Discussion of "Stock-still Behavior: A Potential Developmental Marker" by Susan P. Sherkow, M.D., Lissa Weinstein, Ph.D., Sarah R. Kamens, M.A., Matthew Megyes, B.A. B.S., Lynn P. Tishman, Ph.D., and Cheryl Williams, Psy. D.

Peter Fonagy, PhD FBA

It is a particular pleasure to discuss Susan Sherkow, Lissa Weinstein, and their colleagues' paper for many reasons, only one of which is that it describes an intriguing developmental observation with very many ramifications. I am also delighted to be back in this room with many friends and particularly delighted because Dr Sherkow a few years ago attended the IPA's London-based Research Training Programme to seek advice about her observational study from a Faculty of developmental luminaries such as Bob Emde, the late Stuart Hauser, Linda Mayes and the like. I clearly remember giving her advice about appropriate themes for her study and I am pleased to see that she took none of my suggestions seriously and a far more exciting project emerged as a consequence. However, she clearly took the meta-message of the RTP to heart – that research in the laboratory, in the consulting room or in the nursery is about one thing above all else: *the*

willingness to allow ones observations to surprise one. The study we heard about this evening is the product of such an unexpected observation.

To summarize very briefly, the intriguing observation is of a developmental phase-specific response of momentary freezing, (stock-still behavior) triggered by the imperative to pass from one familiar social context into another. Of six closely observed children, all of them manifested this behavior, spanning from a few seconds to up to five minutes, between 16 ½ months and 18½ months. We are assured that this is not an artifact of systematic observation as, informally at least, the parents confirm their children behave in this way in other settings. The authors suggest that the behavior is a more or less universal marker of "the development of the mental capacity, to distinguish a sense of self from object". Before entertaining this possibility, let us address ourselves, as the authors do in a very commendable way, to some of the challenges which will inevitably be made to this explanation. We all come to new discoveries with understandable ambivalence: our hunger to learn something new is normally commensurate with our reluctance to be told something that we didn't already know.

Firstly, if stock-still behavior is a universal marker, why has it not been noticed and reported before by the many accomplished observers of development who have devoted their working lives to the naturalistic and experimental study of infant development? There may be several reasons for this. One could be, that the behavior occurs in a relatively brief developmental window. It is a signal of a phase-shift rather than a newly emerging but persisting fresh acquisition to the child's behavioral repertoire. If we blink, or if we don't specifically look for it, we might well miss it.

The second possibility is that the behavior was noted but no particular significance was attributed to it. The authors cite Annie Bergmann who is reminded by these observations of similar behaviors recorded at the Masters' Centre, under her leadership.

A third possibility is that the behavior was noted by other observers but was inappropriately classified as an indication of something else, something more readily apprehended. The authors draw our attention to a number of candidates. First, is it possible that freezing at the threshold of the nursery is an indication of a maturing capacity for inhibition? Indeed there is strong evidence that behavioral inhibition takes a step forward at around this time

and so does cognitive inhibition (Holmboe, Pasco Fearon, Csibra, Tucker, & Johnson, 2008; Janson & Mathiesen, 2008; Roth & Saykin, 2004; Sirois & Mareschal, 2004). The authors correctly point out that the emergence of cognitive inhibition is indeed a necessary precondition for self-other differentiation (which is their favored explanation). However, this argument is weakened by what we know about the loosely coupled nature of behavioral and cognitive inhibition. Even in extreme cases such as ADHD, one may frequently observe attention deficits without hyperactivity (e.g., Sayal, Hornsey, Warren, MacDiarmid, & Taylor, 2006; J. Williams & Taylor, 2006). In this instance the authors are looking for a behavioral marker for a cognitive change. Stock-still behavior may indeed be a good behavioral marker of some tectonic shifts at an intrapsychic level. But a one-to-one correspondence between behavioral and cognitive inhibition is improbable.

