

Communicative Musicality and Infant Mental Health

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Infant Intersubjectivity: Human Vitality Adapted For Imaginative Cooperation In Rhythm

“The old model of thinking of the newborn infant as helpless and ready to be shaped by his environment prevented us from seeing his power as a communicant in the early mother-father-infant interaction. To see the neonate as chaotic or insensitive provided us with the capacity to see ourselves as acting ‘on’ rather than ‘with’ him.” (Brazelton, 1979, p. 79)

Infants have long been conceived by many philosophers, by medical science, and by agencies responsible for their care, as weak reflex organisms requiring physical support -- uncoordinated by intentions and consciousness, and animated by unconscious bodily drives and feelings protective, as chemical processes, of the body and its vital functions. They have been assumed to move by reacting to stimuli, submitting with primitive emotions of pleasure and pain that require external regulation, first by loving maternal care, then by sterner paternal discipline. A young child must acquire, first, a self-conscious Ego by engaging with and representing the immediate environment, discovering its sensations, limits and uses; and then gaining a responsible personality or Super-Ego that has learned to obey moral principles of behaviour in relationships with other persons, and that has developed respect for social rules. By this learning the rational awareness and accumulated knowledge of an educated adult mind develops and becomes adapted to an industrious employment in a complex, artificial social system, ruled by symbols, customs, techniques and laws, and to a mechanical sense of time. Physical and emotional well-being in this cultivated way of life depends on an acquired self-confidence in a personal agency that understands practical reality, and mastery of self-conscious restraint in communication about facts and opinions, building wisdom that incorporates respect for artificial moral values as well as understanding of a history of human achievement in a particular culture. Infants totally lack this personal initiative and knowledge and are insensitive to it in other persons. They lack intentions and self-conscious awareness and they cannot know other minds.

But there are consistent and coherent ‘common sense’ beliefs, and much life evidence, that these reductive or abstract suppositions are incomplete -- that infants have perceptive awareness of a

world in which they can chose to move in different ways, that they have emotions expressive of their sense of vitality, and that they communicate intimately with the actions and emotions of other persons especially when these are responsive to themselves. A natural science of infancy brings evidence of intrinsic emotional and imaginative purposes in human behaviours from birth (Stern, 2000, 2010; Trevarthen, 1979, 2001a; Trevarthen and Aitken, 2003a). The newborn infant has been confirmed to possess an imaginative mind that regulates coherent prospective control of self-conscious and rhythmically patterned whole-body movement, and with a capacity for separate intelligently-directed action of body parts (Trevarthen, 2011a). Human organs of special sense formed before birth -- eyes, hands and hearing – are aimed selectively and with curiosity to the outside world, in combinations and sequences that quickly build up a discriminating awareness of the natures and affordances of external objects (Trevarthen, 2001b). In short, a newborn, although limited in mobility and experience, can act and learn as one conscious and intentional *subject*, with an autonomous sense of time and space for moving that originates innately in the brain, which maps the body and its capacities for action in engagement with the world as one whole emotionally-regulated Self (Northoff and Panksepp, 2008). Most importantly, a newborn infant also has a predisposition to engage intimately with the actions and emotions of other human beings, *inter-subjectively*, resonating with their intentions and emotions, reacting to them as persons with whom communication may be sustained by means of synchronized expressive gestures, and to whom an intimate emotional attachment is sought (Trevarthen, 1979, 1998, 2004a, 2011a; Aitken and Trevarthen, 2003; Trevarthen and Aitken, 2003a).

Even in infancy, human individuals also show temperamental differences in response to intimate contact, in more distant communication, and in cooperation. They differ in timidity and fearfulness or defensive reaction when anxious, in ability to form warm affectionate attachment and friendship, and in tendency to be assertive or aggressive. These relate to differences in emotions and sociability between individuals in other mammal species (Panksepp, 2001; Hausberger et al., 2004; Soumi, 2007). They do not begin as acquired cognitive responses elaborated by social learning in the expanse of the human neocortex. But they are adapted to respond to generous human company, and to become motives for taking part in an imaginative community of understanding and skill (Trevarthen, 2009a; Frank and Trevarthen, 2011).

The differences between children in their developing agency and communication and response to stress are susceptible to modification or ‘epigenetic programming’ by both physiological and psychological relations with other human lives, a process that begins in transactions with the mother’s vitality and emotions, inside her body, before birth, and that is particularly intense and vulnerable in early childhood (Narvaes et al., 2011). As they gain socially regulated habits and articulate awareness, a child’s feelings and personality become integrated as a ‘personal history’ of

experiences, the foundations for which were laid in the motivating and emotional systems that made contact with other human minds and bodies in early years and were affected by their responses (Vandekerckhove and Panksepp, 2009). These are the systems formed in the human body and mind that need affectionate maternal care, and that can be damaged by stress or neglect (Trevarthen et al., 2006).

