A Longitudinal Examination of Verbal Reassurance During Infant Immunization: Occurrence and Examination of Emotional Availability as a Potential Moderator*

Nicole M. Racine,1 MA, Rebecca R. Pillai Riddell,1,2 PhD, David Flora,1 PhD, Hartley Garfield,2 MD, and Saul Greenberg,2 PhD

1York University and 2Hospital for Sick Children, University of Toronto

All correspondence concerning this article should be addressed to Dr. Rebecca Pillai Riddell, Department of Psychology, York University, 4700 Keele Street, Toronto, ON, Canada, M3J 1P3. E-mail: rpr@yorku.ca

Received October 15, 2011; revisions received April 3, 2012; accepted April 4, 2012

Objective This study investigated the associations between caregiver verbal reassurance and infant pain-related distress during immunization over the first year of life. The relationships between verbal reassurance and caregiver emotional availability (EA) were also examined. Finally, EA was investigated as a moderator of the relationship between verbal reassurance and infant pain.

Methods A cross-sectional analysis was conducted with 606 infants (and their parents) at 4 different ages (n = 376 at 2 months, n = 455 at 4 months, n = 484 at 6 months, and n = 407 at 12 months).

Results Verbal reassurance was positively associated with infant distress across all four ages. EA was only negatively related to verbal reassurance at 12 months of age. EA was not a significant moderator at any age.

Conclusion Findings demonstrate consistent but small relationships between verbal reassurance and infant pain over the first year of life.

Key words emotional availability; immunization; infant pain; verbal reassurance.

The Importance of the Caregiver and Verbal Reassurance

Both healthy and ill infants endure various painful medical procedures throughout development. An important aspect of understanding how to manage pain in infancy is to explore the integral role of the caregiver (Pillai Riddell & Racine, 2009). Acknowledging the importance of parental behavior for infant pain responding during painful medical procedures, several studies have examined the impact of these behaviors on infant pain-related distress. Among parental soothing behaviors used during painful medical procedures, verbal reassurance has garnered significant attention (e.g., McMurtry, McGrath, & Chambers, 2006). Examples of verbal reassurance in the pain context include “it’s okay,” “you’re fine,” and “it’s almost over.” This trend in the literature can partially be attributed to the paradoxical association between parental use of apparently empathetic language and increased child and infant distress. Despite the parent’s obvious intention to soothe her or his infant by using reassuring statements, many studies have found a fairly consistent association between parental verbal reassurance and increased infant distress (Blount, Devine, Cheng, Simons, & Hayutin, 2008; Cohen, Bernard, McClellan, & MacLaren, 2005; Piira, Champion, Bustos, Donnelly, & Lui, 2007; Sweet & McGrath, 1998; Wolff et al., 2009). This finding has led researchers to attempt to understand the mechanism by which verbal reassurance has an impact on infant pain responding.

Verbal Reassurance and Pain Responses in Infancy

In contrast to the child literature, there is less research examining the role of verbal reassurance and its impact
on pain in infants. Most studies in infancy have confirmed the positive relationship between infant pain-related distress and verbal reassurance (Cohen et al., 2005; Piira et al., 2007; Sweet & McGrath, 1998; Wolff et al., 2009) with the exception of one study (Bustos, Jaaniste, Salmon, & Champion, 2008). Additionally, Blount and colleagues (2008) showed that reassuring did not impact infant distress as there was no change in infant behavior from before to after these behaviors were enacted.

