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Infant stress reactivity and Home Cultural Ecology of Italian infants and families

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Abstract

Although it is well known that maternal behavior with infants and cultural ecology of family life varies widely both across and within cultures, the effects of these variations on infant responses to stress are not well understood. In this report, North Italian infants and their mothers were observed longitudinally at 5 and 12 months during routine pediatric vaccinations. We interviewed mothers when babies were 8 months regarding how they organize their family daily routines, how they respond to their babies, and their cultural models about baby care. The main results were: (a) infants quiet faster at 12 than at 5 months; (b) more maternal responsive soothing at 5 months is concurrently and predictively associated with longer Infant Quieting; (c) the best predictor of individual differences in speed of Infant Quieting at 12 months are variations in Infant Home Cultural Ecology; (d) variations in infant care and ecology of the family can modify individual developmental patterns of stress reactivity between 5 and 12 months. Italian cultural models of parenting and variations in the organization of the daily routine were assessed using qualitative and quantitative methods. Eighteen features characterizing Italian home and family culture are identified and described which influence Infant Quieting, including patterns of close parental proximity to the baby, strong family support for caretakers, and cultural goals preferring a "vivace" (lively, socially engaged) infant.

Keywords: Infancy; Pain reactivity; Ecocultural context; Maternal soothing

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1. Introduction

Although it is well known that maternal behavior with infants, and the cultural ecology of family life, varies widely both across and within cultures, the effects of these variations on infant responses to stress are not well understood. In this report, North Italian infants and their mothers were observed longitudinally at 5 and 12 months during routine pediatric vaccinations, which are widely used as a standard way for assessing infant stress reactivity. We interviewed mothers at 8 months regarding how they organize their family daily routine and respond to their babies, and their cultural models of infant care. We expected that variations in infant care and the cultural ecology of the family would mediate change and stability in infant stress reactivity between 5 and 12 months. The rationale for expecting interactions between infant distress and family context is that the baby and the environment "make each other up"—the infant shapes responses from the environment, and the environment shapes the baby's reactivity (Harkness & Super, 1996; Shore, 1996; Shweder, 1991; Small, 1998).

Pain is a psychobiological phenomenon as well as an ecocultural one, encompassing biological mechanisms of pain transmission and inhibition. It includes psychological mechanisms relating to pain perception. Pain experiences and responses also incorporate cultural models of infancy and soothing (Zeltzer, Bursh, & Walco, 1997). Individual differences in pain reactions can be identified in newborns and are stable in early infancy (Axia & Bonichini, 1998; Gunnar, Broderson, Krugere, & Rigatuso, 1996; Lewis & Ramsay, 1995a, 1995b; Worobey & Lewis, 1989). The factors which may account for individual variability in infant response to pain are several, including genetic-regulated reactivity (Davis & Emory, 1995), pre-natal or perinatal factors and previous experience. Cognition also seems to be related to individual differences in pain reactivity. Axia, Bonichini, and Benini (1999) found that individual differences in pain reactivity are associated with individual differences in duration of looking by infants at 3, 5 and 11 months of age. Short lookers in the laboratory assessment of visual attention show *less* behavioral reactivity to vaccination than long lookers, suggesting that a consistent relation between attention and stress regulation can be found early in life.

In the study of infant reactivity to pain, it is useful to take into account the distinction between reactivity and regulation processes (Rothbart & Derryberry, 1981; Rothbart, 1989). Reactivity refers to the initial excitability of the system. It can be measured by the intensity of initial response or threshold. Regulation refers to the dampening or modulation of the initial response. It is measured by duration of response, recovery time from the initial perturbation or by indices of dampening of initial response. Such measures have been used in research on infant behavioral reactivity to pain and have identified reliable individual differences in early infancy (Lewis & Thomas, 1990; Lewis, Ramsay, & Kawakami, 1993). Individual differences in regulation of pain may be due to temperamental dispositions of the individuals as well as specific infant–environment transactions. As Lewis and Ramsay (1999b) suggest, developmental research on child–environment transactions has traditionally focussed upon mother–infant dyadic interactions. However, "Family and social contexts may directly affect infants' development in addition to an indirect effect via maternal behavior. Thus, to adequately assess environmental factors that might affect the infant, we need to consider family and maternal variables" (p. 174). Regulation and management of infant distress is likely shaped by culture and family ecology.

