulted in higher ratings of parental happiness than if accompanied by a fearful facial expression ($M = 0.61$). The effect size for this difference was large ($\omega^2 = .59$). There was also a trend toward significance in the interaction between tone and facial expression, $F(1, 98) = 3.741$, $p = .056$. An exploratory t-test indicated that when uninformative reassurance accompanied by a fearful facial expression was spoken with a falling tone ($M = 0.74$) it received higher ratings of parental happiness than if a rising tone was used ($M = 0.48$), $t(98) = 2.21$, $p < .05$, representing a small effect ($d = .23$). Vocal tone made no difference on ratings of parental happiness when uninformative reassurance was accompanied by a happy facial expression, $t(99) = 0.75$, $p > .05$.

The final ANOVA on the distraction vignettes revealed a main effect of face, $F(1, 99) =$ 151.56, $p < .001$ as well as a two-way interaction of tone and face, $F(1, 99) = 9.28$, $p < .01$. A paired samples t-test used to break apart the two-way interaction indicated that when distraction was accompanied by a fearful facial expression, use of a rising tone ($M = 1.16$) resulted in higher ratings of parental happiness than if a falling tone ($M = 0.76$) was used, $t(99) = 2.84$, $p < .01$. This represents a small effect (d = .29). There was no difference found for tone on ratings of parental happiness when distraction was accompanied by a happy facial expression, $t(99) = 1.76$, $p > .05$.

4. Discussion

The present research provided a novel, detailed examination of children's perceptions of adult emotion during reassurance and distraction using complementary methodologies. Children completed a video-mediated recall task in which they were asked to rate their parents' emotions during spontaneous reassurance and distracting behaviors from their venipuncture. The results provide partial support for the hypothesis that children would perceive their parents as worried when they reassure. While no significant differences were found between children's ratings of parental happiness or fear when the planned analysis was performed, the pattern of effect sizes showed children gave higher ratings of parental fear (and lower ratings of parental happiness) for reassurance compared with distraction. Furthermore, a supplementary analysis revealed that children gave significantly higher ratings of parental fear for reassurance than for distraction. Children were also asked to rate the intensity of happiness and fear experienced by an actor portraying a mother whose facial expression, tone, and verbal content were systematically manipulated in video vignettes. Children's responses to the vignettes also provided partial indication that they perceive parents to be worried during reassurance. Overall, children gave

higher ratings of parental fear in response to the vignettes containing reassurance compared to distraction. However, their interpretations of adult emotion varied with the characteristics of the adult's behavior. Specifically, as expected, children indicated that reassurance (both informative and uninformative) and distraction accompanied by a fearful facial expression conveyed greater fear than if accompanied by a happy expression. Similarly, children rated the parent as happier during both types of reassurance and distraction when a happy facial expression was displayed compared to a fearful facial expression.

In contrast to expectations, there was no difference in overall ratings of parental fear for uninformative versus informative reassurance; however, the verbal content of reassurance did interact with the other qualities to effect children's ratings. Results showed that the influence of tone on children's perceptions of parental emotion varied with both verbal content and accompanying facial expression. For informative reassurance, tone only had an impact on children's ratings of parental fear when accompanied by a fearful facial expression with rising tone seen as more fearful. Tone had no reliable influence on children's ratings of parental happiness or fear during uninformative reassurance. It could be that children used vocal tone to help clarify seemingly inconsistent verbal (informative reassurance) and facial (fearful) cues to determine the vignette parent's emotion in these informative reassurance vignettes.

Children's responses to the distraction vignettes showed an unexpected influence of vocal tone: children perceived greater happiness when a rising tone was used (and greater fear when a falling tone was present). It may be that the interaction of the rising vocal tone with the verbal content ("look fish, fish on the wall") of the distraction vignettes signaled playfulness to the children as higher pitch is frequently used in "motherese" or infant-directed speech [19]. Anecdotally, some of the children reported the mother was being silly or trying to be funny

during these vignettes. There was no influence of tone on ratings of parental happiness or fear when distraction was accompanied by a happy facial expression.

Overall, facial expressions of emotion were more salient to the children than vocal tone when they responded to the vignettes; happy facial expressions in particular showed a strong influence on children's perceptions of emotion. Facial expression may serve as a simpler and more direct method of communicating emotion than the rising versus falling pitch contours presented in the vignettes [43]. When an unambiguous happy facial expression was present, children did not respond to vocal signals indicating uncertainty through a rising contour. In contrast, when a fearful facial expression was present, children were more likely to examine vocal cues of emotion. This is consistent with developmental literature demonstrating that fearful faces are more difficult to recognize than happy facial expressions [27]. The presence of fearful facial expressions seemed to lead children to look for other cues to clarify the emotion compared to happy facial expressions.