Factors having an impact on the relationship between verbal reassurance and pain in infancy remain largely unexplored. In children, some studies have suggested that parental use of verbal reassurance typically follows child pain-related distress (Kleiber & McCarthy, 1999; Spagrud et al., 2008), while others have suggested that there is most likely a cyclical bidirectional relationship between child distress and verbal reassurance, whereby verbal reassurance occurs both before and after child distress (Blount et al., 1989; Frank, Blount, Smith, Manimala, & Martin, 1995; Mahoney, Ayers, & Seddon, 2010; Manimala, Blount, & Cohen, 2000). On a more fine-grained level, some infant researchers have hypothesized that verbal reassurance in infancy communicates a message through associated nonverbal factors, such as tone of voice, facial expression, body language, and touch (Bustos et al., 2008; Piira et al., 2007). However, taking a broader approach to understand the mechanisms subsuming verbal reassurance has not been taken. A broader construct that encompasses both verbal and nonverbal caregiver behaviors could have an impact on the relationship between verbal reassurance and increased infant pain-related distress. Emotional availability (EA) is a broad construct encompassing parental sensitivity. Both verbal and nonverbal elements are included in this more global clinical judgment of how “emotionally available” a parent is (including constructs such as parental hostility, intrusiveness, and how well they structure an interaction with their child). EA has been shown to be quite stable over the first year of life (Pillai Riddell et al., 2011), and given it describes the quality of the parent–infant interaction within the immunization setting, it has the potential to help explain the relationship between verbal reassurance and increased infant pain-related distress. EA, based on attachment theory and parenting theory, examines the quality of communication and connection between a caregiver and an infant or child (Biringen, 2000). A caregiver who is less emotionally available may communicate fear and anxiety to their infant during reassurance, thus exacerbating the relationship between verbal reassurance and infant pain. Since increased infant pain-related distress is associated with verbal reassurance (e.g., Cohen et al., 2005) and low parental EA (Din, Pillai Riddell, & Gordner, 2009), the possibility arises that EA may moderate the relationship between verbal reassurance and infant pain responses.

Research has also yet to investigate the effect of verbal reassurance on infant pain developmentally. Previous research has demonstrated that infant age accounted for a significant amount of variance in infant pain-related responses, illustrating the importance of examining development difference (Piira et al., 2007). Infancy is a period of rapid development, and it is unknown whether reassurance is related to infant pain uniformly across age during infancy or whether different relationships may emerge across age. Finally, another gap in the literature is that most studies examining verbal reassurance in infancy have focused on immediate infant pain response. Whether verbal reassurance has an effect on pain-related distress regulation after the painful stimuli would provide important information for infant pain management. The current study aims to help address some of these gaps in the literature.

**Current Study**

The overarching goals of the current study were two-fold. First we sought to examine the relationships between parent verbal reassurance (before needle, one minute, and two minutes post-immunization needle) and infant pain responses (immediately after needle, 1 minute after needle, and 2 minutes after needle) over the first year of life (at two, four, six, and 12 months of age). Second, we sought to determine whether parental emotional availability (one global score at two, four, six, and 12 months, respectively) moderates the relationship between verbal reassurance and infant pain. Data come from a longitudinal cohort examining the relationship between infant and caregiver in the immunization context between the ages of 2 months and 5 years. The current study has three main objectives: (1) to examine the bivariate relationships among parental use of verbal reassurance (one minute before needle, one minute after needle, and two minutes after needle) and infant pain responses (immediately one minute after needle, and two minutes after needle) over the first year of life; (2) to examine the relationships between verbal reassurance and EA over the first year of life; and (3) to examine whether parental EA moderates the relationship between parental use of verbal reassurance and infant pain responses to an immunization.

Based on the previous literature (Cohen et al., 2005; Piira et al., 2007; Sweet & McGrath, 1998; Wolff et al., 2009), it was hypothesized that verbal reassurance and infant pain would be positively related and that these relationships would increase as infants got older, consistent
with infant receptive language development (Tincoff & Jusczyk, 2000). It was also hypothesized that EA and verbal reassurance would be negatively related due to the established relationship between verbal reassurance and increased infant pain. More sensitive caregivers would be more likely to use other more effective strategies to soothe their infant rather than use a strategy that is ineffective (Blount et al., 2008). EA was hypothesized to function as a moderator whereby more emotionally available parenting would decrease the strength of the positive relationship between verbal reassurance and infant pain-related distress. The affectively positive and structuring manner in which the caregiver interacts with the child is thought to mitigate the negative effects or the fear and anxiety being communicated by the verbal reassurance. The moderating effect was hypothesized to increase with age.