There is ample evidence showing that culture and family variations shape responses to infants generally, and to infant overt signals of distress (Chisholm, 1996; Harkness & Super, 1996; Harwood, Miller, & Irizarry, 1995; Hewlett, 1991; Lancy, 1996; Leiderman, Tulkin, & Rosenfeld, 1977; LeVine, 1988; LeVine et al., 1994; Konner, 1976; Munroe, Munroe, & Whiting, 1981; Pachter & Harwood, 1996; Small, 1998; Whiting & Whiting, 1975; Whiting & Edwards, 1988). Pain and its behavioral expressions are experienced in a cultural context, and the kinds of pain people notice and report, the degree of pain and its location in the body as well as in society, and the reasons for pain and suffering, are culturally mediated. The origins and experience of pain and suffering depend on what society defines as suffering and what it does to us, as well as a universally recognizable personal experience (Garro, 1992; Good, Brodwin, Good, & Kleinman, 1992). As Garro (1990) says, "Pain and suffering are at once universal and unique ..." (p. 34). This is clearly as valid a generalization for infants as it is for older children and adults.

Most of the reported literature on infant pain and distress comes from samples in the US and Canada; only a few percent report on infants of color or from diverse cultures and nationalities (e.g., a review by Fitzgerald et al., 1999). The only study we are aware of which takes account of infant ethnicity specifically in relationship to distress measures (e.g., Lewis et al., 1993) did not look specifically at the family routine and cultural ecology, as we do in the present study. Our study analyzes the effects of ecocultural differences between families on infant distress, using a North Italian sample. It provides data that may be useful in further cross-cultural studies in addition to adding new data on Italian cultural models of infancy. One way to think about the Italian model is to grasp the notion of "vivacità" or liveliness. This concept is related to the familiar musical term "vivace." The cultural goal for most Italian mothers is a vivace infant, even if that infant might be troublesome in some ways. The worrisome pathway is not an active baby, but rather a baby who is too quiet, not lively. Such children are considered less healthy, less lovable (Axia, 1998, 1999; Harkness et al., 2001). A mother in our interviews was asked, "What do you do when Kevin is ill?" The mother says, "Well, he is low, he is not so 'vivace' as usual, he is quiet." Another mother was asked about sleep problems. She says, "He is a 'vivace' child. He is 'allegro' and full of life. I think that he does not want to sleep because he wants to be awake and to live until he can. And, then, he is good and I cannot complain. This is how he is: he is my love."

We wondered if perhaps Italian mothers wish for highly reactive infants, whose first reactions are not too dampened by successive regulation processes—sometimes to the cost of staying awake for large parts of their nights. If this is true, the Italian style of parental response may foster self-regulation processes which do not inhibit much the initial emotional and behavioral reactions.

The evidence that temperament and cultural parental models of maternal responsiveness impact infant regulation of distress in patterned ways is controversial. Indeed, there are at least three main positions in the literature.

First, there is support for the widespread assumption that maternal behavior has an important role in soothing infant negative emotionality and relieving infant distress. To the extent that temperament and cultural parental models influence soothing, infant distress should be affected. For example, holding and skin to skin contact reduce newborn infant pain responses (Gormally et al., 2001; Gray, Watt, & Blass, 2000). Sweet, McGrath, and Symons (1999) found that at 6 months of age, 44% of the variability in infant pain behavior was predicted by infant difficult

temperament and mother vocalization during immunization. Secure attachment in late infancy has often been related to early maternal sensitivity (for instance, Ainsworth, Blehar, Waters, & Walls, 1978; De Wolff & van Ijzendoon, 1997). Successful regulation of negative emotion has also been associated with maternal sensitivity (Eisenberg & Fabes, 1992; Fox, 1994).