These results provide evidence that children may perceive their parents as fearful when they reassure. However, this investigation cannot speak to whether children's perception of parental fear then leads to increased child distress during procedural pain. Proposals that the relationship between reassurance and child distress is cyclical in nature are supported by previous research [3]. However, a cyclical relationship does not explain why reassurance is either ineffectual in reducing child distress or harmful by increasing child distress. The present results indicate that both the nonverbal characteristics of reassurance (i.e., facial expression and vocal tone) as well as verbal content are important factors to consider. Using an operant model of learning, reassurance is often viewed as an attending behavior which reinforces child distress [45]. One assumption here is that these attending behaviors are inherently reinforcing which is in

contrast to Fordyce's [22] original conceptualization: "…any given consequences to pain behaviors are not inherently reinforcing" (p. 57). Some individuals might find the experience of receiving reassurance pleasant because it focuses attention on them, while others might find this same experience aversive.

A significant strength of this investigation was the inclusion of both observational and experimental methodology with a large, single sample of participants. The observational portion used a clinical pain stimulus with children responding to videos from their actual procedure. The use of spontaneous parental behaviors from the children's venipunctures as stimuli for their perceptions of reassurance and distraction was innovative. This is the only study to date to directly elicit children's perceptions of their parents' behaviors during painful medical procedures. In addition, the vignettes allowed systematic exploration of various factors (and their potential interactions) thought to contribute to children's perceptions of parental emotion during medical procedures enabling conclusions about the direct effects of each of these factors. The detailed examination of reassurance was strengthened by a direct comparison with distraction. Distraction was an ideal comparison for reassurance as the two behaviours have demonstrated reliably different relationships with child outcome.

Limitations of the current study include the fact that the parental behaviors were recorded in a busy clinical lab and a number of the clips were very difficult to hear. This reduced the sample size and the power to detect significant differences. In addition, the children's ratings of their own parents' fear were low overall. The high internal validity resulting from the use of vignette methodology must be balanced against the reduced external validity compared with real life settings. A single actor was used in the vignettes who was not the children's mother. The vignettes also consisted of staged vocal, verbal, and facial behaviors. Thus, children's responses

to these vignettes may not generalize to spontaneous parent-child interactions during needle procedures. A simplified rising versus falling tone was used in the vignettes created for the present study rather than using "angry", "sad", "happy", or "fearful" tones of voice [38]. Thus, although the tonal manipulation in the vignettes was very controlled, it addressed only one prosodic quality. However, there is no consensus on the acoustic properties of vocal signals of particular emotions [24,46]. On average, participating children came from a middle class background and were relatively experienced with venipunctures; thus these results may not generalize to other populations.

This work highlights several avenues for future research. For example, the potential importance of vocal tone has been referenced in the literature on pediatric pain but few studies have explicitly measured or provided operational definitions of this variable. What is the best conceptualization of a reassuring tone? Future work could describe the prosodic features (e.g., fundamental frequency or pitch) of parental speech during pediatric pain. Parental facial expression during children's procedural pain also emerged as an important variable deserving further research. A future study could describe parents' spontaneous facial expressions during their children's procedural pain with concurrent use of sequential analysis to tease out the interactional effects of parent behavior (both verbal and facial) and child distress.

Although the present work focused on proximal variables, consideration of more distal variables is also important both within pediatric procedural pain as well as other contexts (e.g., medical reassurance, excessive reassurance-seeking seen in anxiety disorders). The qualities of reassurance are likely influenced by the context (e.g., source of pain) as well as the historical (e.g., interaction history with child, trait anxiety) and situational (e.g., interpretation of child's distress) factors affecting the person delivering the reassurance. In turn, the impact of the

reassurance on the child may be influenced not only by the qualities of the reassurance, but also the context, as well as his/her own historical (e.g., temperament), and situational (e.g., level of distress) factors.

The present study provided a detailed examination of reassurance - a common, but unhelpful parental behavior during painful pediatric procedures. A greater understanding of reassurance is warranted as even when parents are trained to engage in more helpful behaviors such as distraction they still may reassure [32]. The provision of reassurance when children are in pain may be an ingrained response [34] that parents believe is helpful to their children. The present results demonstrate that adult reassurance is complex and facial expression, vocal tone, and verbal content of adult behaviors have an important influence on children during painful procedures.

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