

Co-constructing mother–infant distress in face-to-face interactions: Contributions of microanalysis¹

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Abstract

We describe a range of interactions of maternal intrusion and infant avoidance, based on microanalysis of videotaped face-to-face play between mothers and 4-month infants. After a brief review of our theory of interaction, and approach to microanalysis, we describe the following interaction patterns: facial mirroring, chase and dodge, chase and dodge in a mother–infant treatment case, vocal rhythm coordination, mutually escalating over-arousal, oral teasing and the disturbance of infant self-regulation, and pulling the child into the parent's agenda.

Keywords: *Mother–infant therapy, video feedback, microanalysis*

Introduction

This paper will describe a series of videotapes of face-to-face play, illustrating a complex and varied range of interactions of maternal intrusion and infant avoidance, based on microanalyses of face-to-face play at three to four months. In one sense infant aversion and withdrawal are completely usual and adaptive coping capacities. From time to time all infants look away and turn their heads and bodies away in order to regulate arousal back down to a comfortable range. On the other hand, more extreme forms of infant aversion and withdrawal can be observed, particularly in relation to maternal over-stimulation and intrusion. Although these patterns are of great importance in the origins of early psychopathology, there are many other potential pictures of early mother–infant difficulty, such as maternal ‘absence of provision’ and infant withdrawal, or complex forms of approach and withdrawal in both partners (Beebe 2002, 2003), which lie outside the scope of this discussion. These distressed mother–infant interactions must be viewed within a mutual regulation model of interaction, in which both partners contribute moment-by-moment to the exchange, although not

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necessarily equally or symmetrically (see Tronick 1989, Beebe *et al.* 1992, Beebe and Lachmann 2002).

Theory of interaction

A theory of interaction requires an understanding of how each partner is affected by his own behaviour, 'self-regulation', as well as how each partner is affected by the behaviour of the other, interactive regulation (Thomas and Malone 1979, Tronick, 1989). Mutual regulation, mutual influence, or co-construction are all terms with a similar meaning that have been used to describe how interactions work. Alan Fogel (1992) has a beautiful description of interactive regulation, which he terms 'co-regulation': all behaviour is unfolding in the individual while simultaneously modifying and being modified by the changing behaviour of the partner.

Every dyad, such as mother and infant, or analyst and patient, participates in a moment-to-moment interactive regulation process at the nonverbal level. This is not a causal process but a predictive one: each person's behaviour can be predicted from that of the other. The behavioural process of one partner (e.g. rhythm, facial expression, or vocal intonation) can be predicted from that of the other partner and vice versa. These processes occur largely out of an adult's awareness. At the same time, each is affected by his/her own behaviour (self-regulation). This is the fundamental nature of face-to-face social behaviour across the lifespan (Jaffe and Feldstein 1970, Feldstein and Welkowitz 1978, Badalamenti and Langs 1992, Fogel 1993, Warner 1998). Therefore we conceptualize maternal intrusion and infant withdrawal as a co-constructed process between the mother and the infant. This emphasis on the contribution of both partners to the organization of the exchange avoids the temptation to locate the source of difficulty in only one partner or the other, for example, in maternal intrusiveness or in infant temperament difficulty. However, this reciprocal nature of the interactive process does not imply that both partners affect each other in equal, symmetrical, or even similar ways (Beebe and Lachmann 2002). The mother (caretaker) has the greater range, flexibility, and capacity. Nevertheless the infant plays an important role, with powerful capacities to seek and avoid engagement.

Mother and infant co-construct their interactions in two different ways. In a more general way, the mother brings transferences to the baby based on her own history, and the baby often brings self-regulation difficulties, such as difficulties in regulation of arousal, or unusual sensitivities to sound or texture, often referred to as difficult temperaments. So each partner may contribute to an aversive interaction in this way. Secondly each contributes within the dyadic exchange in the sense that, moment-to-moment, both partners adjust their behaviours to the other. They adjust timing (rhythm, pausing, turn-taking), spatial pattern (approach-avoid), facial and vocal affect, and arousal (behavioural activation/inhibition as well as physiological arousal), which constitute the basic dimensions of the system.

