# Ostensive gestures in triadic interactions

## From rhythmic ostensive gestures of the adult to children's gestures at the end of the first year of life


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TESIS DOCTORAL

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Gracias por darme la fuerza
para vencer el miedo que da
cuando ya no se tiene a aquel
que hizo de tus días, lo que eres.

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# Introducción

Mi formación académica ha estado orientada desde sus inicios hacia el área de la Psicología del Desarrollo y de la Educación. Mi siempre creciente interés por el desarrollo temprano me hizo tomar la decisión de buscar un programa de posgrado que me permitiese desarrollar y llevar a cabo las ideas de investigación que tanto entusiasmo me generaban. De este modo, decidí continuar mis estudios en la Universidad Autónoma de Madrid. Allí me encontré, de la mano de Cintia Rodríguez, con la semiótica a través de la perspectiva de la Pragmática del Objeto, lo que cambió definitivamente mi forma de mirar las interacciones tempranas. Esta perspectiva parte de tres grandes supuestos teóricos: el estatus pragmático que se le otorga al objeto; la necesidad de observar las interacciones triádicas adulto-bebé-objeto –donde el adulto actúa como guía– como unidad mínima de análisis, incluso en el inicio de la vida; y el papel del desarrollo semiótico. Desde esta perspectiva, el objeto no es una mera realidad "física" (Piaget, 1936/2007), sino que es considerado desde sus funciones en la vida cotidiana, sus posibilidades de uso y los sistemas semióticos que toman parte en la comunicación de adulto y niño *acerca de* y *con* los objetos.

A lo largo de estos años, en los que he formado parte del grupo de investigación Desarrollo Temprano y Educación (DETEDUCA) de la Universidad Autónoma de Madrid, siento que he crecido en lo académico y en lo personal. He tenido la oportunidad de discutir y compartir opiniones en ricos espacios de reflexión, que despertaron mi interés por el papel que los signos juegan en la comunicación adulto-bebé, en situaciones cotidianas en las que los adultos proporcionan a los niños instrumentos de comunicación, y en los que el bebé se incluye en la interacción con el otro, para usarlos por sí mismo más adelante en el desarrollo. He tenido la oportunidad de seguir de cerca el desarrollo de diversas investigaciones que han sido

desarrolladas en el grupo en relación a diferentes momentos de la etapa prelingüística –desde la segunda mitad del primer año hasta el segundo año de vida–. Entre estos trabajos, se encuentran las investigaciones acerca de cuándo y cómo los niños comienzan a realizar usos simbólicos: recién llegada a la UAM pude asistir a la defensa de tesis de Pedro Palacios, en 2009, con quien años después he podido compartir cómo su línea de estudio continúa dando sus frutos, en parte gracias a la tesis doctoral de Karina Cárdenas, que continúa esta línea de trabajo con niños con Síndrome de Down (Cárdenas, Rodríguez y Palacios, 2014; Rodríguez, Palacios, Cárdenas y Yuste, 2014). Un paso más allá sigue la investigación realizada por Noemí Yuste, quien analiza el desarrollo de los símbolos en interacción entre iguales, en un contexto de Escuela Infantil. Además, he compartido y aprendido mucho de Noelia Sosa, cuyos trabajos acerca del origen de los protointerrogativos a partir de los 12 meses guardan una estrecha relación con parte de mi tesis en cuanto a la importancia que otorga a las funciones comunicativas. También los estudios acerca de la entrada de los niños en los usos privados y gestos con una función de autorregulación, realizados por Marisol Basilio (Basilio y Rodríguez, 2011), me otorgaron mucha luz acerca de la mirada microgenética que caracteriza al grupo. Más recientemente, cabe destacar las investigaciones en curso de Luisa Estrada, quien pone el foco en los aspectos emocionales involucrados en las interacciones triádicas, y Sílvia Cavalcante (Cavalcante y Rodríguez, *en prensa*), cuya investigación acerca del concepto del número entre los 2 y los 3 años es un excelente ejemplo acerca del desarrollo de sistemas semióticos complejos. Por otra parte, no puedo obviar los estudios de Mª Jesús del Olmo realizados en contextos hospitalarios (Del Olmo, 2007, 2009; Del Olmo, Rodríguez y Ruza, 2010), en los que se observó la importancia de las acciones rítmico-sonoras del adulto en interacción con bebés en situación de riesgo. Estos estudios evidencian los beneficios de la música y el ritmo cuando actúan como mediador semiótico entre el bebé y el adulto, y justifican la estrecha relación que se da entre el cuerpo, las emociones y el ritmo. También cabe mencionar la mirada que

aporta al equipo José Luis de los Reyes, quien como historiador nos ayuda a pensar el estatus cultural del objeto desde una perspectiva que muchas veces escapa a nuestra mirada psicológica.

Todos estos trabajos sentaron las bases que inspiraron lo que hoy es esta tesis. Desde casi mis inicios en la investigación de la mano del equipo, me conciencié de la necesidad de desarrollar estudios que analizasen cómo emergen los primeros signos ostensivos en el niño, poniendo atención a las ostensiones realizadas por el adulto en los primeros meses de vida, y enfatizando sus posibles aspectos rítmico-sonoros. Asimismo, creo fundamental conceder la importancia que merece a la intervención del adulto en el origen de los sistemas semióticos y en cómo éstos evolucionan en los primeros meses de vida, pues desconocía en gran medida cuál es la naturaleza de ese proceso educativo.

El objetivo principal de esta tesis ha sido definir cómo se organizan esos sistemas de signos, así como determinar cuáles son los más básicos en el desarrollo. Los sistemas de signos son primero herramientas de comunicación que se convierten a lo largo del desarrollo en herramientas de pensamiento. Esto, que es relevante para la comprensión del desarrollo típico, también lo es para hacer frente a los distintos desarrollos que se pueden presentar en niños de riesgo; mundo del que vengo y al que, en algún momento, me gustaría regresar. Se han realizado tres estudios, que presentaremos detenidamente en los capítulos siguientes.

En el Capítulo I se realizará una revisión de la literatura y se presentará la línea argumental que une los tres estudios, y que proporciona la lógica central de esta tesis. Las producciones ostensivas son, de este modo, el principal foco de interés del proyecto; bien sea en base a las acciones del adulto, como se verá en los dos primeros estudios, como en las propias producciones de los niños, como muestra el tercer trabajo. También se pone en evidencia el interés por las interacciones triádicas, aquellas en las que se incorpora el objeto en la acción comunicativo-educativa del

adulto con el niño. Las interacciones triádicas no se producen únicamente hacia el final del primer año, sino que existe otro tipo de interacción triádica “más básica” que tiene lugar en los primeros meses de vida: parten de la iniciativa del adulto, quien, a través de ostensiones, aproxima el mundo material al bebé reuniendo en un mismo acto comunicativo la relación entre el mundo y el niño. Esta relación inicial con el mundo material a través del adulto parece complejizarse progresivamente a través de la participación, cada vez más activa, del niño, quien, hacia el final del primer año, es ya capaz de proponer intencionalmente por sí mismo situaciones de comunicación con el otro. Esto ha llevado a la necesidad de abordar cómo son esas producciones del niño y qué funciones comunicativas conllevan.

El Capítulo II está dedicado al estudio piloto, un diseño longitudinal-observacional, realizado con tres bebés de 2 a 6 meses de edad y sus padres. El objetivo central fue explorar cómo los adultos se sirven de diferentes sistemas semióticos que segmentan y organizan el mundo material para presentárselo al niño, suponiendo que el ritmo y la sonoridad podrían ser importantes instrumentos de mediación. Los resultados muestran que tanto los gestos ostensivos como los usos también ostensivos –demostraciones del uso del objeto– tienen una gran presencia en las acciones del adulto. Se propone además que los componentes rítmicos, sonoros y melódicos conforman uno de los sistemas semióticos básicos sobre los que el adulto se apoya para segmentar y organizar el mundo al comunicarse con el niño. Del mismo modo, los niños responden activamente a estas presentaciones, buscando la sonoridad del objeto por sí mismos cuando son capaces de interactuar de manera más autónoma. Este capítulo ha dado lugar a un artículo, que ha sido aceptado y se encuentra actualmente en su segunda fase de revisión: Moreno-Núñez, A., Rodríguez, C. y del Olmo, M.J. (*enviado*). The rhythmic, sonorous and melodic components of adult-child-object interactions between age 2 and 6 months. *Integrative Psychological and Behavioral Science.*

A partir de estos resultados, se diseñaron dos estudios más, que se presentarán en los Capítulos III y V respectivamente. Con estos nuevos estudios, se ha buscado poner en evidencia la importancia de las ostensiones como (1) una potente herramienta semiótica en manos del adulto que permite el establecimiento de las primeras interacciones triádicas con los niños entre 2 y 4 meses y (2) los primeros y más frecuentes gestos producidos por los niños entre 9 y 13 meses.

En el Capítulo III se describe el estudio realizado directamente a partir del estudio piloto. Se redujeron los tiempos de análisis a tomas de datos mensuales (en lugar de bimensuales) para profundizar en las primeras interacciones triádicas en las que el adulto toma la iniciativa. Se presenta así un estudio longitudinal con 6 niños a los 2, 3 y 4 meses de edad y sus madres, introduciendo un objeto sonoro (MARACA) en la interacción, para analizar las propuestas comunicativas del adulto y su efectividad en la atención/acción de los niños. Los resultados muestran que los niños no comprenden súbitamente la intención comunicativa del adulto, sino que se introducen gradualmente. Los primeros acuerdos entre adulto y niño se producen en torno a los objetos usados con compones rítmico-sonoros. Además las ostensiones vuelven a actuar aquí como ocurría en el estudio piloto, como una herramienta comunicativa que favorece la atención/acción conjunta. El adulto espacia cada vez más sus acciones: se ajusta al niño, dejando eventualmente de regular toda la actividad y cediéndole el espacio necesario para que progresivamente pueda interactuar con el objeto. El niño es cada vez más activo en la interacción y desde los 3 meses se anticipa al giving que suele seguir a la ostensión rítmica del adulto. De este capítulo se derivará un artículo que se encuentra en preparación: Moreno-Núñez, A., Rodríguez, C. y del Olmo, M.J. (*en prep*.). Adult-baby-object interactions from 2 to 4 months old: rhythmic aspect of ostensive gestures.

El Capítulo IV es teórico y está dedicado a argumentar que no es el pointing, sino las ostensiones el gesto que primero permite la referencia compartida; además,

aparece primero en el desarrollo, tanto en comprensión como en producción. Concretamente, se propone: (1) que los gestos ostensivos son gestos; (2) que los niños comprenden y producen ostensiones antes que los gestos de señalar, y que los adultos producen gestos ostensivos con objetos en un espacio compartido con el niño desde edades muy tempranas, mucho antes que los pointing; y (3) que es necesaria una conceptualización teórica y pragmática de los objetos más allá de sus propiedades "físicas". Los objetos son productos culturales con funciones públicas, y por tanto también pueden ser poderosos instrumentos de comunicación entre personas, especialmente durante los primeros años de vida, y no únicamente el contexto que rodea el nicho comunicativo. Finalmente, a partir de estudios previos, se discuten tres nuevas funciones comunicativas de los gestos ostensivos, además de la imperativa y declarativa: (1) *para sí* con una función *exploratoria* y/o contemplativa, (2) *privada* con una función de *autorregulación*, e (3) *interrogativa*. El artículo al que ha dado lugar este capítulo se encuentra actualmente en su segunda fase de revisión: Rodríguez, C., Moreno-Núñez, A., Basilio, M. y Sosa, N. (*enviado*). Ostensive gestures come first. Their role in the beginning of the shared reference. Special Issue: Semiotic Development. *Cognitive Development.*

El Capítulo V consiste en un tercer estudio longitudinal con 6 niños a los 9, 11 y 13 meses de edad, coincidiendo con el origen de la intención comunicativa según se señala en la literatura. Se pone de manifiesto que, a pesar del enorme énfasis que la Psicología ha puesto en el gesto de señalar (signo y referente difieren), los gestos ostensivos (signo y referente coinciden) son gestos intencionales de propio derecho. Se han analizado las producciones de gestos ostensivos e indiciales (añadiendo al pointing clásico el pointing inmediato, cuando el gesto toca el referente) y sus funciones: *exploratoria* para sí, *fática* y *privada*, además de las clásicas *imperativa* y *declarativa*. Los resultados confirman que los gestos ostensivos están muy presentes desde los 9 meses, y que pueden tener diferentes funciones comunicativas, mientras

que los gestos de señalar aparecen más tarde y son mucho menos frecuentes. Al igual que con los capítulos anteriores, de éste se ha derivado un artículo que se encuentra enviado a revista: Moreno-Núñez, A., Rodríguez, C. y Miranda-Zapata, E. (*enviado*). Development of ostensive and indexical gestures and their functions in children from 9 to 13 months old. *Gesture.*

Por último, el Capítulo VI está dedicado a las conclusiones generales. Además se analizarán las limitaciones de los diferentes estudios y se propondrán posibles líneas de investigación futuras que de aquí puedan derivarse.

# Introduction

My academic background has been oriented since its beginning to the area of Developmental and Educational Psychology. My always growing interest in early development made me take the decision to seek for a postgraduate program where I could develop and conduct the research ideas that generated so much enthusiasm in me. Thus, I decided to continue my studies at the Universidad Autónoma de Madrid. There I met, thanks to Cintia Rodriguez, Semiotics through the Pragmatic of Object perspective, which definitely changed my way of look at early interactions. This perspective starts out from three main theoretical assumptions: the pragmatic status that is given to the object; the necessity of observing triadic interactions adult-baby-object –where the adult acts as a guide– as the minimum unit of analyses, even at the beginning of life; and the role that semiotic development plays. From this perspective, the object is not a mere "physical" reality (Piaget, 1936/2007), but it is considered from its functions in daily life, their possibilities of use and the semiotic systems that take part in adult and baby communication *about* and *with* the objects.