A fourth possibility raised by the authors is 'wariness'. Indeed it is highly probable that previous observers of this kind of freezing behavior at a physical or temporal point of discontinuity between social contexts have attributed the behavior to fear. The authors argue that 'trepidation' is not a likely account of their observations a) because social contexts on both sides

of the threshold are familiar, b) because there was no indication of habituation, and c) because the behavior resembles less someone struck by anxiety and more a person 'momentarily preoccupied with their internal experience'. I tend to agree with the authors' conclusions but we may differ in the weight we give to these arguments. Taking their points in reverse order: (a) I am not convinced that without more detailed, probably psychophysiological measurement or Paul Eckman-type facial-affect coding, one can differentiate dissociative freezing born of anxiety from an iconic representation of separateness or difference with a new capacity to decouple behavioral action from perceptual stimuli.

(b) In relation to habituation, the authors themselves report that habituation does occur, that these toddlers stop exhibiting this behavior fairly soon after it starts.

(c) It is true that wariness is most likely to occur in contexts strange to the child. Yet the mental world of the 18month-old is such that external reality may not be a good marker for what feels strange. Mary Target and I have talked of this as psychic equivalence (Target & Fonagy, 1996), which put simply means, that for the 18month-old, what is in their mind and what is out there carries comparable weight. Thus whilst the parents, the nursery staff, the authors and all of us may be confident that the world beyond the

threshold is carefully arranged so as to be familiar to the child, such conscientious effort on the part of the adult world melts into nothingness in the face of a momentary fantasy on the part of the child. Psychic reality you might say (Fonagy & Target, 1996). For the same reasons that we will never convince a 2 year-old frightened of a tiger, purportedly domiciled under his bed, that there is no tiger, no matter how often we might explore the dark space under the bedstead, we cannot know what the immature autobiographical memory of an 18 month-old might retrieve about the world beyond the threshold. We cannot know and we must not assume that we do.

But, whilst I disagree about the reasons, I do agree that the observations about stock-still behavior ***is*** iconic of something other than anxiety. If children were anxious at that age I would expect them to proximity-seek, unless that is, their attachment was disorganized and we have no evidence that had been the case. But as the authors hint, there may indeed be links between the stock-stillness and the mechanisms underpinning attachment disorganization. The maltreated 18 month-old child with disorganized attachment commonly freezes in the strange situation, exhibiting a moment of something like dissociation. We assume that this is because of a loss of attachment strategies, lost because of the irresolvable internal conflict

created by the need for reassurance from the very person who created an experience of lack of safety, and a consequent overwhelming sense of helplessness and hopelessness. The moment of freezing seems like a wish for the world to stop while they find a way out of the confusion. I don't for a moment believe that the internal world of the child manifesting stock-still behavior is reflecting the same degree of disorganization.

Nevertheless, the child is creating a deliberate pause, producing a break between two interpersonal settings. The threshold is one between the child being in dyadic contact with the mother and the one where she is about to share her world with a larger group. Why should this create a problem, a pause for thought, and why particularly at 17 months?

I agree with the authors that the answer is to be found in the emergence of selfhood at this age. Not by the way of physical selfhood. Dr Sherkow and her colleagues are following Mahler and other distinguished developmentalists who spoke in this room in trying to map the emergence of intentional awareness, the recognition of the distinction between ones own and other's minds. More recent research on the emergence of 'theory of mind', less hampered by the verbal methodologies that inevitably delayed

the age at which we estimated that mentalization emerged, has suggested that appreciation of the knowledge state of an other starts around the same time when the stock-still behavior observations were made (Onishi & Baillargeon, 2005; Onishi, Baillargeon, & Leslie, 2007). Infants in the 1st half of their second year show surprise when an adult acts in ways that suggests they had access to information which the child witnessed the adult was deprived of. So it is around this time that the children cease to uniquely see themselves as psychologically part of a parent-infant co-consciousness.