Second, there is evidence showing that maternal responsiveness fosters worse infant regulation of pain as well as of negative emotion. Here again, to the extent that temperament preferences and cultural parental models influence maternal responsiveness, infant pain regulation should be affected. For example, Sweet and McGrath (1998) reported that maternal reassurance predicted *increased* infant pain behavior while staff's behavior (e.g., distraction) predicted decreased infant pain behavior. Van Ijzendoorn and Hubbard repeatedly failed to show that early maternal responsiveness to infant cry influenced later successful regulation of negative emotionality. They found that more responsive mothers had infants who cried more frequently (Hubbard & Van Ijzendoorn, 1991; Van Ijzendoorn & Hubbard, 2000).

Finally, there also is evidence that maternal soothing may have little or no effect on infant responses. If so, cultural variations in maternal models, if they affect temperament preferences, soothing, or maternal responsiveness, should not be related to infant responses. Barr (1989) found that maternal soothing reduced the length of crying episodes but not their frequency (Hunziker & Barr, 1986). Lewis and Ramsay (1999a, 1999b) could not find any evidence that maternal soothing was effective in reducing infant's cortisol or behavioral responses to immunizations in babies from 2 to 6 months.

In brief, although cultures, families and infants clearly vary in responses to pain and distress, the relationships are not at all clear in the literature and have not been demonstrated. Our main hypothesis is that variations in cultural ecology and parental response will *mediate* variations in infant stress reactivity as currently measured in the field. To explore this question, we examined features of everyday life that we thought would potentially impact infant stress reactivity, such as how parents respond to distress, the availability of caregivers, and the resources families have for support. We assessed the family cultural ecology of infant care using the Ecocultural Family Interview (EFI; Weisner, Coots, & Bernheimer, 1997), a conversational and thematically focused interview with parents. From our analysis of the rich interview materials from the EFI, we identified key dimensions of Italian family ecology relevant to infancy, including family connectedness, workload and help from extended family, amount of parental time for the baby, activity focused specifically on infant care, and infant care patterns. To assess infant stress reactivity, we observed infant behavior during routine vaccinations at 5 and 12 months. We used the observational scoring system developed by Lewis and Ramsay (1995a, 1995b, 1999a) to measure infant stress reactivity and maternal behavior after painful pediatric procedures.

Our major expectation was that variations in our ecocultural variables would be systematically associated with both infant stress reactivity and maternal soothing of infants during and after the vaccination procedures. Assessment of effects during the procedure involved comparing parental family ecology and infant care to baby and maternal responses during the vaccinations themselves. Assessment of effects after the procedures involves comparing infant stress reactivity and maternal responses during vaccinations, with subsequent family measures and later vaccination episodes. We expected that these behaviors at 5 months would be associated with family cultural ecology and caretaking patterns of infants at home at 8 months and that both 5 months stress measures and 8 months home measures would in turn predict infant

and mother behaviors observed at 12 months at the second vaccination. Our view is that maternal and infant behaviors during stress situations are, in addition to endogenously-influenced variations, shaped by family variations in culturally-patterned responses.

2. Method

2.1. Participants and procedures

Participants in the study were 30 Italian infants (15 boys, 15 girls) and their mothers. The infants were observed during routine immunizations at the age of 5 months ($N = 30$) and 12 months ($N = 22$) in one of the Mother–Child Health Clinics in Padova, Italy. All infants were observed between 8.30 and 10.30 a.m. in the morning. The mothers were observed during immunization and were later interviewed at home when the babies were a mean age of 8 months ($N = 30$). Mothers and infants behaviors during the immunization procedures were video-recorded. All infants were in good health at the time of inoculations. The mothers belonged to middle class families and their families belonged to the community surrounding the clinic. Informed consent was obtained from the mothers prior to the study when they were recruited by the nurse of the clinic. Care was taken to recruit full-term infants who were not too hungry, sleepy, tired or otherwise distressed during the pediatric routine. The procedure of immunization was the same for all infants and was carried out by the same two nurses. The infant was put on the table and undressed. Mother and nurse played with the infant to quiet him or her down. Then, the infant was first given an oral vaccine and after 1 min one shot on the left-upper leg and one shot on the upper-right leg. The mother was free to move around the table, to get close to the baby, to touch, cuddle and comfort it—or not—during the whole procedure. Infant and maternal behavior during vaccination was tape-recorded and later coded. Interviews with mothers were tape-recorded and later transcribed.