Throughout these years, since I have been part of the research group Education and Early Development (DETEDUCA) of the Universidad Autónoma de Madrid, I feel I have grown both academically and personally. I have had the opportunity to discuss and share opinions on riches reflexive spaces, which sparked my interest in the role that signs play in adult-infant communication in daily situations, where adults provide children with communication tools, and where baby is included in the interaction with the other, to use them himself later in development. I have had the opportunity to follow closely the development of many investigations that have been developed in the group in relation to different moments of the pre-linguistic stage –from the second half of the first year to the second year of life. Among these studies, there

are researches about when and how children begin to perform symbolic uses: just arrived to the UAM I could assist to the defense of Pedro Palacios' Thesis, in 2009, with whom, years later, I was able to share how his line of study continues being fruitful, thanks in part to Karina Cárdenas' Thesis of, who continues this line of research with children with Down syndrome (Cárdenas, Rodríguez & Palacios, 2014; Rodríguez Palacios, Cárdenas & Yuste, 2014). A further step is the research conducted by Noemi Yuste, who analyzes the development of symbols in peer interaction in the context of the Kindergarten. Also, I have shared and learned a lot from Noelia Sosa, whose studies on the origin of protointerrogatives after 12 months old are closely linked with part of my thesis regarding the importance she brings to communicative functions. Also the studies on children's entrance into private uses and gestures with a self-regulatory function, performed by Marisol Basilio (Basilio & Rodriguez, 2011), provide me of a lot of light on the microgenetic look that characterizes the group. More recently, I should highlight other ongoing researches, as the project initiated by Luisa Estrada, who puts the focus on the emotional aspects involved in triadic interaction, and Sílvia Cavalcante (Cavalcante & Rodríguez, *in press*), whose research on the acquisition of the concept of number between 2 and 3 years is an excellent example of the development of complex semiotic systems. Moreover, I cannot overlook M. Jesús del Olmo's studies, performed in hospital settings (Del Olmo, 2007, 2009, Del Olmo, Rodríguez & Ruza, 2010), in which the importance of adult's rhythmic-sonorous actions were observed in interaction with infants at risk. These studies demonstrate the benefits of music and rhythm when act as a semiotic mediator between infant and adult, and justify the existence of a close relationship between body, emotions and rhythm. Also noteworthy is the look that Jose Luis Reyes brings to the team, a historian who helps us to think about the cultural status of the object from a perspective that often escapes our psychological look.

All these works laid the groundwork that inspired what is now this thesis. For almost my beginning in research in the group, I became aware of the necessity to develop studies that analyzes how the first ostensive signs emerge in children, paying attention to ostensive gestures and uses made by the adult in the first months of life, and emphasizing its potential rhythmic-sonorous aspects. I also believe essential to give the importance that adult intervention deserves in the origin of semiotic systems and how they evolve in the first months of life, because I have barely known what was the nature of the educational process.

The main objective of this thesis is to define how these signs systems are getting organized and determine which are the most basic in development. Sign systems are communication tools first that become over development in tools of thought. This is relevant for the understanding of typical development, but also to address the several developments that may occur in children at risk; world I come from and to what, at some point, I would like to return. Three studies have been performed, which we will present carefully in the following sections.

In Chapter I, we will conduct a literature review and the storyline that links all three studies, which provides the central logic that underlies this thesis. Thus, ostensive productions are the main focus of this project; either based on adult's actions, as discussed in the first two studies, or in children’s productions, as the third study will highlight. It also emphasizes the interest in triadic interactions, those in which the object is embedded in communicative and educative action of the adult with the child. Triadic interactions occur not only at the end of the first year, but there is another kind of "more basic" triadic interaction that takes place in the first months of life, based on the initiative of the adult, who through ostensive gestures and uses approaches the material world to the baby gathering in the same communicative act the relationship between the world and the child. This initial relationship with the material world through the adult seems to get progressively more complex through the participation,

increasingly more active, of the child, who, towards the end of the first year, is able to propose himself intentionally communicative situations with other. This has led to the necessity of address how are those child's productions and what are the communicative functions involved.

Chapter II is dedicated to the pilot study, a longitudinal-observational design, made with three babies from 2 to 6 months old and their parents. The main objective was to explore how adults serves themselves of different semiotic systems that segment and organize the material world to present it to the child, assuming that the rhythm and sonority could be important mediation tools. The results show that both ostensive gestures and uses –demonstrations of the use of object– have a great presence in adult's actions. Besides, it is proposed that rhythmic, sonorous and components are one of the basic semiotic systems on which the adult is supported to segment and organize the world to communicate with the child. Likewise, children actively respond to these presentations, seeking the sound of the object by themselves when they are able to interact more independently. This chapter has led to an article that has been accepted and is currently in its second phase of review: Moreno-Núñez, A., Rodríguez, C. & del Olmo, MJ (*submitted*). The rhythmic, sonorous and melodic components of adult-child-object interactions between age 2 and 6 months. *Integrative Psychological and Behavioral Science.*

From these results, two studies, which are presented in Chapters III and V respectively, were designed. With these new studies, we have sought to highlight the importance of ostensive actions as (1) a powerful semiotic tool in the hands of the adult that allows the establishment of the first triadic interactions with children between 2 and 4 months, and (2) the first and most frequent gestures produced by children between 9 and 13 months.

In Chapter III the study directly performed from the pilot study is described. Analysis times were reduced to archive monthly data (instead of bi-monthly) to get

deeper in the first triadic interactions, where adult takes the initiative. Thus, a longitudinal study was conducted with 6 children at 2, 3 and 4 months of age and their mothers, introducing a sonorous object (MARACA) in the interaction, to analyze adult's communicative proposals and their effectiveness of children's attention/action. The results show that children do not suddenly understand adult's communicative intention, but they are gradually introduced into the interaction. The first agreements between adult and child take place around the objects and their uses with rhythmic-sonorous components. Besides, ostensive actions are here again, as in the pilot study, performed as a communicative tool that favors joint attention/action. The adult increasingly spaces her actions: she adjust herself to the child, eventually stopping of regulate the whole action and leading space to the child to be able to interact with the object. The child is gradually more active in the interaction, and from 3 months anticipates the adult's giving gesture that usually follows the rhythmic demonstration. This chapter have become in an article that is actually in preparation: Moreno-Núñez, A., Rodríguez, C. & del Olmo, M.J. (*in prep*.). Adult-baby-object interactions from 2 to 4 months old: rhythmic aspect of ostensive gestures.

Chapter IV is theoretical and is dedicated to argue that it is not pointing, but the ostensive gesture which first allows shared reference; besides, the latter appears first in development, both in comprehension and production. Specifically, we propose: (1) that ostensive gestures are gestures; (2) that children understand and produce ostensive gestures before pointing, and that adults produce ostensive gestures with objects in a shared space with the child from an early age, long before pointing; and (3) it is necessary to argue a theoretical and pragmatic conceptualization of objects beyond their "physical" properties. Objects are cultural products with public functions, and therefore, they can also be powerful tools of communication between people, especially during the first years of life, not just the context surrounding the communicative niche. Finally, based on previous studies, three new communicative

functions of ostensive gestures are discussed, along with the imperative and declarative: (1) to self with an exploratory and/or contemplative function, (2) a private self-regulatory function, and (3) interrogative. This chapter has resulted in a paper, which is currently in its second phase of review: Rodriguez, C., Moreno-Núñez, A. Basilio, M. & Sosa, N. (*submitted*). Ostensive gestures come first. Their role in the beginning of the shared reference. Special Issue: Semiotic Development. *Cognitive Development.*

Chapter V describes the third longitudinal study that we have performed with 6 children at 9, 11 and 13 months of age, coinciding with the origin of the communicative intention, as reflected in the literature. It shows that, despite the enormous emphasis that Psychology has put into pointing gesture (sign and referent differ), the ostensive gestures (sign and referent coincide) are intentional gestures in their own right. We analyzed ostensive and indexical gestures' productions (adding to classic pointing the immediate one, when the gesture touches the referent) and their functions: explorative to self, phatic and private, added to classic imperative and declarative. The results confirm that ostensive gestures are present in high frequency from 9 months, and may have different communicative functions, while pointing gestures appear later in development and are much less frequent. As happens with the previous chapters, this one has derived in an article that it is already submitted: Moreno-Núñez, A., Rodríguez, C. & Miranda-Zapata, E. (*submitted*). Development of ostensive and indexical gestures and their functions in children from 9 to 13 months old. *Gesture*.

Finally, Chapter VI is dedicated to general conclusions. Besides, the limitations of the different studies will be discussed and possible future lines of research that may arise will be proposed here.

# Chapter I

## Objects in early communication

The importance of the object in child's cognitive development has been emphasized from Piaget's studies during the first two years of life (Piaget, 1936/2007), which marked a turning point in Developmental Psychology. However, his analyses did not realize the importance of adults as a guide in early development, as we can found in the theories of other classic authors such as Vygotski (1996). The problem that arises is the paradox concerning the role of the adult: in the case of Piaget, he was not concerned about the adult, even when in his conclusion adult is always found indirectly, as an agent who provides children with objects, facilitating frameworks of possible interaction. Meanwhile, Vygotski, despite he emphasizes the role of the adult as a guide in child development, this is not reflected in his distinction between higher and lower psychological functions, giving the latter a biological, not cultural status, and ignoring or indirectly questioning the role of the adult from the beginning of life.

Recent Influential studies argue that infants have innate abilities to perceive the context in terms of objects (Baillargeon, Spelke, & Wasserman, 1986; Rochat, 2001; Slater 2001). At the beginning, this perception is not exactly like in adults, but children are able to progressively segment full scenes in grounds and figures, and the figures into individual units that correspond to objects.

According to these theories, children get to segment the world into objects by a "magical" mode, which must be qualified, since it seems to completely ignore the possible influence of adult (Rodríguez, 2012). From the beginning of life, children are

exposed to certain objects and events in their immediate environment, to which they would not have access, because of their immaturity, if adults do not mediate on it through his/her action. Objects, and their understanding as independent entities, as well as the shared rules of use, are a developmental product largely derived from children interaction with adults and peers.

Traditionally, triadic interactions have not been addressed since the first months of life, but at the end of the first year, when the child understands other's intentions. This idea has been highlight by influential researchers: from the first intentional communicative behaviors for Bates, Camaioni & Volterra (1975), to Tomasello's (2004, 2008) 9 months Revolution, through Trevarthen's secondary intersubjectivity (2003). Although with different terminology, all of them refers to when the child is able to communicate intentionally with others about something in the world, combining processes such as joint attention, social referencing, and communicative gestures (see also Bates, 1976; Bates, Benigni, Bretherton, Camaioni & Volterra, 1979; Blake, O'Rourke & Borzellino, 1994; Capirci & Volterra, 2008; Gullberg, de Bot & Volterra, 2010; Perucchini, 1997; Tomasello & Camaioni, 1997).

Back to Vygotski, this thesis proposes that triadic interactions are present from the first months of life, thanks to the communicative niches that the adult presents (Moreno-Núñez, Rodríguez & del Olmo, *submitted*). In this beginning, the adult suggests a functional world (in terms of rules) in which the child is not yet immersed. However, early on, the latter is already sensitive to some signs proposed by adult in the interaction. This is demonstrated, for example, by eye contact, gaze tracking, smiles or body movements. Thus, the first shared references arise from the gestures and ostensive actions of the adult, which, as discussed in Chapters II and III, are very effective for attracting attention/action of children, and to generate the first niches of joint action.

At the beginning, adults favor the most basic uses of objects, where rhythmic-sonorous ones are include, by shaking or percussing them. Before children are able to do themselves the first canonical rhythmic-sonorous uses, adults introduce them in their own actions, helping children to "ride on them" while performing a joint use. These protoconventional uses (Rodriguez & Moro, 2008) are initiated and largely carried out by the adult. In them, children's participation plays an important role, which will get increased as they gain more skills that enable precise manipulate of objects by their own.

## 1. From natural rhythms to rhythmic-sonorous components in first triadic interactions

For several decades now, numerous studies have described various rhythmic cycles that can be easily observed in nature –summer follows winter, the new moon follows old, day follows night–, as well as in different living organisms in which periodicity is part of the own development –the behavior of the cells (which also has been called cellular "clock"), rhythms in relation to light, seasonal rhythms, reproductive and breeding cycles, lunar rhythms in terrestrial animals, rhythms related to tidal, diurnal rhythms in vertebrates. Currently, the presence of certain rhythms in living organisms is highly accepted as a result of the interaction of two agents: the external environment and own internal rhythms (Cloudsley-Thompson, 1961; Lefebvre, 2004).

Notwithstanding, when it comes to human beings, not only numerous physical behaviors are dictated by this natural "clock", but more complex behaviors, such as moods, ranging in time in relation to daily circadian rhythms. These rhythms are orchestrated by a core "clock". According to Foster & Kreitzman (2004), when the internal "clock" is disrupted, we suffer from relatively mild symptoms like jet lag, to more serious ones, like depression or sleep disorders. Precisely in this regard lays the

great difference between humans and other living beings, because, in a way, we are able to cognitively circumvent these strongly anchored rhythms in biology.

In the first months of life, rhythm is present in different types of movements of the child, responding to stimuli that can also be heard. Recent studies in children at risk (Del Olmo, Rodríguez & Ruza, 2010) have shown that taking into account the "natural" rhythms, lacked of intentionality –for example, the tempo in baby's breath, the beating of his heart or the intensity of her movements– and act accordingly and consistently, helps to provide the stimuli and appropriate sound responses that enable a better communication between adult and child. With the voice, movements, intonation and intensity of the words, adult gives the baby a repertoire of meanings, which in turn favors interaction. This ability, not only to perceive, but also to transmit sounds with emotion, plays an important role in development since it is involved in the regulation of emotional communication between children and adults from a very early age (Trehub, 2003; Trehub, Schellenberg &Hill, 1997). The rhythm could be one of the first semiotic systems that are configured in development. When the adult makes presentations of the material world for the child, often introduces rhythmic aspects. In this case it would be no longer strictly natural rhythms, but it would help to generate consensus, providing structure to the interaction itself. Its introduction by adults seems to favor the entry of children into the interaction long before they can understand other's intentions (Tomasello, 2014). As discussed in Chapters II and III, the rhythm is a basic component of the interaction that is initially proposed by the adult, going through the object that acts as a referent for the communication.

