



Assessment of Pain by the Child, Dentist, and Independent Observers

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Abstract

Purpose: The objective of this study was to analyze the assessment of pain and distress by the child, dentist, and independent observers during a dental injection and study the relationship between the different assessments.

Methods: The amount of pain experienced by the child during local anesthesia was reported independently by the child to both the dentist and parent on a 4-point scale running from "no pain" to "a lot of pain." The dentist and observers also gave a score for the pain experienced on a 4-point scale. The amount of distress experienced by the child during local anesthesia was assessed by the dentist and observers using a 6-point scale (from "relaxed" to "out of contact").

Results: The dentists' pain assessment was the lowest. A substantial correlation was found between the child's self-reported pain and the pain as assessed by independent observers. There was a moderate correlation between the amount of distress and pain intensity as reported by the child during the anesthesia phase.

Conclusions: Observation of a child in a videotaped procedure is apparently the most reliable method to accurately assess pain behavior and to discriminate pain from distress. A combination of the child's report and video observation is advised to assess pain in young children. (*Pediatr Dent.* 2004;26:445-449)

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Pain and distress are terms used to describe pain and pain-related fear, anxiety, and agitated behavior.¹ Because pain and distress in children are correlated, they are difficult to assess independently.^{2,3} Since pain has sensory, emotional, cognitive, and behavioral components that are interrelated with environmental, developmental, sociocultural, and contextual factors,⁴ it is a complex multidimensional concept that can vary in quality, intensity, duration, location, and unpleasantness. Children may, therefore, experience different levels of pain from the same stimulus (eg, a dental injection). Moreover, the concepts of pain applicable to children seem to differ from those applicable to adults, probably due to different levels of cognitive development.¹ Toddlers and preschoolers are also unable to verbally describe their pain perception accurately.

Distress, on the other hand, can be defined as an occurrence of emotions felt or behavior displayed during (dental) treatment caused by factors other than pain (eg, fear, anxiety, and anticipatory or situational stress). Fur-

thermore, distress lacks the direct stimulus of physical damage.

Finding a gold standard for the objective assessment of pain in young children indeed is a challenging and critical task for health professionals. An accurate and reliable measurement of pain is necessary, both for diagnostic purposes and for evaluating pain behavior. While pain can be assessed through self-report measures (eg, facial scales, visual analogue scales), behavioral measures (facial expression, behavioral rating) and physiological measures (heart rate, sweating, and EEG), the choice of the proper instrument depends on the nature of the painful stimulus (eg, chronic or acute), age of the child, and his or her communication capabilities.^{4,5} In dentistry, behavioral ratings are often used for pain assessment in toddlers and preschoolers. For children between 4 and 6 years, an adapted self-report (facial scales) combined with some form of behavioral rating is the most common method.⁶ For children above 6 years, self-report is recommended.⁶

Pain measurement, however, is complicated by major methodological and developmental issues. For instance, there is only a limited correlation between facial scales and behavior ratings.⁷ In addition, whether ratings are provided by the parents, child, nurse, and/or trained observers, there is poor agreement in the outcome of behavioral pain measurement. Different factors contribute to differences between ratings.⁸ For example, parents' ratings of child pain seem strongly influenced by their preprocedural expectations of how much pain the child would experience. Nurses' ratings of acute pain reflect the overt distress behaviors exhibited by a child during the procedure. In all likelihood, the ratings made by direct caregivers most closely approximate objective assessment of pain and distress.⁸

There is a fairly pervasive and systematic tendency, however, for proxy judgments to underestimate the pain experience of others.⁴ Health care professionals who often work with painful procedures can develop "pain blindness," leading them to underestimate the extent of pain experienced by children.⁹ A study by Singer et al on the correlation between different pain observers has shown that the correlation between parents' and children's pain ratings is larger than between practitioners' and children's pain rating, suggesting that a parent might be a better assessor of a child's pain.¹⁰ Because the former study used a variety of instruments to assess a wide range of pain types, however, a comparison between the pain scores was impossible.

Pain measurement complexity is exacerbated by the fact that it is difficult to distinguish between behavior resulting purely from pain and behavior resulting from fear and a mixture of other factors. While there are methods to assess distress, these measure overt behavior without distinguishing between pain behavior and distress behavior. On the other hand, behavior measurements for pain intensity may be influenced by behavior resulting from distress. To this it should be added that there is sparse literature on the differences between pain and distress during dental treatment and the influence of one on the other.