The self-regulation dimension of these interactions can be illustrated by an experiment of Field (1981). Field monitored infant heart rate just before, and just after the infant looked away from mother, while mother and infant were playing face-to-face. In the five seconds before the baby turns away from the mother, infant heart rate shoots up from baseline, a pattern indicating decreasing ability to process information. As soon as it looks away, the baby's heart rate shoots back down to baseline, information processing is facilitated, and soon afterward it looks back at the mother.

In many of the films described below, just at the point that the baby is attempting to regulate arousal down, the mother has difficulty tolerating the baby's moment of

separation, the moment of looking away. She will try to up the ante and call the baby, possibly pull the hand, or even gently try to force the infant's head back toward her. She is escalating the stimulation at the very point the baby needs to decrease stimulation and arousal. This is a critical moment of conflict in mother–infant interactions and it is prevalent in many of these films. The baby's goal is to regulate its arousal within comfortable limits. Looking away is a frequent and adaptive means of regulating arousal. If the partner does not interfere with it, the moment of looking away is brief and the baby comes right back.

Another study of difficulties in infant self-regulation is that of Koulomzin *et al.* (2002). This study distinguished secure versus avoidant attachment patterns (Ainsworth separation–reunion paradigm) at 12 months from four-month *infant* behaviour during face-to-face interaction with mother. At four months, the infants who will later be classified as avoidant look at the mother less. Only when they are self-soothing by fingering their clothing or a strap are they able to sustain gazing at mother that is equivalent to that of the secure infant.

Our model of interaction proposes that we are always attempting to regulate what goes on inside us, self-regulation, in relation to what is going on in the interactive process, interactive regulation. Self-regulation has many dimensions. The infant's capacity to self-soothe is an essential aspect, but the term covers the capacity to regulate arousal through all the states of sleep and wake, as well as the ongoing predictability of the infant's behaviour. Louis Sander (1977, 1995) has argued that the nature of self-regulation in infancy sets a trajectory for its lifespan development, although this trajectory may certainly transform. What is at stake in the self-regulation process is access to inner state. Sander poses these questions: as development proceeds, what kind of awareness do we have of our inner state? What capacity to articulate our inner state? What regard for our inner state? What ability to use our inner state to organize what we do next? Self-regulation and interactive regulation are always going on together, each affecting the success of the other (see also Gianino and Tronick 1988, Tronick 1989).

Infant pre-symbolic intelligence

What kind of intelligence are infants capable of? How might infants represent these interactions? Infants have a remarkable intelligence, but it is *pre-symbolic* or *procedural*, organized through action-sequences (Beebe and Lachmann 1988, 1994, Beebe *et al.* 1997). They perceive events in time and space, and facial and vocal affect; they sense their own arousal at every moment. Infants have an early sense of agency: they can predict that certain of their behaviours are followed by certain consequences in the environment, leading to a primitive sense of causality that 'this' leads to 'that'. They have an extraordinary early memory, far better than we ever imagined (Perris *et al.* 1990).

From birth and even in the uterus infants perceive durations of events and temporal sequences (DeCasper and Carstens 1980). By the time infants are three to four months, when most of this research is conducted, infants perceive the existence and magnitude of contingencies and can anticipate when events will occur (Watson 1985, Haith *et al.* 1988, Jaffe *et al.* 2001). These capacities enable the infant to anticipate how each partner changes predictably in relation to the other's changes, organizing 'expectancies' of 'how I affect you', and 'how you affect me'. These infant capacities for the perception of sequence, contingency detection, and the anticipation of events underlie the generation of procedural, pre-symbolic representations of interactive sequences (Beebe and Stern 1977, Stern 1985, Tronick 1989, Beebe *et al.* 1997, Gergeley and Watson 1997). Thus moment-to-moment,

infants anticipate the sequences between their own actions and those of their partner: in time (rhythm, pausing, tempo), in space (intrusion, approach–avoid), in affect (facial and vocal), and their own proprioception and arousal. Eventually toward the end of the first year, infants begin to be able to represent in a more symbolic form. A symbol (here, a word) has an arbitrary relationship to its referent. Symbolic capacity is not consolidated until 36 months.

The study of face-to-face play

For over three decades, researchers have studied mother–infant face-to-face play in the laboratory. Mother and infant (in an infant seat) are seated in the same plane, with two cameras on the face and upper body of each partner. The cameras are synchronized into one split-screen view. The mother is instructed to ‘play with your infant as you would at home’, and the two are left alone to interact. Until nine to twelve months, we do not provide toys.