2.2. Scoring of observational data

2.2.1. Infant reactivity during vaccinations: scoring

Infants' behavior was coded in 5-s intervals during the 90 s following the second shot. The scoring system is the one adopted by Lewis and Ramsay (1995a, 1995b, 1999a). The infant's peak facial expression is coded on a 0–3 scale: 3—Full distress (brows, cheeks and mouth involved); 2—Partial distress (affective expression involving any two of the above areas); 1—Mild distress (only one area involved); 0—No distress. Peak vocal expression is coded on a 0–3 scale: 3—Full cry (for continuous cry); 2—Fussy cry (for cry that dampens during the interval); 1—Minimal cry (for discrete sobs or squeaks); 0—No cry.

Facial and vocal scores were highly correlated in the Lewis's studies as well as in the Italian sample ($r = .99$), so the two scores were combined into a single Affect Score, ranging from 0 to 6. A *Behavioral Quieting* measure was also derived from the Affect Score. The score ranges from 0 to -1, representing the slope of the successive Affective Scores after vaccination. This is a measure of infant speed of regulation of initial reactivity. The rationale for selecting this measure is that it gives the best representation of individual differences in infant regulation of

distress and has been successfully used in previous work on maternal effects on infant reactivity following inoculation (Lewis & Ramsay, 1999a). Two independent observers coded the tapes. The overall inter-coder reliability was 85%.

2.2.2. Maternal soothing during vaccinations: scoring

Maternal behavior was coded in 3-s intervals during the 90 s following the second shot according to the checklist of 20 maternal behaviors proposed by Lewis and Ramsay (1999b). For the purposes of this study, an Intimate Soothing index was derived from the following six items: hugging, rocking, kissing, face-to-face contact, frontal–frontal contact, and empathic sounds (e.g., "mmh", "aww"). Intimate Soothing captures close mother–infant proximity, maternal warmth and empathy. The index can be considered a relevant behavioral instantiation of the widespread Italian cultural model encouraging "emotional closeness" between parent and child which we identified in previous cross-cultural research (Axia, 1999; Harkness et al., 2001). Two independent observers coded the tapes. The overall inter-coder reliability was 83%.

2.2.3. Scoring of interview data

In this study, we use the EFI (Weisner, 1984, 1997) to explore some of the complex dimensions of Italian family life that might be influencing maternal and child behaviors. The EFI is a parent interview about the daily routine of family life, and the salient concerns regarding how that routine is organized with regard to the infant. It can be used to assess shared patterns as well as individual differences in a community. The interview used for the present study has a special focus on the baby-care related family routines, on infant crying episodes, and maternal activities during everyday life (Axia & Weisner, 2000). The interview technique is a guided conversation which leads the participants to describe and narrate their routine behaviors and habits during their everyday life. "Walk me through your day with your baby." "Tell me about your daily life now that you have your baby." We were interested in learning about the typical organization of the families with babies in our Italian community. To that aim mothers narrated their everyday lives with the babies and described several episodes or "vignettes" relative to them. We focussed our participant's attention, among other things, on episodes of baby cry, fussing or other manifestations of pain, illness or distress.