## 2. First gestures in child development

As Zlatev & Andrén point (2009), the development of communication in the prelinguistic stage is built on establishing new semiotic capabilities. In recent decades, numerous studies have suggested that the communicative development of children is

largely based on gestures production. However, nowadays, far from a consensus among researchers, interpretations about the nature of the gestures are very diverse (Andrén, 2010; Rodríguez, F.G., 2012): some authors consider only gestures as hand movements and upper extremities, others include facial expressions; some consider them as independent (or co-occurring) to speech, and others believe that speech is properly gestural. Notwithstanding, most of these authors might agree that, when the child has not spoken yet, early intentional communicative behaviors occur through gestures, becoming, as Goldin-Meadow (2009) argues, at least in the first portion of significance (see also Goldin-Meadow, Levine, Zinchenko, Yip, Hemani & Factor, 2012). According to Kendon (2000, 2004), "gesture" is a tag for those actions that have characteristics of a manifested and deliberated expressiveness, which tend to be perceived as volunteer and are performed to express more than for a practical purpose.

Traditionally, several studies have considered gestures as behaviors that precede and prepare the emergence of language, identified exclusively with speech (Goldin-Meadow, 2003; McNeill, 1992, 2005; Roth, 2002). Gesture is considered a crucial link between conceptualization and linguistic capabilities, closely connected to sophisticated internal linguistic processes, also influenced by contextual and socio-psychological factors. Some of these studies indicate that gestural and vocal modalities are semantic and temporarily integrated from the earliest stages, being gesture the first type of behavior that could goes as a linguistic form (Camaioni, Volterra & Bates, 1976; Kendon, 1991; Rodrigo, González, de Vega, Muñetón-Ayala & Rodríguez, 2004). At present, more and more authors focus on the specific analysis of gesture development as a communication tool itself, without seeing them only as precursors of language (Behne, Carpenter & Tomasello, 2005; Delgado, Gómez & Sarriá, 2010, 2011; Flom, Déak, Phill & Pick, 2004; Grosse, Behne, Carpenter & Tomasello, 2010; Liszkowski, Carpenter, Striano & Tomasello, 2006).

Nevertheless, all the works mentioned have traditionally ignored, to a greater or lesser extent, the role of the object as part of the gesture, as they have privileged pointing as the quintessential gesture of shared reference. Examples of this are the arguments of Guidetti (2002) or Liszkowski (see Gullberg et al., 2010). For the latter, is cognitively unclear to what extent children's ostensive gestures are intentionally directed to the other, even noting that there are no experiments that have directly tested the referential intention that underlies babies' showing or placing. For him, showing and placing simply reflect a way to interact with others, but not referentially.

Other perspectives also propose the ultra-sociality of human beings as the origin of gestures in infants. They defend that gestures are embedded in rich contexts of interaction with competent adult communicators from the first months of life, providing a solid basis for the ontogenetic origins of human communication. For these authors, the forms and meanings of gestures are set in the context of adult-child interaction. Children's gestures would be so closely linked to adults' gestural input, which would support later the child's gestural production (Leroy, Mathiot & Morgenstern, 2009).

Many studies agree on a general classification of deictic gestures, in which the referent is present (Capirci, Contaldo, Caselli & Volterra, 2005; Capirci & Volterra, 2008; Gullberg et al., 2008; Iverson, Capirci, Volterra & Goldin-Meadow, 2008; Tomasello & Camaioni, 1997). In these gestures, it is just possible to determine the referent in the physical context in which communication takes place. This classification includes studies about specific gestures such as reaching, showing, giving and pointing.

In this thesis we consider crucial to divide deictic gestures according to their semiotic complexity, foreseeing that ostensive gestures could occupy a previous place (in both comprehension and production) than indexical. We will deep more in this aspect in following subsections.

### 2.1. Ostensive gestures

From the inspiring work of Bates et al. (1975), who provided a careful description of first referential gestures in infants, ostensive gestures have almost disappeared from the literature on early development and, apparently, from the interest of researchers in this area, who have focused on pointing gesture as the first milestone in prelinguistic intentional communication. Instead, it has gained ground the idea that there is only gesture if the hand is empty, not being common to accept the material object as part of the gesture (Goldin-Meadow & Butcher, 2003).

Ostensive gestures to give and show are, in good semiotical logic (Eco, 1977), the communication instrument that is used when two interlocutors do not have more basic agreements to lean on. They would be one of the first tools that favors the establishment of shared reference, since sign (gesture) and referent coincide: the reference is occupying the hand that is performing the gesture. Also, as Peirce (1987) indicated, the semiotical logic is not modular, but the signs get progressively "open" to more complex ones. This would question the idea that signs are pure, opening the possibility that they could be mixed signs with different semiotic complexity. Hence, the peircian thesis could support the hypothesis that ostensive gestures sustain the development and acquisition of indexical gestures. Ostensive gestures and mixed ostensive-indexical gestures could be the key to the genesis of the indexical, and therefore to how operates the progressive distance between sign and referent.

Some authors have recently highlighted the importance of the ostensive signs and their presence in the first months of life. Thus, for Csibra (2010, Parise & Csibra, 2010, 2013; see also Colas, 1999) babies have innate abilities to attend adults' ostensive signals performed in front of them. This could follow the same line that Reddy (2008) when referring to ostensive signals in early communication.

In this thesis we consider that ostensive gestures are gestures, because: (1) they allow to communicate to another something about a particular referent, and (2)

they meet together child's relationship with others and the world in the same communicative act, differing from indexical gestures where sign and referent do not coincide.

## 2.2. Indexical gestures

Studies conducted in animal psychology (Bourjade, Meunier, Blois-Heulin & Vauclair, 2013; Leavens & Bard, 2011; Leavens & Racine, 2009; Leavens, Hopkins & Bard, 2005; Lyn, Greenfield, Savage-Rumbaugh, Gillepie-Lynch & Hopkins, 2010; Vauclair, 2002) have given some clues about the implications of pointing gesture for human psychological development. First studies in primatology started by the analysis of gestures in relation to language, but recently the center has been moved to the analysis of intentional communication, basically through pointing gesture. This has probably fed back the current trend in studies with infants, in which similar situations are replicated in laboratory, focusing on pointing's production related to a specific distal referent. This is possibly due to the relative ease to elicit pointing when a distant and interesting stimulus for the child appears. Notwithstanding, this situation is not recurrent in contexts of daily interaction.

Pointing has been considered the quintessence of shared reference, the gesture par excellence. Often, following Vygotski and Wundt, its origin is explained from child's failed attempts to grasp the object, which end up being ritualized through social interaction with adults, becoming a pointing gesture (Camaioni et al., 1976; Vauclair & Cochet, 2013). Its importance, as a prelude to the development of language, has been widely studied, considering pointing combinations with first linguistic productions as the starting point of intentional communication. However, these combinations seem to be a more demanding communicative feature, which is far from the anticipations of the grip of the object observed from 3 months of age (see Chapter III). Therefore, refer to the failed attempt to grasp something, as the source of pointing to establish shared

reference, suppose a trivialization of how ostensive gestures seem to lay on the foundations of the first agreements about the referent, which is very well organized when the child begins to produce the first pointing gestures.

This idea also questions the supposed natural status of pointing. Authors such as Butterworth (1998) argue that it is only pointing when the index finger is in opposition to the rest of the hand, understanding pointing gesture as a naturalized product of development. For Tomasello pointing gesture is also natural: "it appears in a certain naturally way –perhaps not as a socially oriented action that becomes a social interaction with others" (2008, p. 112). However, other authors claim for the importance of what it is pointed, without giving much importance to how it is done, including those gestures that are done with the whole hand (Gullberg et al., 2008; Liszkowski, Carpenter & Tomasello, 2007). Carpendale & Carpendale called pre-pointing when children point with a curved finger, without extending it in opposition to the rest of the hand. Along this line, Wilkins' studies (2003, 2006) also highlight how adults indicate through various forms in different cultures, what would question the "natural" status of the gesture. Moreover, if, as we advance in the previous point, there could be mixed gestures, it is necessary to open the debate about whether there is a variety of pointing gestures.

It may seem paradoxical the importance of pointing gesture in the actual literature when, in situations where the object is in proximity, pointing is barely frequent, as we will discuss in the study presented in Chapter V. In previous studies (Rodríguez & Moro, 1999; Basilio & Rodriguez, 2011), immediate pointing have been described (when the gesture touches the referent), what it would be a good example of mixed gesture, halfway between indexical and ostensive. This gesture is commonly used by the adult to rest ambiguity to the referent when communicating with the child in situations to solve complex tasks. Thus, both the immediate pointing gesture, as its

multiple and iconic repetitions, would serve as adult's gesture redundancies, that facilitate the communication with the child.

### 2.3. Gestures' communicative functions

The communicative functions of referential gestures have been studied since the studies of Bates et al. (1975, 1979). According to their descriptions, any time between 9 and 12 months of age, babies begin to communicate intentionally about external referents of their immediate environment. However, the same type of gesture does not always indicate the same purpose, but this may change if they the circumstances of production do so. Thus, a child can request his favourite toy, extending his arm with the hand open, or making movements to pointing towards the referent (what they called "protoimperative" gestures). Or he can point with his finger extended to a light that catch his attention (which would be a "protodeclarative" gesture). These gestures were often accompanied by alternation of gaze between the object and the person to whom the act is directed. Bates and his team suggested that this criteria –looking at the object and the person he wants to communicate–, is fundamental to identify early intentional communication. The child seems to check the success of his gesture directing adult's attention toward the right goal, while using the gaze as an additional gesture to clarify the referent.

Moreover, the results of studies with nonhuman primates suggest that there might be a cut between declarative and imperative function already pointed by Bates et al. (1975, 1979): they are capable to produce the latter, but not the former (Leavens, Hopkins & Bard, 1996). Nevertheless, when primates are bred by humans, the situation changes: in this case they would be able to establish a declarative communication, justified by the existence of an emotional relationship with the caregiver, which probably plays an important role in the constitution of that function. Despite these data, authors such as Juan Carlos Gómez (2007) insist that we should not trivialize the

complexity of the imperative function, because it is more complex in nonhuman primates than it is commonly held.

Would be necessary to analyze with much more delicacy what aspects of the world are involved and meet together with the other, understood as an intentional agent. In this sense, some authors refer to more complex communicative functions such as the interrogative, both in pointings (Begus & Southgate, 2012), and in ostensive gestures (Rodríguez, 2009), or self-regulatory functions (Basilio & Rodríguez, 2011; Rodríguez, 2007; Rodríguez, Moreno-Núñez, Basilio & Sosa, *submitted*; Rodríguez & Palacios, 2007).

In Tables 1.1 and 1.2 we can observe in more detail a compilation of several representative studies that have been conducted on gestures in the last decades, differentiating adult's and children's production. On it has been pointed out (1) the specific type of gesture that it is addressed, or the communicative signs in case is was not designated as gesture, (2) the purpose of the study, (3) whether it consider or not their communicative functions, and (4) the ages of production.

| Specific gesture produced by adults | Topic addressed in the study | Communicative functions | Babies ages | References |
|---|---|---|---|---|
| Ostensive signals (including gazes, motherese, visual contact and playing situations) | Babies attend to adult ostensive signals from adults since the first months of life. | - | 2-6 months | Csibra, 2010 |
| Ostensive gestures | The importance of ostensive gestures in the establishment of shared reference. | (Functions described are here related to children's production, see Table 1.2) | 2-12 months | Rodríguez et al., *submitted* |
| Maternal ostensive marks | Referred to: gestural signs (that could be: oriented, iconic, conventional, rhythmic (beats)) vs prosodic signs (emphasis, focal accent). | - | 4-13 months | Colas, 1999 |
| Ostensive signals | Children's neural responses to adult's multimodal ostensive signals. | - | 5 months | Parise & Csibra, 2010, 2013 |

TABLE 1.1.