The use of video microanalysis and ‘video feedback’ as part of parent–infant psychotherapy still constitutes a new approach to mother–infant treatment, despite the fact that Stern (1995), Cramer and Stern (1988), Tutors (1991), McDonough (1993), and Downing (2001) among others, have been using variations of this technique for over a decade (for current work see for example van den Boom 1995, Malphurs *et al.* 1996, Bakermans-Kranenburg *et al.* 1998, Hofacker and Papousek 1998, Marvin *et al.* 2002).

Video feedback is introduced to the parent as a way of learning about the infant’s ‘nonverbal language’, and of becoming aware of the ways the parent may respond. Video feedback is a remarkable clinical tool in the hands of an experienced ‘baby watcher’ who is also a sensitive clinician. A videotape played in slowed time, or frame-by-frame, acts like a ‘social microscope’, revealing subtleties and subliminal details of interactions which are too rapid and complex to grasp with the naked eye in ongoing time. It is difficult for anyone to be aware of his or her nonverbal behaviour. If the video feedback is handled with great care to protect the parent’s self-esteem, it helps the parent to *see how* both infant and parent affect each other, moment-by-moment. Video feedback provides an opportunity for the parent to process and reflect on the difficult moments in the interaction, as well as the successful ones (Fonagy *et al.* 2002).

Microanalysis teaches us to observe

Video microanalysis can teach us to observe the subtle, fleeting details of the mother–infant action language. The interactions we study are extremely rapid, with individual behaviours lasting on average 1/4 to 1/3 of a second; lag times between the onset of one individual’s behaviour and the onset of the partner’s behaviour are generally within 1/2 second (Stern 1971, Beebe 1982, Cohn and Beebe 1990). Thus many aspects of these interactions occur out of awareness, often subliminally; they are ‘non-conscious’, rather than dynamically ‘unconscious’ (see Lyons-Ruth 1998), although the parent has many dynamically unconscious motivations as well. The infant’s repertoire during a face-to-face exchange is complex. There is a remarkable range of behaviours at the infant’s disposal to initiate, maintain, disrupt, or avoid a face-to-face encounter (Stern 1971, 1985).

Gaze. We begin by observing gaze. Mothers tend to look at the infant’s face most of the time, and it is the infant who typically engages in a look–look-away cycle, looking at mother’s face for a period of time, looking away, and then looking back (Stern 1971, 1974).

As ethologists note, looking into the face of a partner can be very stimulating; most animals do not sustain long periods of such looking unless they are about to fight or make love (Eibl-Eibesfeldt 1970, Chance and Larsen 1996). Field (1981) verified that infants organize their look–look-away cycle to regulate degree of arousal. She monitored infant heart rate during face-to-face play and showed that the moment that the infant looks away is preceded by a burst of arousal in the previous five seconds; following the infant's gaze aversion, heart rate decreases back down to baseline within the next five seconds, and then the infant returns to gazing at mother's face. Thus infant gaze aversion is an important aspect of infant self-regulation. Brazelton *et al.* (1974) first showed that mothers typically pace the amount of stimulation according to this gaze cycle, stimulating more as the infant looks, and decreasing stimulation as the infant looks away. Although these are typical patterns, we have also noted a pattern of mutual 'eye love' (Beebe 1973, Beebe and Stern 1977) in which mothers and infants can sustain prolonged mutual gaze for up to 100 seconds during periods of positive affect. These are the moments, of course, that every parent loves.

Maternal difficulty in tolerating momentary infant gaze aversion is one of the most common pictures observed in mothers and infants who present for treatment. If the mother feels that her infant does not like her or is not interested in her, she may pursue the infant, increasing rather than decreasing the amount of stimulation. In her pursuit or 'chase' mother may call the infant's name, pull the infant's hand, or in rare instances actually attempt to force the infant's head to get the infant to look. Maternal 'chase' behaviour is counter-productive; the infant then requires more time to regulate arousal down sufficiently to return to gazing at mother. Instead, if the mother can be helped to give the baby a 'time-out' to re-regulate, 'cooling it' when the infant looks away, trusting her infant to return to her, the infant will rapidly re-engage.

