78 - MOTOR BEHAVIOR IN MOTHER-INFANT INTERACTION

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Publications related to early interactions (characteristics of interactions in different ages, interactional synchrony, maternal responsiveness, role of maternal beliefs on interactions, and interrelation between interactions and child development) had a significant increase over the past decades. The aim of these studies was to enlarge the understanding of social-cognitive basis or genesis of human development. However, the role of motor behavior in this process remains poorly investigated.

This assay intends to narrow the gap in psychologic literature (Rosenbaum, 2005) and to show the importance of motor behavior (control, development and learning) in the process of interaction between mother and child. This will be made through a discussion of motor behavior as a reciprocal source of communication and stimulation that influence infant global development, and contributes to the emergence of intersubjectivity (Trevarthen, 1998).

Since birth, infants act in their environment and are engaged in social interaction with their caregivers through a bilateral process that forms their intersubjectivity. These first interactions are still disorganized and demand adjustments that will contribute to the subsequent development process.

Behavior is a human expression and is considered the capacity of responding or producing something in a particular moment. This process depends on one's sufficient motor control in executing an objective movement or specific action. Development is inferred from these movements and specific actions. This inference can be made because these actions produce and are produced in a dynamic way, through physical (growth), motor capacity (behavior), psychological profile (personality), and relationship capacity with others (sociability) changes, all of them simultaneously interrelated.

The infant motor behavior can be understood as a part of a repertory of social interaction possibilities that occur at the beginning of life.

Mechanisms that involve acquisition of motor abilities and the factors that influence them can be characterized as motor learning that is different from control and development. However these two entities are related and are part of the study of motor behavior (Tani, 2005).

Levels of stability in behavior depend on motor control, defined as a set of processes that enable beings (live or artificial) to stabilize or move the body or body extensions (utensils) in desirable ways (Rosenbaum, 2005). In order to control movements, it is necessary to produce intentional motor behaviors in form of exploration, stabilization and manipulation that involves objects and other persons.

At this point a differentiated approach of motor behavior emerges. It is assumed that this motor behavior is almost always mediated by at least a dyadic relationship process between people and objects (interactions), and that relations are full of knowledge, expectations, and values, present on a socio-cultural context where the person is inserted. Thus, in order to investigate these relations, it is necessary to integrate multidisciplinary information.

According to Caballo (1993) explains that the developmental origins of abilities to interaction between human beings are found in childhood, when the first learning experiences are combined with biological predispositions to establish certain patterns relatively consistent with the person functioning. These period experiences shape responses and pattern of behavior that functioned in some particular occasions. So, on beginning, innate dispositions may help selecting stimulus that provokes infant behavior responses. Later, the infant will repeat motor behaviors that was positively reforced or functioned well with a particular social group on a certain moment.

The infant developmental niche (Super and Harkness, 1994) is the micro-context (Bronfenbrenner, 1996) of interaction with the mother or caregiver, where the quality of interaction is essential. This quality is associated with mother sensitivity and availability and infant temper characteristics (Ribas, 2002). A child that succeed in feeling confidence (Erikson, 1976) with mother interaction, tend to present more adaptative behavior in social life.

Bowlby (1984), in his attachment theory, defends the idea that human baby has a tendency to bond with some members of his species. This feature is a biological function incorporated on evolutionary time to ensure his survival, since human baby depends on adult to protect, feed and comfort him.

This bond enable interactive exchanges that show specific characteristics, such as a) emotional communication present between child and mother since the very first moments of life; b) respect to emotional needs form each participant of interaction; c) rewards as base of motivation for the continuity of interaction; d) the interaction turns negatively if one is pushed do participate, which produce conflict (Matos, 1997); e) interaction is bidirectional and mutually regulated (Seidl de Moura,1999).

Infant relationship life starts with body contact and proximity provided by maternal primary care. Body touch for care or affection, trigger emotions and feelings on the infant, that gradually develop motor abilities to respond interactional requests to survival and well-being. According to Keller (2002) this kind of stimulation is one of the universal parenting systems. Motor availability and control in body uses, increase the possibility of being understood and corresponded. Then, all motor behaviors aim at interactional goals and enable meaning formation in child actions.

Infant abilities repertory is: facial expressions, glance types, smile, cry and gestures. Non-verbal communication not only begins before language acquisition, but remains afterwards. Gestures are body silent language and have social meanings constructed according to specific cultural characteristics. The same gesture can have different meanings according to socio-cultural context. Gestures are actions previously defined by local culture. The main functions of gestures are to represent shared ideas by a social group, to adapt and obtain satisfaction to body needs, and to reinforce verbal communication (Caballo, 1993). Infants socially assimilate the three kinds of the previous cited gestures. However, they begin their motor activity with spontaneous gestures and then adaptive stereotypes.

