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Age Possible Meanings, the Dyadic Expansion of Consciousness and the
Still-Face.

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Things Still to Be Done on the Still-Face Effect

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Introduction

Adamson and Frick (2003, this Journal) have written a fine and challenging review of the research on the Still Face (SF). Of special value is their placement of the development of the paradigm in an historical framework, which permits us to see how much about the SF effect and infant functioning we have learned in the past 30 years. In this commentary I would like to discuss the issue of standardizing the Face-to-Face Still-Face (FFSF) paradigm, the explanation of the SF effect, and some suggestions for further research. But allow me an additional personal historical note.

Adamson and Frick describe the first presentation of the SF effect at SRCD in 1975. It was part of a symposium on my laboratory's work on face-to-face (FF) interactions with my colleagues, Lauren Adamson, Heidi Als, and T. B. Brazelton. I presented the SF. It was shown on a huge screen (film not video) to what I recall was a session for all the attendees. During the showing of the normal interaction there were laughs and smiles in the audience but the response changed dramatically to the SF. There was agitation and an undertone in the audience. When the SF episode finished the audience was silent. Silent! A mass of still-faces. I felt like escaping. I was sure that my career was finished. After an interminable amount of time, likely 5 micro-seconds that felt like a 100 hr, the audience applauded. Flooded with adrenaline, I of course heard the applause as congratulations, but likely it was as much relief that the SF had ended.

Should the Procedures of the Face-to-face Still-Face Paradigm be Standardized?

Adamson and Frick raise an interesting question as to whether or not the SF Paradigm should be standardized. In the context of the question of standardization it is necessary to include all the episodes of what is referred to as the FFSF paradigm. In the same way as we referred to the SF as the adult saying "hello" and "goodbye" at the same time in the original article (Tronick, E. Z., Als, H., Adamson, L., Wise, S., & Brazelton, T. B., 1978), my answer is yes and no at the same time.

Process Oriented Studies: My interests have always been in understanding infant capacities and infant-adult social interactive processes. Process oriented studies of the SF and interaction have been worked on with my long-term colleagues—T. B. Brazelton, K.W. Weinberg, J. Cohn, and D. Muir. We have examined the contingencies of infant-adult affective signals, rates of change, and coherence as measured using time series regression, matching, and the role of different modalities. The SF as well as the simulated depression (SD) paradigm (Cohn, J. F. & Tronick, E. Z., 1983) were experimental manipulations for “taking apart” infant interactions to test hypotheses.

The SF tested the hypothesis that the infant was agenic and the SD paradigm tested the hypothesis that contingency was the key feature of the interaction. Both of these manipulations brought to light significant findings: the infant was agenic, the interaction was mutually generated, and that contingency without positive affect was insufficient to generate positive affect in the infant. Others such as Murray (Murray, L. & Trevarthen, C., 1985), Fogel (Toda, S. & Fogel, A., 1993), Field (Stoller, S. & Field, T., 1982), Rochat (Rochat, P., Neisser, U., & Marian, V., 1998), and Cohn (Cohn, J. F. & Elmore, M., 1988) have perturbed the interaction in one or another way in order to reveal hidden processes. Likely the most systematic of these studies are those by Muir and his colleagues (Stack, D. M. & Muir, D. W., 1992) who have examined the role of touch during the SF. More recently Muir has developed the exciting virtual mother technique for exploring interactive processes.

These process-oriented studies could not have been carried out without modification of the FFSF paradigm. They have revealed striking infant capacities (e.g., Cohn’s finding that a 5 s SF during an on-going interaction was detected and responded to by the infant, and Fogel’s finding that the response to the SF was dependent on the affective state the infant was in when SF occurred). For me these studies on the FFSF paradigm led to the replacement of the “as if idealized view” of the infant-mother/adult interaction (Kaye, K., 1977; Schaffer, H. R., 1984) with the match-mismatch-reparation (MMR) hypothesis. The ‘as if idealized’ hypothesis was that the infant was passive and the observed interactive organization was the product of the adult, and that the ‘normal/good’ interaction was highly synchronized, simultaneously organized and characterized by positive affect. In this idealized model the achievement of synchrony

was the critical feature of the interaction and the more synchrony the “better” the interaction. This idealized model is similar if not identical to the argument in the attachment literature that the greater the sensitivity of the mother the more ‘normal/good’ the interaction and the more likely the infant will be securely attached. DeWolff, M & van Ijzendoorn, M. H., 1997). A more hidden feature of the idealized model is that it sees the infant as lacking agency and intention.