They know from birth that they are physically separate. An infant of two weeks recognizes the difference between his own fingers being moved to touch his cheek and someone else's finger doing the same (only the latter triggers a rooting reflex) (Rochat, 2009). But even a one year-old is profoundly distressed by the mother who is instructed to keep her face still for a minute and suddenly stops responding contingently with the child's expressions and actions (Tronick, 2007). We assume that this is because their own experience of self is hard to sustain without the presence of another who has their mind in mind (Hobson, 2002; Rochat, 2009). If awareness of the self is initially co-constructed then obviously moving from one co-consciousness (being with mother) to another (being with nursery

staff) will lead to radical changes in the experience of selfhood as represented; of course this only happens once there is a separate sense of mental self and is a source of concern at least until this self is robustly established. This is the developmental reasoning behind attachment theorists arguing for limited numbers of carers working to define the child's self experience (Bowlby, 1988).

Before the emergence of self-other differentiation, the change in self with a change of the other causes no immediate difficulty for the child. It simply implies a change in state as one experience of co-consciousness is exchanged for another. With self-other differentiation, the child acquires a second-order representation that demands coherence and continuity of the self-state, yet the influence of the other is so powerful and the risk of loss of coherence is so great that a moments pause, standing still on the threshold of a new experience may be essential. Even as mature adults we sometimes talk of 'collecting ourselves' as an occasional requirement for ensuring a continuity of identity when under significant internal or external pressure. Going back to the context within which the observations of stock-still behavior took place: a few seconds for gaining meta-cognitive composure seems eminently reasonable for an 18 month-old about to switch their

identity between a self born of dyadic mother-infant interaction and a social self capable of triadification and entering complex social domains.

But this leaves open a question: through what mechanism can the other can the other have such powerful influence on the self. It is in this context that perhaps we might come closest to understanding (with current knowledge) stock-still behavior. Why is the other assumed by the child to be so close to the self? Why is the pressure for a separate sense of intentionality such a driving force of motivation in all of us? Why is it so readily threatened in some of us by the slightest injury to our self-worth? Why does a child need to stop for three minutes on the threshold between two inter-subjective self-states? I believe the answer lies in the rather peculiar way our self-consciousness is organized at the fulcrum of the imperative for empathy and the imperative for self-determination, or what Sydney Blatt (2008) refers to as the dialectic between relatedness and self-definition (individuation or separation if you prefer). Let me try support the Sherkow et al. paper's contentions about the functions of stock-still behavior as well as my assertions about the intersubjective roots of the psychological self with some relatively recent behavioral and neuroscience data about the nature of self-other differentiation.

There is a surprising commonality between processes underpinning self and other understanding in mental state terms. Both developmental psychopathology and neuroimaging research suggest that the capacity to distinguish between self and others is fundamental in the ability to negotiate the social world. In this context, neuroimaging studies have consistently supported the assumption that envisioning the mind of another is underpinned by the same brain systems as identify one's own thoughts and feelings (Dimaggio, Lysaker, Carcione, Nicolo, & Semerari, 2008; Lieberman, 2007; Lombardo, Barnes, Wheelwright, & Baron-Cohen, 2007; Uddin, Iacoboni, Lange, & Keenan, 2007). The common circuitry used in mentalizing self and other may explain the struggle of the normally developing child to acquire a sense of self-hood which stock still behavior marks and also self-other confusions in disorders (such as BPD) which are associated with the dysfunction of these neural systems. Reviews of the neuroimaging literature suggest that two distinct neural networks are shared by psychological self- and other-knowing (Lieberman, 2007; Uddin et al., 2007). The first system is the more bodily-based, frontoparietal mirror-neuron system that is involved in understanding the multimodal embodied self (e.g., face and body recognition) and understanding others through