Ribas and Seidl de Moura (1999) concluded that the infant develops in the context of interactions. For those authors the genesis of specific processes of development occurs in mother-infant interactions since early childhood. In this case, mother would be the mediator between the child and the world. The transformation of spontaneous movement into objective gesture is not only the manifestation of infant intention (intersubjectivity), but the introjection by cultural transmission of non-verbal communication, parental cognitions about development, stimulation, body contact and proximity with the caregiver.

Trevarthen (1998) describes two kinds of intersubjectivity: *primary*, refers to face-to-face interaction through mutual eye contact since the very first moments of infant life, when infant and mother experiment positive emotions in connection; *secondary*, around six to nine months of age, when some bio-psycho-social changes take place and favor the emergence of a new interactional category. Infant starts to engage in more complex social interactions when share with his mother thoughts

and feelings about himself, other persons and objects.

During the mother-infant interaction, when the mother point to something, the four months old baby will gaze her finger and not the pointed object. Between five and six months of age, the same infant will be able to direct his attention to caregivers finger look at the same direction that his mother is looking, and pay attention to objects or events which adults are showing (Trevarthen, 1998).

These joint attention behaviors "seems to indicate the emergence of comprehension of other persons as intentional agents as oneself, which relations with external entities can be followed, directed and shared" (Tomasello, 2003, p.85). The dyadic interaction turns into extra-dyadic involving coordination between interactions, objects and persons in a referential triangle: infant, caregiver, and object or event to attend.

On extra-dyadic interaction, infant and caregiver engage themselves in a relatively extensive activity sections involving objects. From this point the adult acquires the status of social reference in the awareness of object, in his possible actions and learning experiences.

Infants start to manipulate mother's attention to external objects or events. In this way, infants overcome stereotyped gestures, like standing their arms to be hold, and start to gesticulate on a communicative fashion.

Tomasello (2003) is included in a theoretical group who considers the act of pointing an object, as the intention to share attention to it, a specific human communicative act. To this author, pointing is an infant spontaneous non-communicative expression. However, Tomasello believes that joint attention behavior starts only at nine months of age. Trevarthen (1998) considers that this capacity could be present earlier. Otherwise, it seems that children are born with dialogue capacities. Infants only need to develop motor abilities to be able to express their secondary intersubjectivity and the capacity of sharing attention to objects. At this level, infant is even more actively involved in playing games which is partially explained by a better motor performance.

Tomasello disagrees that infant sensitivity to social interaction features with other person is an indicator of infant's ability to understand other. According to Tomasello this is the cornerstone of joint attention. To this author, a five month old infant has already motor abilities to gaze and point objects with his hands, but don't perform this action.

Despite the divergences and lack of empiric evidences on a set age for joint attention beginning, the conclusion is that without certain motor abilities, it would be impossible to recognize this manifestation, even if it could be detected earlier in life.

The question is if the determination of an exact time for the emergence of this relational phenomenon is inadequate, because each type of interaction, characteristics of partners and niche where the child lives will contribute to the time of infant motor and relation development. From this aspect, it is important to consider Vygotsky ideas (1984), that the higher mental functions first emerges on a social level (interpersonal), and then appears on individual level (intrapersonal). Assuming that culture constructs meanings and mediate cognition, it is not possible to consider that interaction phenomenon manifests without environmental influences.

It is supposed that these important transformations in infant attention and behavior enable the opening of the dyad to explore the world together; and that maybe the tools or means of mediation shape the infant psychology and interaction activities (Werstch, Del Rio and Alvarez, 1998).

The concept of cultural mediation has, as central element, the activity notion as "involving people engaged in sociocultural achievements, using and increasing a set of artifacts and cultural practices inherited form previous generations" (Seidl de Moura, 1999). Activity means sociocultural insertion, a process that artifacts from different levels have relevant roles.

The activity mediated with objects and diverse artifacts acts as construction zones, where reciprocal modifications in interaction participants are possible through negotiation and appropriation of diverse ways of signification (Seidl de Moura, 1999). Mother and infant in interaction share the object and its cultural representation. In his way, the infant gradually internalizes an activity model. In the relation adult-infant-object, the motor behavior finds its first social function, enlarging the partners' possibilities of intersubjectivity and serving as cultural artifact for both developments.

This set of conceptions entail the idea that motor behavior is constructed in social interaction. The reciprocal activities between interaction participants trigger mutual stimulation. Mother and infant interact and both together manipulate and learn about objects and each other. Consequently, infant develops more sophisticated forms of intersubjectivity.

