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The Interpersonal Development of an Embodied Sense of Agency

Catherine E. Deans, Doris McIlwain, and Andrew Geeves
Macquarie University

We argue that a sense of agency has interpersonal origins and arises from a contingent coupling of the self and the social and material world. This perspective has implications for the assessment and conceptualization of a sense of agency in the empirical literature. We explore the development of a sense of agency as, in part, an implicit, embodied assumption that arises through the child's experience of "good-enough" contingent responsiveness from caregivers. We contend that a caregiver's capacity for audience uptake and access to a full range of feelings, coupled with the scaffolding of an infant's attempts at creating contingency in his or her environment, will affect the development of a sense of agency. Presenting the experience of infants in neonatal intensive care as an example, we raise a series of questions about the development of a sense of agency in an atypical early environment in which opportunities for interpersonal contingency may be limited.

Keywords: embodiment, attunement, contingency, sense of agency, infancy

Disruptions to a sense of agency (SoA) are associated with diverse manifestations of psychopathology (Frith, Blakemore, & Wolpert, 2000; Seligman, 1974). Understanding the ways in which we develop (or fail to optimally develop) a SoA carries important implications for how we understand and treat disruptions in SoA. Research on SoA has proliferated in recent years, not only in clinical and neurological treatment settings (e.g., Frith et al., 2000; Tsakiris & Haggard, 2005) but also in understanding social and cultural phenomena more broadly (David, Obhi, & Moore, 2015). Still, as David and colleagues (2015) note, numerous questions remain unanswered, including "how . . . the sense of agency develop[s] across the lifespan" (p. 2). Additional areas in which SoA research is lacking, or in which contradictory empirical findings remain to be explicated, include the link between a SoA and emotion (Gentsch & Synofzik, 2014) and SoA in social contexts (Obhi & Hall, 2011).

In this article, we explore how a SoA develops in infancy and early childhood. In particular, we highlight the real-world social and emotional context in which SoA develops, as distinct from laboratory settings in which agency is typically investigated in isolated, controlled settings. We examine patterns of interactions with caregivers early in life that shape a person's implicit assumptions about the self, the world, and other people, and contribute to a SoA. We draw together empirical and theoretical studies from diverse literatures, including infant research, developmental psychology, and cognitive science, with the goal of illuminating and integrating rich insights from each. Moreover, we call attention to potential sources of individual differences in SoA, which thus far have received little focus in the empirical literature. We consider whether a history of atypical experiences of interpersonal contingency in infancy might engender a diminished or disrupted SoA. Our developmental perspective provides a framework for understanding potential individual differences in SoA in adulthood, with implications for ways it can be empirically assessed.

Prereflective Agency—Why Does Our Early Life Matter?

During infancy, the millions of repetitions of interactions with caregivers occurring when the brain is most plastic and rapidly adapting to the

Catherine E. Deans, Doris McIlwain, and Andrew Geeves, Department of Psychology, Macquarie University.

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Correspondence concerning this article should be addressed to Catherine E. Deans, Department of Psychology, Macquarie University, Sydney, NSW 2109, Australia. E-mail: catherine.deans@mq.edu.au

environment are crucial in forming implicit and embodied basic assumptions about the world, self, and others. Bendit (2011) provides the following example from the Boston Change Process Study Group of a depressed mother and her 1.5-year-old son:

> The mother is sitting on the couch and her son is sitting a foot or two away from her, drinking from his bottle. She is sitting stiffly in the far corner of the couch staring into space. . . . Her toddler finishes his bottle and stands up on the couch, bouncing up and down for a minute or two. Then he pauses before flopping over onto his mother's lap. At this point, without moving her stiff and remote arms, she jerks her head toward him and barks, "I told you not to jump on the couch!". . . In other sequences on the same videotape, they describe her son walking up to her and reaching out his hand toward her knee, only to pull it away suddenly before actually touching her. His mother's aversion to affectionate touch appears to have led him to inhibit his own initiatives around seeking physical contact with her. (Stern & BCPSG, 2007, as cited in Bendit, 2011, p. 26)

Bendit contends that as an adult this child ". . . will have no memory of the laying down of these implicit memories. He will be able to remember later instances of difficulty with touch, perhaps describing a situation in high school where he found himself unable to cuddle his first girlfriend" (p. 26). What is encoded implicitly is likely to shape the infant's cognitive-affective-behavioral schemas for "how other people are" and "how I am" and these will then strongly influence the schemas this child goes on to hold as an adult. Bollas (1987) referred to these implicit assumptions as the "unthought known"—aspects of experience that come to be tacit, embodied assumptions that sculpt expectations and scaffold salient features of the environment. If implicit assumptions form most rapidly during infancy, how then do patterned interactions during this time period impact SoA?