Development of Agency and Personality Before Birth

There is an elaborate preparation for intentional and cooperative inter-mental life in the prenatal growth of the human being, both in visceral or vital organs and functions and in outwardly directed somatic or physical ones (Trevarthen, 2001b, 2004b; Trevarthen et al., 2006). In the early foetus, before the first movements are generated, sensory and motor organs form that are anatomically adapted for human ways of communicating feelings and thoughts in conversation. The life functions of the embryo body are guided by intercellular collaborations to prepare for a sentient, mobile agency that is shaped with an anterior receptive pole and a posterior motor one. The primary germ layers map somatic and visceral, sensory and motor prospects for an active conscious life of an integrated body. The first fibre systems to grow in the embryo brain are those for neuro-hormonal control of vital functions within the body. Interneuron systems of the autonomic nervous system, hypothalamus, reticular formation, basal ganglia and limbic system, which mediate intermodal sensory integration and the coordination of motor patterns and motive states, appear in the second month of gestation. These structures, constituting the Intrinsic Motive Formation (IMF), are developed before cortical neurons are generated (Trevarthen and Aitken, 1994). As core neural systems they act as morphogenetic regulators of neurogenesis and nerve net formation in later developing systems, including the cerebral cortex tissues that will become motor executive and sensory-perceptual mediators for intelligent life (Trevarthen et al., 2006). Cranial nerve nuclei, which will animate communication by vocalization, head and eye movements and facial expressions, and centres of the brain stem that transmit motor activation and sensory feedback of the hands in gesturing and touching, also differentiate in the late embryo period (Trevarthen, 2001b, 2004b).

Recently it has been found, by precise analysis *in utero* of the spontaneous dynamics of mid-term foetuses, that when well-coordinated movements do develop, they are seeking self-exploratory intentional control of their hands and mouth, mapping out an awareness of the body by self-touching (Piontelli, 2002; Trevarthen, et al., 2006 ; Zoia, et al., 2007). It has been claimed that interactions between twin foetuses may demonstrate a different 'self-other' sensibility (Castiello, et al., 2010). The movements twins make to touch one another appear to be tentatively seeking

response of a 'social' or interpersonal nature. To begin to be a *Self As Agent*, or a *Person In Relation* (Macmurray, 1959, 1961), and to have *Moral Sentiments* (Smith, 1759) a human being does not have to wait on the learning of articulate reason and artificial cultural habits (Panksepp, 2005).

Affectionate Sharing of Meaning Transmits Culture

In the first year infants gain increasing awareness of the intentions of other persons and the objects that they use, and they find pleasure in sharing purposes and discoveries. Ritual signals and activities of social life are copied, making shared manners and a tradition of action games and songs (Papoušek and Papoušek, 1981; Gratier and Trevarthen, 2008; Trevarthen, 1999, 2008a, 2011b). These developments prove innate human motives adapted for cultural learning, for artful invention and 'learning how to mean' (Halliday, 1975). The interest in shared meaningful use and interpretation of the shared world, which we have called '*secondary intersubjectivity*' (Trevarthen and Hubley, 1978), precedes language learning and motivates it.

We live in a fictional world that is passed on and constantly reinvented and evaluated by negotiation of our separate interests to enable cooperative actions and desires (Trevarthen, 2011b). Our cultural knowledge grows not only in special affectively-intense relationships of *attachment*, in which vital functions of the body and emotions of well-being are regulated, but mainly in convivial *companionship* of "friends" and "teachers," doing and knowing together in creative "technical" and "artistic" ways, with pleasure from sharing. Infants are born with motives that seek joy in this playful creation of consciousness "with" others (Gratier & Trevarthen, 2008; Reddy, 2008; Trevarthen, 2004a, 2009a, b).

The sensitive motives that guide cooperation in action and awareness and learning of shared meaning before language are susceptible to disorder and responsible for infant psychopathology, either because of deviant internal regulations or because the human environment has not provided the anticipated and solicited support. Understanding of the strong emotions that evaluate the progress of the grasp of meanings to be shared, and of their expression in the vitality of movements (Stern, 2010), is essential for helping children who, at any stage of development, are losing confidence in their capacity to share and cooperate with the people who have care of them (Hundeide, 1991; Hughes, 2006). The interaction between a mother's pre and post-natal mental health during and the mutual emotional engagement between her and her developing child's mind is made clear by investigations of substance abusing mother-baby pairs and demonstrations of how enhancing mothering and attention to the infant's natural powers can benefit the mother and her

child, reanimating both the process of the mother's healthy response to adversity and development of her infant's new life (Suchman, Pajulo and Mayes, 2011).

All achievements of technique and art depend upon the affections and shared enthusiasms of interpersonal relationships, and upon the natural process by which this learning grows in infancy and how it may recover from traumatic events. Recent advances in functional brain science confirm that the proprioceptive regulations of intentions in the self can be shared by sympathetic "alteroception," so that creative actions and experiences, and the emotions associated with them, may be cooperative or 'altero-ceptive' (Rizzolatti and Sinigaglia, 2008; Bråten, 2009; Sinigaglia, 2009). Both language and rational thought rest upon the innate motives and feelings for this dynamic intersubjective coordination of conscious activity. Individual personalities and self-consciousness grow in relationships and come to recognize traditional beliefs and practices of the community.