By contrast, based on the growing body of empirical micro-descriptive evidence, I advanced the match-mismatch-reparation hypothesis (Tronick, E. Z. & Cohn, J. F., 1989). The MMR hypothesis asserts that the ‘good’ interaction is characterized by interactive and affective reparation—frequent changes from matching to mismatching and back to matching affective dyadic states. In this MMR model of FF infant-adult interactions, a lack of coordination is inherent to the interaction. The capacity of the infant-adult dyad in repairing mismatches is a critical feature of ‘good’ interactions, rather than the interaction simply being in synchrony. The MMR implied that attempts to assess problematic interactions based on the idea more synchrony is better are misdirected (e.g., predict abuse from non-synchronous interactions). Rather, based on the MMR model I believe we need to evaluate a dyad’s capacity for reparation, a task that has yet to be accomplished.

Studies of Group and Individual Differences: Clearly my focus has been on the process of social interactions and modification of the FFSF paradigm is essential to that endeavor. Nonetheless, there also is a need to have a standardized paradigm for those who want to explore individual and group differences, and the effects of parenting and other factors on the infant. For example, studies of the effects of maternal depression on infant development have used variants of the FFSF paradigm. The studies have been quite illuminating but the variation in procedure makes direct comparison among the studies difficult. We cannot tell whether the differences are due to group differences or methodological differences. Even in the face of the robustness of the SF effect, methodological confabulation can arise from even small changes and confound our understanding. For example, in our own studies we have found gender differences in infants’ reactions to the FFSF paradigm (Weinberg, M. K., Tronick, E. Z., Cohn, J. F., & Olson, K. L., 1999). Others have found effects but the findings are

different (Carter, A. S., Mayes, L. C., & Pajer, K. A., 1990). However, procedures were not the same in the studies. Infants in one study experienced all three episodes in sequence with the mother turning away for 15 s between episodes, whereas in the other study infants who became upset were removed from the chair, comforted and put back. Given what we know about infants' exquisite sensitivity to affect and the interaction, in part uncovered by the studies which have manipulated the FFSF procedure, there is little doubt that the procedural differences between these two studies could have had a dramatic effect on the findings.

Thus for studies of group differences, individual differences, effects of conditions, such as prematurity or parental affective disorders, a standardized protocol is required. My suggestion would be to use the procedures we have developed as reported in Weinberg & Tronick, 1996. I make this suggestion because these procedures have been used in a series of studies that provide data at different ages (e.g., 3, 6, and 9 months) using coding schemes which are either micro-analytically detailed and time consuming (e.g., Infant Regulatory Scoring System) or more global and faster (Infant Caregiver Engagement System), both of which are usable with matching and time series analyses.

Explanation of the SF Effect

Adamson and Frick review a number of interpretations of the SF. They point out that the most widely accepted hypothesis is our original expectancy hypothesis, and that there are few strong alternative explanatory contenders. However, over the years in my thinking about the SF and related interactive issues I have come to question the expectancy hypothesis and tried to develop some more powerful, testable alternatives. The critical features of my thinking about the SF effect and the FFSF paradigm are to have an explanation anchored in models of the "normal" infant-adult interactive processes and the social emotional capacities of the infant, rather than formulating an explanation restricted to the SF effect in-and-of-itself. In addition, I want any formulation to be at least with a formulation of humans as open biological systems in such a way as to not only conform to the principles of open systems, but to lead to testable implications about the FFSF paradigm and other developmental phenomenon. As you will see I have attempted to meet these requirements starting with my hypotheses of the Mutual

Regulation Model (MRM) that has now been elaborated and generalized in the Dyadic Expansion of Consciousness hypothesis (Tronick E.Z. et al., 1998).

The SF and the Mutual Regulation Model: As noted by Adamson and Frick, when I developed the FFSF paradigm, both the FF episodes and SF procedure were designed to evaluate my MRM of infant-adult social interaction (Gianino, A. & Tronick, E. Z., 1988). The MRM asserted that the infant had capacities for self-regulation of their affective state but these capacities were limited. To overcome the limitation, the infant-adult social exchange was mutually regulated with both the infant and the adult modifying their affective communications about the state of what they were doing together in response to their partner's communications. My idea for the SF was a pretty simple deduction from the MRM: If the interaction is mutually regulated, then in response to the elimination of the adult-regulatory component, the infant would engage in activities to reinstate the interaction; or failing that, the infant would engage in activities to regulate his or her own affective state. What we found, and Adamson was there for the very first baby we ran, was the SF effect. It was stunning to see the infant cope with the perturbation and the robustness of the SF effect.

Implicit in the MRM was the idea that the infant had a relational goal or relational intention. Indeed, the SF reaction seemed to meet the criteria for motivated intention advanced by (Spitz, R., 1965) and (Bruner, J., 1990). The infant engaged in a variety of sequentially organized specific substitutable actions to re-engage the mother and utilized equally well organized sequential behaviors to cope with the relational failure, but when the goal was achieved (i.e., the mother resumed FF after the SF) the infant's behavior changed. Furthermore, the infant's turning away and engaging in self-comforting behaviors supported the MRM's hypothesis based on the brilliant work of Hofer (Hofer, M. A., 1984) that the mother/adult functioned as an external regulator of the infant's own affective state. When the mother failed to regulate the infant during the SF, the infant's affect changed to sadness and withdrawal because the infant was failing to achieve his or her interactive goal. As a consequence the infant was forced to rely on self-directed behaviors to regulate his or her own affective state. Thus it was the form of the infant's response—what the infant did and the organization of what the infant did—that was so telling about the infant's relational intent.