The present study had a two-fold aim:

1. Determine whether assessments of pain severity by children ages 4 to 8 years correlate with similar assessments made by dentists and independent observers;
2. Assess the relation between pain and distress in young children, and analyze the extent to which the reported pain is influenced by anticipatory and situational distress.

In this study, the same type of pain measurement was used by observers, practitioners, and patients. At the same time, a specific type of pain was studied (ie, pain resulting from a dental injection). Because a topical anesthetic was used, the pain experience was softened. In an attempt to isolate the pain behavior from the distress behavior, patient behavior was recorded on video during the painful stimulus. In addition, the authors controlled for patient's levels of dental anxiety.

Methods

Subjects, dentists, observers

This study was conducted among 50 children (31 girls) between 4 and 8 years of age (mean=5.6±1.2), treated at a special dental care centre (SBT) in Amsterdam or in a private dental practice specialized in treating children. All children were referred because treatment by their regular dentist was considered unworkable. The treatment was performed, in the absence of the parents, by 5 dentists experienced in treating children. All treatments were videotaped and analyzed by 2 specially trained advanced psychology students.

This study was approved by the Interuniversity Dentistry Research School (IOT) at the Academic Centre of Dentistry Amsterdam. Parental consent for all children was obtained.

Pain measurement

Pain was defined as a sudden behavior change during or shortly after needle insertion. The pain during the dental injection (restricted to the PDL injections) was assessed in 4 different ways:

1. After the dental injection was applied, the dentist rated the child's pain-associated behavior.
2. After the dental injection, when the child was calm (eg, after a sip of water), the dentist asked the child if he/she noticed it when his/her tooth was made to sleep.
3. After the treatment, when the child was reunited with the parent and the dentist had left, the parent asked the child the same question as the dentist.
4. Two independent observers rated the child's pain-associated behavior based on a videotape of the dental injection.

Each dentist independently assessed the children they treated. All the pain measurements were rated on a 4-point scale: (1) no pain; (2) a little pain; (3) modest pain; and (4) a lot of pain.

Distress measurement

Distress was defined as the stress behavior displayed by a child which might not be the result of pain. For purposes of coding the child's distress behavior, the first part of the treatment, including the local anesthesia, was divided into 3 non-overlapping phases:

1. period between the child's entry into the room and the application of the topical anesthesia;
2. period from phase 1 until the dentist picked up the local anesthesia syringe;
3. period from phase 2 until the end of local anesthesia.

The child's behaviors were coded using a modified version of the Venham scale (ie, a 6-point scale: (1) relaxed; (2) uneasy; (3) tense; (4) reluctant; (5) interference; and (6) out of contact or untreatable.¹¹ The dentist rated the amount of distress the children displayed during the treatment's 3 separate phases. The 2 observers gave a distress rating based on

Table 1. Pain Assessments During Administration of Local Anesthesia: Means, Standard Deviations, and Correlations

Variable (N=50)	Mean±SD	Observer (<i>r</i>)	Child to dentist (<i>r</i>)	Child to parent (<i>r</i>)
Dentist ratings	1.64±0.66*	.41‡	.36‡	.18
Observer ratings	2.04±0.75†	—	.57‡	.41‡
Child's report to the dentist	2.16±0.96	—	—	.65‡
Child's report to the parent	2.44±1.13	—	—	—

*Significantly different from all other ratings; $P < .01$.

†Significantly different from self-report to the parent; $P < .01$.

‡Significant correlation at $P < .01$.

the videotapes of the treatment. The score was the peak amount of distress displayed by the child in that particular phase.

Dental subscale of the children's fear survey schedule (CFSS-DS)

Dental fear could influence a child's expressed behavior during a dental injection. To assess the level of dental fear experienced by the subjects, the parent was asked to complete the CFSS-DS on behalf of his/her child. Since younger children are unable to complete the CFSS-DS on their own and to enable comparisons between different ages, it was decided to use the parent's version of the CFSS-DS. The CFSS-DS consists of 15 items, related to various aspects of dental treatment (eg, "how afraid is your child of: the noise of the dentist drilling or having somebody examine your mouth"). Each item can be scored on a 5-point scale (1="not afraid at all" to 5="very afraid"). Thus, total scores range from 15 to 75.