In addition to the qualitative data from interviews and fieldnotes, fieldworkers also rated the salience and importance of 18 items important in parents' lives. Each item evaluates how much a given issue is present or absent in the daily routines of the parents and the baby. The scores range from 0 to 8. A score of 0 indicates that the variable is not present, 1 only minimally present, up to 8 which indicates a very strong presence of the item in question. All the items devised for this study are constructed so that a score of 0 represents the negative condition whereas a score of 8 represents the positive one. For example, a score of 0 or 1 in everyday paternal time for baby means that the father hardly ever spends some time with his baby while a score of 7 or 8 means a high amount of paternal time for baby (for example, all the afternoons and the week-ends). Two independent judges coded the 30 interviews along the 18 items; their agreement was 93.9%. Through blending qualitative understanding of Italian parent–infant life, with reliable ratings about variations within the sample and the strength of the various dimensions of their cultural ecology, we could relate infant distress measures to the infant ecocultural niche measures.

From the 18 items (see Appendix A), we derived a Home Cultural Ecology factor which describes the overall characteristics and ecology of daily life, how much the family is organized around the baby, the quantity and distribution of domestic workload, the amount of help and support from relatives, pediatricians and friends, and the degree of parental closeness. Several items focus on how much the mother is helped and supported in her relation with the baby during her daily life. The α value is .73, showing that all these aspects as measured here relate meaningfully to each other. The mean is 4.73 (SD = .81).

3. Results

The results of this section are reported in the following order: (a) age differences in infant distress and maternal soothing after vaccination; (b) correlations between EFI Infant Home Cultural Ecology factor, infant stress reactivity and Maternal Soothing at 5 and 12 months; (c) predictive value of Home Cultural Ecology.

3.1. Age differences in infant distress and maternal soothing after vaccination

The *t*-tests for repeated measures were carried out on the scores for behavioral quieting and for maternal soothing in the longitudinal sample. The results reported in Table 1 show that infants quiet faster at 12 months than at 5 months, and that mothers do more Intimate Soothing at 12 months than at 5 months.

The *t*-tests for gender did not reveal any significant difference. No stability in infant measures between 5 and 12 months was found for Infant Quieting ($r = .14$) nor for Maternal Soothing ($r = .06$). A statistically significant positive concurrent relation between Infant Quieting and Maternal Soothing was found at 5 months ($r = .53$, $p = .004$) but not at 12 months ($r = -.29$). More Maternal Soothing at 5 months predicts longer quieting at 12 months ($r = .37$, $p < .05$).

3.2. Correlations between EFI Infant Home Cultural Ecology, infant distress and Maternal Soothing at 5 and 12 months

The EFI Home Cultural Ecology factor was correlated with both Maternal Soothing and Infant Quieting at the two age levels. The results show that the level of infant distress observed at vaccination at 5 months ($N = 30$) predicts Home Cultural Ecology at 8 months ($r = -.36$, $p < .05$). Maternal Soothing during the 5-month vaccination ($N = 30$) does not significantly predict Home Cultural Ecology later on in development ($r = .21$, ns), although the trend is in

Table 1
Mean age differences in Infant Quieting and Maternal Soothing (SD in brackets)

Infant and maternal behavior during vaccination	5 months	12 months	*t*-value	df	*p*
Infant behavioral quieting[a]	−.68 (.31)	−.85 (.10)	2.4	21	.025
Maternal intimate soothing	2.35 (2.36)	5.04 (3.4)	3.32	21	.003

[a]Behavioral Quieting is indexed by a score ranging from 0 (No quieting) to −1 (Faster quieting).

the positive direction. But Home Cultural Ecology assessed at 8 months predicts both Infant Quieting ($N = 22$; $r = -.44$, $p < .02$) and maternal intimacy ($N = 22$; $r = .56$, $p < .01$) after vaccination at 12 months. In brief, infants who quiet faster at 5 months have a daily life at 8 months with higher support and closer maternal–child contact, which, in turn, predicts faster quieting at 12 months. (Note that the infant behavioral quieting measure has negative scores, hence correlations are negative.)