Head orientation. We next observe infant head orientation to the mother: is the head oriented vis-à-vis, or displaced in the horizontal plane approximately 30, 60, or 90 degrees away? In the 90-degree aversion, first described by Stern (1971), the infant's head is tucked into the chin, which takes considerable energy. Are head aversion movements in the horizontal plane complicated by oblique angles of the head down (or up) as well? These increasing degrees of head aversion are described by ethologists as degrees of severity of 'cut-off' acts (Chance 1962, McGrew 1972). They are 'read' by the partner as active initiations of disengagement. As the infant turns away up to about 60 degrees, it can still monitor the mother with its peripheral vision (tracking presence, direction, and intensity of movement); by 90 degrees away, or arching, however, it may lose peripheral visual monitoring of its movements. More usual gaze aversions retain head orientation within an approximately 30-degree angle from the vis-à-vis, retaining access to rapid visual re-engagement with minimal effort.

In relation to the maternal 'chase' behaviours above, the infant may 'dodge' with increasing degrees of head aversion, as well as arching back, freezing (described by Fraiberg 1982), or going limp and giving up tonus. Beebe and Stern (1977) described split-second sequences of 'chase and dodge' in which maternal chase movements predicted infant dodges, as the infant monitored her every movement through peripheral vision; but infant dodges also predicted maternal chase behaviours, a reciprocal, bi-lateral interactive regulation. Through increasing head aversions, arching, or going limp, this infant had a remarkable 'veto power' over the possibility of a sustained, mutual gaze encounter.

Face. If mother and infant together manage the infant's look–look-away cycle so that the infant can comfortably regulate arousal, periods of sustained mutual gaze with infant

vis-à-vis orientation can be enjoyed. During these periods, facial and vocal communication takes centre stage. By three to four months there is a flowering of the infant's social capacity. Although the innervation of the facial musculature is myelinated before the infant is born, the full display of facial expression emerges only gradually from two to four months.

The infant's opening and closing of the mouth is a powerful and continuous form of communication. Even without any hint of widening or smiling, a fully opened mouth ('neutral gape') is highly evocative (Beebe 1973, Bennett 1976). A fully widened smile by itself, with closed lips, is only moderately positive. As increasing degrees of mouth opening are added to a smile, positive affect increases up and up into the fully opened 'gape smile', hugely exciting for both partners. Mothers intuitively *roughly* match the infant's increments, so that both build to a peak of positive facial excitement. Often both partners excitedly vocalize at such moments, further increasing the intensity (see Beebe 1973, Stern 1985, Tronick 1989, Beebe and Lachmann 2002). In general, mothers and infants tend to match the direction of the other's positive-to-negative affective change, increasing and decreasing together (Beebe *et al.* 2006). Rarely is there an exact match of expression. Elaboration (Fogel 1993), echo or complementing (Trevarthen 1977) are better metaphors than matching or imitation (Stern 1985). Instead of the more romanticized notion that mothers and infants exactly match, or are in exact 'synch', Tronick and Cohn (1989) have shown that a more flexible process of match, mismatch, and re-match (disruption and repair) characterizes the exchange. Furthermore, a greater likelihood of rapid re-match (within two seconds) predicts secure attachment at one year. It is unusual for mothers to display no facial matching at all, particularly when infants are distressed. Malatesta *et al.* (1989) showed that unusual responses such as maternal joy or surprise to infant anger or sadness predict toddler preoccupation with attempts to dampen negative affect (compressed lips, frowning, sadness). We construe these patterns as 'failures of facial empathy'.

Vocalization. A key feature of the vocal exchange is a turn-taking structure. Both partners contribute to turn-taking by matching the brief 'switching pause' as turns are exchanged. Mothers contribute by slowing their speech rhythms, providing a great deal of repetition, and matching the intonation of the infant's sounds. Vocal contours refer to the 'shape' of the sound. Across cultures, a sinusoidal shape indicates approval and a rightward falling shape disapproval (Fernald 1993). Mothers also optimally pause sufficiently to give the infant a turn. Mothers who prattle continuously do not permit this; on the other hand, mothers who are silent partners can disturb the development of vocal turn-taking, an essential building block of language. When infants present for treatment with difficulty in sustaining mutual gaze and the face-to-face encounter, matching the infant's vocal contours and rhythms can be an effective way to make contact with the infant. Because the infant does not have to orient or to look, approximately matching the infant's rhythms (vocal or motoric) is a non-intrusive way of helping the infant feel sensed: someone is on his 'wavelength'.