The Expectancy verses an MRM Affective Hypothesis: At the time we first reported the SF effect our interpretation was that the infant had developed expectations based on a scheme or schema about the mother's response, and the SF violated the expectations. The concept of expectations, a cognitive concept, fit the research demonstrating the fabulous, but heretofore, unseen competencies of the infant (Brazelton, T. B., 1979). To this day this cognitive schema sort-of-explanation is found in Stern's (Stern, D., 1985) concept of RIGS and the idea of the infant having implicit relational knowing Lyons-Ruth (Lyons-Ruth, K., 1998), which is a much more sophisticated cognitive model. The expectancy explanation was well received.

Other implications of the MRM were met with skepticism. Colleagues found it difficult to accept that the infant was motivated to be social (had relational intentions). Even today infant intention is still seen by many as problematic. Though it seemed undeniable that infants' might be motivated to grasp objects, to assert that the infant was motivated to socially interact with another person was seen simply as attributing too much to the infant (Schaffer, H. R., 1984). Social motivation or relational intention implied that the infant had specific organized actions for people (e.g., communicative displays) that were different than their responses to and expectations for objects (or checkerboards). Relational intentions also required that the infant apprehend (literally, grasp) the meaning of the displays of another person and organize his or her act(s) in relation to his or her apprehension of the other person's displays. At a practical level, social interactions were fast, on the order of seconds and even half seconds, and they were sequentially ordered. How could this immature being keep pace and play an effective role in such an exchange? And though it was obvious what the goal was in grasping an object, what was the goal of interaction? Something soft like love or joy!

An additional issue that provoked skepticism about the MRM was that the infant was only one component of a dyadic system with the adult as the other component. The challenge to colleagues thinking from the perspective of the MRM, was that although the infant might be dependant on the caregiver, the infant was not incompetent and passive. Rather the infant was active, having both self-regulatory and other-directed capacities for effective functioning within the dyadic system. As a consequence the infant was not a "stand alone entity" but a relational entity. A further

rub was that the means of regulation were primarily affective, and affect at the very least has some “location in the body” not just the mind. Thus the MRM viewed the infant as relational and embodied, and it challenged the idea of the individual infant developing as having disembodied mind.

For the most part the implications of the MRM would find much greater acceptance today. Twenty-five years or more of research has brought a richer understanding of infant self-regulation of state and affect, emotions, emotional expressions, and the capacities to apprehend emotions and to act in relation to the emotional expressions of others (Campos, J. J., Barrett, K. C., Lamb, M. E., Goldsmith, H. H., & Stenberg, C., 1983). Emotions as such are no longer seen as disorganizing but as organizers of infant behavior (Emde, R. N., 1983). This transformation of thinking forced me to think about an emotional or affective alternative to the explanation of the SF effect as a violation of expectancy.

It seemed to me that an affective hypothesis derived from the MRM was that the SF provokes a negative affective state in the infant (e.g., anger) because of the withdrawal of maternal/adult regulatory scaffolding. The infant engages in other-directed regulatory behaviors to solicit the mother’s regulatory input, but with continued failure to reinstate the dyadic system the infant’s negative affect increases. As a consequence the infant comes to rely on his or her own self-regulatory capacities to reduce the negative affect and to control the disorganization brought on by the maternal/caregiver withdrawal of external regulatory input. In this affective hypothesis it is the immediate and on-going withdrawal of external regulatory support that generates the SF effect, not the violation of a cognitive expectancy.

This MRM affective hypothesis explains the sequence affective changes (e.g., positive affect, sad, and angry affect) and the forms of behavior (e.g., solicits, self-comforting, loss of postural control) seen during the SF episode. These affects and behaviors are difficult for an expectancy hypothesis to explain (e.g., why isn’t the infant simply bored since there is less going on in the SF?). Importantly, the affective hypothesis also explains the infant’s behavior during the reunion-FF episode. In carefully examining the reunion-FF episode (Weinberg, M. K. & Tronick, E. Z., 1996), Weinberg found that the infant displays levels of positive affect that are similar to the

levels seen in the first-FF episode as well as the levels of negative affect seen in the SF episode. In the 1978 paper on the SF we reported a carry-over effect of negative affect into the reunion-FF episode but did not make much of it. Though there is no violation of expectancy in the reunion-FF episode nor for that matter is there a disruption of the dyadic system, at the time the carry-over did not lead me to question the expectancy hypothesis. But Weinberg wondered why does the infant express such high levels of negative affect along with positive affect?