Although lack of SoA at an explicit level might be exemplified by someone who does not feel that he can ask for what he wants or strive for a desired outcome, in contrast, lack of SoA at a more implicit level might be illustrated by someone for whom asserting his needs and wants or striving to achieve a particular outcome does not even come to mind as an option. The latter case illustrates what we mean when we refer to "prereflective" SoA. We use the term prereflective here in accord with Stolorow's concept of the prereflective unconscious, defined as "a system of organizing principles formed in a lifetime of relational experiences, that pattern and thematize our lived experience [and that] operate outside of reflective self-awareness" (as cited in Kenny, 2013, p. 201). Used in this sense, prereflective SoA is formed (primarily, although not only) during infancy and typically remains outside of awareness, but it might nonetheless become subject to reflection later in life. Of note, this use of the term prereflective differs from the way researchers such as Gallagher (2012) use the term, in which prereflective SoA refers instead to SoA that is phenomenologically recessive; that is, it is not usually within the realm of explicit awareness but could nonetheless become the object of awareness if attention were directed toward it.

Contingency, Agency, and Pleasure

Contingency detection is necessary, but not sufficient, for the development of SoA. After all, without such detection, we would not be able to observe the relation between cause and effect in everyday actions. Given that the initial environment is necessarily social, insofar as an infant is unable to care for himself, we argue that the setting for contingency detection and the development of a SoA is primarily the interpersonal realm.

In numerous studies, researchers have documented the infant's delight in his or her actions that cause contingent outcomes in the environment. For example, Broucek (1979) emphasized the difficulties in using traditional stimulus-response frameworks to account for the pleasure derived from contingency. He highlights Papoušek and Papoušek's (1975) experiments in which infants had to first discover that a head rotation of 30° in a specified direction would switch on a light display. In a control condition, the light stimulus was presented in a noncontingent manner and the infant displayed orienting behavior that habituated over time. In contrast, in the experimental condition, when the infant discovered that his own head movements could turn on the light display, "he repeated his feat so many times and with such joyful affect in his gestures and vocalization that it seemed more like attachment than habituation" (Papoušek & Papoušek, 1975, p. 252). Broucek

(1979) regarded this sense of pleasure, linked to the experience of producing at will a contingency that the infant initially did not expect, as pivotal to the development of a sense of self. He writes, "this sense of efficacy and the pleasure associated with it are in my opinion the foundation of self feeling" (Broucek, 1979, p. 312).

Attunement, Audience Uptake, and Fullness of Feeling

It is worthwhile expanding Broucek's claim to better understand how the development of SoA might be supported or disrupted, and thereby delineate sources of individual differences in the SoA later in life. We contend that it is not simply pleasure in being the cause of contingent outcomes that is the "foundation of self feeling" (p. 312). Instead, the notion of pleasure in being "the cause" is intimately and intrinsically connected with interpersonal elements of the experience (see also Alvarez & Furgiuele, 1997; Lichtenberg, 1991; Rustin, 1997).