Introduction to the film vignettes

It is essential to place maternal intrusion and infant withdrawal within a broad range of early interactions, from positive ones, to disruptions and their repair (Tronick 1989, Beebe and Lachmann 1994), to derailed interactions without repair. Every dyad has access to the entire 'positive-negative' range. Thus the question is not the presence of disruptions, but the balance between disruption and repair. Tronick (1989) (see also Tronick and Cohn 1989) has shown that, in successful mother-infant interactions, there are typical sequences

of match–mismatch–rematch. In Tronick’s data, whenever a pair enters a mismatched state (for example, mother in smile, infant in neutral face), they return to a matched state (for example, both positive face) within two seconds. Tronick calls this ‘interactive repair’. Furthermore, the more likely that mismatches are repaired, the more likely that the infant is securely attached at 12 months.

Many of the films described below show disruption without repair. Even when the balance does tip toward a prevalence of negative interactions without repair, it is important to remember that both the mother and the infant are motivated to attach (as well as having a broad range of other motivations) (Lichtenberg 1989). Even in these very derailed interactions, the mother is often desperate to reach her baby. It is this very desperation that often escalates maternal intrusion–infant withdrawal patterns out of control.

It is important to recognize that ranges of ‘normal’ interactions are more ambiguous than extremes of difficulty, and there is no one optimal mode of interaction. Despite extensive research predicting developmental outcomes from face-to-face interaction patterns, there are no official ‘norms’, and this research is still in progress. All dyads use problematic patterns at some moments, as adaptive modes of coping and defence in the context of specific interactive dilemmas.

Facial mirroring film

In the facial mirroring interactions, we found a significant lack of exact matching of engagement level between mother and infant. Engagement level is measured by degree of orientation to the partner, gaze on–off the partner, and degree of negative to positive facial expression. Instead, the partners are primarily moving in the same affective direction, rising or falling together on the scale. Stern (1985) would call this ‘matching the gradient’, and Werner (1948) would suggest that mother and infant are matching the ‘dynamic-vectorial quality’ of behaviour.

In this film which beautifully illustrates facial mirroring, watching the two faces together, at several moments each rises at the same moment, mouth opening wide, head going up, even though the facial expression is not identical. The mother seems to synchronize these moments with her rhythm of swinging the infants hands in and out. There are brief moments when the infant looks away but rapidly re-engages. The baby looks down, re-regulates its arousal, comes right back to her, and then they both have wonderful, big, open gape smiles. Facial affect ranges from high positive to neutral for the infant, and high to low positive for the mother.

Chase and dodge film

In ‘Chase and dodge’ interactions mother and infant may briefly engage each other but with each engagement the mother ‘looms’ in to the baby as the baby attempts to disengage. The statistical analysis of this interaction shows predictable sequences. When the mother looms, the baby moves its body and/or head back, down and away (a ‘dodge’). Once the baby has dodged, the mother follows in the direction in which the baby has just moved (a ‘chase’). The mother’s following, in turn, influences the baby to turn away more. Thus the regulation remains bi-directional. Each partner keeps the sequence going, and both are very active. Many of the sequences of maternal head movement toward the infant, and infant head movement away, were found to be split-second and quasi-simultaneous: before one completed a movement, the other had already begun an adjusting movement (Beebe and Stern 1977).

We have called this interaction "chase-and-dodge" but it could as well be called "dodge-and-chase". The infant's withdrawal elicits the mother's intrusion, and the mother's intrusion influences the infant's withdrawal. By the end of such an engagement the infant begins to go limp, an "inhibition of responsivity," so that the dodging behaviour gives way to a shutdown (Beebe and Stern 1977). In the chase and dodge interaction, the problem for the infant is specifically in the spatial dimension, approach-avoid. There is little facial or vocal behaviour.

Obviously the mother has the greater range of control, but the infant has a remarkable influence. For its part, the infant can have literal veto power over the mother's attempt to visually engage it. The baby's power is to 'say no' with its body. An extreme form of 'no' is to shut down, go limp or become motionless. The mother could stop the chase and dodge process by sitting back, pausing or waiting for the infant to return. This response can, however, be taught, as illustrated in the case below.