*List of studies about gestures in early development (adult's productions)*

| Specific gesture produced by adults | Topic addressed in the study | Communicative functions | Ages of production | References |
|---|---|---|---|---|
| Deictic gestures (ritualized request, showing, giving and pointing)<br>Symbolic play | Review of studies about gestures and their relationship with language.<br>Gestures are performed to focus attention over objects, places or events. The referents only could be identified in the physical context where communication takes place. | Imperative and declarative | 9-30 months | Capirci & Volterra, 2008 |
| Deictic gestures | Gestures in the origin of language development.<br>Combinations gestures + words. | - | 10-23 months | Capirci et al., 2005 |
| Deictic gestures (request, showing, reaching and pointing) vs representational gestures | More gestural "vocabulary" in Italian children compared with American children, probably because the former were raised in a gestural rich context.<br>Gesture + word combinations. | - | 10-24 months | Iverson et al., 2008 |
| Deictic gestures (ritualized request, showing, offering and pointing) + Symbolic | Gestural communication in humans and primates.<br>Children always produced distal deictic gestures. They are only directed to the other from 8-9 months. | Imperative<br>Declarative (in humans) | 12-24 months | Tomasello & Camaioni, 1997 |
| Deictic gestures (request, showing, giving and pointing) | Gestures and their role in language development. | - | Before 12 months (language) | Gullberg et al., 2008 |
| Ostensive gestures and Symbols | Importance of ostensive gestures. Communicative functions of gestures. First uses of objects. | Declarative, Imperative, Interrogative. | 7-18 months | Rodríguez, 2007 |
| Ostensive gestures | Importance of ostensive gestures in the establishment of shared reference. | Declarative, Imperative, Interrogative and Private | From 9 months | Rodríguez et al., *submitted* |

| | | | | |
|---|---|---|---|---|
| Showing, offering, giving, to attract attention, comments about what they have | Declarative uses of children, but barely founded in primates. | Declarative | 12-24 months | Lyn et al., 2010 |
| Ostensive gestures (showing and giving)<br>Pointing gestures | The acquisition of pragmatics in relation to language development. | Imperative and declarative | 9-13 months | Bates, 1976 |
| Ostensive and Pointing gestures | Private gestures and uses. | Self-regulation | 11-15 months | Basilio & Rodríguez, 2011 |
| Ostensive and Pointing gestures | Private gestures and uses. | Private | 12-18 months | Rodríguez & Palacios, 2007 |
| Ostensive, Indexical and Symbolic gestures | 'Proto-interrogative' gestures –those through children "request" help or regulation from adults.<br>'Private' gestures –those through children regulate their own behaviour. | Interrogative and Private | 8-18 months | Rodríguez, 2009 |
| Ostensive gestures (showing and giving) and Indexical gestures | Communication in the first year of life. | Declarative and Imperative as precursor of linguistic development | 9-12 months | Camaioni et al., 1976 |
| Ostensive gestures (showing and giving)<br>Pointing gestures<br>Ritualized requests<br>Symbols | The emergence of symbols. The authors include references to self-directed gestures. | Imperative and declarative | 9-13 months | Bates et al., 1979 |
| Pointing, reaching and showing | How children repair a failed request. | - | 18-30 months | Grosse et al., 2010 |

| | | | | |
|---|---|---|---|---|
| Pointing and reaching | Showing and giving as a request are considered into reaching category. | Indicative situations (declaratives) and to request | Around 12 months | Blake et al., 1994 |
| Pointing gestures | Distinction between: Private pointing in a context of a non-communicative demand (to contemplate) and private pointing against a particular task (to act). | Self-regulation | 8-24 months<br>2-4 years old and 4-6 years old | Delgado et al., 2010<br>Delgado et al., 2011 |
| Pointing + gazes and verbalizations | Shared visual attention as a function of gestures about object's location. | - | 9 months | Flom et al., 2004 |
| Pointing gestures | Observe if the imperative function appears before of declarative function in pointing gestures. | Imperative and declarative | 11-14 months | Perucchini, 1997 |
| Pointing gestures | Pointing to inform others. | Informative | 12-18 months | Liszkowski et al., 2006 |
| Pointing gestures | Gestural development, just referred to pointing gesture as a support for early language development. | - | 12-24 months | Rodrigo et al., 2004 |
| Pointing and ostensive gazes | As a communicative signal in a hidding game. | - | 14-24 months | Behne et al., 2005 |
| Pointing | The goal of pointing is to obtain a response charged of information, as a result of sharing attention. If babies actually point to get the information, pointing gesture should be modulated by others' perception ability to provide such information. | Interrogative | 16 months | Begus & Southgate, 2012 |
| Pointing, gestures to accept or reject | Gesture is just considered as such when it is produced with an empty hand. | - | 16-36 months | Guidetti, 2002 |

TABLE 1.2.

*List of studies about gestures in early development (children's productions)*

## 3. References

Baillargeon, R., Spelke, E. S. & Wasserman, S. (1986). Object permanence in five-month-old infants. *Cognition, 20,* 191-208.

Basilio, M. & Rodríguez, C. (2011). Usos, gestos y vocalizaciones privadas. De la interacción social a la autorregulación. *Infancia y Aprendizaje, 34* (2), 181-194.

Bates, E. (1976). *Language and context: The acquisition of pragmatics.* New York: Academic Press.

Bates, E., Camaioni, L. & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merril-Palmer Quarterly, 21*(3), 205-226.

Bates, E., Benigni, L, Bretherton, I., Camaioni, L & Volterra, V. (1979). *The emergence of symbols: Cognition and Communication in Infancy*. New York: Academic Press.

Behne, T., Carpenter, M. & Tomasello, M. (2005). One-year-olds comprehend the communicative intentions behind gestures in a hiding game. *Developmental Science, 8* (6), 492-499.

Blake, J., O'Rourke, P. & Borzellino, G. (1994). Form and function in the development of pointing and reaching gestures. *Infant Behavior and Development, 17,* 195-203.

Bourjade, M., Meunier, H., Blois.Heulin, C. & Vauclair, J. (2013). Baboons' hand preference for a communicative gesture, but not for a simple manipulative action, is not influenced by spatial factors. *Developmental Psychobiology, 55* (6), 651-661.

Butterworth, G. (1998). Origins of joint visual attention in infancy. *Monographs of the Society of Research in Child Development, 63,* 144-166.

Camaioni, L., Volterra, V. & Bates, E. (1976). *La comunicazione nel primo anno di vita.* Torino: Boringhieri.

Capirci, O., Contaldo, A., Caselli, M.C. & Volterra, V. (2005). From action to language through gesture: A longitudinal perspective. *Gesture, 5* (1), 155-177.

Capirci, O. & Volterra, V. (2008). Gesture and speech. The emergence and development of a strong and changing partnership. *Gesture, 8* (1), 22-44.

Carpendale, J. & Carpendale, A. B. (2010). The Development of Pointing: From Personal Directedness to Interpersonal Direction. *Human Development, 53,* 110-126.

Cloudsley-Thompson, J. L. (1961). *Rhythmic activity in animal physiology and behaviour.* New York/London: Academic Press.

Colas, A. (1999). Introducing infants to referential events: a development study of maternal ostensive marking in French. *Journal of child language, 26,* 113-131.

Csibra, G. (2010). Recognizing communicative intentions in infancy. *Mind & Language, 25* (2), 141-168.

Delgado, B., Gómez, J.C. & Sarriá, E. (2010). Funciones tempranas del gesto de señalar privado: La contemplación y la autorregulación a través del gesto de señalar. *Acción Psicológica, 7* (2), 59-70.

Delgado, B., Gómez, J.C. & Sarriá, E. (2011). Pointing gestures as a cognitive tool in young children: Experimental evidence. *Journal of Experimental Child Psychology, 110*, 299-312.

Del Olmo, M. J., Rodríguez, C. & Ruza, F. (2010). Music therapy in the PICU: 0- to 6-month-old babies. *Music and Medicine, 2*(3), 158-166.

Eco, U. (1976). *Tratado de semiótica general.* Barcelona: Lumen.

Flom, R., Deák, G. O., Phill, C. G. & Pick, A. D. (2004). Nine-month-olds' shared visual attention as a function of gesture and object location. *Infant Behavior and Development, 27,* 181-194.

Foster, R. & Kreitzman, L. (2004). *Rhythms of life: the biological clocks that control the daily lives of every living thing.* London: Profile Books.

Goldin-Meadow, S. (2003). *The resilience of language: What gesture creation in deaf children can tell us about how all children learn language.* New York: Psychology Press.

Goldin-Meadow, S. (2009). Gesture's role in creating and learning language. In J. Zlatev, M. Andrén, N. Johansson-Falck & C. Lundmark (Eds.). *Studies in Language and* Cognition (pp. 363-379). Cambridge: Cambridge Scholars Publishing.

Goldin-Meadow, S. & Butcher, C. (2003). Pointing toward two-word speech in young children. In S. Kita (Ed.). *Pointing: Where language, culture, and cognition meet* (pp. 85-107). Mahwah, NJ: Earlbaum Associates.

Goldin-Meadow, S., Levine, S., Zinchenko, E., Yip. T., Hemani, N. & Factor, L. (2012). Doing gesture promotes learning a mental transformation task better than seeing gesture. *Developmental Science, 15* (6), 876-884.

Gómez, J. C. (2007). Pointing Behaviors in Apes and Human Infants: A Balanced Interpretation. *Child Development, 78* (3), 729-734.

Grosse, G., Behne, T., Carpenter, M. & Tomasello, M. (2010). Infants communicate in order to be understood. *Developmental Psychology, 46* (6), 1710-1722.

Guidetti, M. (2002). *Pragmatique et psychologie du développement. Comment communiquent les jeunes enfants.* Paris: Belin.

Gullberg, M., de Bot, K. & Volterra, V. (2010). Gestures and some key issues in the study of language development. In M. Gullberg & K. de Bot (Eds.). *Gestures in Language Development* (pp. 3-33). Amsterdam: John Benjamins.

Iverson, J.M., Capirci, O., Volterra, V. & Goldin-Meadow, S. (2008). Learning to talk in a gesture-rich world: Early communication in Italian vs. American children. *First Language, 28,* 164-181.

Kendon, A. (1991). Some considerations for a theory of language origins. *Man, 26,* 199-221.

Kendon, A. (2000). Language and gesture: unity or duality?. In D. McNeill (Ed.). *Language and gesture* (pp. 47-63). Cambridge: Cambridge University Press.

Kendon, A. (2004). *Gesture: Visible action as utterance.* Cambridge: Cambridge University Press.

Leavens, D. & Bard, K. (2011). Environmental influences on joint attention in Great Apes: implications for human cognition. *Journal of Cognitive Education and Psychology, 10* (1), 9-31.

Leavens, D., Hopkins, W. & Bard, K. (1996). Indexical and referential pointing in chimpanzees (Pan troglodytes). *Journal of Comparative Psychology, 110* (4), 346-353.

Leavens, D., Hopkins, W. & Bard, K. (2005). Understanding the point of chimpanzee pointing: Epigenesis and ecological validity. *Current Directions in Psychological Science, 14,* 185-189.

Leavens, D. & Racine, T. (2009). Joint attention in apes and humans: Are humans unique?. *Journal of Conciousness Studies, 16,* 240-267.

Lefebvre, H. (2004). *Rhythmanalyses: space, time and everyday life.* London: Continuum.

Leroy, M., Mathiot, E. & Morgenstern, A. (2009). Pointing gestures and demonstrative words: Deixis between the ages of one and three. In J. Zlatev, M. Andrén, N. Johansson-Falck & C. Lundmark (Eds.). *Studies in Language and* Cognition (pp. 402-420). Cambridge: Cambridge Scholars Publishing.

Liszkowski, U., Carpenter, M., Striano, T., & Tomasello, M. (2006). 12-and-18-Months-Olds point to provide information for others. *Journal Child Language, 7* (2), 173-187.

Liszkowski, U. & Tomasello, M. (2007). Pointing out new news, old news, and absent referents at 12 months of age. *Developmental Science, 10* (2), F1-F7.

Lyn, H., Greenfield, P. M., Savage-Rumbaugh, S., Gillepie-Lynch, K. & Hopkins, W. D. (2010). Nonhuman primates do declare! A comparison of declarative symbol and gesture use in two children, two bonobos, and a chimpanzee. *Language and communication, 31,* 63-74.

McNeill, D. (1992). *Hand and Mind: What Gestures Reveal About Thought.* Chicago: University of Chicago Press.

McNeill, D. (2005). *Thought, Imagery, and Language: How gestures fuel thought and speech.* Chicago: University of Chicago Press.

Moreno-Núñez, A., Rodríguez, C. & del Olmo, M.J. (*submitted*). The rhythmic, sonorous and melodic components of adult-child-object interactions between age 2 and 6 months.

Moro, C. & Rodríguez, C, (2005). *L'objet et la construction de son usage chez le bébé. Une approche sémiotique du développement préverbal.* Bern-Nueva York: Peter Lang.

Parise, E. & Csibra, G. (2010). How 5-month-old infants integrate ostensive signals: An ERP study. *International Journal of Psychophysiology, 77*, 239-287.

Parise, E. & Csibra, G. (2013). Neural Responses to multimodal ostensive signals in 5-month-old infants. *Plos One 8* (8), 1-9.

Peirce, C. S. (1987). *Obra lógico-semiótica.* Madrid: Taurus.

Perucchini, P. (1997). Sviluppo delle funzioni richiestiva e dichiarativa del gesto di indicare. *Giornale italiano di psicologia, 24* (4), 813-829.

Piaget, J. (1936/2007). *El nacimiento de la inteligencia en el niño.* Barcelona: Ares y Mares.

Reddy, V. (2008). *How infants know minds.* Cambridge: Harvard University Press.

Rochat, P. (2001). *The infants world.* Cambridge: Harvard University Press.

Rodrigo, M. J., González, A., De Vega, M., Muñetón-Ayala, M. & Rodríguez, G. (2004). From gestural to verbal deixis: a longitudinal study with Spanish infants and toddlers. *First Language, 24* (1), 71-90.

Rodríguez, C. (2007). El ojo de Dios no mira signos. Desarrollo Temprano y Semiótica. *Infancia y Aprenzaje, 30* (3), 343-374.

Rodríguez, C. (2012). The functional permanence of the object: a product of consensus. In Martí, E. & Rodríguez, C. (Eds.). *After Piaget* (pp. 123-150). New Jersey: Transactions Publishers.

Rodríguez, C., Moreno-Núñez, A., Basilio, M. & Sosa, N. (*submitted*). Ostensive gestures come first: their role in the beginning of shared reference. *Cognitive Development*.

Rodríguez, C. & Moro, C. (1999). *El mágico número tres: cuando los niños aún no hablan.* Barcelona: Paidós.

Rodríguez, C. & Moro, C. (2008). Coming to agreement: Object use by infants and adults. In Zlatev, J., Racine, T., Sinha, C. & Itkonen, E. (Eds.), *The shared mind: Perspectives on intersubjectivity* (pp. 89-114). Amsterdam/Philadelphia: John Benjamins.

Rodríguez, F.G. (2012). El hermano menor de la palabra. Panorámica de los estudios sobre el gesto. *Psiencia, Revista Latinoamericana de Ciencia Psicológica, 4* (1), 43-56.

Roth, W. M. (2002). From action to discourse: The bridging function of gestures. *Cognitive Systems Research, 3,* 535-554.

Slater, A. (2001). Visual perception. In G. Bremner & A. Fogel (Eds.). *Infant development* (pp. 5-34). Oxford: Blackwell.

Tomasello, M. (2004). Learnig throug others. *Daedalus Winter, 133* (1), 51-58.

Tomasello, M. (2008). *Origins of human communication.* Cambridge: MIT Press.

Tomasello, M. (2014). *A natural history of human thinking.* Cambridge: Harvard University Press.

Tomasello, M. & Camaioni, L. (1997). A comparison of the gestural communication of apes and human infants. *Human Development, 40* (1), 7-24.

Trehub, S. (2003). The developmental origins of musicality. *Nature Neuroscience, 7*(6), 669-673.