The affective hypothesis explains the complexity of the infant's affect in the reunion-FF episode by arguing that the negative affect generated in the SF episode is not fully regulated with the resumption of normal FF play in the reunion-FF episode. Instead the negative affect is still "operative" and it continues to be operative into the reunion-FF episode; that is the infant continues to experience negative affect. At the same time, the resumption FF play and the reestablishment of the dyadic system allows the infant to experience positive affect. Weinberg is responsible for bringing our attention to the stress of the reunion-FF episode. Further, Weinberg argues that the reunion-FF episode may be more difficult to regulate than the SF because of the complexity of the emotions operative in the reunion-FF episode.

A critical implication of the affective hypothesis is that affective states persist even after the provoking event has ended (i.e., they have a duration that is independent of the initiating event). This is a critical observation because the persistence of an affective state can function to bring the past history in the present. In the FFSF paradigm the affect of the SF episode is brought into and present in the reunion-FF episode. The continuation of affect into the future has led me to hypothesize that infants have moods, long-lasting affective states that are untied from initiating conditions. Indeed mothers often observe that their infant "just woke up in a bad mood and there was NOTHING I could do to change it." My idea is that moods function to organize the infants' behavior over periods of time and as a non-cognitive mechanism for bringing the past into the present, an idea I have explored elsewhere (Tronick E.Z. et al., 1998; Tronick E.Z., 2002).

Untying the SF effect and the MRM from Infancy: The MRM and the affective-SF hypothesis provide a model of proximal affective processes as the means for

coordinating self and external regulation of infant affective and behavioral states. Moreover, the MRM essentially argues that the infant must be part of a dyadic system because when they are not, developmental derailment ensues. However, the MRM is anchored in infancy, which restricts the usefulness of the model. It becomes difficult to assert for example, that children and adults must be part of an affective dyadic system to self-regulate themselves. For example, Vygotsky (Vygotsky, L., 1962) convincingly argues that children use self-directed speech to regulate themselves, and adults can use internal thought processes to accomplish the same goal. Moreover, older children and adults have other ways of coordinating social exchanges, such as language that are not affect or action based. Nonetheless, at any age we know that the making and breaking of connections (e.g., the SF in older children [see below], loss, divorce, separations (Hofer, M. A., 1984)) has such powerful effects on functioning and experience. Thus it seems to me that as attached as I am to the MRM it is inadequate for explaining the effects of connection or the breaking of connection beyond infancy. However, I believe that we can understand the effects of connection/disconnection at any age by making the exchange and co-creation of age-appropriate “meaning” the coinage of what is regulated by the participants in a relationship. I have attempted to do this with my hypotheses of Dyadic States of Consciousness and the Dyadic Expansion of Consciousness. I believe these hypotheses integrate our understanding of relational connection and the breaking of connection as in the SF over the life span.

The MRM and the Dyadic Expansion of Consciousness: My hypothesis as to the connection through meaning is what I call the Dyadic Expansion of Consciousness (DEC) hypothesis (Tronick E.Z. et al., 1998). Though the DEC may seem far removed from the SF, I hope to show it is not. Individuals have states of consciousness or states of knowing about the world. These states may or may not involve awareness. They are an organization of age-appropriate meanings about the world. The meanings are not dictionary meanings that are abstracted from the body and the context, but age-appropriate, or better seen as age-possible meanings. By age-possible meanings I mean to imply the forms of meaning that are achieved with development (e.g., sensory-motor meanings in infancy, symbolic meanings in childhood). A Dyadic State of Consciousness (DSC) is formed when age-possible meanings are mutually exchanged

and co-created. Literally the states of consciousness of each individual come to share meanings from the other's state of consciousness. When the exchange is successful the participants become components of a larger dyadic state of meanings, dyadic states of knowing about the world. A DSC is formed. Critically, the DEC hypothesis asserts that the effect of creating a DSC is that their state of knowing about the world changes and expands, whereas the breaking of dyadic connection leads to the resumption of the sameness of their consciousness or even diminishment of it.

The DEC, as an elaboration of the MRM has no age limit. Individuals must make meaning about the world, but the way they come to know the world, their age-possible sense of the world, qualitatively changes with development. The infant's age-possible meanings are affective, sensory-motor, and intentional, and it is mostly implicit. For the older child and the adult their states of consciousness likely include (though not necessarily) earlier forms of meaning. Further, their states of consciousness include later-developing age-possible meanings in the forms of language, gestures, cultural forms of behavior, symbols, abstract concepts, representations, and more. To some extent for the adult much of their knowing about the world is consciousness, though much is still implicit. Indeed some of their knowing may be dynamically out of awareness. Given this developmental change in age-possible knowing, the older child and adult co-create DSC using the forms of meaning available to them. They are not simply stuck with the infant's affects and intentions. And in forming a DSC they too expand their age-appropriate states of consciousness.