Approach to mother–infant treatment: Linda and Dan film

This film illustrates the chase and dodge pattern in a mother–infant treatment case, Dan and Linda (Cohen and Beebe 2002). The mother was seen in an ongoing psychoanalytically oriented psychotherapy, and I consulted to the parent–infant interaction. In our method of parent–infant therapy (Beebe 2003), the mothers receive the same evaluation as the research subjects: a split screen, face-to-face filming with mother–infant (father–infant) and stranger–infant. A week or two later a two-hour 'video-feedback' consultation with the parent(s) follows, in which we look at the videotape together. We try to identify moments which went well, and moments which did not. I teach the parent to be a 'baby-watcher', and show how each partner affects the other. I encourage associations to the parent's own childhood upbringing. Together we try to link the 'stories' of the presenting complaints, the video interaction, and the childhood history. Often the parent can immediately grasp key aspects of what is problematic. In some instances the treatment can be brief, that is two or three cycles of filming and video feedback, or in other cases the treatment may go on for several years.

When the mother brings a difficult transference to the baby, her capacity to observe her effect on the baby is often disrupted. For all of us, it is not easy to observe our own nonverbal behaviours, and a difficult transference compounds the problem. In the Dan and Linda case below, the mother's transference to the baby is that the baby does not love her and shows her up as an inadequate mother. She herself feels that she has nothing to give. The mother can usually put into words what the baby is doing that is troublesome, such as 'my baby doesn't look at me'. But she often cannot observe, much less verbalize, how she affects the baby. Linda and Dan were involved in extensive chase and dodge sequences, but Linda could not see the consequences of her own behaviour, that she was pushing the baby out of the interaction. When a mother is desperate to reach her infant, it is counter-intuitive to pull back and wait.

Translating research into treatment: Chase and dodge in the case of Dan and Linda

Linda had been depressed as an adolescent and was very depressed during her pregnancy (Cohen and Beebe 2002). After Dan was born she did not want to live. She began psychotherapy with Dr Cohen when Dan was two months old. When Dan was five months, Linda brought him to see Dr Cohen on the advice of the paediatrician, who was worried

that Dan had no social smile. Dr Cohen then brought the family to me when Dan was five-and-a-half months.

The film begins with a brief glance at Linda by Dan, who then rapidly averts gaze. During the whole interaction he rarely gives her more than a split-second glance. When he looks, he has a remarkable deep frown, or a strong surprise expression with raised eyebrows. At first Linda plays a clap-hands game to get Dan's attention. Dan is continuously involved in self-regulatory activity, fingering his clothing, or kicking intensely. This is a baby who is over aroused, over-stimulated. Whenever Dan looks away, Linda calls him, goes into his face and strokes his cheek, gently tugs on his hand, and asks him to 'give her a kiss'. These are Linda's efforts to get Dan to look at her, but they occur just when Dan is trying to regulate his arousal down. So they get into trouble at precisely that point, and Dan looks away for longer and longer. Linda then moves into very high arousal, intrusive games. She plays a 'goody, goody, goody' game going right into the baby's stomach, over and over. For some babies this game would be fine, but for Dan, who has already begun to shut down, it's over-stimulating. Dan hangs his head down limp as she goes over and over into his stomach.

The intervention, initiated by me and continued in the treatment with Dr Cohen, was to help Linda to slow down, to not try so hard, to teach her that 'less is more' with this baby. I drew for her Field's finding that infants look away to facilitate re-regulation of heart rate, to help her feel less rejected when Dan looked away. We talked about how hard it was to wait for him to reorient to her; that she was worried he never would. I suggested that she try to engage him with her voice and her face, for a while, instead of her hands, which were more stimulating. Dr Cohen and Linda worked on Linda's relationship with her own mother, gradually coming to realize ways in which Linda had felt starved for affection from her mother. She was now trying to get that affection from Dan.

By the time of filming when Dan is nine-months-old, Linda sits back more. She asks, 'Where are we?' indicating more ability to see the situation from the baby's point of view. She pursues Dan less. While Dan looks away, Linda has a disappointed expression, which turns into a sad and angry expression. But she does actually wait. This is a big accomplishment. Twice Dan actually looks and smiles briefly at Linda, rewarding her patience. A lot of work will be needed, but they are doing slightly better (Cohen and Beebe 2002).