If development of an infant is normal or healthy, there are predictable age-related events in the first year. These may be disturbed by stress from the outside world or disordered internal epigenetics that change how growth and differentiation proceed. They are defined by 'periods of rapid change' that normally open a succession of new preferences and interests, but their healthy emergence depend on affectionate human care and interest. There are advances in motor sequencing and versatility, in posture and locomotion, and in the ways infants seek or react to events or to objects to which they can direct attention, or how they attempt to seize hold of and explore things with hands or mouth. The most important changes are in attention and response to other persons, and these correlate with conspicuous developments in parts of the brain (Trevarthen and Aitken, 2003b).

The regulations of development can only be understood by detailed analysis of behaviours in a wide range of natural circumstances, with interpretation of adaptive motives of the whole human subject. This interpretation may be supported by detailed science of the mechanisms involved, such as high resolution imaging of fast changing and intricately woven brain activity, studies of gene expression and its regulation, and tests of the chemistry of intercellular communication (Narvaes et al., 2011). We can only infer changes in awareness, initiatives and feelings by collecting evidence from the vitality and curiosity of infants in rich natural situations with intimate parental attention. Margaret Donaldson (1992) presents a comprehensive psychological view of the infant's growing awareness which she describes as an expanding 'locus of control' within the 'concerns' of the infant, which includes imagination for the future and memory of past events, both dependent on emotional appraisal of experiences, and emotional support from companions appreciated with 'human sense'. Developments in this mental vitality, and its vulnerability, are not comprehended by detailed sciences of genetics, neurobiology and biochemistry alone.

Proto-Conversational Narratives Build Shared Experience

Pioneering work by Mary Catherine Bateson established the criteria by which the special features of human conversation or shared imagination may be identified very early in infancy. She described behaviours exchanged and mutually regulated in a film of an engagement between a 9-week-old infant and the mother.

“A study of these sequences established that the mother and infant were collaborating in a pattern of more or less alternating, nonoverlapping vocalization, the mother speaking brief sentences and the infant responding with coos and murmurs, together producing a brief joint performance similar to conversation, which I called 'proto conversation'. ... These interactions were characterized by a sort of delighted, ritualized courtesy and more or less sustained attention and mutual gaze. Many of the vocalizations were of types not described in the acoustic literature on infancy, since they were very brief and faint, and yet were crucial parts of the jointly sustained performances.” (Bateson, M. C., 1979, p. 65)

Her interpretation of these behaviours relied upon evolutionary theory and the observational method of animal ethology. She demonstrated that both infant and mother have adaptations of behaviour that promote learning of meaning in shared expressive activity, and these, she concluded, motivate language learning, which is not an isolated skill specific for accumulation of a vocabulary of symbols.

“Infant and mother may enter into such interactions because previous experience combined with phylogenetic characteristics prepares them to do so. The particular kind of preparation, as well as a comparison with other kinds of contexts in which rapid and intense learning takes place, suggests that interactions of this sort have a very high potential not only for pleasure but also for learning. ... A concept of structured receptivity or readiness to learn, as we are able to define it, casts a totally different light on the value and usefulness of environmental input. Specifically, in this case, we are suggesting that mother and child, long before speech, have the potential for developing joint vocal performances (although these will clearly take different forms in different cultures), which function as contexts for learning.” (Bateson, M. C., 1979, pp. 75-76)

Description of the expressive timing and organization of these intimate playful events into memorable “narratives of expression” has confirmed that the intricate behaviours of the infant and adult are adapted to synchronise self-regulatory *subjective* states of mind between persons, so that purposes, interests, and feelings are shared, *inter-subjectively* (Trevarthen, 2009a). The theory of

infant intersubjectivity is a theory of innate rhythmic motives for the active and conscious self-regulation, and regulation of companionship in different degrees of intimacy (Trevarthen, 1979, 1998; Aitken and Trevarthen, 2003; Trevarthen and Aitken, 2003a). It gives a grounding for understanding the emotional “moral” regulations of a human culture with its artificial rituals and technologies, the feelings of relatedness to one another in a family and community, the sense each individual has of self-worth, and the growth of a “personal narrative history” discovered in relation with recognized others, and in deference to the special will and tolerance of each of them (Gratier & Trevarthen, 2008; Trevarthen, 2005a, b).

Endel Tulving (2002) proposes that an ‘episodic memory’, recalling key moments of experience for future reference, is a special human talent. It seems to be what makes problem-thinking, imaginative and inventive intelligence possible. The process of ‘autonoesis’ or self-knowing links emotion-charged moments of action and awareness in ‘phenomenological present’ and recalls them as specially significant in a fictional plan of life’s ambitions and achievements (Vandekerckhove and Panksepp, 2009). Stern describes how the ‘vitality dynamics’, which are so important in communication with infants, in all sincere and intimate negotiations in families and in society, and in respectful therapeutic conversations with psychiatric patients, are cultivated in the arts as ‘layered composite narratives’ (Stern, 2010, p, 131). A healthy mind builds proud memories in loving company with specially trusted family and friends, making a good, self-confident story. Loneliness, shame, depression and sadness are the emotions that identify loss of this collective story-making, which can be called ‘socio-noesis’ (Trevarthen, 2007; Frank and Trevarthen, 2011). The developing human psyche has needs for company, and human psychopathology defines a deep confusion in self-awareness and well as an incapacity to communicate sympathetically with other human imaginations and purposes (Northoff, 2011), or to contribute to work in society (Heckman, 2007).