Trehub, S., Schellenberg, E. & Hill, D. (1997). The origins of music perception and cognition: a developmental perspective. In I, Deliège & J. Sloboda *Perception and cognition of music* (pp. 83-102). East Sussex: Psychology Press.

Trevarthen, C. (2003). *Conversations with a two-month-old.* Philadelfia: Whurr Publishers.

Vauclair, J. (2002). The emergence of a new paradigm in ape language research. *Behavioral and brain sciences, 25,* 605-656.

Vauclair, J. & Cochet, H. (2013). Hand preference for pointing and language development in toddlers. *Developmental Psychobiology, 55,* 757-765.

Vygotski, L. S. (1996). El primer año. In Vygotski, L. S., *Obras escogidas IV. Psicología infantil* (pp. 275-318). Madrid: Visor.

Wilkins, D. 2003. Why pointing with the index finger is not a universal (in sociocultural and semiotic terms). In S. Kita (Ed.). *Pointing: where language, culture, and cognition meet* (pp. 171-215). Mahwah, N.J.: Lawrence Erlbaum Associates.

Wilkins, D. (2006). Adam Kendon (2004). Gesture: Visible action as utterance. *Gesture, 6,* 119-119.

Zlatev, J. & Andrén, M. (2009). Stages and transitions in children's semiotic development. In J. Zlatev, M. Andrén, N. Johansson-Falck & C. Lundmark (Eds.). *Studies in Language and* Cognition (pp. 380-401). Cambridge: Cambridge Scholars Publishing.

# Chapter II

## The rhythmic, sonorous and melodic components of adult-child-object interactions between 2 and 6 months old:

A pilot study[1]

### 1. Some theoretical foundations

There is a large consensus among psychologists regarding the definition of the "triadic interaction" that involves, among others, joint attention, social reference and communicative gestures (Bates, Camaioni & Volterra, 1975; Tomasello, 2004, 2008). For them, triadic interaction appears at the end of the infant's first year of life, when the child is able to intentionally communicate with others about something in the world.

Colwyn Trevarthen thoroughly investigated this subject in his well-known distinction between primary intersubjectivity, which refers to the coordination of the self and the other, and secondary intersubjectivity, which includes an object (Malloch & Trevarthen, 2009; Trevarthen, 1999, 2003). Prior to the secondary intersubjectivity, the child is assumed to relate only in dyads, either with objects or others, but not both. According to Trevarthen, coordination between the self, the other and an object develops between 9 and 12 months old and is based on the cooperative exchange of referential gestures. In fact, a critical change is produced from play situations to a growing initiative that leads to the systematic combination of intentions with respect to the other and the object.

[1] Moreno-Núñez, A., Rodríguez, C. & del Olmo, M.J. (*submitted*). The rhythmic, sonorous and melodic components of adult-child-object interactions between age 2 and 6 months. *Integrative Psychological and Behavioral Science.*

The idea that triadic interactions occur only at the end of the infant's first year of life remains relatively unchanged. Recently conducted studies (Liszkowski, Carpenter, Striano & Tomasello, 2006; Liszkowski & Tomasello, 2007; Tomasello, 2004, 2008) have shown that 12-month-olds not only interpret other social partners but also take the initiative in communicating with intention, finding themselves "in tune" with adult attention and behavior. From this time onwards, a child communicates something to the adult about something in the world: for example, giving or showing the object intentionally (Andrén, 2010; Reddy, 2008) or, later, pointing a desired object that is out of reach (Csibra, 2010; Futó, Teglas, Csibra & Gergely, 2010; Leavens, Hopkins & Bard, 2008; Southgate, Van Maanen & Csibra, 2007).

However, the concept of "triadic interaction" has other meanings. Vygotski and the classic development theorists (Vygotski, 1984/1996; Wallon, 1972) postulated the existence of triadic interactions in the infant's first months of life, but these ideas were not sufficiently measured and therefore did not survive. However, Piaget did provide empirical data, although neither communication (Piaget, 2007) nor the adult's role as a guide was analyzed, despite the fact that the adult was present during almost all observations (Bronckart, 2012).

The common denominator in the literature nowadays is that the adult as a guide in the origin of triadic interactions, at the end of the first year, has been ignored. Very often the function of concrete objects in producing gestures is not specified, relegating them to a secondary position and paying little attention to their functional nature. Few studies have emphasized the existence of early triadic interaction or the role of the object in the communicative space between adults and infants under 9 months old. Triadic interactions in the infant's first months of life, thanks to the communicative intention from the adult, might help to explain, understand and analyze the nature of the transformations that allow a later entry into the "classic" triad discussed in the literature.

The semiotic and pragmatic perspective of objects (Moro & Rodríguez, 2005; Rodríguez & Moro, 1999) extends the pragmatic tradition of Bruner regarding language use to object use in communicative settings (Rodríguez, 2007). According to this perspective, triadic interactions do not begin when the child intentionally initiates communication with the other but when the adult, who is also an interaction partner, guides the child and combines their relationship with the material world through communication. This guiding role occurs through different semiotic systems, such as the rhythmic-sonorous, gestures, uses of objects, symbols, language and so on.

Objects are part of tradition, are subject to public-use rules, possess social properties approved/shared by the community, involve forms of life and activity and are part of communication (Rodríguez, 2012a; Sinha & Rodríguez, 2008).

Throughout their first year, children construct the public and cultural functions of objects as they begin to use them as class members. There is a form of *functional permanence* in objects that is public and socially agreed upon, as well as being necessary for communication and intersubjective understanding (Rodríguez, 2012a, 2012b). The child alone cannot decode the complexity of the meaning of the artifact object, but he/she needs the mediation/guidance of another person through systems of signs. Furthermore, the objects are a part of communication because the adult and child construct a shared reference to them. Communicative niches are constructed in triadic interactions, from which tremendously rich and varied meanings emerge during the first two years of the infant's life.

Objects play an important role in everyday adult-child interactions, where the adults provide the children with instruments and their conditions of use and the children accesses them via interaction with the adults. Later, the child uses objects by him/herself. Semiotic systems are tools to communicate and become tools for thought later in development. Therefore, analyzing how developmental communicative processes are produced is important because these processes enable the transfer of

cultural knowledge regarding the objects that an adult gives a child in his/her first months of life.

From the pragmatic of the object perspective, studies have been conducted on triadic interactions adult-child-object throughout the first and second year, regarding children's first conventional uses of objects (Rodríguez & Moro, 1999), how and when they begin to perform symbolic actions (Cárdenas, Rodríguez & Palacios, 2014; Palacios & Rodríguez, 2014; Rodríguez, Palacios, Cardenas & Yuste, 2014), how and when children use private gestures with a self-regulation function (Basilio & Rodríguez, 2011; Rodríguez & Palacios, 2007), the early interactions through music (Del Olmo, Rodríguez & Ruza, 2010), and the use of number between two and three years (Cavalcante & Rodríguez, 2014). Adults assume an educative role, segmenting and selecting portions of the world to share with the infant in his/her first months of life by relying on different semiotic systems, including rhythm and sound.

There is a general agreement in the literature about the importance of rhythm as an early form of child-adult interaction (Perinat, 1993; Díaz, 2004; Hargreaves, 2002; Jaffe, Beebe, Feldstein, Crown, Jasnow, Rochat & Stern, 2001; Rodríguez, 2006; Trehub, 2003). However, we did not find studies about rhythm including objects in these early interactions.

In this study, we seek to identify the place of rhythm and sound as a basic semiotic system that is crucial to understand early child-adult interaction. There is a need to analyze upon which basic semiotic systems the adult relies in order to segment and organize objects in the world and how to present them to the child in the best possible way. In this study, we explore the rhythmic components of adult-child interaction, including those in objects and defining these components as one of the first forms of shared reference.

We want to analyze how the first agreements between adult and child are built in relation to the objects, hypothesizing that ostensive gestures are one of the main

tools to reach them. Rhythmic, sonorous and melodic components are assumed to play important roles in the presentation of objects used by the adult *in front of* and *for* the infant.

## 2. Material and Methods

### 2.1. Participants

Two typicaly-developing boys (henceforth, Child1 and Child2) and one girl (Child3) were filmed at age 2, 4 and 6 months with a parent. Child2 was filmed with his father and Child1 and Child3 with their mothers.

### 2.2. Procedures and Materials

Each child was systematically recorded at home at three observational and longitudinal sessions (nine 5-minute sessions in total). Adults were provided with the object[2] (see Table 2.1). Parents were asked to be free to place the child in a comfortable position, where both could interact, and were instructed to "Play with your child as you normally would."

The object of study was chosen because it favors triadic interactions: (1) for adults to produce gestures as demonstrations of uses of objects and ostensive gestures with rhythmic, sonorous and melodic components and (2) for productions of the child in relation to rhythm and sound.

A formal authorization was required to parents in order to register the sessions and to spread and publish the results of the study. Parents also signed an informed acquiescence where the terms of their participation on the study were made explicit and the anonymity of the participants was guaranteed.

[2] The same object was used in a case study of the self-regulation function in private gestures on a 18 months old girl with Down Syndrome (Rodríguez & Palacios, 2007).

| | |
|---|---|
| **Ring Pyramid**<br>  | The object consisted of: (1) six RINGS of different diameters that could be placed on (2) a narrow supporting pole.<br><br>Three RINGS were transparent and filled with small plastic balls, so that they sounded like a rattle when shaken (SONOROUS RING). The other three rings were colored, hollow and did not produce a sound (NONSONOROUS RING). |
|  <br>**Sonorous ring** |  <br>**Nonsonorous Ring** |

TABLE 2.1.

*Object description*

Microgenetic and qualitative analyses of frequencies and proportion comparison were conducted. Although the object can be used in multiple ways, parents of 2-, 4- and 6-month-olds discard the more complex uses (even when they are more socially rooted) and merely places the RINGS on the pole (Rodríguez & Palacios, 2007). The adult favors "easier" uses of objects, that is, their rhythmic, sonorous and melodic components, which presumably allows him/her to create a shared meaning with the child.

## 2.3. Data Analysis

For transcription was used ELAN (EUDICO linguistic annotator, 2011), based on the transcription protocol of Rodríguez & Moro (1999). Sequences were selected using the following criteria: gestures, actions, or both with (1) rhythmic –with or without sound–, (2) sonorous –changes in sound intensity–, or (3) melodic components.

A series of adult-child interactions were categorized on the basis of previous semiotic categories (Rodríguez & Moro, 1999) and other emergent categories, where rhythmic, sonorous and melodic components of the adult's actions and rhythmic and sonorous components of the child's actions were added (Table 2.2).

| ***CHILDREN*** | ***ADULTS*** |
|---|---|
| ***Attention***<br>Child's visual activity towards:<br>*The object*<br>*The adult*<br>*The adult's action* | |
| ***Uses of objects***<br>*Non conventional Uses:* Child uses the object in a non conventional way such as sucking RINGS or shaking the NON-SONOROUS RING.<br>*Precursors to Conventional Uses:* Child includes him/herself in the joint action *initiated* and *directed* by adult. For example, before the ostensive action of adult, child takes or attempt to grasp the object.<br>*Conventional uses:* Child performs or attempts to perform the rhythmic-sonorous use of the object. For example, shaking the SONOROUS RING or striking the NON-SONOROUS RING against something to make a sound. | ***Communicative mediators of adults***<br>**Demonstrations**: Performing the conventional sonorous use of the object in an organized manner. These ostensive gestures have rhythmic and sonorous characters. Types:<br>*Distant:* When adult performed a complete or incomplete conventional use of the SONOROUS RING (i.e., using it as a rattle) or percuting the NON-SONOROUS RING with another object to child.<br>*Inmediate:* When adult directed or introduced the use to child through his/her body to perform a joint action (e.g., when adult inserted the SONOROUS RING onto child's wrist and shook her arm, or when adult struck the SONOROUS RING against the chest of the child). |
| ***Ostensive gestures***<br>*Self-Ostensive gesture with the* RINGS*:* Child "shows" the object to him or herself in an exploratory mode. | **Ostensive gestures**<br>*Ostensive gesture:* Gestures with the object itself to draw the attention of the other (e.g., holding the SONOROUS or NON-SONOROUS RING in front of the child).<br>*Rhythmic ostensive gesture*: When the ostensive gesture is also rhythmic (i.e., with organized movement) using the NON-SONOROUS RING. Or when the SONOROUS RING is presented rhythmically and slowly, focusing on the visual aspect of balls inside, which produces the non-sonorous behavior of them. |
| ***Vocalizations***<br>Vocal sounds emitted by the child that can vary in tone or intensity (e.g., screams, tweets, or chirps). | **Language, Verbalizations and Vocalizations:** Musical components using one's voice to add a melodic character, tone, or intensity. Usually accompanied by rhythm and the sound of the object being acted upon. |

TABLE 2.2

*Observation categories*

Coding reliability was analyzed by three independent coders. Intercoder agreement index (Freelon, 2010) of Krippendorff's Alpha was 0.921, which denotes an excellent level of reliability (Cicchetti, 1994).

We also used SPSS to perform Chi-square test to assess differences among frequencies distribution into a variable, and a proportion comparison among frequencies of uses of objects through the different variables studied.

# 3. Results

## 3.1. Adult's Communicative Mediators

Over time, the adult used different semiotic systems to communicate with his/her child about, and through the object. Especially at 2 and 4 months old, the primary action responsibility and initiative comes from the adult, as 2-month-olds are unable to manipulate objects by themselves and do so with difficulty at 4 months old. This situation changes at age 6 months, when children no longer have difficulty in manipulating objects.

Importantly, different uses of objects and social forms of action can be organized. However, the rhythmicity of action is not only found in objects designed to be sonorous but it can also be found in any object when a rhythm is applied (e.g., striking an object against another in an organized manner). We consider the conventional use of these particular objects to shake it in different manners, which involves a rhythmic organization, either with SONOROUS or NON-SONOROUS RINGS.