White (1959) posited that pleasure in a SoA, or what he called "effectance pleasure," is the intrinsic motivation for mastery experiences. Block (2002) contextualizes effectance pleasure in evolutionary terms, suggesting that effectance pleasure and allied efforts at mastery confer reproductive fitness and survival advantages. Nevertheless, interpersonal factors affect the meaning of this pleasure (Campbell, 1997; Trevarthen, 2009). Pleasure may be met in the interpersonal environment with attunement (Stern, 1985) and "audience uptake" (Campbell, 1997), in the optimal case, or it may instead be dismissed or misperceived. Accordingly, the interpersonal contingencies available both in the recognition and reception of infants' pleasure, and in infants' developing capacity to identify and become aware of their own internal states, contribute to the development of a SoA. Stern (1985) nicely captures the act of attunement in his example of a 9-month-old baby reaching for a toy, looking at her mother, and emitting a joyous "Aaaah" as she does. These exchanges are uneven, in that one partner possesses an already developed sense of self and is more or less able to accurately perceive the state of the other. Although the mother may share the state that the baby experiences (e.g., the pleasure in reaching for a desired play object), this shared experience is not simply an "experiencing with"—instead, the mother optimally provides "marked feedback," or cross-modal signaling, to the baby, conveying that, although she shares the intensity, rhythm, and timing of the expression of the baby's pleasure, she and the baby are separate centers of experiencing. Therefore, the baby may express a joyous vocalized "Aaaah" in reaching for a toy, and the mother may respond with a delighted gestural shimmy of the upper body of the same intensity, rhythm, and timing but in another expressive sensory register (i.e., gestural vs. vocal). Furthermore, there is a temporal gap between infant action and parental response. What is signaled to the younger person is that her inner state of joy is discernible to another person and exerts an impact on that other person. The capacity of the caregiver to respond to the child in a marked way, reflecting back a discernment of the child's own experience, is crucial for the child's joy to be experienced and identified by her as hers (Stern, 1985). This interactional pattern stands in contrast to emotion contagion (Fonagy, Gergely, Jurist, & Target, 2002; von Scheve & Ismer, 2013), in which the caregiver is "experiencing with" the infant, in an unmarked way, such that the emotion is amplified rather than attuned to and contained, where containment here refers to the modulation of powerful affect.

The very process of the formation of feeling is an interpersonal phenomenon. Campbell's (1997) concept of audience uptake clarifies the intersubjective nature of this process. According to this view, audience uptake is an iterative process by which (in this case) the parent's receptivity to the infant's unfolding pleasure dynamically fosters the generation and further expression of that pleasure (Campbell, 1997). In contrast, when audience uptake is limited or absent, the emerging feeling might be dismissed or overlooked, curtailing not just the expression but also the ongoing formation of the emotion (Campbell, 1997).

A capacity for what is called "fullness of feeling" (McIlwain, 2009) within the parent is essential for adequate audience uptake of the infant's feelings. Parents must have access to the full intensity and range of nuanced feeling so that they are able to attune to those feelings as they arise within the infant (McIlwain, 2009). However, parents themselves may not have experienced adequate attunement to, or audience

uptake of, their own feelings early in life, as can occur in societies where the socialization of emotional expression is drawn along gendered lines (McIlwain, 2009). If fullness of feeling is lacking, then parents may be limited in their capacity to identify, attune to, and contain certain feelings, thus increasing the likelihood that the infant will cope defensively (Campbell, 1997; McIlwain, 2009). Defensive coping includes habitual ways of managing negative affect that are relatively automatic and inflexibly employed (Tronick & Beeghly, 2011). If such defensive coping occurs often enough, particularly when the brain is most plastic in early life, then it may later result in habitual diminished access to, or prereflective partitioning off of, those feelings, limiting the scope of adaptive behavioral choices in the future (McIlwain, 2008, 2009, 2014).

The experience of attunement and audience uptake facilitates the infant's formation and identification of his emotional states. The experience of the infant, as it relates to the development of agency, might be as Alvarez and Furgiuele (1997) formulate it: "I cause things to happen in her, therefore I begin to feel that I am, and I also begin to feel that she is" (p. 125). SoA is an interpersonal phenomenon, arising through repeated acknowledgment of one's feelings and one's capacity to act on the world and others (Rustin, 1997). Furthermore, emotionally contingent responsiveness from another during infancy is itself reinforcing. This process of attunement contributes to the developing recognition of the self as differentiated from the other, the sense of self or "I," and a corresponding SoA.

Individual and dyadic differences are important to consider in the development of the SoA. As stated earlier, the parent's ability to recognize what an infant might be feeling is essential for audience uptake and attunement. Such recognition requires that the parent's emotional repertoire encompass the affect communicated by the infant and demands too that the parent respond in an attuned way to that affect, as opposed to being too joyously consumed and distracted by another person's presence or anxiously preoccupied with his or her own emotional state. Infants also vary in their capacity to engender feeling and responsiveness in a parent and in the clarity of their communicative cues. The particular "fit" of temperaments of each member of the dyad influences how easy it is for the infant and parent to be in sync, or to discern each other's respective states (Rustin, 1997; Sander, 1983). Thus, an extraverted mother and an introverted baby, to take an oversimplified example, might experience greater struggle in understanding and intuitively responding to each other's mental and physical states than dyads with a greater degree of concordance of intersubjective experience. The emphasis on the multimodal or cross-modal aspects of attunement also highlights the embodied form in which attunement occurs (McIlwain, 2007; Stern, 1985). We return to attunement and its relation with embodied cognition in a later section, but it is worth emphasizing here that attunement is a global body/mind phenomenon.