All these special abilities of the human mind are beginning in proto-conversations with two-month-olds and, if they are affectionately supported by responsive parental attention, they lead to the growth of a shared meaningful experiences. Both auto-noesis and socio-noesis begin in the early months (Frank and Trevarthen, 2011).

The Growth of Self-Conscious Play and Provocative Games: Enjoying the Ritual

The expressive vitality of infants’ and mothers’ talk and play is led to new inventions by changes in the bodies and motive impulses of the infants after three months. Infants move from prospective engagement in proto-conversations to mastery of the theatrical rituals of action games (Trevarthen, 1999; Merker, 2009). They take an active part in the rhythmic art or ‘communicative musicality’ of

baby songs (Mazokopaki and Kugiumutzakis, 2009), giving their excitement to the story, making jokes of meaning, testing what their partners in the performance have in mind and what their emotional expectations are. Bruner and Sherwood (1975) used analysis of the game of 'peek a boo' to illustrate the mastery of the rules of 'story-making' as a bridge to learning how to talk.

Gratier (2007; Gratier and Trevarthen, 2008) has named the special games or 'rituals' a mother and infant create a 'proto-habitus', a world of expected occasions for sharing interests, actions and 'roles'. The infant attends and becomes familiar with a mother's particular habits and the games she has learned, and the infant's interest has strong innate dynamic 'purposes' and aesthetic 'preferences'. There are 'rules' for a good game or action song with an infant (Malloch, 1999; Trevarthen, 1999), and they derive from how the baby wants to act and share the pleasure, and from their appreciation of musical, emotional and story-telling features in the human voice (Papoušek and Papoušek, 1981; Dissanayake, 2000; Trehub, 2003; Trevarthen, 2008a, 2011c).

Stern pioneered film study of the dynamic creativity of play of a mother with her three-and-a-half-month-old twins. He defined 'relational emotions' and their composition in 'dynamic narrative envelopes' or 'vitality contours' (Stern 1999), such as Malloch (1999; Malloch and Trevarthen, 2009) identified as 'narratives of musicality', and Stern and his colleagues (Stern et al, 1985) introduced the idea that sharing of experience begins with 'affect attunement', by which a mother joins with and confirms her infant's changing expressions of energy in play using 'intermodal fluency' to translate between forms of expression. The 'visceral' or 'arousal' energy (Stern, 2010) of human body movement is channelled and enhanced by the 'teasing' engagement between mother and baby is evident, as Darwin recorded when he played 'peek a boo' with his son (Darwin, 1877).

In the middle of the first year, after the transformation of awareness and the capacity to manipulate objects around 4 months, babies gain a social self-consciousness and a lively playfulness that likes to tease and practice trickery and jokes. They learn customary expressions of their family, and they make fun of them, seeking appreciation of their wittiness. Reddy (2008) takes these convivial behaviours as proof of a self-and-other awareness or 'second person intentionality', and she demonstrates its importance for the development of the 'self-consciousness-in-the-eyes-of-the-other' -- the I-Thou relationship of Martin Buber, and the 'social Me' of George Herbert Mead. From this intimacy and mutual appraisal develops the capacity to share practical attentions to the world and to participate in the purposes and emotions of 'acts of meaning' before language.

Sharing Tasks and Inventive Projects: Making Meaning

We have identified a major transformation at 9 months in infants' interest in sharing interests and ways of using objects more 'seriously' to collaborate (Trevarthen and Hubley, 1978; Hubley and

Trevarthen, 1979). They become willing to take 'instructions' or 'directions' of how to take part in simple cooperative projects, accepting initiatives to make combinations of objects or to move an object in a particular way. They behave as confident co-workers in a 'secondary inter-subjectivity' where practical intentions and social gestures were shared in a cooperative and knowing way. The change is more than a development of 'joint attention'. Rather it is a development of the pleasure of predicting another's actions to imitate their intentions and to share their interest and initiative (Trevarthen, 2011d). Child and parent take part in creative and constructive projects when the child has no words. To cooperate in this way two persons must pay attention 'seriously' to the movements of another's head, eyes and hands, to observe their acts of intention with imagination, understanding of the 'affordances' of objects, sometimes sharing 'affective appraisal' of how the performance goes, participating together, sharing what Piaget called 'pleasure in mastery'. Neither Piaget nor Freud believed infants had any reciprocal sympathy of understanding of others' purposes of feelings before developing an 'object concept' after months of experiment with effects of moving to test 'schemas' of object properties, as an individual. We find, on the contrary, that the beginning of cooperative awareness is a development of the imitative dialogues, protoconversations and games of youngest primary intersubjectivity stage, and that secondary intersubjectivity is, moreover, essential preparation for naming actions and their objects. It constitutes the 'proto-language' of Halliday (1975) in which non-verbal acts of meaning are made with combinations of gestured intentions and affective vocalizations.