motor-simulation mechanisms (Gallese, Keysers, & Rizzolatti, 2004; Rizzolatti & Craighero, 2004). This suggests that a fundamental process that allows us to appreciate the actions and emotions of others involves the activation of the mirror neurone system for actions and the activation of viscero-motor centres for the understanding of affect. This is thought to be one of the key evolutionary mechanisms underpinning social empathy – knowing from the inside as it were how an other feels. Since the discovery of mirror neurons, a number of similar experiments (Calmels et al., 2006; Gazzola, Aziz-Zadeh, & Keysers, 2006; Lotze et al., 2006; Molnar-Szakacs, Kaplan, Greenfield, & Iacoboni, 2006) as well as indirectly connected studies for example on facial mimicry (Sato & Yoshikawa, 2006), gender differences (Cheng, Tzeng, Decety, Imada, & Hsieh, 2006), and autism (Dapretto et al., 2006; J. H. Williams et al., 2006) have been interpreted as implying that we understand the actions, emotions and sensations of others from the perspective of sharing their actions (Keysers & Gazzola, 2006; Rizzolatti, Ferrari, Rozzi, & Fogassi, 2006). It is suggested that a single mechanism (shared circuits) applies to witnessing the actions, sensations and emotions of other individuals and to performing the same actions ourselves (Calvo-Merino, Glaser, Grezes, Passingham, & Haggard, 2005; Calvo-Merino, Grezes, Glaser, Passingham, & Haggard, 2006). Similarly, feeling

the same sensations and emotions and translating the sight and sound of what other people do and feel into the language of the observer's own actions and feelings provides intuitive insights for the observer into the inner life of the observed. Hence, this is an implicit, automatic system, providing physical other-to-self and self-to-other mapping, which is involved in the immediate understanding (or misunderstanding) of self and others. The so called 'chameleon effect', the unconscious imitation of a conversational partner's gestures (Chartrand & Bargh, 1999), may be an example of the system in action. We all experienced how observing someone else yawn can create an irresistible temptation to do likewise.

The sharing of structures not only implies a model for acquisition but also highlights the potential for conflating the embodied simulation of another person's experience with one's own experience. Such conflations often appear to occur in BPD (Allen, Fonagy, & Bateman, 2008), a disorder incidentally that is often characterized by dissociative breaks in consciousness. So how does the child learn to differentiate self from others? What changes in brain function might stock-still behavior be marking?

A second, cortical midline system which consists of the medial prefrontal cortex, anterior cingulated cortex (ACC), and the precuneus starts to 'come on line' gradually in the second year. This system is less bodily based, and processes information about the self and others in more abstract and symbolic ways (Frith, 2007; Frith & Frith, 2006; Uddin et al., 2007). Importantly, this system is shaped across development by interpersonal relationships. By contrast, the frontoparietal system appears to be established earlier and is altogether less experience-based. The neural circuits involved in the cortical midline system (the mPFC, and the temporal parietal junction) (Lieberman, 2007; Uddin et al., 2007) concern themselves with beliefs, desires and wishes in self and other. The overlap in the recruitment of neural tissue for self and other may be greatest when the comparison is based in referential judgments and when the 'other' and 'self' are closely matched in terms of intimacy and affective salience (Zhang et al., 2006). So making character judgments about self and one's mother recruit the same parts of the brain regardless how similar the participant perceives himself to be to her mother. Underpinning this overlap in neural tissue recruitment is a thoroughly integrated system of self-cognition and other-cognition that is a product of early child development. Within the resultant network, the skills, ideas, beliefs, organizational systems and assumptions

used in dealing with the internal world of one's own mind are also used when dealing with the external social world (Keysers & Gazzola, 2007; Mitchell, Macrae, & Banaji, 2006; Saxe, Moran, Scholz, & Gabrieli, 2006; Uddin et al., 2007).