Good-Enough Attunement, Negative Capability, and Containment

Previous infant researchers assumed that the greater the interpersonal contingency between parent–infant dyads the better. However, more recent findings based on video microanalytic data have suggested otherwise (Beebe et al., 2010; Beebe & Steele, 2013). What we will term "good-enough" attunement, to extend Winnicott's (1965) phrase, is optimal. Video microanalysis examines parent–infant interactions in face-to-face settings and can be described as a "social microscope, capable of identifying 'subterranean' rapid communications, which are often not quite perceptible in real time" (Beebe & Steele, 2013, p. 583). Analysis is usually undertaken at the level of 1-sec units. Interpersonal contingency is then measured using time series analyses to compute the extent to which one interactive partner's prior behavior predicts the other individual's current behavior (Beebe et al., 2010; Beebe & Steele, 2013). Recent microanalytic studies have demonstrated that infants who later become securely attached are actually more likely to experience dyadic interactions with their primary caregiver in the middle range of interpersonal contingency (Beebe et al., 2010; Beebe & Steele, 2013; Jaffe, Beebe, Feldstein, Crown, & Jasnow, 2001). In contrast, dyads with very low, or very high, interpersonal contingency were more likely to become insecurely attached (Beebe et al. 2010; Jaffe et al., 2001).

Tronick (2007) suggests that this pattern of findings can be explained by the infants' increased frequency of experiences of mismatch (i.e., dyssynchronous, noncontingent interaction between parent and child) and successful repair (i.e., reestablishment of synchrony) in this middle band of dyads. That is, if things go "well enough" but not perfectly, the infant experiences the interaction getting back on track after disruption and may have the opportunity to develop both a sense of trust that repair is reliably possible as well as a SoA in co-creating the experience of repair (Tronick, 2007). Beebe et al. (2010) highlight how infants can display an impressive repertoire of behaviors to engage actively in the re-initiation of communication after a mismatch, including in situations after the caregiver has initiated a mismatch (Beebe et al., 2010).

Another key element in explaining why this middle band of dyads might be relatively more secure relates to Bion's (1970) theory of containment and his formulation of what was originally Keats' notion of "negative capability"—the sense of being able to "not know" yet, or to be "capable of being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason" (Keats, as cited in Bion, 1970, p. 125). This capability requires a certain level of comfort or ability to tolerate the anxiety of ambiguity, including both predictive uncertainty and the absence of control. Tolerance of ambiguity affords the caregiver the possibility of discovering what experience is arising in the infant, as opposed to responding preemptively, perhaps before the infant has more than a wisp of awareness of what it is he feels himself. Thus, "good-enough," but less than perfect, attunement may allow an infant to acquire awareness of what he feels while being "held in mind" by a caregiver. This process allows the infant to develop trust in his capacity for fullness of feeling—that what he feels can be identified, responded to, and contained—at first by another person, and eventually himself through the internalization of this process (Winnicott, 1965).

Embodying Agency

Interpersonal interaction in infancy is an embodied enterprise. Our implicit interactional embodied memory is shaped through acting on the world as infants, first and foremost through our bodies in relation to our needs and to the experience (or not) of a reciprocal response. Interactional implicit memory is encoded and expressed in how we relate to others through nonverbal cues as well as paralinguistic indicators such as the prosody, tone, and rhythm of speech (Bendit, 2011; Trevarthen, 2005). These features are overlooked in the assessment of adult attachment using the adult attachment interview (based purely on written transcripts), but they appear to be embodied prereflective markers of security (or indeed insecurity) of attachment.