A baby is born with many 'anticipatory adaptations for cultural learning', of which a capacity for joint attention to share consciousness of objects is just one, and not the earliest or most imaginative. First they share intimate dialogues of expression, then amusing games and jokes about the sharing of their playful 'rules' or rites with members of the family. Toward the end of the first year they become more skilled at sharing both the purposes and the pleasures of tasks, and the people they prefer to work with become friends and collaborators, while strangers are greeted with caution and suspicion, and their knowledge and trustfulness is tested attentively. Right from the neonate stage, who you respond to, and who responds to you, is important, as well as the sensitivity, respect and spontaneity of their actions towards you, sharing feelings. That is what is made clear by studies of infants' preference for having fun or doing tasks with familiar persons, their withdrawal from strangers, and their confusion and distress when engagement with a known person is perturbed by non-response or by emotionally defensive or aggressive behaviour. Learning meaning from others depends on 'openness' to them with your feelings, and a trust that they will be open with you, sympathetically (Reddy, 2008). Emotional distress with fear, sadness and anger follows from insensitive, intrusive and coercive treatment by others, or from neglect and loneliness.

Each of the main transitions in development of these socio-emotional stages of infancy is associated with a change in attachment or emotional dependence on responses from identified others.

According to dynamic systems theory of each developing relationship, they arise out of the events created with and between infant and child, but there are causes within the developing dynamic system or organism of the infant, in both body and brain. Advances as well as periods of significant fragility or instability are strongly influenced by developments in infant vitality and motivation, and the effects of inappropriate or insufficient support from the human environment relate to these developments (Van de Rijt-Plooij and Plooij, 1992; Brazelton, 1993; Trevarthen and Aitken, 2003b).

Communicative Musicality: Intrinsic Rhythms of Vitality and their Transformation for Social Life.

From birth a child is motivated to act in and to perceive the world and to engage with the rhythmic actions and awareness of other persons, to move in synchrony with them (Trevarthen, 1999; Dissanayake, 2000). Our gestures and expressions of face and voice communicate to other minds the anticipated and imagined events in a creative “flow” of consciousness (James, 1890; Csikszentmihalyi & Csikszentmihalyi, 1988) that animates conversation for practical cooperation, for friendship and teaching, as well as for psychotherapy (Meares, 2004). Body movements are emotionally charged “acts of meaning” that seek the interest and appreciation of others and that require fanciful translation to become part of group understanding (Bruner, 1990; Trevarthen, Delafield-Butt, & Schögler, 2011). They are adapted simultaneously for choosing experiences of ongoing events, for knowing what they are “worth” for our Self, and for sharing them in the drama of an imaginative community—for making a cultural narrative that becomes our familiar home.

The theory of Communicative Musicality (CM) was developed from musical acoustic analysis of vocal communications between infants and their mothers (Malloch and Trevarthen, 2009). It defines parameters of rhythmic time or *pulse*, of emotional expressive *quality* of vocal sound, and the generation and sharing of *narrative* sequences of vitality or energy in motor activity through periods of inner or visceral time of tens of seconds. Non-verbal or pre-verbal narrations have natural communicative function, being regulated by emotions that lead to ‘intersynchrony’ of purposes and interests between adult and infant, comparable with those described by ‘conversational analysis’ of spontaneous and informal interactions between adults. CM theory has been used to trace the development of rituals of play through infancy and the development of syntactic forms of expression in cooperative engagements with shared attention to the environment that lead to protolanguage and, in the second year, to verbal discourse. Comparisons between

different cultures with different languages confirm universal features of musical expression and coordination with infants, and they support the theory that language is an evolutionary development from motives for community activity in the form of narrative dance and music.

All animal movements must be measured with a *rhythmic time base*, one that reflects the physiological functions that sustain internal well being of the body and its vital processes (Wittman, 2009; Meissner and Wittman, 2011), and that may also accommodate to the physical constraints of the body in order to guide movements so they make effective exploitation of environmental resources. *Vital time* is evident in viscerio-ceptive, intero-ceptive or proprio-ceptive self-regulation in the matter of the body, and extero-ceptive purposefulness of an animal's movements in relation to the outside world (Sherrington, 1906). It forms the innate foundation for intentionality and its communication, and is elaborately developed in humans, which have exceptionally complex motility and social cooperation (Osborne, 2009a; Trevarthen, 2011e)

Methods by which social psychologists have measured the intuitive timing of social signalling in conversation (Condon and Ogston, 1971) have been applied to transform the theory of the infant mind, and its capacity for participation in time with the agency of another human mind (Condon and Sander, 1974; Stern, 2000; Trevarthen, 1979, 1998, 1999; Trevarthen and Aitken, 2003a; Bråten, 2009). The infant and adult move and sense one another 'altero-ceptively' by engaging their rhythmic motives of *subjectivity*, regulating them by interpersonal emotions that assess the 'sympathy' of the interactions in *inter-subjectivity*. Recently this work has been strengthened by the use of 'tau' theory of motor control (Lee, 2009), and motion capture to accurately track limb movements in 3D space, to demonstrate how movements of neonates are regulated as expressions of internal state and of body awareness, for orientation to objects outside the body, and for engagement in communication with the expressions of an other attentive and sympathetically attuned person (Van der Meer, Van der Weel and Lee, 1995; Craig and Lee, 1999; von Hofsten, 2004; Trevarthen, Delafield-Butt and Schögler, 2011).