Previous research has indicated scores below 32 as "nonclinical," scores between 32 to 38 as "borderline range," and scores of 39 and higher as "clinical range" of dental fear. Children scoring in the nonclinical range generally are non- or less fearful, and are expected not to cause problems during treatment. Of the Dutch child population 14% suffers from some degree of dental fear.¹²

Behavior ratings

On the basis of the videotapes, the observers separately rated the amount of pain-associated behavior and the distress behavior each child experienced. To separate distress behavior from pain behavior, the observers studied the behavioral change at the moment the injection was given. Any change in behavior (eg, suddenly starting to cry, crying louder, closing eyes, or sudden body movements) was interpreted as pain behavior. The 2 observers evaluated each child independently, comparing their score, and, in case of disagreement, reaching a final rating by joint decision. They reached good agreement (interclass correlations=0.88-1). All dentists and observers were trained using videotapes not included in the study.

Data analysis

ANOVA for repeated measures was used to test for significant differences in distress assessment (between the dentist's 3 ratings and the observers' 3 ratings) and pain assessment (between the pain ratings of the child, dentist, and observers). When a significant effect was found, a paired comparison was performed to identify specific differences. Spearman rank

correlation coefficient was used to assess the relation between the different distress assessments and the different pain assessments.

Results

The mean total CFSS-DS score was 34.6 (± 11.65); 59% had a score of 32 or higher. No significant differences in total CFSS-DS scores between boys and girls, nor an association between the total scores and age or any of the pain or distress ratings, were found. One CFSS-DS question, about fear for a dental injection, had a significant ($P = .005$) but modest correlation with the amount of distress displayed during the injection phase ($r = .39$).

Pain

Gender and age were not associated with any of the pain ratings. The different mean pain assessments were subjected to an analysis of variance (ANOVA) for repeated measures, resulting in a significant effect. Subsequent paired comparison analysis showed that the dentists (mean=1.46±0.66) assessed the pain significantly lower than the observers (mean=2.04±0.75; $P < .01$), lower than the child to the dentist (mean=2.16±0.96; $P < .01$), and lower than the child to the parent (mean=2.44±1.13; $P < .01$). The observers (mean=2.04±0.75) assessed the pain significantly lower than the child to the parent (mean=2.44±1.13; $P < .01$). The means are presented in Table 1.

The 2 pain reports of the child—to the dentist and parent—showed a good correlation ($r = .65$; $P < .01$; Table 1). When the 2 pain reports were compared, however, it was found that 12% of the children reported more pain to the dentist and 28% reported more pain to the parent.

Substantial correlations were found between the:

1. observers' pain assessment and child's report to the dentist ($r = .57$; $P < .01$);
2. observers and the dentist ($r = .41$; $P < .01$);
3. observers and the child's report to the parent ($r = .41$; $P < .01$).

A low correlation was found between pain assessed by the dentist and child's report to the dentist ($r = .36$, $P < 0.01$). No significant correlation was found between pain assessed by the dentist and child's report to the parent ($r = .18$).

Table 2. Means of Distress Assessments

Variable (N=50)	Observers	Dentists
	Mean±SD	Mean±SD
Start of the treatment	2.38±1.12	2.20±1.59*
During topical anesthesia	2.40±0.73	2.20±1.15
During local anesthesia	2.66±1.06†	3.00±1.65†

*Significantly less distress at the start of the treatment than during local anesthesia; $P<.01$.

†Significant difference between the rates of the observers and the dentists.

Distress

Gender and age were not associated with any of the distress assessments. An ANOVA for repeated measures and subsequent paired comparison showed a higher amount of distress assessed by both the dentists and the observers during the start of treatment (mean=2.38±1.12 and mean=2.20±1.59) than during local anesthesia (mean=2.66±1.06 and mean=3.00±1.65). The dentist's assessments of distress during the injection (mean=3.00±1.65) were higher than those of the observers (mean=2.66±1.06; $t[49]=-2.43$; $P=.019$). The means are presented in Table 2.

Pain versus distress

The pain assessed by the observers correlates significantly with the different distress assessments over the 3 treatment phases (ie, entering, topical anesthesia, local anesthesia). The pain as reported by the child to the parent correlates with all distress assessments, except for the distress assessment as given by the dentist for phase 1. On the contrary, the pain assessments by the dentist and the pain as reported by the child to the dentist only correlate significantly with the distress assessment as given by the dentist for phase 3. The correlations are presented in Table 3.