On the other hand, Newell (1989) presents a triangle model for studying motor abilities. In this model the complexity and dynamics of its constitution and the subjacent mechanisms are studied. He considers that motor behavior changes produce and are produced by cognitive and affective modifications. When person, task and environment interact, the qualitative result of the motor behavior characterizes the set. For example, if an infant try to crawls on a slippery floor, the environment will intervene in the action of crawling. The model describes their components as structural and functional restrictions that may limit motor behavior, but at the same time give it a shape.

The model of restriction helps the understanding that motor behavior emerges from interaction between restrictions e related factors. That model enables the comprehension that each infant can construct a different motor pattern inside his own social group.

Infant expresses himself and relates with others through motor behavior. Motricity does not happen randomly. "Motricity is neither gratuitous, nor a superfluous organic manifestation" (Feijó, 1992, p. 34). The early motor behavior seems to fulfill adaptation functions. It aims to harmoniously integrate person to environment (Aucouturier, 1993). The capacity to suck, for example, has a distinctive meaning by demonstrating the solution for a basic problem, alimentation. However, infant motor behavior does not exist without "the other". In human interaction processes, the assimilation of affection and awareness into action will be a source of sociability.

Motor behavior implies movement-action, and is directed to the accomplishment of needs, lacks (Beresford, 2000), or larger intentions. This secondary intentionality distinguishes the human motricity from instinctive animal mobility. The movement assumes a sociocultural perspective in which motor behavior is intentionally oriented by body practices diversity that is part of human development.

The concept of motor behavior, as a possibility of supplementation of complex needs (physical, emotional and sociocultural), reinforces the idea that motricity owns specific meanings and values. These meanings and values are constructed inside the culture from where the infant extracts subsistence and accomplishments to fulfill his needs.

Motor behavior activates diverse psychosomatic processes required to attain specific goals. These goals can be to touch mother's face, to get a ball, to crawl or to run. In this way, the body goals are the mental goals and vice versa. Because of that, motor behavior can be defined as psychomotor.

Since birth, infant presents expressions and small movements that represent a very complex system called motor coordination (Béziers, 1994). This system represents the basis for subsequent motor development that lasts for the entire life. In some cases and situations this system requires external stimulation for better adaptation.

The first studies on motor development were based on a maturation perspective. According to this point of view, motor development follows a determined biologic program that has a stable sequence and is resistant to external environment influences.

In contrast to maturation perspective, emerges the emphasis in environmental forces, in experience and individual learning. The infant motor behavior is considered part of a hereditary program, not determinant, but with the possibility to occur

or not, depending on social context.

In this way, the infant motor behavior development depends on the mediation of environmental components. To drag or crawl, for example, infant needs a visual external target as a stimulus. In order to achieve an erectile posture, infant needs support for his hands. Without appropriate environment mediation, the normal rhythms of motor development can be modified.

Motor development is investigated by behavior observation. This primary process may supply developmental information about subjacent processes. The observation of psychomotor practice implies in knowing relations between body, time, space (Cratty, 1979) and other person.

Recent investigations demonstrate that infants, since intra-uterine phase, move their arms spontaneously, similar to what they do with their legs (Small, 1998). These spontaneous arm movements are not directed to a goal and neither necessary or intentional, but show well coordinated finger extensions in synchronism with hand, fist and elbow. These actions remember movements that anticipate the voluntary grasp.

Other types of infant spontaneous movements are the *reflexes*, involuntary responses to specific external stimulation. They are frequently related to protection, in order to guarantee the newborn survival, and to permit greater awareness of the body and external environment. Reflexes are classified in primitive, postural and of locomotion (Haywood and Getchell, 2004).

Against the traditional maturation perspective, researchers with an ecologic view of development pointed out the possible connection between reflexive behaviors and subsequent voluntary movements. Zelazo and collaborators (1972) elaborated a simple experiment that demonstrated the interrelation between walking reflexes and voluntary walking. These investigators stimulate daily the stepping reflex in an infant group during the first eight weeks of life. As a result, they obtained an increase over time in the walking reflex and precocity in the emergence of voluntary walking in these infants. Currently, diverse experiments corroborate to the idea of existence of a norm of continuity between reflexes and voluntary movements (Thelen, 1995).

It seems that the infant motor project is to turn his motor behavior into voluntary and autonomous. Volition and intention are closely related to voluntary action. The emergence of intentional movements indicates that frontal cortex is mature and can assume new functions. With infant motor development, reflexive activities are inhibited, and the movements assume controlled rudimentary forms. It is the beginning of objective motor activity and the integration of sensorial and motor systems characterizes the stage known as *motor pre-control* (Thelen, *op.cit.*).