Changes in the rhythms, expressive quality and narrative coherence of the behaviours of mothers diagnosed with clinical depression or bi-polar psychosis when they are attempting engagement with their infants, and the negative and disorganised reactions of their infants, indicate that CM analysis may be used to define the difficulties characteristic of these disorders, and to give guidance for therapy (Gratier and Apter-Danon, 2009; Marwick and Murray, 2009). Non-verbal therapies, especially music therapy, illustrate the power of controlled musicality in empathic communication with a patient for support of disorganised and discordant expressive behaviours characteristic of anxiety, depression, psychosis, mental handicap and autism (Osborne, 2009b; Robarts, 2009; Wigram and Elefant, 2009).

Clinical and Therapeutic Applications of Infant Communication Theory

Given that the newborn infant has the active consciousness of a coherent self or human agent (Trevarthen and Reddy, 2007), and that it is motivated with clear emotions to provoke intimate engagement with the mind and affections of a parent (Reddy and Trevarthen, 2004; Trevarthen, 2005a, 2009b), an infant's mental health may be defined as the state of well-being in an intimate living mutual relationship between two persons, regulated by their emotions. In '*primary intersubjectivity*' infant and parent both need to be in an open 'other-directed state' with reciprocal sympathy of their common human vitality and intentions. Distress in one distresses the other, disorganizing the engagement, and can lead to emotional states in the infant that require special sympathetic compensation or 'regulation'. This care must be sensitive and aimed to support and facilitate positive states of 'arousal' and rhythms of conscious agency that benefit from open interest in company, rather than those that lead to withdrawal and protest (Trevarthen, 2001a; Trevarthen et al., 2006).

Acceptance of the prenatal adaptations for human mutual awareness, and for emotional attachment between mother and infant, has transformed paediatric care (Brazelton, 1979; Als, 1995; Brazelton and Nugent, 1995; Nagy, 2011). It has encouraged development of non-verbal motor therapies that address intuitive responses to vocal and gestural expression of feelings. There are important implications for social policy and the distribution of resources for the very young and their families, and for women who are about to give birth, and their partners. In health the human brain grows to build creative relationships with joy in human company (Hughes, 2006; Perry and Szalavitz, 2010). The politics of social work, preschool education, parental employment and leave for family care in modern states need to be transformed to fully respond to inherent and early developing human emotional needs (Heckman, 2007; Narvaes, Panksepp, Schore and Gleason, 2011)

Prenatal Vitality, Its Early Development, and Its Vulnerability:

A human foetus has peripheral motor and sensory organs adapted for searching in the world and for communication – face, eyes, hands and vocal system -- and these are linked in motive processes with neurochemical emotion systems concerned with modulating visceral states and with vital self-regulation (Panksepp, 1998; Porges, 2003). After birth, this 'intrinsic motive formation' (IMF), evolved from core systems of the brain that generate internal vital processes (Trevarthen and Aitken, 1994) is shaped by arousal of motor actions and the stimuli arising 'in the moment' from them, and especially by 'attuned' communication with the vitality of other persons and their states of arousal (Stern, 2010). This psychological communication elaborates both a coherent agency with

self-awareness, and an immediate sense of sympathy for other persons' movements, and it gives essential emotional support for early development of the emotional mind (Northoff and Panksepp, 2008; Panksepp, 2011; Schore, 2003, 2011).

Intrauterine development depends on close vital collaboration with the mother's body and the regulations of its life. We have named this mutual physiological relationship 'amphotero-nomic', to distinguish it from the processes of 'autonomic' regulation within the separate bodies of the embryo or foetus and the mother (Trevarthen et al., 2006). Transfer of substances that can affect their vitalities is regulated at the placenta, and through the body surfaces in contact with the amniotic fluid. Important effects on the developing foetus are recorded when the mother is stressed, depressed or anxious during pregnancy, in relation to her hormonal condition, or if she takes stimulating drugs. These effects may lead to future abnormalities of sleep regulation, anxiety and socio-emotional behaviour and cognitive abilities in children (O'Connor et al., 2007; Bergman, Glover et al., 2010; Bergman, Sarkar et al., 2010).

Appropriate care of disturbances of the mother's emotional health through pregnancy and through infancy may benefit both mother and infant, and secure affectionate attachment with the mother after birth moderates disturbances of motivation and emotion (Bergman, Sarkar et al., 2010). A mother's postnatal depression can lead to enhanced stress response and risk of depression in her child at adolescence, and this leads to a recommendation for treatment that aids mothers with depression to have active and positive engagement with their infants (Murray et al., 2010). Research with rhesus monkeys shows that affectionate maternal attention may protect offspring from tendencies to anxiety and aggression (Soumi, 2007). A 'fetal programming' effect of a mother's anxiety and stress during pregnancy leading to hyperactivity, conduct disorder, aggression or anxiety in her child may be an adaptation to prepare for growing up in a dangerous environment (Glover, 2011). The perception of 'pathology' in the child may be in part a product of structured and controlled, yet dangerous, society that seeks to suppresses this kind of defensive response as inappropriate. Panksepp (2007) has warned of the damage done to the 'social brain' if children with ADHD are given psychostimulants to quieten them, and he advocates a form of play therapy to make use of their natural vitality.