Methods
Participants
The data for the current study come from an ongoing longitudinal cohort (the OUCH cohort) where caregiver–infant dyads are recruited from three pediatric clinics in the Toronto Area, and naturalistically observed during their immunization appointment. The first four waves of the study, recruited from October 2007 to August 2011, have caregiver–infant dyads videotaped at their 2-, 4-, 6-, and 12-month immunization appointments. The fifth wave of the study follows a subsample of the larger cohort at 12–18 months to measure attachment status. The sixth wave follows the cohort at the preschool (4–5 years) immunization appointment and also involves a psycho-educational and socio-emotional assessment. The overarching goal of this cohort is to examine the interrelationships between caregiver factors, infant/child pain in the immunization context, and indicators of child health/mental health. No previously published (Pillai Riddell et al., 2011) or planned/submitted manuscripts from this cohort have hypotheses or analyses that overlap with the current manuscript.

The current analysis is a cross-sectional examination. Thus, dyads who were videotaped at least once during the infant’s 2-, 4-, 6-, or 12-month appointment for a routine immunization, had complete data for caregiver EA, caregiver use of verbal reassurance, and infant pain behavior, were included in the current study. Inclusion criteria for each dyad specified that the caregiver was able to speak English, the infant had no suspected developmental delays or chronic illnesses, and was born no earlier than 37 weeks. As such, 754 caregiver–infant dyads were screened for eligibility. A total of 148 participants did not have complete infant pain, EA, and verbal reassurance data for at least one time point. Thus 606 parent–infant dyads were included in the present study (172 followed for four time points; 226 for three time points; 148 for two time points; and 60 for one time point). As a result of the cross-sectional nature of the study, there were 376 participants included at 2 months, 455 participants included at 4 months, 484 participants included at 6 months, and 407 participants included at 12 months.

Table I presents demographic variables for the caregiver–infant dyads included at 2-, 4-, 6-, and 12-months of age. On average, the primary caregiver’s age was 33.59 across time points. See Table I for other demographic information. Infants were almost equally split by gender at all four immunization appointments (on average 48.5% male). Infants received between one and three needles with more than 80% of the infants receiving two needles across the four time points.

Procedure
The Research Ethics Boards at the participating university and associated tertiary-level pediatric hospital approved the protocol for the larger study. Caregivers with infants receiving immunizations were provided a flyer by the medical receptionist and asked if they would like to learn more about the study. If they indicated interest, informed consent was obtained and caregivers were informed that their participation was confidential and voluntary, and that they were free to end participation in the study at anytime. The caregiver subsequently completed a demographic information form with the research assistant. The dyad was videotaped from the moment the infant entered the room until 5 min after the immunization or when the caregiver and infant left the clinic room (naturalistic observation). This footage was used to code all caregiver and infant behaviors (see measures for exact times). At present, the withdrawal rate in the longitudinal study (Waves 1–4) is 3%, with the most common reason for withdrawal being lack of interest and the second most common reason being that the family was relocating.

Apparatus
Two Canon HD Video Camcorders HV20 were used. One camera was positioned on a tripod and fitted with a wide-angle lens to capture the entire interaction, specifically the infant’s and the caregiver’s behaviors. A second camera held by a research assistant was used to capture the infant’s facial expressions.
Measures

Demographic Questionnaire
Parents were asked to complete a brief demographic questionnaire as part of the larger research study. The questionnaire asked about personal information, such as relation to the infant, age, cultural background, profession, and education level, as well as information pertaining to the infant, such as infant age, gender, and previous medical conditions.

Infant Pain Behavior
The Modified Behavior Pain Scale (MBPS; Taddio, Nulman, Koren, & Stevens, 1995) was used to assess the degree of infant pain and distress. This scale uses behavioral indices to determine how much pain the infant is experiencing. There are three subsections of the scale (facial expression, cry, and body movement), each requiring the coder to decide on a score based on overt infant behavior during a 15-s epoch. All sections of the measure are summed to get an infant pain score out of 10. Moderate to high concurrent and construct validity as well as item-total and inter-rater reliability have all been demonstrated in the immunization context (Taddio et al., 1995). Data for this scale were collected right after the needle (immediate MBPS), as well as 1 and 2 min after needle. MBPS was coded by trained primary coders who were blind to the study hypotheses. Inter-rater reliability was high with intra-class correlations ranging from .93 to .96.