The idea of states of consciousness may be difficult to understand and the process of their creation may seem immaterial, ethereal, or even mystical. But, it is not. The creation of a DSC is a material process of the exchange of meanings through the expression of affects and intentions using configurations of face, voice and body, language, and other expressive forms as ways of expressing age-possible meanings from embodied affects to abstract and representational meanings that make up the states of consciousness of the interactants. To materialize the idea in a very limited and unsatisfactory manner, one could think of two brains becoming the workings of a two-brain system in which they work together to share different information and to generate new information that both share with the other. Schore (Schore, A. N., 1994) has

suggested that the cingulate and parts of the limbic system may play a critical role in generating dyadic states of consciousness.

The phenomenology of DSC also may help in coming to grips with these ideas. When a DSC is established there is an experience of growth and exuberance. There is a sense of continuity and a feeling that we are in tune with the other person, even a sense of knowing the other person's state of mind. Indeed the DSC asserts that each person in fact does know some of the knowings of the other person's state of mind. By contrast, when a DSC is not formed or is disrupted there is a sense of loss, a feeling of being smaller. In the extreme I believe there can be a terrifying feeling of annihilation.

The MRM, the DSC and DEC as Related to Open-Systems Theory: These ideas can also be formalized in terms of open-systems theory. Humans are open biologic systems and the DSC can be described using first principals of open-systems theory. Of course, utilizing a theory as general and broad as systems theory can be relatively easy and generate a lot of "just so" stories. However, bringing the DSC and DEC into the framework of systems theory is not simply descriptive. Rather, as I hope to show, implications and deductions from its principles about the development and operation of dyadic systems can be derived.

Prigogine (Stengers, I. & Prigogine, I, 1997) has stated that a primary principle of open systems is that they must acquire energy or resources in an appropriate form (e.g., energy, information, meaning) during exchanges with the environment in order to maintain and increase the coherence of their states of organization. Coherence refers to the orderliness, complexity, and the integration of states (physical, physiologic or mental). Coherence is the distance the system is from entropy—from randomness. Though open systems have self-organizing processes for maintaining their coherence, the resources available for self-organization are limited. This limitation is an inherent and unavoidable characteristic of all open systems.

Prigogine (Stengers, I. & Prigogine, I, 1997) has stated that to overcome this limitation, open systems act to acquire and incorporate energy in an appropriate form that can be utilized by the system from the surrounding environment. Indeed the garnering of resources is a defining feature of open systems. When open systems are successful they are able to maintain a state of coherence as distant as possible from

entropy. It is also unfortunately the case that an open system is dissipative. When an open system fails to acquire energy it “falls back” toward entropy. It loses coherence, orderliness and complexity. It becomes simpler. Prigogine states that open systems must engage in exchanges with the environment to acquire utilizable resources to ‘avoid’ dissipation, and when possible to increase their coherence.

With open systems in mind, a re-phrasing of my question as to why connection is so critical and the breaking of connection, as in the SF, so powerful, would be: “How do individuals acquire resources in the form of meanings to maintain and increase the coherence of their states of consciousness and their distance from entropy?” Much of the argument has been made in other terms. The DEC hypothesis proposes that the resources humans must acquire to maintain and expand their own state of consciousness are age-appropriate forms of meaning that are appropriated during interaction with another person. The individual—the infant, child or adult –acts on the world to acquire and create meaning. However, at every stage of development the individual’s own capacities are limited. As a consequence, when the individual’s actions fail to garner resources from the external environment, the individual’s state of consciousness dissipates, moves toward entropy and loses coherence. The primary way to overcome this limitation is to co-create a DSC with another person. In this dyadic state both individuals can acquire meanings and their states of consciousness gain coherence and distance from entropy. Following Prigogine, each individual within a dyadic state fulfills the principle of systems theory of increasing coherence by acquiring external resources. When mutual regulation fails, their states of consciousness dissipate, become less orderly, simpler, and move closer to entropy.

The SF as the Dissipation of States of Consciousness: The SF has its effects because by breaking and preventing connection between the infant and the adult, the infant’s state of consciousness dissipates. The infant experiences a loss of coherence, a shrinking. After attempts to reinstate the dyadic system, the infant turns to self-regulation of his or her state of consciousness to prevent its further dissipation. Self-regulation is a kind of maintenance activity. But self-regulation can at best only be partially successful and the coherence of behavior becomes less coherent and less complex. We see infants huddle up, lose postural control, self-comfort, and remain

unengaged. Infants in the SF take on the apathetic appearance of Harlow's socially deprived monkeys or Spitz's orphanage-reared infants. Seeing infants—orphans or monkeys—one can almost see the dissipation and feel the infants' sense of shrinking.