Recently the work of Marcel Brass and colleagues has offered a suggestion about how the fronto-parietal (motor neurone) and cortical midline systems, both of which process representations of both self and other, may interact to create an experience of not-me and therefore me (Brass, Derrfuss, Forstmann, & von Cramon, 2005; Brass & Haggard, 2008; Brass, Schmitt, Spengler, & Gergely, 2007). And by-the-by the theory offers an account for why the child might from time to time need to hold still – deactivating the motor cortex preventing tenuously held symbolic states of mind from being dominated by experiences acquired through a more developmentally primitive, mirroring process. The theoretical claim that self and other representations are shared and are the default mode of the motor system is, as we have seen reasonably well supported. People have a tendency to automatically mirror actions. This causes interference with voluntary action when the observed action of another is incongruent with an intended act. It is well established that observing an action has a powerful influence on

movement execution, congruent observation primes while non-corresponding observation interferes (e.g. Kilner, Paulignan, & Blakemore, 2003). (For example, if the participant observes someone lifting their index finger at the same time as they are instructed to lift their middle finger, reaction time will be extended). Interference from incongruent observed actions appears to be particularly powerful when the observed action is seen as intentional (Liepelt, Cramon, & Brass, 2008) and when the intent is perceived (even without the movement being performed) (Liepelt et al., 2009). And this is the case with our mature brains. Imagine what the possibilities of interference might be for a small child whose symbolic representational systems for his own mental states are just forming. Standing still for a moment may then be construed as an explicit and specific rejection of the potential 'chameleon effect' they anticipate upon entering a social situation – a gesture of self preservation if you will. This may be a clue to the notorious hyperactivity of small children. In one nursery schoolroom observational study, in seven timed minutes, (Ames and Ilg, 1976) the researchers fount that at eighteen months, a child's locomotion covered about sixty sites, in all areas of the room, zigzagging in every direction; at two years the average child covers twenty-five sites along one diagonal; and at three years, only three sites, from one side of the room to the other, and

back to the original one. Toddlers need to think with their feet, their motor cortex, in case someone takes their thinking over. Movement, as much as stock-still behavior, may protect against the motor system co-opting for the child the mental states of others.

This is where the child's relative immaturity must be taken into consideration. If perceiving an intention in another triggers the impulse to perform the same behaviour, the question of how automatic imitation can be avoided becomes a central issue. Luria (1966) noted echopractic response tendencies in prefrontal patients and recent research has confirmed that patients with frontal lesions have problems with inhibiting imitative response tendencies (Brass, Derrfuss, Matthes-von Cramon, & von Cramon, 2003). Neuroimaging studies indicate that the neural regions which are most often recruited in the inhibition of imitative behaviour are the aMFC and the TPJ (Brass et al., 2005; Derrfuss, Brass, Neumann, & von Cramon, 2005), in other words cortical areas that are also related to mentalizing, self-referential processing and self-agency. There appears to be a functional relationship between the inhibition of imitative behaviour and the capacity for belief-desire reasoning. Thus, the capacity to inhibit imitative behaviour may be key to enabling us to generate a sense of 'me'-ness through achieving a 'not-

other'-ness when we are with others. We can also assert me-ness by standing still. And, of course, we can best think about rather then being taken over by our patients' subjective states by ensuring that they lie on the couch, out of our sight,

More generally, if the child needs to interpret the other's actions and yet retain a sense of who THEY are, there may be a sequence in which an initial imitative matching response with the other within a motor neurone self-other system interacts with the reflective mentalizing self-other system. Thus by necessity this involves an inhibition of the mirror system and reduce the extent of 'primary identification' with the other. We might hypothesize that with a relatively immature medial prefrontal and temporo-parietal mentalizing function the young child will experience difficulties in decoupling their representations of another person's experience from their self-representations. Hence the inevitable co-construction of consciousness before the mPFC and TPJ fully functions emerge.