Control and coordination of manual activity are considered abilities extremely relevant to human conduct. This ability composes and participates in the construction of diverse possibilities of movement and enables human interaction, manipulation and construction of objects. If hands control is detached from body context, it is possible to observe how complex and interesting hands movement's elaboration is.

The integration between biology and environment is extremely important because changes on its aspects affect the infant as a whole, promoting the intentional conduct. The environment achieves its role by setting the desire to accomplish goals. This triggers stimuli to build biologic and biomechanic mechanisms that enable motor behavior. “Movement formation considers the human desire to understand the world” (Freire, 1991, p.27).

Desire and intentionality associated with environmental stimuli and human biologic maturation permit the human infant to use his motor behavior on a functional way. The visual motor coordination development allows hands to interact with the environment. Hands and eyes must be integrated to make a joint performance. Perception and action are closely connected. A possible explanation why, after the first great bio-socio-behavioral transition, (around two months of age), infants may start objective grasping at the same time they earn discriminative visual accuracy.

Initially moving shapes capture more effectively the infant visual attention than static ones. Child's reaction is to extend one or both hand towards the object, many times without reaching it. The coordination eye-hand improves with maturation and experience, even with individual differences in rapidity and vigour to reach objects. Hand control, in the context of early development, can be understood as the autonomy gain that enables the infant to engage in more specific relations with his immediate context. The infant progresses in environmental control while experiencing emotions and feelings during the exploration of the environment. The early manual control is a sign of global motor auto-control and the beginning of environmental control.

We conclude that on social relation, the use of voluntarily the motor behavior enlarges the infant's possibilities of contact. The infant responds actively to mothers´ irresistible offers of interaction. It is also possible to observe that the early social interaction is important to the construction of infant motor behavior and its intersubjectivity. Involving the motor aspect in the study of interactions and intersubjectivity can be useful to better understand the human development.

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MOTOR BEHAVIOR IN MOTHER-INFANT INTERACTION

Abstract:
Human development has been investigated with its different early social interaction components. However, motor behavior has been neglected despite its importance for mutual regulation between mother and infant during interaction. The present article discusses the theoretic basis of the importance of the infant motor behavior in the interaction with the mother, assuming the motor behavior development as socially mediated. Infant motor behaviors participate and influence the interactions and are reciprocally constructed and stimulated by them.

LE COMPORTAMENT MOTEUR DANS L'INTERACTION MÈRE-BÉBÉ

Résumé:
Les aspects recherchés comme composants dês interactions sociales initiales dans lê développment humain sont nombreux. Le comportément moteur, par contre, est um domaine pratiquement oublié malgré l'importance de as manifestation pour lê réglage mutuel entre la mère et lê bébé dans l'interaction. Cet article fait donc une fondamentation théorique à propôs de la participation du comportament moteur du bébé dans ses interactions avec la mère, ayant pour base que la manifestation dês comportaments moteur soit construite socialement. Le comportement moteur du bébé partipent et influencent les interactions et sont, em même temps, construits et stimulés par elles.

EL COMPORTAMIENTO MOTOR EM LA INTERACIóN MADRE-BEBé

Resumen:
Son muchos los aspectos averiguados como componentes de las interacciones sociales iniciales en el desarrollo humano. ÉI comportamiento motor, sin embargo, es un campo negligenciado, a pesar de la importancia de su manifestación para la regulación mutua entre la madre y el bebé, en la interacción. Êl presente artigo, entonces, hace un fundamento teórico sobre la participación del comportamiento motor del bebé en sus interacciones con la madre, teniendo como presupuesto que la manifestación de los comportamientos motores sea mediada socialmente. Los comportamientos motores del bebé participan y influencian en las interacciones y simultáneamente son por ellas construidos y estimulados.

O COMPORTAMENTO MOTOR NA INTERAçãO MãE-BEBê

Resumo:
São inúmeros os aspectos investigados como componentes das interações sociais iniciais no desenvolvimento humano. O comportamento motor, no entanto, é um campo negligenciado, apesar da importância de sua manifestação para a regulação mútua entre a mãe e o bebê, na interação. O presente artigo, então, faz uma fundamentação teórica sobre a participação do comportamento motor do bebê em suas interações com a mãe, tendo como pressuposto que a manifestação dos comportamentos motores seja mediada socialmente. Os comportamentos motores do bebê participam e influenciam as interações e simultaneamente são por elas construído.