Jonas (1974) emphasized the body in action as the key initial experience of causality. Prereflective SoA is distinct from, although linked to, our conscious beliefs about our capacity, or our sense of self-efficacy, to perform a given action. Early experiences of interaction or isolation, of contingency or noncontingency, of agency or lack thereof, occur across millions of repetitions and form part of the "unthought known," or the very "reality" of the world, self, and others, for the infant. To underscore the point, this reality is an embodied reality—an aspect of the unthought known captured in Behnke's (1997) notion of "ghost gestures" and McIlwain and Sutton's (2014) concept of "signature patterns of tension," including "silent zones." These aspects of oneself are not necessarily held in current phenomenological awareness, but they shape future action-pattern propensities and perceptions. The key overlapping concept that unites these diverse notions of unreflected or implicit beliefs and action tendencies is the notion of an ongoing accumulation of the residue of repetition of patterns of acting on the world and others and the experience of the reception of these actions through caregiver containment and audience uptake (Campbell, 1997). This accumulated residue forms a crucial part of what we bring to our encounter with the world in the future, including our capacity for agency and what we are capable of imagining and bringing to mind.

Ways in Which the Development of a SoA Might Go Awry

We now explore some of the ways in which the development of a SoA might go awry. We view these disruptions as important sources of individual differences to be kept in mind when

examining agency later in life. Of course, there are myriad difficulties that may arise or are inherited (e.g., organic neurological deficits) that we will not discuss; rather, our focus will be primarily on the early interpersonal environment.

Taking as a starting point the need for opportunities for experiencing contingency in the environment, we ask the following: What happens when infants lack such opportunities? Papoušek and Papoušek (1975) described the reaction of a typical infant to a situation in which noncontingency predominates (e.g., insoluble problems) as one in which a sudden behavioral change may occur, akin to "a biological playing possum: the infant lies motionless with nonconverging, staring eyes and sleep-like respiration . . . This passive behavioral state, which may be characterized as a sort of total inner separation from the environment, may appear more frequently during the first two months of life" (p. 251). This description captures what happens when typical infants are faced with an isolated event of noncontingent responsiveness. However, what happens when noncontingent responsiveness is repeated over time? A wealth of empirical studies examine defensive strategies (i.e., habitual ways of coping with negative affect that are relatively automatic and inflexibly employed) used by infants who experience a repeated lack of contingent responsiveness from their caregivers. Defenses can reliably be identified as early as 4 months of age (Tronick, 2007; Tronick & Beeghly, 2011). In the "still face" experimental paradigm, the caregiver is instructed to remain expressionless for a short period of time, thereby simulating an absence of contingency (Tronick, 1989, 2007). Likewise, in the double video paradigm, parent and infant interact via video link-up, and interpersonal contingency is manipulated through the use of either live video streaming (regular interpersonal contingency condition) or delayed video streaming (lower contingency condition). Research utilizing these paradigms supports the hypothesis that infants develop defenses to protect themselves from negative affect in situations in which they experience a lack of contingency (Tronick, 1989; Tronick, Als, Adamson, Weise, & Brazelton, 1978). Because defenses are automatically used with the aim of minimizing future experiences of negative affect, they necessarily limit the possibility of novel experiences and engagement in new situations (Tronick, 1989, 2007). Our early interactions include our SoA in a given moment, but they also contribute (through repetition) to the development of a prereflective SoA as an implicit, embodied assumption that often unknowingly shapes future interactions. This shaping process may then enhance or preclude a person's capacity to become aware of the full range of affordances in the psychological environment. McIlwain (2008) describes this process as a sequence of cascading constraints by which early suboptimal experience alters the range of available developmental trajectories, including through the development of defenses, thus limiting future possibilities.

Defenses also arise in coping with mismatches of a different sort—namely, situations in which a parent is misattuned through misidentification of what an infant feels. This misattunement may arise from distraction, or more significantly as a habitual affective pattern of responding over time because of limitations in parental fullness of feeling, which impacts audience uptake of specific emotions and thereby limits opportunities for contingency development, pleasure in contingency recognition, and ultimately the infant's SoA.

In contrast, interpersonal contingency that is "too concordant" can also limit or disrupt the infant's SoA (Beebe & Steele, 2013). Prediction of cause and effect may engender SoA and a feeling of security within a predictable caregiving relationship that gives rise to the capacity for negative capability described earlier. Nevertheless, prediction can also be associated with a more reactive stance. Thus, a person might be hypervigilant to her surroundings and exceptionally good at predicting what might happen without experiencing an accompanying SoA—a sense that she could do something to influence what occurs.