Let me illustrate what I mean using a well known phenomenon: the 'curse of knowledge bias'. Children consider the things that they are taught to be shared cultural knowledge available to all others. It follows then that the

small child assumes that his knowledge is knowledge held by all. What he knows is known by others and what is taught by others is accessible to all others. He will therefore also assume that there is nothing unique about his own thoughts or feelings (Fonagy, Gergely, & Target, 2007). Developmentally, with the acquisition of the realisation that not all knowledge is shared by all (a key aspect of theory of mind Bloom, 2004), children normally learn the conditions under which this assumption should be suspended. The overvaluation of one's own perspective characteristic of naïve realism stems from the same developmental source as the 'curse of knowledge bias' (S.A.J. Birch & Bloom, 2004) which provides an excellent account for the so-called 'egocentrism' of young children. Toddlers readily assume that other children will know facts that they themselves have just learned (S.A.J Birch & Bloom, 2003). They find it challenging to appreciate another person's perspective in Piaget's three mountains task, not because they assume that everyone's perspective is the same as theirs, but because they assume that everyone knows the same things. Many diverse studies show this (S.A.J Birch & Bloom, 2003; Fischhoff, 1975; Kelley & Jacoby, 1996; Keysar, Lin, & Barr, 2003; Taylor, Esbensen, & Bennett, 1994). Piaget's concept of egocentrism has exactly the opposite emotional valence to what is actually taking place. With regard to toddlers it is important to

realize that developmentally it is not the overvaluing of private knowledge, but rather the undifferentiated experience of shared knowledge that hinders perspective-taking prior to the development of the PFC. Thus one way to understand the rage and frustration proneness of the toddler may be related to their inability to inhibit their own reactions when they are thinking about the mind of someone else. The shared world and individual minds are not clearly demarcated -- they expect other people to know what they are thinking and feeling, and to see situations in the same way they do. Thus, thwarting their intentions seems malign or willfully obtuse, rather than the result of a different point of view, alternative priorities, etc. This makes such frustrations not merely hurtful but intolerable and maddening, a denial of what they believe to be a shared reality.

To conclude: if stock-still behavior turns out to be a reliable observation marking moments when children in toddler-hood move across social situations, one motivation for it may be the buttressing of a state of selfhood as they move from one imitative context to another. The dramatic standing still may characterize a mind that is becoming aware of its own thoughts and intentions, but this is not yet robust enough to carry it through seamlessly from one self-state to another. With development, reflective mentalizing

maintains self-other differentiation by enabling us to distinguish our own and others' intentions and inhibiting the tendency for overly concrete experience of the other as if the other was a physical part of the self. In particular, the close linking of self-cognition and social cognition implies the closeness and intertwining of self and other representations, with profound implications for the experience of the integrity of the self. The object (the mother) sustains the child's symbolic capacities for self reflection and creates a crisis of identity in the face of this loss very characteristic of this age. The acute suffering that experiences of separation lead to for toddlers perhaps becomes more understandable if we assume that when symbolic mentalization fails the child is exposed to a direct (unmoderated) experience of vulnerability to others' reactions (an unmitigated chameleon effect), now necessarily fragmented and impossible to differentiate from phenomenological self experience. Winnicott's concept of unthinkable anxiety comes close to describing the phenomenology of this loss experience characterized as going to pieces, falling for ever, having no relation to the body and complete isolation because of there being no means of communication (Winnicott, 1962). This aspect of subjectivity rooted in the vulnerability of the self in an interpersonal context was noted by Hegel (1807) in his description of the emergence of the self from a relationship of

‘Lordship and Bondage’ and by Freud (1921) in his description of the experiences the individual in groups where the self has to liberate itself from the dominance of the other. The self can only emerge when the person is able to know (to compute) mental states (beliefs, wishes, desires) of both self and other and thereby inhibit i.e. moderate primary identification. So the surprise is that stock-still behavior only lasts a few seconds and only in toddlerhood – given the universal temptation to become the other, it could last a life-time. Finally, I want to thank Dr Sherkow, Dr Weinstein and their colleagues for an exceptionally stimulating and thought provoking paper.

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