The breaking of connection and loss of relationships in childhood and adulthood have similar dissipative effects. A research assistant of mine, Lisa Bohne, interviewed college sophomores after they participated in an experimental role-play of an adult version of the still-face paradigm. One student role-played an unresponsive mother and the other student simulated being "in the mind of an infant." The "infant-persons" who experienced the SF reported feeling anxious, angry, frustrated, sad, vulnerable, afraid, confused, and even "panic." Reciprocally, the students who acted out the still-faced mother reported feeling guilty, distressed, confused, anxious, depressed, shamed, and vulnerable. A "SF-mother" student reported, "It felt terrible to be so closed off from the 'infant.' It made me feel depressed and I'm sure the 'infant' did too after our interaction." Indeed, though what follows is a disjunctive leap, I believe individuals who feel depressed are no longer able to create dyadic states of consciousness and are suffering a feeling of dissipation.

Implications from Utilizing Systems Principles for the MRM: Utilizing the principles of open systems to formalize the MRM and the DEC and to apply it to individuals of any age is not simply descriptive. Beyond the explanation of the SF effect for infants, the formalizations clarify what is exchanged between individuals (i.e., age-appropriate meanings) and generalizes the MRM to individuals of any age. Further, the systems principles as realized in the DEC explain why exchange and connection with people are more critical for development than exchanges with objects. Engaging with people is more complex and unpredictable than engaging with objects. Thus there is more meaning to be gained by interacting with people compared to objects. After all, as Bruner (Bruner, J., 1990) has said, people are meaning makers whereas objects are not. An important implication of this interpretation is that there is no need for a pre-formed inherited distinction between people and objects, only that humans conform to the principles of expanding the coherence of their state of consciousness.

The concepts of states of consciousness and their expansion, and the conforming to the principles of systems theory distinguishes these concepts from states

of intersubjectivity. Intersubjective states are primarily understood because of their phenomenology. There is little proximal explanation for how they come about and evolutionary explanations simply make them seem pre-ordained and to appear de novo. In contrast, the expansion of states of consciousness comes out of human interactive processes and these processes as well as states of consciousness have a developmental, ontogenetic course.

We need to think about the development of meaning and states of consciousness. For example, the sense of the world for the infant is not the sense of the world for the older child. The older child has symbols and language, and neither the infant nor the child have the same sense of world as a teenager who has self-reflective capacities. Neither the infant nor the child will gain coherence from acquiring resources in the form of abstract meanings, but the teenager can form a DSC with another teenager using abstractions and as a consequence expand his or her state of consciousness. The idea that DSCs are formed at different ages using different forms of meaning has implications for truly integrating insight-driven therapeutic processes and relationally-driven therapies.

That the infant acts to increase coherence and to move further away from entropy places a number of phenomenon outside the ubiquitous reach of attachment theory. The 6-month-old infant is in the presence of the still-faced mother, but cannot achieve connectedness and experiences dissipation. Perhaps the 9-month-old infant in the presence of a stranger is wary and anxious because the stranger intrudes on the connectedness with the mother and the infant is unable to establish connectedness to this unfamiliar person and there is a threat of dissipation. The 11- to 18-month-old baby left alone in the room is under a direct threat of dissipation. The children we see in the preschool SF (see below) utilize complex thoughts about the mother's state of mind to explain her disconnection in their attempts to maintain their sense of what is going on, their coherence. However, these explanations eventually fail to maintain the preschoolers' behavioral organization and their behavior becomes simpler and less coherent. In adults, loss and grieving as described by Hofer (Hofer, M. A., 1984) are outcomes of the disconnection of critical regulatory components—ways of making sense of the world—of dyadic systems. The disconnection that comes with loss

effectively threatens the adult with dissipation of their states of consciousness. The adult can no longer make sense of the world. Put more generally, the implication is that connectedness is not just another term for attachment or the quality of attachment. I believe that “insecurity” comes when there is a threat that the individual’s state of consciousness will dissipate.

The first principle governing the human dyadic system is that successful mutual regulation of social interactions requires a mutual mapping of age-appropriate meanings from each individual’s state of consciousness into the other’s state of consciousness. When this mapping is successful a DSC is created and each individual’s state of consciousness is expanded, becomes more complex and coherent. It literally grows. Thus the process of fulfilling this principle of systems theory requires two minds that reciprocally communicate and co-create meanings with another person. When successful in fulfilling this principle consciousness expands, becomes more coherent, and changes qualitatively. When that principle is violated development fails. I believe the SF is one such violation.

Some Future Directions

Developmental research on the DSC at all ages, on individuals suffering affective and mental disorders and on therapy is clearly called for, but other specific issues about the SF pointed at by Adamson and Frick need to be addressed as well.

Stability and Individual Differences: Adamson and Frick suggest that one unaddressed issue is whether or not there is stability of the infant’s reaction to the SF. Given researchers’ interest in individual differences and temperament, and the robustness as well as the reactive complexity of infants’ response to the SF, the lack of research is striking and unfortunate.