The distinction between the infant's predictive and active capacities is also supported by research noted earlier that found that especially high levels of attunement are linked with worse rather than better outcomes (Beebe et al., 2010). Perhaps individuals in a more highly attuned infant–mother dyad are more reactive, in a hypervigilant sense, toward each other than individuals with good-enough (middle range) attunement. The more highly attuned dyad may be better at prediction, whereas creative, spontane-

ously arising action is constrained at the same time (Fonagy et al., 2002). Hypervigilance may occur at the expense of free-floating attentional resources that are available for capturing feelings that emerge within the infant and directing attention and interest outward in exploring contingencies available in the environment.

For a securely operating dyad, the risk of disruption of attunement may be more manageable and contending with it more pleasurable; both members of the dyad are comfortable in bringing the interaction back on track in the event of a mismatch. In contrast, the insecure dyad, while perhaps minimizing the risk of a mismatch, may perpetuate a situation in which hypervigilance (or avoidance) regarding each member's behavior and emotional state limits spontaneous, creative, and connective interaction. The recovery from mismatch may not be experienced as a given because of the limited opportunities for experiences of agency in the past.

Sander (1983) emphasizes brief windows of "open space" in which the dyad is free from basic regulatory demands (e.g., nutrition, temperature regulation) in the development of SoA. Such windows can provide important intervals during which infants— while being held in mind by caregivers—might begin to pursue their unique preferences and conduct self-initiated explorations of the world around them (Lichtenberg, 1991; Rustin, 1997). Nevertheless, we also underscore the importance of experiences of agency during interactional regulation. Infants do not wait for windows of time to experience agency—the experience of exerting an impact on others and having needs recognized and met (or not) is the context in which the developing SoA is shaped (McIlwain, 2008). Stated in another way, interpersonal contingency occurs within the embodied context of our needs as infants, and it is within this context that a SoA develops.

If this interpersonal opportunity is not available, then an infant might develop the capacity to "react" but not to "act." To act requires awareness of an internal state or need that prompts action. This identification and awareness of inner states allows for a greater range of available adaptive responses consistent with the individual's skill repertoire and environmental affordances, as opposed to merely reacting to external stimuli that demand attention. This description of what it is to act rather than react includes the case in which the infant responds to a stimulus that arises externally, but the response is enacted with an awareness of choice rather than compulsion; that is, she is aware of her feelings, and external demands do not obliterate her connection with these feelings. As Blomfield (1993) described, "what emerges from an opening-up of intersubjectivity is allowed to take its own form and not have form imposed on it" (p. 92). Parents' capacity for negative capability (the containment of anxiety associated with the uncertainty) allows for a temporal gap in the interaction with the infant to arise, which creates the possibility that infants will increasingly identify and become aware of their personal internal states. Over millions of interactions, this process is scaffolded through attunement to, and audience uptake of, feeling states, thereby facilitating a SoA. We suggest that this pattern of interpersonal interaction becomes internalized as part of the unthought known (Bollas, 1987) and promotes the unfolding of the SoA as an implicit, prereflective embodied assumption. This prereflective SoA has the potential to become a more reflective, and indeed self-reflective SoA as the suite of developmental competencies is enhanced over the early life period.

Limited Contingent Responsiveness—A Case Example

What happens if experiences of noncontingency are repeated consistently over time? Examining atypical early environments provides a window into what cannot be explored in laboratory-based research. Some environments, which lack contingent responsiveness on the part of the main caregiver, have been extensively researched. A wealth of research suggests that children of mothers who experience postnatal depression are more likely to go on to experience insecure attachment and have a higher likelihood of suffering from psychopathology later in life (Fonagy & Target, 2005; Murray, 1992; Murray et al., 2011).

However, a less well-explored example of an atypical early environment is the neonatal intensive care unit (NICU). Studies of parents' visitation and holding of their infants in the NICU suggest that many infants in this setting experience fewer opportunities for interpersonal contingency and the collateral development of a SoA. Fortunately, visitation and holding of in-

fants in the NICU has been increasingly feasible because of changed hospital policies in many countries and programs such as "Kangaroo Care" that encourage skin-to-skin contact with infants (Feldman & Eidelman, 2003; Reynolds et al., 2013). Nevertheless, visitation and holding frequency vary considerably. Some studies report that daily visits occurred for most infants whereas other studies found that most infants were visited on 5 or fewer days per week (Latva, Lehtonen, Salmelin, & Tamminen, 2007; Reynolds et al., 2013). Thus, this environment is characterized by a relatively high degree of variation in exposure to interpersonal contingency and opportunities for containment, attunement, and scaffolding. We would expect the development of a SoA to be impacted by this atypical experience and (often lack of) interpersonal contingency.