Verbal Reassurance
Caregiver use of verbal reassurance was coded using the Measure of Adult and Infant Soothing and Distress (MAISD; Cohen et al., 2005). The MAISD is a reliable and valid behavioral observation scale that was developed to evaluate the behaviors of infants, parents, and health care professionals during painful pediatric medical procedures. For the purposes of this study, only the verbal reassurance subscale was used. Verbal reassurance is coded as present (1) or absent (0) for 5 s epochs during the following phases: 1 min prior to the first needle and 2 min after the last needle. Analyses used index scores representing the ratio of time each behavior was present to the total number of epochs available for coding. The index score ranged from 0 to 1, with higher scores reflecting greater frequency of behavior. Trained MAISD primary coders, blinded to the study hypotheses, coded the data. Inter-rater reliability was high with an intra-class correlation of .82.

Emotional Availability (EA)
EA was coded using the fourth edition of the Infancy/Early Childhood Version of the Emotional Availability Scales (EAS; Biringen, 2000). The EAS is a global clinical judgment of caregiving behavior. For a caregiver to have a high EA score, he or she would have to engage in consistent and sensitive behaviors to address the infant’s pain-related distress. The EAS has been well-validated in a variety of

Table I. Demographic Characteristics

<table>
<thead>
<tr>
<th></th>
<th>2 months (n = 376) (%)</th>
<th>4 months (n = 455) (%)</th>
<th>6 months (n = 484) (%)</th>
<th>12 months (n = 407) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of caregiver present</td>
<td>33.56</td>
<td>33.65</td>
<td>33.65</td>
<td>33.48</td>
</tr>
<tr>
<td>Mother</td>
<td>52.1</td>
<td>63.3</td>
<td>61.6</td>
<td>55.5</td>
</tr>
<tr>
<td>Mother and father</td>
<td>38.3</td>
<td>28.6</td>
<td>29.5</td>
<td>26.4</td>
</tr>
<tr>
<td>Father</td>
<td>2.1</td>
<td>1.3</td>
<td>2.5</td>
<td>10.3</td>
</tr>
<tr>
<td>Parent(s) and grandparent(s)</td>
<td>4.3</td>
<td>3.5</td>
<td>3.3</td>
<td>3.4</td>
</tr>
<tr>
<td>Other</td>
<td>3.2</td>
<td>3.2</td>
<td>3</td>
<td>4.1</td>
</tr>
<tr>
<td>Self-reported heritage culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European</td>
<td>36.7</td>
<td>36.0</td>
<td>35.1</td>
<td>34.9</td>
</tr>
<tr>
<td>Canadian/American</td>
<td>12.8</td>
<td>13.4</td>
<td>13.2</td>
<td>10.1</td>
</tr>
<tr>
<td>Asian</td>
<td>19.9</td>
<td>19.1</td>
<td>19.2</td>
<td>20.1</td>
</tr>
<tr>
<td>African/Middle Eastern</td>
<td>4.8</td>
<td>3.5</td>
<td>4.7</td>
<td>5.7</td>
</tr>
<tr>
<td>Other</td>
<td>24.3</td>
<td>26.6</td>
<td>25.6</td>
<td>27.3</td>
</tr>
<tr>
<td>Missing</td>
<td>1.5</td>
<td>1.4</td>
<td>2.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate/Professional School</td>
<td>27.9</td>
<td>31.0</td>
<td>29.8</td>
<td>30.7</td>
</tr>
<tr>
<td>University/Partial University</td>
<td>47.1</td>
<td>47.2</td>
<td>46.3</td>
<td>46.4</td>
</tr>
<tr>
<td>Trade School/College</td>
<td>16.8</td>
<td>14.3</td>
<td>15.7</td>
<td>15.5</td>
</tr>
<tr>
<td>High School or less</td>
<td>7.9</td>
<td>7.5</td>
<td>7.4</td>
<td>6.8</td>
</tr>
<tr>
<td>Missing</td>
<td>0.3</td>
<td>0.2</td>
<td>0.8</td>
<td>0.5</td>
</tr>
</tbody>
</table>
distressing nonpain contexts, and examines four main 
caregiver subscales (sensitivity, structuring, nonintrusive-
ness, and nonhostility), which are summed to form an 
overall score (Biringen, 2000).