That the foetus has some adaptive capacity to identify expression in the mother's voice is proved by studies of the preferential responses to her voice or to heartbeat sounds immediately after birth. These special affiliative reactions to her are mediated by the left ear (right hemisphere), whereas hearing of unfamiliar speech is mediated by the right ear (left hemisphere) (DeCasper and Prescott, 2009). It may be that human hearing is adapted from the start to distinguish intimate and more formal and 'distant' forms of vocal communication (Takada, 2005).

Post-Natal Companionship and Learning Conventions of Sociability

After birth the infant uses the special expressive and receptive organs that are adapted to monitor mental processes in the self and in others and keep track of the prospective awareness made manifest in the shape and timing of movements (Trevarthen, 2001b). This psychological regulation of active relationship mediated by distance senses we have called ‘synrhythmic’ (Trevarthen et al., 2006). A key component is the polyrhythmic time generator in the brain built to track and make productive use of proprioceptive and visceral dynamics throughout the body (Meissner and Wittmann, 2011). This time sense, a hierarchical biochronology of rhythms, is innate and it facilitates matching between the infant and an attentive adult in early communication, enabling them to attune in agile jazz-like synchrony and alternation, leading and following one another in a way that generates pleasure and makes learning of new creations easy (Gratier, 2007; Gratier and Trevarthen, 2008; Osborne, 2009a).

The innate sympathetic process, and its rhythmic affective regulations, may be demonstrated in mutual imitative exchanges with a newborn infant, as long as the *initiatives* of the infant to make the exchange of signs reciprocal are recorded, not just the imitative *responses*. Newborns can imitate facial, vocal and gestural expressions, employing complex motor patterns with purposeful and emotional control, and they *repeat what they have imitated to confirm and extend human contact* (Kugiumutzakis, 1998; Nagy and Molnár, 2004; Trevarthen, 2011a). The brain mechanisms in left and right cerebral hemisphere for this mutual awareness and readiness for exchange of initiatives have been revealed by imaging of brain activity when a two-month-old infant is looking at to another person, even when the other person is presented only in the form of a photograph of an unfamiliar woman looking toward the infant (Tzourio-Mazoyer et al., 2002). The right hemisphere of infant and mother become engaged to provide an intimate regulation of mutual awareness and affection (Schore, 2011). The left hemisphere is already oriented to hear and respond to informative messages that will become language.

In early weeks, the mother can be described as an ‘external regulator’ for a baby’s vital functions and state of animation (Hofer, 1994). She helps the baby be at ease with a brain and a body that, while growing rapidly, are trying to engage the world and other people in complex ways. To do so she must be responsive to the infant’s initiatives and to their motive qualities. She is not just a protector of the infant’s body and its functions. She is also required as a partner in more adventurous or creative activities that engage the infant’s imaginative mind and exploratory feelings. From the start a young human seeks playful ‘intersubjective’ communication of purposes and interests, and he or she gains pleasure and encouragement from reciprocating with the

initiatives of playmates (Trevvarthen, 1998; Trevvarthen and Aitken, 2001, 2003a). The emotional attachment between parent and child is a sharing of playful 'companionship', not just a provision by the adult of biological care and protection, and not just a mirroring of the shape and aim of movements (Trevvarthen, 2005b).

Disturbances of Communication Provoke Distress

Infants have prospective interest in the expressions and their motives in a partner, expecting it to be lively and sympathetic, and they are disturbed if the actions of the other express unsympathetic feelings, or are unresponsive and mis-timed or non-contingent. Studies in which the mother's communication is experimentally disrupted or perturbed so that she appears and sounds unresponsive (Tronick *et al.* 1978; Murray and Trevvarthen 1985; Nadel *et al.* 1999) prove the active role of the infant. The infant is seeking sensitive attunement to his or her state and changes in expressive behaviour, which shown to be necessary for successful communication and learning language (Bruner 1983; Papoušek and Papoušek, 1981). Infants' sensitivity to the rhythmic prosody or 'musicality' of the human voice in the 'motherese' or 'infant directed speech' of a happy and affectionate mother is confirmed by their disturbance when they hear the subdued tones and monotonous rhythms of a depressed or psychotic mother (Marwick and Murray, 2009; Gratier and Apter-Danon, 2009). Infants of depressed mothers become anxious and their lack of self-confidence may persist, affecting learning at school (Murray and Cooper, 1997).

Intersubjective Therapies in Infancy and Early Childhood

The principles of intimate and rhythmic emotional communication can be applied to benefit the well-being and development of children with developmental disorders (Trevvarthen, 1997). The physical/acoustic analysis of vocal communication has brought to light the principles of timing, emotional tone and narrative that universally mediate in interpersonal contacts and relationships, and the same dynamic principles can be extended to observe the quality of communication by touch or gesture. Research on the methods and effects of music therapy and movement therapy has demonstrated benefits for distressed infants born very prematurely (Schoemark, 1999) and Als (1995) reports that individualised care for very low birth weight infants that involves 'kangarooing' or skin contact with mother or father reduces states of dysregulation in the infant. Kangaroo care for premature infants has significant positive effects on perceptual-cognitive and motor development through the first six months of life (Feldman, Eidelman, Sirota & Weller 2002). Treatments that give the mother information on infant behaviour and communication, and on care of a preterm infant and the mother at home can enhance the mother's sensitivity to infant cues

leading to higher levels of affectionate speech, smiling and physical contact with the infant (Meyer, Coll, Lester, Boukydis, McDonough, and Oh, 1994), and they reduce the mother's depression. An intensive early intervention programme for low birth weight premature infants led to improvements in communication and self-confidence of the child at 30 months (Spiker, Ferguson & Brooks-Gunn, 1993). Persistent crying in infancy, and problems with feeding and establishing a normal sleep-wake cycle are associated with a significantly elevated risk of poorer academic achievement and pervasive hyperactive behaviour (Wolke, Rizzo and Woods 2002) and kangaroo care has been shown to be an efficient method of reducing crying in distressed infants (Ludington-Hoe, Cong and Hashemi 2002),