We recently completed a study of eighty-one 6-month-old infants who visited the laboratory twice with a separation of 2-3 weeks (Tronick E.Z., Weinberg M.K., & Olson K.L., 2002). The 3-week separation between visits was chosen to avoid developmental changes. Our goals were to evaluate the extent to which young infants display stable coping and social-emotional behaviors during SF and normal FF play episodes of the FFSF, and to evaluate the individual and dyadic interactive factors that predicted infants’ reactions. Between the SF episodes there was significant stability for infant

Object Attend, Object Play, and Social Attend. We also found that the significant predictors of infant behavior in the SF episode at Visit 2 were infant engagement scale scores during the SF episode in Visit 1 and the engagement scale scores during the first-FF episode in Visit 2. There also were high levels of stability in infants' behavior in the first-Play episodes between Visit 1 and 2.

These findings suggest that infant coping and social-emotional reactivity to the stress of the SF is already moderately stable at 6 months of age. Moreover, that infant behavior, as opposed to maternal behavior or dyadic interactive variables, was a better predictor of the infants' reaction to the Still-Face suggesting that infant temperament may be at play. However, infant behavior was also more stable between the first-FF episodes with the mother than when the infant was alone during the SF episodes. These findings attest to the role of maternal regulatory scaffolding and dyadic factors as organizers of infant behavior. Perhaps what is relevant is the demonstration of the usefulness of the FFSF for studying issues of individual differences. In particular, the FFSF allows for the examination of the relations among maternal and infant interactive behavior, infant coping, and interactive dyadic variables (e.g., matching). This study takes a limited look at one age, but we now have methods for examining the stability of coping at older ages that span major developmental transitions.

Longitudinal Studies of the SF: Adamson and Frick emphasize the need for developmental studies. A few of these have been carried out during the first year of life with interesting findings on the emergence of different coping capacities (e.g., the infant's capacity to use an alternative focus of attention to cope with the SF). However, the age range of these studies is restricted and they have not been related to developmental changes of capacities, such as the development of age-possible meanings. For example, one would expect a shift in coping and reaction to the SF in infants who have achieved social referencing compared to infants who have not yet achieved these capacities. "Referencers" compared to "non-referencers" have different ways of making sense of the world. Studies on "referencers" and "non-referencers" might help reveal how the capacity to know another's state of mind affects the infant's reactivity to the other's behavior as an expression of the infant's own state of mind and the meaning to them of the other's state of mind. Another intriguing study would be to

elaborate on Campos' work with walking and not-yet-walking same-aged children. Campos has shown how affect and meaning of the world shift with this developmental shift. Indeed it would be intriguing to take Campos' ideas on these shifts and identify such shifts (e.g., shifts referred to by Brazelton as Touchpoints (Brazelton, T. B., 1992)) in older infants and children as a way of understanding changes in children's response to the SF (see below).

Restricting a developmental look at coping to infancy with the FFSF is limiting especially in light of the DEC hypothesis. Katherine Weinberg (Weinberg, M. K., Beeghly, M., Olson, K. L., & Tronick, E. Z., 2002) in my laboratory has developed a procedure for using the SF with older children. In the first episode of this procedure the child and the adult engage in floor-play with toys. This episode is followed by a SF episode in which the mother "freezes" and does not respond to the infant. In a third episode the mother resumes her normal play. In the case of older children's coping with the SF, better coping is expected to reflect a motivation to reconnect and maintain engagement with the mother (e.g., requests for interaction, requests for information about what is happening) and an ability to maintain self-regulation and not become distressed, fearful, angry, aggressive, or disengaged (e.g., yell, hit the mother, run around the room, tantrum). Also, based on our previous research conducted during the infancy period (Weinberg, M. K., Tronick, E. Z., Cohn, J. F., & Olson, K. L., 1999), which found that infant boys are more affected than girls when the mother abruptly stops interacting and providing regulatory scaffolding, we expected that male toddlers and preschoolers will have greater difficulty regulating their affect and behavior during the SF than female toddlers.

Our findings with 30-month-old preschoolers are as striking as our findings with infants. Preschoolers responded to the maternal SF with heightened negative affect and approach-avoidance behaviors, such as simultaneously verbally (e.g., questions – "Why don't you talk to me?" or commands – "Talk to me.") and gesturally (e.g., tapping or almost hitting the mother) soliciting the mother's interactive behavior, and distancing themselves from her. The preschoolers also attribute states of mind to the mother (e.g., "Are you sleeping? Wake up!"; "Don't be afraid of the alligator [toy]!"). As in the FFSF with infants, a carry-over of negative affect and approach-avoidance behaviors was

observed during reunion-play episode. Only one gender effect was observed: Boys made more requests than girls overall. These findings replicate and extend the SF to the preschool period but not only in the affective domain characteristic of infants, but in the more symbolic way that preschoolers make sense of the world. Nonetheless, despite the differences between preschoolers' and infants' meaning systems, the SF profoundly affects them as well.