### 3.1.1. T1/ 2 Months: *Adult favors Rhythmic and Sonorous Components, especially through distant demonstrations*

At 2 months old, three aspects draw attention about the adult's action (Table 2.3): (1) favored SONOROUS RINGS compared with NON-SONOROUS ones, presenting

proportions that differ statistically (*p*<.05), (2) preferred to produce *distant demonstrations* by shaking the RINGS, actually distant demonstrations presents a higher proportion than other actions –immediate demonstrations, and basic and rhythmic ostensive gestures– (p<.05), and (3) also used some *ostensive gestures* to present the RINGS.

*The adult used the SONOROUS RING more than the NON-SONOROUS RING*

The adult used the SONOROUS RINGS preferably compared to the NON-SONOROUS with their 2-month-old babies. This object selection was striking in the case of Child1 and Child3 and the trend remained for Child2 but with minor differences. Importantly, the adult used the NON-SONOROUS RINGS in a sonorous way by percussing them against another object.

| | | 2 months | | | 4 months | | | 6 months | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Child1 | Child2 | Child3 | Child1 | Child2 | Child3 | Child1 | Child2 | Child3 |
| Sonorous ring | Distant Demonstration | 60 | 12 | 46 | 88 | 3 | 23 | 27 | 1 | 4 |
| | Immediate Demonstration | 4 | 1 | 1 | 13 | - | 2 | 7 | - | - |
| | Ostensive Gestures | 2 | 2 | 6 | 12 | 3 | 12 | 18 | 1 | - |
| | Rhythmic Ost. Gestures | 11 | - | 3 | 15 | 1 | 10 | 2 | - | 1 |
| Non sonorousring | Distant Demonstration | 1 | - | 27 | - | - | 8 | 6 | 1 | 5 |
| | Immediate Demonstration | - | - | - | - | - | - | 3 | - | - |
| | Ostensive Gestures | 3 | 4 | 7 | - | 1 | 1 | 1 | - | 1 |
| | Rhythmic Ost. Gestures | 2 | 2 | 3 | 2 | 1 | 3 | - | - | 2 |

TABLE 2.3.

*Frequencies of adult's uses of the SONOROUS and NON SONOROUS RINGS with the baby (by participants)*

The RINGS were not arbitrarily presented to the children, but in an organized manner preferably via rhythmic and sonorous components.

*The adult favors distant demonstrations with sound*

Through demonstrations, the adult introduced uses of the objects to the child. The SONOROUS RINGS were shaken like rattles and the NON-SONOROUS ones were struck. Thus, the RINGS became for the child something to hear, to watch, and eventually to use together, becoming objects of joint attention and, to some degree, of joint action. The adult produced less ostensive gestures to the child than demonstrations at age 2 months.

They placed the object between him/herself and the infant in a convergence of multimodal semiotic networks (e.g., by making ascending or descending *glissandos*[3], waving the object, using it, or talking to the child). The adult used the object to communicate with the child, organizing the first communication spaces between them introducing something external (i.e., the earliest forms of triadic interactions adult-child-object).

*The adult produces ostensive gestures with and without rhythm*

In addition to the aforementioned sonorous uses, the adult also displayed ostensive "silent" gestures when presented the RINGS to the child. However, a significant portion of these ostensive gestures was made through rhythmic movements. These actions maintain the rhythm although these objects do not produce any sounds.

Classic ostensive gestures (statically made between adults) are differentiated from the rhythmic ones that we have found. The presentation of the RINGS was performed in a static manner in the former and in a rhythmic (redundant) way in the latter.

[3] *Glissandos* are cascades of sounds produced by the adult in an ascending and descending manner.

Observation 1 illustrates what happened at 2 months old when the uses of the adult organized the interaction through rhythm and sound.

**Observation 1. Child3 0; 1, 16 [duration 54 sec]**
**The adult makes a distant demonstration of the SONOROUS RING between herself and the child**

Child3 is reclined on the sofa while the adult holds her by the arm. Child3 constantly looks at the adult's face, smiling at times. The adult speaks with a melodic intonation: "Look how beautiful this iiis...," placing a NON-SONOROUS RING between herself and Child3, moving it rhythmically. "Loook... Oh, how beautiful this iiis...!" intonating the words as descending *glissandos* and stroking her index finger down Child3's cheek in the same direction. Child3 looks at the object and then smiles at, and babbles the adult back. The adult continues showing her the object, accompanying this action with descending *glissandos* ("Aaaaaah..."), according to the girl's babble. Child3 becomes a bit restless, so the adult releases the NON-SONOROUS RING and *picks up the SONOROUS one, shaking* it in Child3's face and *recovering her attention*. After a *few repetitions*, she accompanies the *glissandos* with *rhythmic uses of the RING, shaking it to the rhythm of the vocalizations emitted by the child*.

In Observation 1, different components of the action of the adult are identified, such as (1) the rhythm in the movement of the ostensive gestures, (2) the rhythm made by the sound of the SONOROUS RING, in order to recover the child's attention, and (3) the rhythm and melody in the adult's verbalizations.

### 3.1.2. T2/ 4 Months: *The Adult continues to favor Rhythmic and Sonorous Uses via distant demonstrations*

The adult at T2 (Table 2.3) still preferred to use the SONOROUS RINGS *versus* the NON-SONOROUS ones ($p<.05$), primarily as a rattle, as in T1. The adult organized the RINGS following rhythmic and sonorous criteria and highlighted the sound they made (see example in Observation 2).

**Observation 2. Child1 0; 4, 3 [duration 50 sec]**
**The adult segments her action through distant demonstrations of two SONOROUS RINGS**

The adult held the large SONOROUS RING over Child1's head and shook it constantly. Child1 *observed the action of the adult and vocalized* until the adult, without altering her action, moved it closer to the child's face. When the adult withdrew, Child1 was distracted and looked away. Then, the adult shook the small

SONOROUS RING, this time in front of Child1's face, who paid attention to the object again. The adult *used both SONOROUS RINGS* the large and the smaller one. During these actions, *Child1 waved his arms and legs and smiled*, watching the adult. Child1 occasionally vocalized to accompany the adult's language: "Looook at how many baaalls! And here's anoooother [ring]". By waving his arms, Child1 *accidentally* placed his arm in the RING that the adult was using to make sound. Then the adult said: "Oops! Did you get it?"

In Observation 2, the adult tried to capture child's attention and, once achieved, the dyad converged into the same action holding the object together, although this use was only intentional by the adult. A big difference with T1 is that 4-month-olds grasp objects and 2-month-olds do not.

Given the clear choice that the adults consistently makes regarding the sonority of the object, children get easily involved in the adult's action when he/she shows or gives the RINGS rhythmically (Observation 3). This implies a categorization according to the sonorous possibilities of the object.

**Observation 3. Child3 0; 4, 1 [duration 30 sec]**
**The adult categorizes the RINGS according to their sonorous *versus* non-sonorous characteristics**

The adult took two RINGS off the pole (one SONOROUS and one NON-SONOROUS) and shook both rings for Child3, *comparing the RINGS that produce sound with those that do not*: "This one makes sounds, see? This one makes noise, and this one does not. This one has nothing, and this one has balls". *Child3 was constantly looking at the SONOROUS RING while waving her arms and legs* and *ignoring the NON-SONOROUS one*.

At T2, as in T1, the adults preferred distant demonstrations *versus* immediate demonstrations and gestures when using the RINGS. The adults show the object to the child but they do not give it to him or her.

The adult's demonstrations and gestures tend to decrease in Child3 and less strikingly in Child2. However, immediate demonstrations and rhythmic ostensive gestures increased. These data are contrary to those for the adult with Child1, who shows an increase in demonstrations and gestures at T2.

### 3.1.3. T3/ 6 Months: *Adult keeps favoring Rhythmic and Sonorous Uses. However, the frequency of demonstrations and ostensive gestures decreases*

As at T1 and T2, at T3 the adult preferably used SONOROUS RINGS *versus* NON-SONOROUS ones, except in the case of Child3's mother. In general, preferences were maintained for organized rhythmic and sonorous RING presentations. Furthermore, all T3 ostensive gestures by the adult were to *give*, not merely to *show* the object to the child ($p$<.05). This trend opposes the findings at T1.

Nevertheless, the adult's uses of objects and gestures decrease accompanied with an increase in children's participation. They practically limited his/her action in terms of providing the children with the support they need to explore the object. Ostensive gestures toward the child with the RINGS decreased, which allowed the child to perform different uses. Whereas 4-month-olds remain involved in the uses performed by the adult most of the time, 6-month-olds are able to use and choose objects autonomously (Observation 4).

**Observation 4. Child2 0; 5, 29 [duration 56 sec]**
**The adult limits his action and supports the child's action**

> Child2 sat on a table with three RINGS and the pole in front of him; his father crouched on the floor directly behind him. *The boy held a SONOROUS RING and used it to hit the table*, waving both arms. Then, with his other hand, he hit the pole and moved it. *His father held the pole at the base to keep it from sliding* while Child2 continued hitting it with his free hand. *This action caused the SONOROUS RINGS on the pole to produce sound*. When Child2 stopped, he held the RING in front of him and moved it slowly to show it to himself (i.e., self-ostensive gesture).

In Observation 4, the adult did not take the initiative, limiting himself to give the object to the child when it was out of reach. The child had more space for action than at T1 and T2 and was able to explore objects' sonorous possibilities by shaking and striking the RINGS against other objects that do not produce sounds by themselves.

### 3.2. The Rhythmic, Sonorous and Melodic actions of the adult

This section highlights two key points: (1) very often the adult adds rhythmic, sonorous and melodic components to his/her demonstrations and gestures; (2) although the adult's uses tend to decrease as the child grows, the remaining uses have rhythmic, sonorous and melodic components.

Quite often, the adult's actions have rhythmic components when presented to the child. We classified these uses whether they are (1) *only rhythmic* without sound (e.g., a rhythmic ostensive gesture with the NON-SONOROUS RING or slowly with the SONOROUS one), (2) *rhythmic and sonorous* (e.g., use conventionally the SONOROUS RING, struck it against the child's chest, or percuss the NON-SONOROUS one), or (3) *rhythmic, sonorous and melodic* (e.g., when adult incorporates melodic components using his/her voice[4]).

Again, adults used more rhythmic presentations of the SONOROUS RINGS than the NON-SONOROUS ones in the three sessions. The *rhythmic and sonorous* uses prevailed over the *rhythmic* and the *rhythmic, sonorous and melodic* uses ($\chi^2(3, N=476)=198.27$, $p<.05$) (Table 2.4).

The rhythmic and sonorous components predominated in all the adults, but not the melody. Melodic components were added to those that were already rhythmic and sonorous. The demonstrations accompanied by all rhythmic, sonorous and melodic components clearly predominate over pure ostensive gestures ($p<.05$).

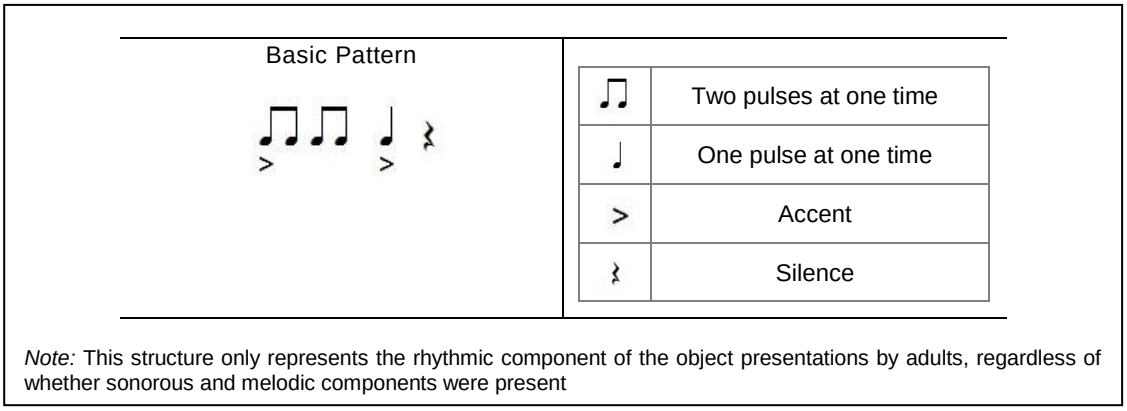
[4] Ostensive gestures, as happens between adults, were eliminated from this classification because they are produced in a static manner and, therefore, they do not involve either rhythm, nor sound.

| | | 2 months | | | 4 months | | | 6 months | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Child1 | Child2 | Child3 | Child1 | Child2 | Child3 | Child1 | Child2 | Child3 |
| Sonorous ring | Rhythmic Uses | 11 | - | 3 | 15 | 1 | 10 | 2 | - | 1 |
| | Rhythmic and Sonorous Uses | 49 | 13 | 34 | 72 | 3 | 20 | 24 | - | - |
| | Rhythmic, Sonorous and Melodic Uses | 15 | - | 13 | 10 | - | 5 | 8 | 1 | 4 |
| Non sonorous ring | Rhythmic Uses | 1 | 2 | 3 | 2 | 1 | 3 | 2 | - | 2 |
| | Rhythmic and Sonorous Uses | 1 | - | 19 | - | - | 8 | 2 | 1 | 4 |
| | Rhythmic, Sonorous and Melodic Uses | 1 | - | 8 | - | - | - | 5 | - | 1 |

TABLE 2.4.

*Frequencies of adult's rhythmic, sonorous and melodic uses with the baby (by participants)*

In addition, a *rhythmic structure of the first uses of objects* was identified in the adult's actions (Figure 2.1), which was characterized by four fast pulses, a long pulse accented at the end and a silent pause.




*Note:* This structure only represents the rhythmic component of the object presentations by adults, regardless of whether sonorous and melodic components were present

FIGURE 2.1.