In a model intervention program combining different techniques of therapy applied to both infants and their mothers, in which the infant came to be viewed as a 'co-therapist', Fraiberg (1980) demonstrated that severely mentally ill mothers could benefit greatly from 'developmental guidance' that alerted them to how their infants responded when communication and care were meeting their needs. In treatment for postnatal depression, interventions to foster improved early interaction, including music 'mood induction', have been confirmed to have significant benefits for both mothers and their infants (Field, 1997; Cooper and Murray, 1997). Therapies aimed to improve maternal mood and reduce infant arousal, including presentation of relaxing music and infant massage, can make the dyad more accessible to more 'rational' approaches focused on improving the form of interaction itself (Field, 1998), and inviting the mother to imitate her infant and monitor the effects can increase a depressed mother's sensitivity to an infant's cues and help her respond appropriately. Participation in infant massage groups, which facilitates mother-infant interaction, can reduce the distress of maternal depression (Jones, Field and Davalos, 1998; Onozawa, Glover, Adams, Modi and Kumar 2001).

With toddlers, it has been shown that a depressed mother fails to support joint attention and 'intent participation learning', and she is more distracted by competing events (Goldsmith and Rogoff, 1997). Such avoidant maternal behaviours, which affect the toddlers language learning, can be changed by positive feedback showing how communication is improved in moments when pleasurable joint attention is achieved, for example by video-feedback training (Hundeide, 1991; Kennedy, Landor and Todd, 2011).

Playful, Attachment-Based Therapy for Neglected or Abused Children and Their Adoptive Parents

The experience of those who offer support for disturbed children and their families, and in particular those rebellious or resistant children who have been removed from their biological parents for their own protection, is that it is necessary to get into responsive engagement with the

child by sensitive use of the same kind of intuitive forms of communication as are used by affectionate and happy parents with infants and toddlers everywhere (Archer, and Burnell, 2003; Hughes, 2006). In this communication, sympathy for what the child is feeling, genuine emotional response that is accepting and flexible, and good humor in play are essential. A scientific or clinical detachment is to be avoided. Children that have been traumatized by violence and neglect in early life respond best to 'body oriented' therapy that engages with their feelings and emotions directly to benefit their physical self-experience and self-awareness, rather than a focus on the interpretative meanings given to their life events and memories of them, or to interrogation of their personal narrative history (van der Kolk, 2006).

Play means interaction with any impulses for adventurous and enjoyable movement and experience. It means sharing expressions of joy and surprise (Panksepp and Burgdorf, 2003). It taps a basic emotion in social sharing, one that supports the basic emotions for pleasure in attachment. Play therapy draws on these psychobiological principles revealed in animal play in a systematic way (Jernberg and Booth, 2001). For a troubled child making happy and trusting friendships in intimately responsive ways is a key to positive learning and emotional security.

Video-recorded evidence of the emotional nature and patterning of this kind of communication is beneficial not only for therapists or teachers, but also for parents attempting to guide a child to better emotional health (Juffer, Bakermans-Kranenburg and van IJzendoorn, 2005; Kennedy, Landor and Todd, 2011). Video feedback is employed as a detailed record of interacting behaviours and a prompt for more supportive and constructive communication. Spontaneous and creative art therapies, in dramatic acting, dance or music all engage with the timing and expressiveness of intuitive communication in the present, bypassing the rationalised detachment of verbal explanations, and not relying wholly on an attempt to trace the generation of fantasy in one mind (van der Kolk, 2007; Robarts, 2009). The play is creative by means of an interpersonal improvisation in which partners are at the same time free to be expressive in themselves and instantly reactive to what others do, and therefore open to guidance and learning. Real intuitive engagement, open to the other, is necessary for the emotions between them to flourish, as with infants (Reddy and Trevarthen, 2004).

Specific memories and verbal explanations guide awareness and direct interests. In normal life, these cognitive components, built up through experiences in established relationships, strengthen the prospective control of attentions and intentions and lead to more knowledgeable and skilful action. In psychopathology, the cognitive contents of memory intrude in imagination and carry affective material that blocks effective consciousness and action. Therapy for adults requires work with these 'declarative' contents, but engaging with the emotions directly and a clear focus on the

interpersonal motives that direct movements in the present can regulate disturbing or inhibiting material from memory and imagination, finding a path to more rewarding and creative purposes in relationships that are affectionate and trusting. A therapist aiming to help a child with developmental psychopathology by intersubjective or interpersonal means has responsibility to stay with the child through periods of resistance or rejection, to find this path (Archer and Burnell, 2003).

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