More generally we now have models in the form of the preschoolers SF paradigm (which likely can be easily extended to older children) and in the adult role-play paradigm, ways of experimentally exploring the experience of the SF over much of the life span. Of course, we can and should more carefully explore maternal and paternal reactions to the SF in the FFSF paradigm during infancy and then beyond infancy. Studies on parental reactions to the SF are intriguing (Carter, A. S., Mayes, L. C., & Pajer, K. A., 1990). Parental reactions can be explored as a way of further understanding the effects of disconnection on the adult and might be of great help in understanding how to proceed with therapeutic work on infant-parent mental health.

What is called for is a longitudinal developmental study of children's reaction to the SF that covers an age range from infancy at least through school age, even into adulthood. It would be fascinating to examine the emergence of coping with the disruption of DSC in relation to the development of age-possible meaning systems, intersubjectivity, complex emotions, social referencing, and the child's theory of mind. A critical variable requiring examination in such a study would be gender, given the differences and the later development of behavior problems in boys (e.g., aggression) and depression in girls. Perhaps early gender-related differences in self-regulation are related to the later development of forms of psychopathology (Gilligan, C., 1996). Developmental studies of infants/children with parents who have affective conditions (e.g., depression, anxiety), the conditions that distort parenting and connectedness (e.g., parental withdrawal, familial violence), would allow for the examination of the negative and (possibly) positive developmental effects of these forms of disconnection on coping, emotions, and DSC. I might expect, for example, that children of anxious mothers would be far less effective in their coping with the SF than infants of mothers free of anxiety. Studies from the perspective of the DEC might also provide a different

understanding of the nature of physical, psychological, and sexual trauma. Additionally, the studies by Nadel (Nadel, J. & Tremblay, A., 2002) raise the question of the autistic child or the child with a pervasive development disorder's reaction to the SF. If as some have argued autism is a disorder of intersubjectivity then the SF with older children should be a powerful tool for exploring these children's capacities and distortions of intersubjectivity.

The relation between behavior and physiology in the SF: The Adamson-Frick review reveals the paucity of studies that have examined the physiology of infants' response to the SF. We carried out a small study examining vagal tone. We found a drop in vagal tone during the SF episode compared to the other episodes and a greater drop in vagal tone for boys compared to girls. As the review demonstrates the SF is a stress on the infant and our work with 30-month-old infants indicates that it is a stress on older children as well. Examination of the relation between the children's SF behavioral response to cortisol, other neurohormones, GSR, and vagal tone should help us to better understand the behavioral and physiologic stress response. Using EEG, which has been done with infants of depressed mothers, or VERs would help add to our understanding of how emotions are organized in the brain. A critical feature of these studies would be the ability to accurately tie infant emotional expression to the brain's activation pattern. However, these studies in young infants may need to await techniques that are less affected by movement artifacts and that provide localized information on brain activation.

Untangling what is going on in the SF: Muir (Stack, D. M. & Muir, D. W., 1992), Fogel (Toda, S. & Fogel, A., 1993), Cohn (Cohn, J. F. & Elmore, M., 1988), Field (Stoller, S. & Field, T., 1982), and others have demonstrated how even small changes of the FFSF procedure affect infants' reactions. I believe that more studies changing features of the procedure will be very revealing, especially with longitudinal examination. Do infants react differently to an anger face compared to a smile face? I expect the infant's initial reaction during the SF might be different but very quickly the reaction would be similar as the SF wore on; and, I expect there would be developmental changes. Muir's virtual image technique will be a powerful technique for

exploring these issues, especially our understanding of the features and assemblages of features that convey and change meaning and connectedness.

I also think at least some of us need to keep looking even more carefully at infants' and children's affective and behavioral reactions. For example, the facial expressions of sadness, anger, and smiles have been somewhat well described in infants. But even for infants one could ask if the smiles in the SF episode are the same smiles as the smiles during play, or do they index a different quality of affect? I expect the latter is true, and if that is found wouldn't the finding question the idea of a few categorical emotions in infants, and possibly the idea that infants cannot make "false" or "deceptive" expressions? What about other expressions, such as fear? Do infants, or more likely older children, express fear in reaction to the SF, or is it that they just express anger, sadness, and withdrawal? The DSC would predict that they experience fear. Is there a sequential pattern of expression: anger to sadness to withdrawal and then possibly to fear?

Conclusion

Adamson and Frick have provided us with an important benchmark for the SF effect. As they emphasize, the SF and FFSF paradigm add to our instrumentation for developmental studies. I think given the work that has been done we can see that the SF effect has led us into new areas of inquiry and that it can be explored in older children and adults. The SF effect is robust and complex, and for me it helps reveal core human characteristics.

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