Footage from the entire immunization appointment 
was used to score the EAS. Scores from the subscales 
were subsequently summed to form a composite EA 
score on a scale from 28 to 116. Higher scores represent 
more optimal interactions. When more than one caregiver 
accompanied the infant for the immunization appoint-
ment, the caregiver who did the majority of the caregiving 
was coded. When both caregivers provided equal care 
during the immunization appointment, both caregivers 
were coded and an average score was obtained 
(2 months: 1.9%; 4 months: 1.3%; 6 months: 1.4%; 12 
months: 3.7%). EAS coders were trained by the scale 
developer during 3 days of intensive training. There were 
six coders for this study (three main coders and three 
reliability coders). Inter-rater reliability was calculated 
between each main coder and each of the reliability 
coders for 17% (n = 291 episodes) of the data. Intra-class 
correlations for the caregiver EAS composite score ranged 
from .80 to .93.

Reliability coding is conducted every 2–4 weeks by a 
graduate student in the lab (reliability coder). When dis-
crepancies arise, primary coders involved in the discrep-
ancy meet within the week to discuss discrepancies with 
the reliability coder, without using the actual case on 
which the disagreement was based. Primary coders then 
re-code the original footage (blind to the primary coder’s 
actual codes), and reliability is calculated. Reliability codes 
are used in the analysis data set. This procedure is the same 
for the MBPS, MAISD, and EAS.

Results

Data Screening, Transformation, and Cleaning

After the data file was reviewed for any data entry errors, 
descriptive statistics were used to examine correlation and 
regression diagnostics. A family-wise error rate was not 
assigned due to the exploratory nature of the analyses. 
Thus, an alpha level of .05 was used for each correlation 
mentioned below. All assumptions for the multivariate 
analyses were met. A total of 15 correlations were con-
ducted at each time point (60 in total).

Objective 1: Examining Relationships Between Verbal 
Reassurance and Infant Pain Responses

In order to test the hypothesis that verbal reassurance and 
infant pain were positively related over the first year of life 
(with more relationships emerging with age), bivariate par-
tial Pearson correlations were calculated at 2-, 4-, 6-, and 
12-months of age controlling for the number of needles the 
infant received.

Two months. There were significant positive correla-
tions between parental use of verbal reassurance 2 min fol-
lowing the needle and infant pain response both one 
(r = .25, p < .001) and 2 min following the needle 
(r = .14, p = .01, see Table II).

Four months. Parental use of verbal reassurance prior to 
the needle was significantly positively related to the imme-
diate infant pain response variable (r = .12, p = .01, see 
Table III). Parental verbal reassurance 1 min following the 
needle was significantly positively related to infant pain 
response immediately following the needle (r = .13, 
p = .004). Parental verbal reassurance 2 min following the 
needle was significantly positively related to infant pain 
responses immediately (r = .13, p = .005), 1 min (r = .26, 
p < .001), and 2 min following the needle (r = .19, 
p < .001).