*Representation of the adult's rhythmic structure of the first uses of objects*

This structure formed a series of continuous, rhythmic sequences in the adult's actions. Figure 2.2 shows how the adult simultaneously applies the same predominant rhythmic structure in her action with the object and how she melodically speaks to the child. Adults create a multimodal, coherent stimulating context that helps children to be included in the action.

| Voice of adult (with rhythmic content) | ¿Qué | te | pa- | -sa a | -ti? | --- |
|---|---|---|---|---|---|---|
| Use of the SONOROUS RING | *Turns the ring left* | *Turns the ring right* | *Turns the ring left* | *Turns the ring right* | *Turns the ring left* | *Offers the ring to child* |
| Rhythmic structure |  | | | | | |

*Note:* "¿Qué te pasa a ti?" can be translated as "What is happening to you?". In this case, it was not translated in text because the meaning of the figure may be lost.

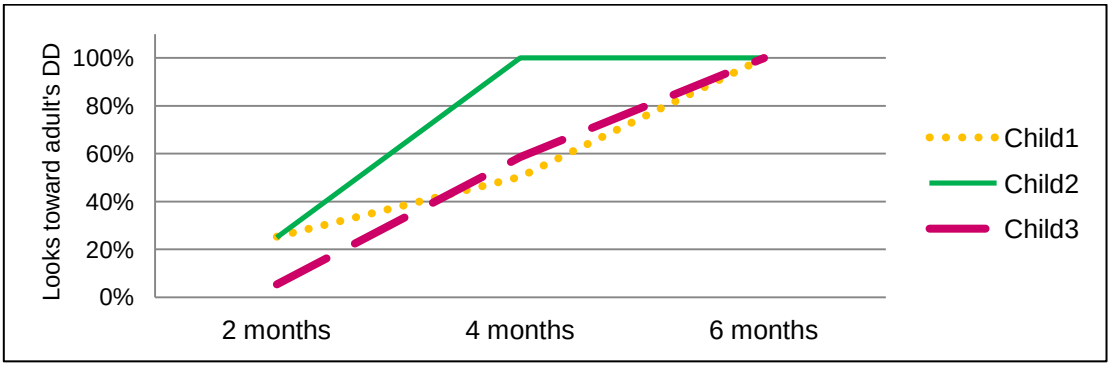
FIGURE 2.2.

*Example of the predominant rhythmic structure in the action of adults*

### 3.3. Patterns of children's activity in response to the Rhythmic, Sonorous and Melodic actions of the adults

The adults constantly engaged the children throughout this type of actions. This section presents the patterns of children's activity prompted by the rhythmic, sonorous and melodic actions of adults.

Children are incorporated into the categories of joint action proposed by adults. Changes in children's gazes and its duration towards the object, the adult and the adult's actions have been observed (Graph 2.1).




GRAPH 2.1.

*Percentage of looks by the child toward the distant demonstrations of the SONOROUS RING made by adults*

Children looked at the SONOROUS object's movements over time. In fact, Child2 looked at all the occurrences at T2 and all three children looked at all the occurrences at T3.

### 3.3.1. T1/ 2 Months: *The child pays attention to the adult's Rhythmic, Sonorous and Melodic actions*

The response patterns of 2-month-olds are characterized by: (1) the child pays attention to the adult's actions when he/she presents the object in the "cutting" line that joins both of their gazes; (2) the child cannot use the objects without the adult's help.

The adult places the RINGS between their previously connected gazes. This way, the adult captures the child's attention via rhythmic, sonorous and melodic actions (Graph I). Moreover, the child stirs, vocalizes and smiles at the adult's actions. In these cases, the adult often adapts his/her own language using *glissandos*, humming, or both.

At age 2 months, the child is not yet able to grasp the object. However, Child1's and Child2's adults placed the SONOROUS RING on their wrists, causing a sound when the children waved their arms. This was considered as a canonical use of the object because the sound was produced directly by shaking their arms, even when nothing indicates intention on the child's part (Table 2.5).

### 3.3.2. T2/ 4 Months: *The child participates in the adult's proposed action*

At 4 months old children: (1) as they are able to grasp the RINGS, this facilitates their entry into uses of objects; (2) performed the first self-ostensive gestures using the RINGS.

| | | 2 months | | | 4 months | | | 6 months | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Child1 | Child2 | Child3 | Child1 | Child2 | Child3 | Child1 | Child2 | Child3 |
| Sonorous ring | Non conventional Uses | - | - | - | 9 | - | 4 | 1 | 2 | - |
| | Precursor to Conventional Uses | 9 | 3 | - | 36 | 2 | 6 | 3 | 17 | 2 |
| | Conventional Uses | - | - | - | 2 | - | - | 1 | 13 | 2 |
| | Self Ostensive Gestures | - | - | - | 2 | - | - | 12 | 1 | - |
| Non sonorous ring | Non conventional Uses | - | - | - | - | 4 | - | - | 9 | 23 |
| | Precursor to Conventional Uses | - | - | - | - | - | 9 | - | 11 | 4 |
| | Conventional Uses | - | - | - | - | - | - | - | - | - |
| | Self Ostensive Gestures | - | - | - | - | - | - | 1 | - | - |

TABLE 2.5.

*Frequencies of children's uses of the SONOROUS and NON SONOROUS RINGS (by participants)*

Four-month-olds clearly show an active response to, and increase in their uses of objects relative to T1 ($p$<.05). Unlike at 2 months old, the adult was able to involve 4-month-olds by using the RINGS and children are now able to hold the object and they can use it themselves. However, these uses are basic and the child needs the adult to place the RING in his/her hand (i.e., to shake it or make a noise with it). 4-month-olds easily understand that the adult's ostensive gestures are at least an invitation to take the RING.

First ostensive gestures appear in Child1, directed to himself as a way to explore the objects. Although these self-ostensive gestures were infrequent (only twice at this age), they occur with the SONOROUS RING.

### 3.3.3. T3/ 6 Months: *The child explores objects' sonority*

At age 6 months, we observed that: (1) the first conventional uses of sonority-related objects appeared; (2) children used the SONOROUS RINGS to strike other

objects, obtaining different sounds; (3) the frequency of self-ostensive gestures increased ($p$<.05).

The children's first conventional uses are to shake the SONOROUS RING, which are linked to rhythm and sonority. Importantly, 6-month-olds shook and struck the RINGS and selected the SONOROUS RINGS by themselves. This suggests that rhythmic and sonorous uses are one of the first conventional ones that children are able to perform.

By T3, children use objects rhythmically, obtaining two types of sound with the RINGS by shaking them or striking them against other objects (e.g., against the table). Self-ostensive gestures of Child1 increased in frequency and Child2 started to display the RINGS to himself, but not the NON-SONOROUS ones (see Observation 4 above). Child3 did not perform any gesture.

## 4. Discussion

This study explored the rhythmic, sonorous and melodic components used by the adult and the child with objects in triadic situations (e.g., when incorporating an object into their interactions). These interactions are less studied in this field compared to exclusively dyadic child-adult interactions (Malloch & Trevarthen, 2009; Trehub, 2003; Trevarthen, 1999, 2003).

The results of this study show that the rhythmic, sonorous (and melodic in case of adult) components compose a semiotic system allowing adult-child communication around/with an object. This semiotic system appears prior to more complex systems related to conventional, symbolic or private uses of also more complex objects made by the children from the end of their first year (Basilio & Rodríguez, 2011; Dimitrova, 2012; Rodríguez, 2012a; Rodríguez & Moro, 1999; Rodríguez & Palacios, 2007). Between age 2 and 6 months, children are not just in a world of dyadic interactions with

adults or with objects (the latter emerges around age 4 or 5 months). Rather, they are sometimes in triadic interactions when the adults mediate the relationship between them and the material world.

### 4.1. Early triadic interactions of a communicative/educational nature

One of the major results of this study is that triadic interactions are strongly supported by the ostensive and intentional actions of the adult, taking place at the second month of the infant's life. These interactions differ from the "classic" triadic interactions that occur at the end of the infant's first year when he/she initiates the interaction (Liszkowski et al., 2006; Liszkowski & Tomasello, 2007; Tomasello, 2004, 2008; Tomasello & Carpenter, 2007; Tomasello & Hamann, 2012). The current study examined interactions whose communicative intentionality stems from the adult. However, children interject themselves at different levels: (1) by paying attention, and (2) by responding to the adult's proposals, which depend on the possible actions (joint or individual) that increase beginning at 4 months old.

The adult plays an educational-communicative role with the child, characterizing the triadic interactions. When an object is placed between both of them, it can play an important role establishing a shared reference. Adults only produce ostensive gestures (we did not observe any pointing), which is remarkable considering that pointing is seen as the ultimate gesture of shared reference in the literature (Rodríguez, Moreno-Núñez, Basilio & Sosa, *submitted*).

Parents did not behave in the same way across all three sessions and neither did the children. Adults progressively relinquished responsibility to the child and they seized control. At 2 months old, the adult maintained responsibility for the triadic interaction; however, at 6 months old, the child often initiated certain rhythmic and sonorous uses of objects, although their use was not as organized as the adult's.

Rhythmic and sonorous uses could be one of the first conventional ones that children are able to perform. More research is needed in this issue.

### 4.2. Rhythm as an instrument of communication: One of the first semiotic systems

Rhythm is the common denominator of the adult's behavior in triadic interactions with 2-month-olds. In fact, if the rhythm of the interaction was removed, then the interaction would lose its structure and organization (Español, 2004; Perinat, 1993; Trehub, 2003; Trevarthen, 1999, 2003). The objects presented to the child by the adult are done with a rhythmic nature. Rhythm is among the first semiotic systems of human communication that references the outside world. This conclusion agrees with the findings of Trehub (2003), which concluded that rhythmic skills are most likely the first to emerge and develop in children.

This study also found the formation of the adult's basic *rhythmic structure of the first uses of objects.* This rhythmic scheme or pattern organizes the adult's action, which attracts the child's attention. One possible explanation for this homogeneity – even when there are some individual differences in terms of frequency of productions in the adult's rhythmic actions with the object– is that this scheme is binary, simple, short and easy to follow for 2-month-olds and up. Adults seemed to notice it, and kept presenting the objects in this way in the different sessions, discarding other unrhythmic actions, what became in a progressive increase of children's percentage of looks to the share action.

Rhythm does not often occur alone; rather, sonorous components accompany it. In fact, when given a choice between SONOROUS or NON-SONOROUS objects, the adult preferred the SONOROUS object at all three ages most of the time.

In addition, melody accompanies the adult's language and vocalizations. This finding corresponds to the observations made by Del Olmo (2009), when the adult responds to the child with a rhythm that is consistent with the child's movement. The child is stimulated by rhythm, sound and body contact (Santiago, 2011; Wallon, 1972) and the adult's voice.

### 4.3. The Child Easily Responds to the Adult's Rhythmic-Sonorous Proposals

From 2 months old, the child attends to the adult's ostensive actions regarding the object as long as these actions occur between the participants. From 4 months old, the child is not only able to attend to the displayed object but he/she can also hold it: objects that were initially "things to look at" become "things to grasp." This ability probably creates the first joint action niches where the child plays an active role.

From the moment that children are able to manipulate objects independently (in this study, at 4 months old) they search for sounds that are often presented in a structured, rhythmic manner. This structure becomes a more organized rhythm at 6 months old than at age 4 months.

Possible future lines of research will be directed at analyzing the rhythmic, sonorous and melodic components as well as the rhythmic patterns identified in the majority of the uses of objects performed by the adult in more detail. These uses of objects can be considered cognitive and semiotic precursors to the triadic interactions characteristic of the end of the first year, when the children initiate and demonstrate intentional communicative abilities.

Further research on this area, extending both participants and sessions, are needed to: (1) explore how this rhythmic, sonorous and melodic components work; (2) what its role in the early development is; (3) how this relates to other semiotic systems.

## 5. Conclusions

Adults play an essential role in 2-, 4- and 6-month-olds, as regards the presentation of the world to children[5]. As previously discussed, adults follow the rhythmic-sonorous-melodic criterion to (1) apply different semiotic systems and ensure that the child is included in the action, (2) select certain uses of objects and discard others, and (3) adjust the way in which he/she organizes action(s).

Rhythm plays a key role in the object action that mediates the adult-child interaction. At 2 months old, children show great interest in objects, primarily because they are used by the adult. It is through rhythm that interests converge in the triadic interaction. This is also an important medium through which the child-adult interaction, including the object, takes place. Based on the transversality of rhythm that marks all interactions adults (with or without sound, melody, or both) provide children with objects and educative intention, as well as share parts of the world. The object focuses the child's attention and both the adult and child learn to share the meaning of the object (e.g., *if* the RING is SONOROUS, *then* grasps it and produces rhythm).

The adult provides space for the child to interact with the object. They adjust themselves to the child's action, which implies a certain interpretation of the other's capabilities. In turn, this behavior eventually stops the regulation of all activity and provides the child with space to control the action through the object. Children's development level allows 6-month-old infants to explore and produce different types of rhythm and sounds by themselves using the objects.

In conclusion, the first semiotic systems are characterized by rhythmic, sonorous and melodic components, and these components are relative to the action with the object. These components are mostly likely organized on the basis of new

[5] See annexed section, where three different sequences were represented by microgenetic graphs, which have not been included in the original paper.