3.3. *Predictive value of Home Cultural Ecology*

Is there a role for ecocultural home circumstances in the development of stress regulation after vaccination? Even with our small sample we were able to search for patterns of mediation between infant distress and home circumstances, since we have a longitudinal design. A linear step-wise regression analysis of Infant Quieting at 5 months, Maternal Soothing at 5 and at 12 months, and Home Cultural Ecology as independent variables predicting Infant Quieting at 12 months as the dependent variable showed that Infant Quieting at 12 months was predicted only by Home Cultural Ecology ($R^2 = .21$; $\beta = -.45$, $t(20\,\text{df}) = 2.22$, $p < .05$). The same pattern was found for Maternal Soothing at 12 months: a linear step-wise regression analysis of Infant Quieting at 5 and 12 months, Maternal Soothing at 5 months, and Home Cultural Ecology as independent variables predicting Maternal Soothing at 12 months as the dependent variable showed that Maternal Soothing at 12 months was predicted only by Home Cultural Ecology ($R^2 = .37$; $\beta = .60$, $t(20\,\text{df}) = 3.31$, $p < .01$).

From the above results, we could expect that ecocultural features might either change the level of distress between 5 and 12 months (e.g., a baby might go from more to less distress if the ecocultural climate is favorable), or the ecocultural circumstances might maintain the level of distress across time periods (e.g., higher distress babies stay high if the ecocultural climate favors more distress) or both. Whereas no stability in infant behavior was found between 5 and 12 months using simple correlations (absent the home cultural ecological data), predictive relations *are* found when we add in the ecocultural circumstances of the family. Pulling all our results together, the associations may be summarized as follows: Infant Quieting (5 months) → ecocultural routines with closer focus on infant and more support at 8 months → infant quieting (12 months).

If it is true that ecocultural circumstances shape infant reactivity, we would expect the following patterns to be more common between 5 and 12 months. Among the infants who quiet *faster at both ages*, ecocultural climates in their homes should show *more* support, closer mother–child contact, etc. Among infants who quiet *slowly at both ages*, ecocultural climates in their homes should have relatively *less* support, etc. Among the babies who quiet relatively fast at 5 months yet *quiet more slowly* at 12 months, the ecocultural circumstances should have relatively less support shown in the home data from 8 months, since less support would make the infant quiet more slowly. And among babies who quiet slowly at 5 months and *faster* at 12 months, the ecocultural climates in their homes should show greater support, etc., since more support would make the infant quiet more rapidly.

The same line of reasoning and the same expectations can be put forward for maternal soothing patterns observed during the vaccination sessions. When mothers soothed more at both 5 and 12 months, ecocultural climates in their homes should be more positive; when

Table 2
Relationships of longitudinal patterns of Infant Quieting and Home Cultural Ecology (HCE)

Pattern of Infant Quieting	HCE above the median	HCE below the median
Faster quieters at both 5 and 12 months	4 (H_1)	–
Slower quieters at both 5 and 12 months	–	4 (H_1)
Slower quieters at 5 months and faster quieters at 12 months	3 (H_1)	3
Faster quieters at 5 months and slower quieters at 12 months	1	1 (H_1)

$N = 16$, as six subjects were right at the median.

Table 3
Relationships of longitudinal patterns of Maternal Soothing and Home Cultural Ecology (HCE)

Pattern of Maternal Soothing	HCE above the median	HCE below the median
Higher soothers at 5 and 12 months	3 (H_1)	1
Lower soothers at 5 and 12 months	2	4 (H_1)
Lower soothers at 5 months and higher soothers at 12 months	4 (H_1)	2
Higher soothers at 5 months and lower soothers at 12 months	–	4 (H_1)

$N = 20$, as two subjects were in the median.

mothers soothed relatively less at both ages, ecocultural climates in their homes should be less supportive; when mothers soothed more at 5 months and less at 12 months, ecocultural climates in their homes should be less supportive; when mothers soothe less at 5 months and more at 12 months, ecocultural climates in their homes should be more supportive.

All the above patterns would confirm our hypothesis (H_1) that there is a mediating function of home ecocultural circumstances in infant stress reactivity. All the other alternatives would not confirm our hypothesis (H_0).