Six months. Parental verbal reassurance 1 min follow-
ing the needle was significantly positively related to infant 
pain response immediately following the needle (r = .10, 
p < .05, see Table IV). Parental verbal reassurance 2 min 
following the needle was significantly positively related to 
infant pain responses immediately (r = .16, p < .01), 1 min

<table>
<thead>
<tr>
<th>Variable</th>
<th>M (SD)</th>
<th>N</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Immediate infant pain response</td>
<td>8.74 (1.03)</td>
<td>376</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2. Infant pain response 1 min postneedle</td>
<td>5.63 (2.92)</td>
<td>376</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3. Infant pain response 2 min postneedle</td>
<td>4.95 (3.10)</td>
<td>376</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>4. Verbal reassurance preneedle</td>
<td>0.02 (0.05)</td>
<td>376</td>
<td>–.00</td>
<td>–.09</td>
<td>–.08</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>5. Verbal reassurance 1 min postneedle</td>
<td>0.18 (0.21)</td>
<td>376</td>
<td>.07</td>
<td>.05</td>
<td>.08</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>6. Verbal reassurance 2 min postneedle</td>
<td>0.15 (0.21)</td>
<td>376</td>
<td>.05</td>
<td>.25***</td>
<td>.14*</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>7. Total caregiver EA score</td>
<td>91.60 (10.56)</td>
<td>376</td>
<td>–.16**</td>
<td>–.13*</td>
<td>–.13*</td>
<td>.06</td>
<td>.09</td>
<td>.08</td>
</tr>
</tbody>
</table>

Note. *p < .05, ***p < .001; (two tailed).
Objective 2: Examining the Relationship Between EA and Verbal Reassurance Across the First Year of Life

In order to test the hypothesis that EA and verbal reassurance were negatively related over the first year of life, bivariate partial Pearson correlations were calculated at 2-, 4-, 6-, and 12-months of age controlling for the number of needles the infant received. It was hypothesized that verbal reassurance would be negatively related to caregiver EA. The only significant relationship between EA and verbal reassurance was a negative correlation between verbal reassurance 2 min postneedle and the total caregiver EA score at 12 months of age ($r = -.13, p = .01$).

Objective 3: Examining Parental EA as a Moderator of the Relationship Between Parental Use of Verbal Reassurance and Infant Pain

In order to test the hypothesis that EA moderates the relationship between verbal reassurance and infant pain across the first year of life, 12 hierarchical multiple regression models (one for each of the three pain measurements at all four of the age time points) were estimated. It was hypothesized that total EA would moderate the relationship between verbal reassurance and infant pain at all four ages. Moderation analyses were performed by (1) centering the variables of interest; (2) entering the number of needles the infant received; (3) entering the predictor variable (verbal reassurance) and moderating variable (EA); and (4) entering their interaction (Aiken & West, 1991). The interaction term was not significant for any of the 12 multiple regressions, indicating that EA does not moderate the relationship between verbal reassurance and infant pain immediately, 1, and 2 min following the needle at 2-, 4-, 6-, or 12-months of age.

Discussion

There were three objectives to this study. The following will be a discussion of the three analyses in sequence.
Objective 1: Relationships Between Verbal Reassurance and Infant Pain

First, relationships among caregiver use of verbal reassurance and infant pain responses were examined over the first year of life. It was hypothesized that verbal reassurance would be positively associated with infant pain-related distress and that this relationship would be stronger for the older infants. Results showed that verbal reassurance was always associated with higher levels of infant pain-related distress across the first year of life. There was also an increase in the number of significant relationships with age, further supporting our hypotheses. This supports previous research with infants that demonstrated that the more verbal reassurance caregivers use, the more pain their infants express (Blount et al., 2008; Cohen et al., 2005; Piira et al., 2007; Sweet & McGrath, 1998; Wolff et al., 2009).

However, novel information is provided by these analyses, owing to the analyses that examined the interrelationships between different temporal measures of verbal reassurance (before the needle, 1 min after the needle, and 2 min after the needle) and pain responses over the appointment (15-s measurements of pain: right after needle, 1 min after needle, and 2 min after needle) at each of the four age groups. In essence, because of measure timing (i.e., preneedle verbal reassurance always preceded infant pain score right after needle; 1 min verbal reassurance always preceded infant pain score 1 min after needle; and 2 min verbal reassurance always preceded infant pain score 2 min after needle), descriptions will be presented in a cross-lagged fashion and then contrasted over age. It should be noted that there was a 15-s overlap between pain measured right after needle and verbal reassurance 1 min postneedle, and between pain 1 min and verbal reassurance 2 min.