Vocal rhythm coordination

The study of 82 mother–infant pairs by Jaffe *et al.* (2001) (see also Beebe *et al.* 2000) used vocal rhythm coordination at four months to predict attachment at one year. Vocal rhythm coordination can range from very loose to very tight. This study found that when vocal rhythm coordination between mother and infant is in the mid-range, each 'tracking' the other's rhythms but not extremely tightly, the infants were classified as secure attachment by the Ainsworth separation–reunion test at one year. When mother and infant were both very tightly coordinated, which we termed 'vigilant high trackers', the infants were classified as insecure–disorganized attachment or insecure–anxious–resistant. If the infant was very loosely coordinated with the stranger, that infant was classified as insecure–avoidant at one year.

The infant does not have to be looking at the mother in order to engage in vocal rhythm coordination. In the mother–infant treatment pairs where the infant is gaze avoidant, teaching the mother to do vocal rhythm coordination is an excellent intervention to help the mother and infant engage.

Building on the vocal rhythm data, we conceptualize a model of interaction with a balance between self and interactive regulation, where the midrange provides the optimal flexibility to go back and forth between self- and interactive regulation (Beebe and Lachmann 2002, Beebe and McCrorie 2006). If the person is a vigilant high tracker, some access to self-regulation is sacrificed. If the person is preoccupied with the partner, the ability to sense and use one's inner states may be compromised. Or, at the other extreme, if interactive regulation is disrupted, the person may become preoccupied with self-regulation on his/ her own, sacrificing the engagement. The treatment of infant Dan illustrates a sacrifice of engagement, instead managing his arousal on his own. His mother cannot help Dan to manage his arousal because she is so over-stimulating. In the midrange optimal balance, one can monitor the partner, influence and be influenced by the partner, and at the same time have access to one's own state and use it in balance with interactive regulation.

Conclusion

Early interaction patterns are represented pre-symbolically, through the procedural organization of action sequences. Predictability and expectancy is a key organizing principle of the infant's brain. Infants form expectancies of how these interactions go, whether they are positive or negative, and these expectancies set a trajectory for development (which can nevertheless transform).

The facial mirroring and the vocal rhythm coordination films illustrate the range of optimal attention and arousal, and shared interest. In this range disruption and repair can occur. In contrast, the chase and dodge, mutually escalating over-arousal, and oral teasing patterns illustrate early 'conflict' (Slavin 2000). The interactions do not repair, and mother and infant have conflicting agendas. The mother's agenda seems to be an increasingly desperate attempt to reach the infant at any cost. The infant's agenda increasingly becomes one of escape.

Negative interactions are just as co-constructed as positive ones. Each person's stream of behaviour can be predicted by that of the partner. Each person makes moment-by-moment adjustments to the partner's behaviour. Although they are negative, the interactions such as chase and dodge and mutually escalating over-arousal are complex, rapid, highly charged, mutually responsive *engagements*. Each partner remains intimately related to the other through the temporal structure of split second reciprocal contingencies, even though the infant's responsiveness is in the withdrawal mode. Therefore to describe the infant as avoiding, withdrawing, or disengaging is misleading. It is too static a picture. Nor is it accurate to call the mother simply intruding or impinging, since each of her moves is so responsive to that of the baby. They are both co-constructing highly negative, highly charged engagements.

Appendix: Additional film illustrations

Mutually escalating over-arousal and high vocal rhythm coordination in a disorganized attachment pair

The film of Amos illustrates an infant and mother who both coordinate vocal and motoric rhythms in the range of vigilant high tracking. In addition, this pair illustrates the pattern of mutually escalating over-arousal. Each one escalates the ante, as the infant builds to a frantic distress, may scream, and in this example, finally throws up. In an escalating over-

arousal pattern, even after extreme distress signals from the infant, such as 90-degree head aversion, arching away, inhibiting reactivity and going limp, or screaming, the mother keeps going. My hypothesis is that she keeps going because she is desperate to reach the baby, and she has some specific transference to the baby, such as for example, the baby has to give her contact to validate her own goodness. Both mother and infant become increasingly upset, and each has the opposite agenda. As the infant escalates distress, and ‘no’ signals of avoidance and moving away, the mother keeps ‘upping the ante’ and trying to get the infant to return, to look, to respond. To each increment of infant distress, the mother increases her own attempt to engage, and vice versa. They have a mutually spiralling process of escalating over-arousal.