We computed the median for all our variables: Home Cultural Ecology (4.94), Infant Quieting at 5 (−.72) and 12 (−.87) months, Maternal Soothing at 5 (1.75) and 12 (4.5) months. We then compared these scores according to whether infant/family context was categorized as high (above the median) or low (below the median). Tables 2 and 3 report the results. In brief, for Infant Quieting, 12 subjects (75%) confirm our predictive hypothesis and only 4 (25%) do not. For Maternal Soothing, 15 subjects (75%) confirm our predictive hypothesis and only 5 do not. This distribution of babies and mothers, though of course based on a relatively small sample size, is statistically significant by a binomial test: infant stress reactivity comparison $p < .05$; mother soothing comparison, $p < .01$.

4. Discussion

The main results of this study are three. The first is that there is an age difference in infant speed of quieting from 5 to 12 months as measured by Lewis and Ramsay's technique (Lewis & Ramsay, 1999a), showing that this measure is able to capture differences in regulation of distress across all the first year of life. Five-month-olds take more time to regulate distress than 12-month-olds, but no stability in individual patterns of Infant Quieting was found. It is

apparent that age is a powerful factor in the development of infant distress regulation, but it is also apparent that age does not explain the individual pathways of development. Our further results may cast more light on this point.

The second set of results is related to maternal soothing of infant distress. Only maternal behavior at 5 months is both concurrently and predictively associated with infant speed of quieting. Italian mothers also are more active during vaccination when their babies are 12 months old than when they are 5 months old. Mothers who show a higher degree of intimacy at 5 months have infants who take more time to quiet down at both ages. As already reported in the literature (Cassidy, 1994; Hubbard & Van Ijzendoorn, 1991; Sweet & McGrath, 1998; Van Ijzendoorn & Hubbard, 2000), children of highly responsive and intimate mothers are more open in their expressions of distress whereas children of less empathetic and warm mothers express less distress. It is not possible to compare directly results from studies adopting such different methods and perspectives. However, our results seem to confirm that high maternal responsivity favors less inhibited negative reactivity. More responsive mothers seem to have infants who take more time to regulate distress. It is possible that protracted intimacy after cry bouts may be one of the ways in which Italian mothers foster "vivacità" in their babies. The fact that amount and type of maternal responsivity changes during the first year of life, as we also observed here, might also suggest that when babies are older, and in mothers' eyes more likely to respond to their activity, increase it. Further longitudinal research should better assess the relationships between cultural styles of maternal responses to baby cry at different age levels, infant temperamental reactivity and development of self-regulation. In particular, it would be useful to identify culture sensitive operational descriptions of maternal responsivity, since what it means to be "responsive" varies in cultures around the world, as well as across families within a cultural community.

In our study, we could account for the development of distress regulation between 5 and 12 months as associated with age changes and the effect of earlier maternal responsivity on later distress regulation. However, recall that we found no stability in infant nor in maternal behavior between 5 and 12 months, and found that individual differences in infant speed of quieting at 12 months cannot be explained by concurrent Maternal Soothing at 12 months (although there was an association at 5 months). Why is this?

Our third set of results regarding Home Cultural Ecology may provide one interpretation. We found that the best predictor of infant regulation of distress at 12 months is Home Cultural Ecology. If the family daily activities accommodate more to the infant's routine, babies take less time to quiet after vaccinations. Regulation in the infant is associated with the degree to which the family organizes the schedule of their daily routines around the baby's needs, there are supports for the family, and the degree to which parents harmoniously understand and empathize with their babies. As Lewis and Ramsay (1999b) pointed out, maternal activity may create expectancies in the baby's mind reflected in infant as well as mother responses in the immunization situation. Are such "expectancies" already in the babies' minds by 12 months, at least as expectations about what will happen to them when they feel distress and pain? We don't know for sure, lacking such a window into the infants' minds, but judging by their responses to the vaccination situations, there is at least some patterned variation in responses there. Of course the observers of the immunization session were completely uncontaminated by the knowledge of ecocultural data, and the vaccination data and EFI data come from quite different levels of analysis (fine-grained behavioral observations using standard codes in the

pediatric situation; home ecocultural levels of analysis for home ecocultural context) as well as very different kinds of methods. These were independent assessments, so any expectancies in mother or infant were not changing the infant evaluation data.