Comparing the correlations between infant pain response and verbal reassurance for each age group over the first year of life, only at 2 months of age were there no relationships between verbal reassurance preneedle or 1 min after needle and any measure of infant pain responding. The chain of relationships began with higher infant pain 1 min following the needle positively relating to higher caregiver verbal reassurance during the second minute postneedle, which in turn was positively related to pain 2 min postneedle. This result suggests that at 2 months of age, compared to the other ages, the relationship between verbal reassurance and pain response begins with the infant’s pain responding during the regulation phase postneedle, not with either infant or parent behaviors preneedle or immediately after needle.

At 4-, 6-, and 12-months of age, there is a consistent relationship pattern between verbal reassurance and pain responding during the entire postneedle period under analysis. Accordingly, for all three older ages studied, pain immediately after the needle was significantly related to verbal reassurance 1 min after the needle; pain 1 min after the needle was significantly related to verbal reassurance 2 min postneedle, which was significantly related to pain 2 min postneedle. In addition, pain right after the needle was also positively related to verbal reassurance 2 min after the needle. However, 4 months was the only age where verbal reassurance preneedle was associated with a higher pain response immediately after the needle. Thus, only at 4 months of age did the cyclical chain between infant pain and parental verbal reassurance appear to begin with caregiver verbal reassurance. Perhaps 4 months is a developmentally sensitive period, whereby infants are particularly sensitive to threat cues. This speculation is in line with the developing of an infant’s ability to differentiate emotions at this age (Montague & Walker-Andrews, 2001).

In summary, the correlational analyses between caregiver reassurance and infant pain responses showed three important overall findings. First, at 2 months of age, verbal reassurance was only positively related to infant pain Table V. Bivariate Partial Pearson Correlations Among Predictor, Moderator, and Outcome Variables at 12-Months Controlling for Number of Needles

<table>
<thead>
<tr>
<th>Variable</th>
<th>M (SD)</th>
<th>N</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Immediate infant pain response</td>
<td>8.25 (1.33)</td>
<td>407</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Infant pain response 1 min postneedle</td>
<td>5.49 (2.62)</td>
<td>407</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Infant pain response 2 min postneedle</td>
<td>4.32 (2.86)</td>
<td>407</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. Verbal reassurance preneedle</td>
<td>0.02 (0.06)</td>
<td>407</td>
<td>-01</td>
<td>0.06</td>
<td>-05</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Verbal reassurance 1 min postneedle</td>
<td>0.18 (0.19)</td>
<td>407</td>
<td>0.16**</td>
<td>0.06</td>
<td>0.03</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Verbal reassurance 2 min postneedle</td>
<td>0.12 (0.19)</td>
<td>407</td>
<td>0.17***</td>
<td>0.20***</td>
<td>0.10*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Total caregiver EA score</td>
<td>92.63 (10.87)</td>
<td>407</td>
<td>-20***</td>
<td>-21***</td>
<td>-19***</td>
<td>0.04</td>
<td>-01</td>
<td>-13*</td>
</tr>
</tbody>
</table>

Note. *p < .05, **p < .01, ***p < .001; (two tailed).
regulation not pain reactivity, suggesting that at this age verbal reassurance does not have an effect when an infant is most highly distressed. Second, 4 months of age was the only time point where verbal reassurance preneedle was associated with higher pain reactivity immediately after the needle, suggesting a potential developmentally sensitive period to verbal reassurance. Third, at 4-, 6-, and 12-months of age, a clear consistent bidirectional pattern was seen in the postneedle period whereby infant pain responding predicted caregiver verbal reassurance, which in turn predicted subsequent infant pain responding, and so on. This finding provides support for the bidirectional hypothesis of verbal reassurance, whereby infant distress leads to reassurance, and reassurance leads to increased infant distress (Blount et al., 2008; Frank et al., 1995; Mahoney et al., 2010; Manimala et al., 2000).