Amos is physiologically over-aroused and beginning to disorganize. Amos is getting very upset, crying and flailing. The mother just keeps going. She also seems to be trying to take the baby’s high negative arousal and ‘ride’ it into a positive state, flashing big smiles at the baby. Amos is now becoming even more upset. Most mothers would back off at this point. She keeps going. By the end of the interaction the baby is sobbing and writhing and throwing up.

Oral teasing and the disturbance of infant self-regulation

In this interaction illustrating maternal ‘oral teasing’, the baby is continuously fussing. For the last ten minutes the mother has been taking her finger in and out of the baby’s mouth. The mother pulls the finger out, and the infant pulls it back in – over and over. This is just a small section of the film. Immediately following the interaction with his mother, I play with the infant. At first he is beautifully responsive. He almost seems like a different baby. He greets me with a huge open ‘gape smile’. Eventually he gets upset, presumably because he has been upset in the interaction with the mother for the previous ten minutes. I match the cry rhythm, and I match the breathing. He backs right off the crying and calms down. It is very dramatic. This is an example of facilitating the down-regulation of a distressed baby, rather than participating in escalating over-arousal. Extensive offering of the mother’s finger can potentially disturb the infant’s ability to find his own ways of regulating himself. Presumably the mother brings her own anxiety about whether the infant can soothe himself. Teasing with the finger potentially disturbs the infant’s sense of agency. Maternal teasing may reflect the mother’s ambivalence about whether she can (or wants to, or ‘should’) provide the soothing for the infant.

Pulling the child into the parent’s agenda

This 12-month-old little girl and her mother present for treatment with the child showing symptoms of severe temper tantrums. I present a microanalysis of the first minute of the videotaped interaction. As the film opens, the child is looking away from the mother. The mother has a bunny rabbit. She calls to the child and says, ‘Ready?’, while the child is looking away. Mother senses that the child is not interested in the bunny rabbit so she takes a music box. This music box is one that pops up, so that it demands attention. As mother winds the box until it pops up, she has a big surprise face. The little girl also shows a big surprise face at the moment the box pops up, and says ‘Wow’, and they both laugh together. Then the girl immediately looks away. She takes a slinky toy and gets involved in playing with it, jiggling it back and forth. The little girl is clearly involved with the slinky toy. Then the mother says, ‘Ready? Let’s do it again.’ Mother takes the music box. The child looks at it the moment that the box pops up, without smiling, and immediately goes back to the

slinky toy. Mother now goes back to the music box. She again winds the music box until it pops up. This time the child laughs briefly – they both laugh together, but immediately the child looks down and sobers. At this moment we see a fascinating behaviour that recurred over and over in later parts of this same interaction. It is a ‘smile-aversion’ in which the child goes up into positive facial expressiveness, but immediately loses it, sobering and looking away. It is a disturbance of positive affect in which the child cannot sustain the positive arousal.

So the little girl looks down, sobers, and goes back to playing with the slinky toy. While she’s playing with the slinky toy, the mother says, ‘Talk to Mommy, talk to Mommy, talk to Mommy.’ Whereas more generally a mother would comment on the child’s focus, with something like ‘oh what a nice little slinky toy’, instead this mother is asking the child to come into her own focus. Finally, the child takes the music box and starts playing with it. The child has joined the mother’s focus of attention, rather than the mother joining the child’s focus of attention. Perhaps we can say that the mother has ‘seduced’ the child into her own agenda, and the child has finally complied.

But the instant that the child takes the music box, the mother goes to the bunny. While the little girl is now absorbed in the music box, the mother says, ‘Bunny, bunny, bunny’. The child is still interested in the music box, looking down at the box. Mother now takes the bunny and moves it right into the child’s belly. The child half shrieks, half laughs – mother laughs at the same time, and then the child looks down and goes back to the music box. Now the mother takes the bunny again, and prepares to interest her daughter in it. And so on.

By continually attempting to move the baby into her agenda, this mother disturbs her daughter’s initiative. When she succeeds in moving the child into her own focus of attention, she rewards the child with high positive affect. We can imagine how the child may have become angry. But for her part, the mother tells a complicated story of how she feels she must ‘entertain’ her daughter constantly, based on difficulties in her own childhood. The microanalysis reveals the interactive details of the mutual difficulties, and a psychodynamic approach reveals the mother’s own history and expectancies that feed into the current difficulty. Both approaches will be necessary for the treatment (see Cohen and Beebe 2002, Beebe 2003).

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