Our qualitative analysis showed that the ecology of home daily life re-orients individual infant patterns of change between our two age-points in 75% of cases. More reactive babies at 5 months tend to "produce" less sensitive everyday ecologies at 8 months. The babies who are then met with relatively more sensitive ecologies develop more regulatory abilities. The babies who are met with a relatively less sensitive ecology remain slow in quieting up to 12 months. Family cultural ecology was the best predictor for higher responsivity and intimate Maternal Soothing at 12 months. Our main conclusion is that the development of infant regulation of distress can be understood only if we take into account home everyday life and culture, and that intracultural variations across a shared Italian way of organizing the Home Cultural Ecology does impact responses to vaccinations. Our interpretation is strengthened by similar findings in the literature. For example, St. James-Roberts, Conroy, and Wilsher (1998) found that between 6 weeks and 15 months, amount of cry and fussing is not a stable characteristic and that maternal and family variables mediated the development of infant negative behavior. Barr and Gunnar (2000) also argued that infant early colicky behavior may be better accounted for by maternal "transient responsivity" than by more endogenous infant temperamental dispositions.

The present study is exploratory and certainly has limits to its interpretation. For example, endogenous temperamental differences among the babies could also influence both family environments and caretakers. We actually rated all 30 infants' temperament. However, all but three were rated as easy (low reactivity, low intensity, high soothability, low overall difficulty). The overall easy temperament of our infants means that temperament of infants was not a likely influence on our present findings, but it also means that the range of temperamental differences is too small to examine interactions of temperament, infant stress and Home Cultural Ecology relationships in our sample. Future research should better assess this point.

We found reliable and patterned connections between the development of infant reactivity to pain, maternal soothing and ecocultural variables of family daily life. The family cultural context is thus brought in to the clinical setting by parents and infants in the ways they differentially responded to the identical vaccination procedure (brought in, therefore, both behaviorally and in cultural models among mothers), and implicitly guides parents' and infants actions. This is an ecocultural line of studies of infancy and parenting which is worth further investment and attention for its potential theoretical and clinical relevance.

Appendix A. Items composing the Home Cultural Ecology factor

1. Family arranges family time or schedule around the baby (mean, 3.27; SD, 2.33).
2. Level of family activity focussed on sustaining and arranging baby care (mean 4.07; SD, 2.36).
3. Information recently received by professionals regarding baby (mean, 4; SD, 2.36).
4. Family activity to access information about baby care (mean, 2.93; SD, 1.69).
5. Conversations with friends and neighbors about baby care (mean, 3.37; SD, 1.69).

6. Ease in maternal organization of the family workload and schedule (mean, 4.37; SD, 2.20).
7. Amount of help for domestic workload that mothers receive from non-relatives or relatives living outside the home (mean, 2.23; SD, 2.67).
8. Amount of help from the extended family to sustain family routine, including baby care (mean, 3.83; SD, 2.55).
9. Amount and use of resources to organize and keep the family daily routine going (mean, 5.67; SD, 1.52).
10. Family connectedness and closeness (mean, 6.67; SD, 1.03).
11. Time availability of father for baby (mean, 5.10; SD, 1.92.).
12. Time availability of mother for baby (mean, 7.00; SD, 1.52).
13. How much the baby affects maternal work arrangements and career decision (mean, 3.70; SD, 2.60).
14. Parental agreement about baby care (mean, 6.01; SD, 1.56).
15. Maternal feelings about support (mean, 5.6; SD, 1.9).
16. Emotional support provided to mothers (mean, 5.5; SD, 1.63).
17. Meaningfulness of daily routine (mean, 6.0; SD, 1.35).
18. Congruence between the family daily routine and the needs of baby (mean, 5.87; SD, 1.17).

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