While these analyses affirm the relationship of verbal reassurance and infant pain-related distress over the first year of life, these effects are smaller than what has been previously theorized and demonstrated in the literature. The differences in findings may be due to the fact that some previous studies have examined both verbal and physical reassurance, including patting and stroking (e.g., Wolff et al., 2009), whereas the current study only examined verbal reassurance. Given that such small effects were found despite a large sample size, whether or not verbal reassurance has a clinically significant impact on pain expression during infancy is unknown.

**Objective 2: Relationships Between Verbal Reassurance and EA**

Second, the relationships between caregiver EA and verbal reassurance were examined. It was hypothesized that verbal reassurance would be negatively related to EA across age. Support for this hypothesis was only found at 12-months of age, 2 min postneedle. It is particularly interesting that this relationship only emerged 2 min after the needle. This may suggest that not all verbal reassurance has the same effect on pain response. For example, a small amount of verbal reassurance used immediately after the painful stimuli may be empathic and sensitive with older infants, whereas higher levels of verbal reassurance used long after the painful stimuli may serve to continue to draw attention to the pain or may demonstrate a lack of other soothing strategies.

**Objective 3: Moderating Effect of EA**

Third, whether parental EA moderates the relationship between caregiver use of verbal reassurance and infant pain responses to an immunization was explored. It was hypothesized that EA would moderate the relationships between verbal reassurance and infant pain. Counter to our hypothesis, total caregiver EA was not a significant moderator at any of the four time points. This indicates that EA did not function to buffer or exacerbate the relationship between verbal reassurance and infant pain. One possible explanation is that more discrete caregiver behaviors that accompany the verbal reassurance (such as facial expression and body movements) may be more influential than the sensitivity of the caregiver who made the reassuring comments. Similar to what has been found in the child literature (McMurtry, Chambers, McGrath, & Asp, 2010), discrete behaviors such as facial expressions and body tension during reassurance may communicate fear to the infant, thus heightening the relationship between verbal reassurance and infant pain-related distress.

**Conclusions and Clinical Implications**

First, across all three analyses, there were developmental differences between the different age groups over the first year of life. These findings suggest that researchers should be wary of collapsing across wide age ranges, especially in infancy when developmental changes occur rapidly. Second, it should be noted that in this study, there were different results for pain reactivity (immediate pain following the needle) and pain regulation (pain 1- and 2-min after the needle). This is particularly important for nurses and physicians who are involved in assessing and managing infant pain. Assessing pain beyond the painful event and encouraging parents to use pain management strategies effective for regulation are important. Lastly, although these findings support the well-established positive relationship between verbal reassurance and infant pain, these results call into question the clinical importance of verbal reassurance in infancy given the small relationships found with a large sample size. Although the use of verbal reassurance has begun to be discouraged by immunizing health professionals for older children, this research suggests that the impact during the first year of life may not be as great.

**Limitations and Directions for Future Research**

The current study has several limitations that may influence the interpretation of the findings. First, although ethnically diverse, the majority of the sample was highly educated, with parents having completed undergraduate or graduate-level university education. Given education has been linked to caregiver sensitivity, these findings may not be generalizable to other less educated and
more high-risk clinical populations. Second, although most participants were observed to habituate to being videotaped, the possibility remains that videotaping may have altered caregiver behavior during the immunization. Third, we did not control for interactions between the infant and caregiver at previous time points, as not all participants had data at all four time points, and whether or not previous immunizations for these infants were received is unknown. The caregiver–infant interaction at previous visits may have contributed to the infant’s behavior at future time points. Future research should examine the relationships and continuity between caregiver behavior and infant pain responses both in the immunization context and in other settings, as well as look at the potential influence of the immunizing health professional on both caregiver and infant behavior.

**Funding**

This work was supported by the Canadian Institutes of Health Research (CIHR; grant MOP#84511), the Ontario Ministry for Research and Innovation, the Ontario Graduate Scholarship program, the Social Sciences and Humanities Research Council, the Lillian Wright Foundation at York University, and the CIHR Pain in Child Health Strategic Training Initiative.

*Conflicts of interest:* None declared.

**References**