Discussion

The group studied here seems to be homogenous; no effects were found for age and gender. The mean total CFSS-DS score was 34.6 (±11.7), and 59% of the children suffered from some form of dental anxiety. This is higher than the mean of the Dutch population (mean=27.0±9.7; 14%), which one might expect for this group of children.¹³ No correlations were found between the total CFSS-DS score and any of the pain or distress ratings. In this age group, the amount of pain and distress seems to be influenced by factors other than dental anxiety.

The pain scores are mostly low to moderate because of the use of a topical anesthetic. The pain ratings reported by children to the dentists and those reported by the observers were comparable; there was a moderate correlation and no difference in mean scores. The 2 pain reports of the child (to the parent and to the dentist) were closely associated, although the exact ratings show that, in 40% of the cases, the children gave a slightly different rating to the dentist than to their parents. This discrepancy may be the consequence of family expectations or socially desirable answers to the dentist.

The pain ratings reported by the dentists were poorly correlated with and had a lower mean than the pain ratings reported by the child to the dentist. Other studies also found low correlations between pain ratings given by health care professionals and those given by their pediatric patients.¹⁰ The pain ratings reported by the dentists look almost standard, as if assuming that each dental injection causes the same amount of pain to every child. The dentists' pain scores are the lowest and have a small standard deviation.

In a study of pain measurement in the clinical practice, Hester et al describes an "illusion of certainty," in which providers assume they know a patient's pain level without having to measure it on the basis of the type of illness or procedure and without regard to the individual patient's experience.¹⁴ Other research has found that practitioners who regularly perform painful procedures are becoming "blind" to the amount of pain behavior displayed by the patient. Neither do dentists always question children regarding their comfort; some of them do not find child reports of pain fully credible.⁹ Of course, all dentists have background information about their patients, and will subjectively incorporate that knowledge into their assessments of pain.

The distress during anesthesia, as rated by the dentists, correlates with all 4 different pain assessments. A possible explanation is that the dentist underestimates the amount of pain experienced by the child, so all the overt behavior displayed by the child is interpreted as distress. In reality, however, part of this overt behavior is the result of the pain experienced at that moment. When communication is difficult (due to age),

Table 3. Correlations Between the Different Pain Assessments and Distress Ratings

	Distress phase 1		Distress phase 2		Distress phase 3	
	Observer	Dentist	Observer	Dentist	Observer	Dentist
Observers' pain rates	0.40*	0.36*	0.44*	0.50*	0.47*	0.70*
Dentists' pain rates	0.08	0.13	0.12	0.26	0.29†	0.51*
Child's pain report to dentist	0.26	0.23	0.28	0.22	0.24	0.41*
Child's pain report to parent	0.38*	0.22	0.41*	0.35†	0.39*	0.44*

*Significant at $P<.01$.

†Significant at $P<.05$.

all personal impressions by health care professionals regarding the behavior's meaning should be examined carefully. Because pain expression reflects physical and emotional states, coping style, and family and cultural expectations, it can be misinterpreted.⁴ For example, children with "difficult" personality types may express more negative behavior when in pain. "Easier" personality types, conversely, may express less negative behavior, and their pain may be overlooked.¹

The pain ratings reported to the parent by the observer and by the child correlated with almost all the distress ratings. This indicates that these pain and distress ratings share similar variance. In other words, these concepts partly overlap. The pain ratings reported to the parent by the observers and by the child may be biased by the amount of distress displayed by the child during the treatment. The authors add that the observers were not blind to the amount of distress displayed by the child during the phases preceding the injection phase. Furthermore, perhaps the child was so overwhelmed by the emotions experienced that it confused its concept of pain when reporting to the parent afterwards.

During the injection phase, the child expresses a certain amount of overt behavior. Part of this is the consequence of the distress the child experiences, and the other part is the consequence of the pain he or she experiences. It seems that, while the dentist and the observers detect the same amount of overt behavior, the dentist attributes more of this behavior to distress and less to pain, and the observer attributes a smaller part to distress and a larger part to pain. The different pain rates show that the observers' rates are congruent with the rates reported by child to the dentist.

Conclusions

Observation of a child on a video apparently is the most reliable method to accurately assess pain behavior and discriminate pain from distress. A combination of self-report of the child and video observation is advised to assess pain in young children.

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