In the NICU, higher visitation frequencies were associated with less infant irritability and stress. Both higher visitation and holding of infants predicted more mature and fluid motor movements, as indicated on the NICU Network Neurobehavioral Assessment Scale (Reynolds et al., 2013). The variability in opportunities for interpersonal contingency is likely to occur over a multitude of repetitions for some infants, rather than as isolated instances such as those that Papoušek and Papoušek (1975) described. Furthermore, ample research demonstrates that premature infants are at a higher risk of psychopathology later in life, ranging from increased rates of attention-deficit hyperactivity disorder (ADHD), anxiety, depression, anorexia, and many other disorders, to an increased prevalence of suicide (Lindberg & Hjern, 2003; Lindström, Lindblad, & Hjern, 2009; Patton, Coffey, Carlin, Olsson, & Morley, 2004; Riordan, Selvaraj, Stark, & Gilbert, 2006). Although a broad brushstroke understanding of this increased risk has signposted the potential vulnerability in these populations, the processes associated with how atypical starts to life confer increased risk are not yet well understood. We postulate that disruptions to SoA may well contribute to the increased risk of psychopathology detected in this population. We are not proposing that a disruption to SoA is the only process by which increased risk of psychopathology is conferred. Other factors, such as parental mental health, undoubtedly play a role in promoting risk and affecting the development of a SoA. In addition, infants in NICUs typically experience an average of 14 painful procedures per day (Grunau, 2013), which could impact the formation of a SoA because of the overwhelming experiences of fear, pain, and helplessness in response to intense affect without audience uptake and containment. Because the primary role of medical professionals is to care for infants' medical health, they may not be optimally positioned to respond to infants' distress, nor may it be advisable at times, given the attention and focus required to perform often life-saving medical procedures (Cohen, 2003).

However, the potential confound of infant medical status is important to note in determining the impact of this atypical environment and lack of interpersonal contingency on mental health in general and the development of prereflective agency in particular. Finally, a wide range of so-called atypical early interactional environments may limit opportunities for contingency and agency. Specifically, factors such as parents' limited capacity to be aware of, and respond to, an infant's state; parents' own attachment styles; childhood exposure to trauma, genetic influences, and the availability of support may all impinge on the early interpersonal environment (Fonagy & Target, 2005; Liotti, 2004).

Final Thoughts

To conclude, we have emphasized the primacy of the environment and highlighted the importance of the caregiver's scaffolding and audience uptake of the infant's pleasure in bringing about contingent outcomes and facilitating a SoA. We have also emphasized attunement in which accurate, marked, intermodal feedback plays an important role in the infant's developing ability to identify and regulate internal states. We suggest that these processes are integral to the development of a prereflective SoA; that is, the infant's experience of another person recognizing and responding to his inner states and, in turn, the infant's experience of affecting another person.

We have also highlighted findings that good-enough attunement—interpersonal contingency in the middle range—is optimal for secure attachment (Beebe et al., 2010). For these dyads, the caregiver's capacity to tolerate uncertainty may create a gap in which infant and parent can

sense feelings as they arise, increasing opportunities for novel spontaneous exchanges while also providing greater opportunity for the repair of mismatches (Tronick, 2007). In contrast, infants in dyads with partners who are unable to surmount anxiety associated with uncertainty, and are thus hypervigilantly attuned (or defensively avoidant), are more likely to go on to experience a diminished SoA. Likewise, we hypothesize that infants in situations where opportunities for contingent relations are limited, such as those that may occur in atypical environments such as the NICU, are more likely to experience SoA disruptions later in life.

We have argued that aspects of a SoA are generally inaccessible to introspection. It is possible that in some instances it is not simply the case that a person may not believe that her actions can cause an adaptive contingent outcome in the environment, but that it may not even occur to her to think that this could be so. Understanding individual differences in the development of an embodied SoA has important implications for how we assess and treat disorders of agency in adulthood. Research is needed to better understand potential individual differences. We hope that by synthesizing diverse literatures, the framework that we have advanced will facilitate this important endeavor.

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