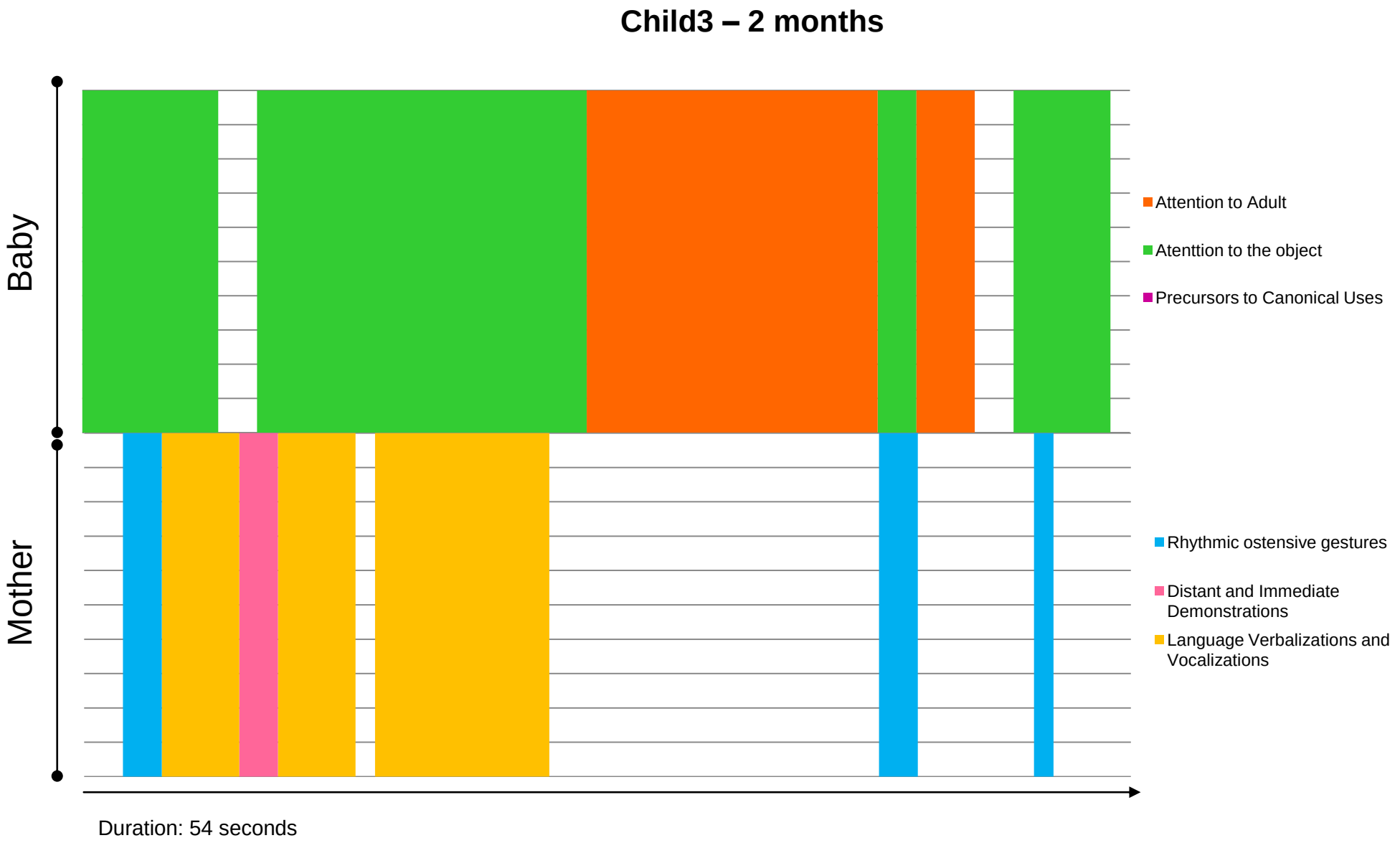
semiotic systems throughout the first and second year of the infant's life (including conventional, symbolic, private and other types of uses).

The results of this study suggest that the entry into triadic interaction occurs when the adult promotes this interaction by introducing the child to his/her own course of intentional action. This introduction does not occur at the end of the first year, when the child understands the intentions of the other as is often claimed in the literature (Bates et al., 1975; Tomasello, 2004; 2008; Tomasello & Carpenter, 2007; Tomasello & Hamann, 2012). For this triadic interaction to occur, the presence of rhythm is required. Rhythm is most likely one of the first systems of meaning that allows the establishment of a shared reference.

## 6. Microgenetic Graphs

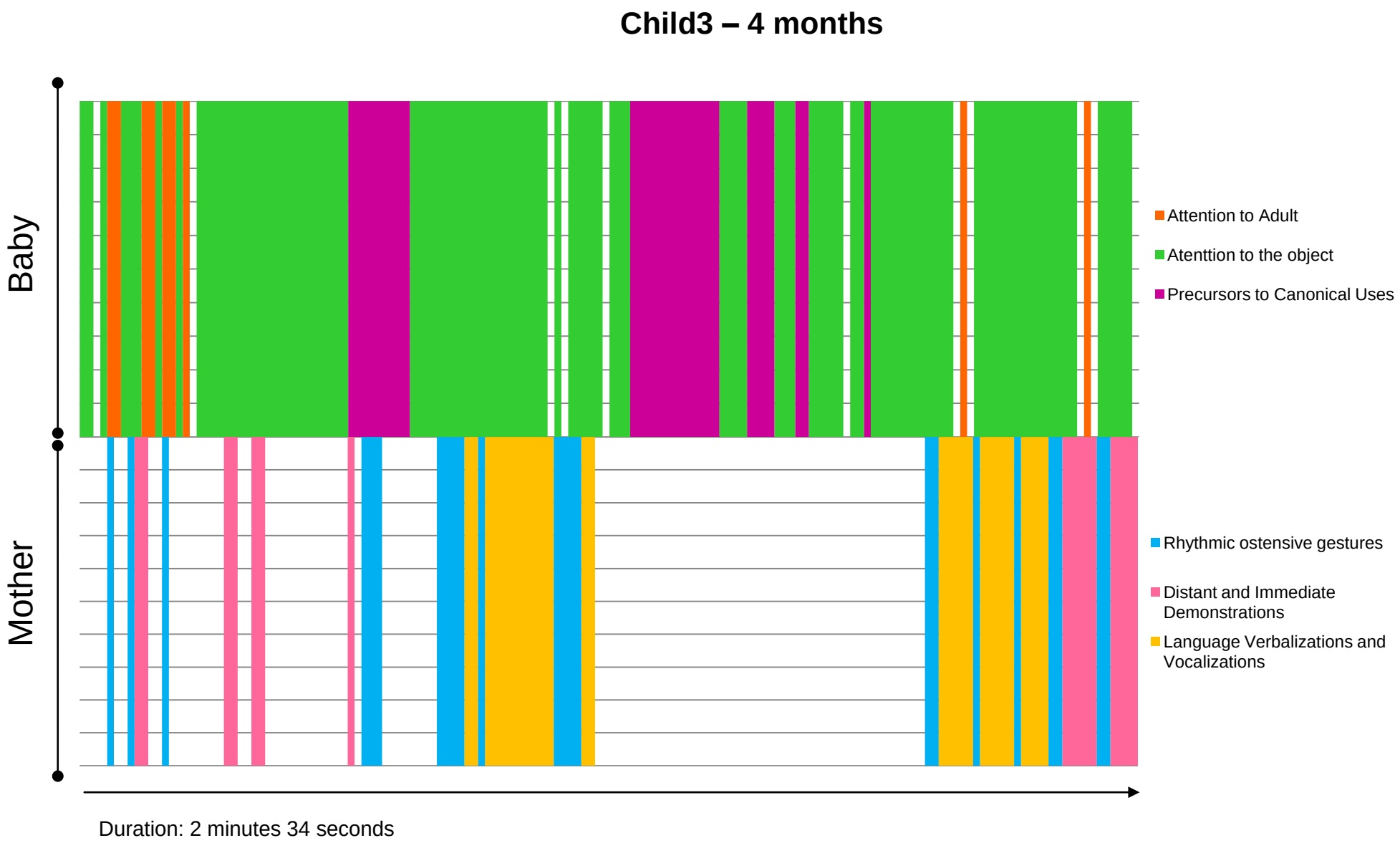
To study adult-baby-object interactions in more detail, we represent the analysis performed in this study using microgenetic graphs, which can represent what happens with both participants –adult and child– in every second of the selected video sequence, being able to observe what the child does when the adult perform a certain action. For the realization of these graphs we have selected three video sequences of the same participants and the same object –Child3 and his mother, with the PYRAMID OF RINGS– at each observation time analyzed –T1, T2 and T3 (see Graph 2.2). Later, we subsequently coded adults' uses: (1) when only perform a rhythmic use, with the category rhythmic ostensive gestures, (2) when perform a rhythmic-sonorous use, with the category distant and immediate demonstrations, and (3) when performing a rhythmic-sonorous-melodic use, with the category language, verbalizations and vocalizations. The gazes and/or the girl's participations in her mother's action have been coded according to: (1) when looking at the adult, with the category attention to adult, (2) when looking at the object, with the category attention to the object, and (3) when trying to participate in the action of the adult, that may be holding the object, or tending the hands toward the object acted by the adult, with the category precursors to canonical uses.

In Graph 2.2 we can observe child's reactions to adult's rhythmic, sonorous and melodic uses. At 2 months, when adult performs this type of use, Child3 alternates looks to the object and at her mother –as well as to the action that she is performing– but does not try to act. Notwithstanding, at 4 months, the adult increases the spaces between her uses, and Child3 shows a more active role, focusing mainly on the object and trying to act –sometimes understood as grasping the object presented by adult, or tender hands to adult's action–. Finally, at 6 months adult uses are clearly reduced, while the girl is totally focused on the object and on its own action with it.




GRAPH 2.2. - A

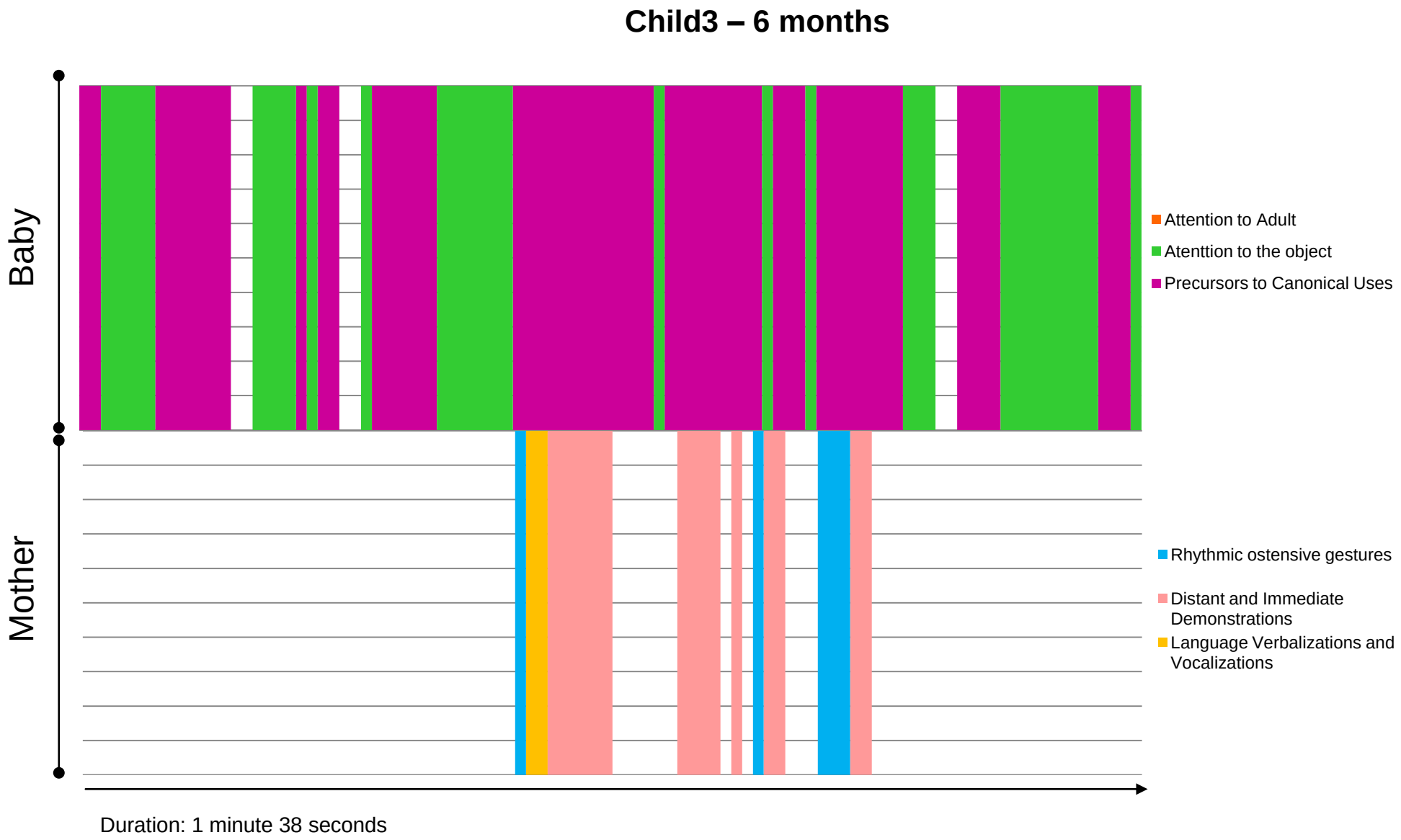
*Microgenetic analyses*






GRAPH 2.2. - B

*Microgenetic analyses*




GRAPH 2.2. - C

*Microgenetic analyses*

## 7. References

Andrén, M. (2010). *Children's gestures from 18 to 30 months.* Travaux de l'Institut de Linguistique de Lund 50. Lund: Lund University.

Basilio, M. & Rodríguez, C. (2011). Usos, gestos y vocalizaciones privadas. De la interacción social a la autorregulación. *Infancia y Aprendizaje, 34* (2), 181-194.

Bates, E., Camaioni, L. & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly, 21* (3), 205-226.

Bronckart, J. P. (2012). Contributions of Piagetian Constructivism to Social Interactionism. In Martí, E. & Rodríguez, C. (Eds.). *After Piaget* (pp. 43-58). New Jersey: Transaction Publishers.

Bühler, K. (2009). *Théorie du langage*. Marsella: Agone.

Cárdenas, K., Rodríguez, C. & Palacios, P. (2014). First symbols in a girl with Down syndrome: a longitudinal study from 12 to 18 months-olds. *Infant, Behavior and Development, 37* (3), 416-427.

Cavalcante, S. & Rodríguez, C. (*en prensa* 2015). Los primeros usos del número: la comprensión del dado como objeto con funciones numéricas en niños entre 24 y 36 meses. Monográfico: Conocimiento matemático temprano. *Estudios de Psicología, 26* (1).

Csibra, G. (2010). Recognizing communicative intentions in infancy. *Mind & Language, 25* (2), 141-168.

Del Olmo, M. J. (2009). *Musicoterapia con bebés de 0 a 6 meses en cuidados intensivos pediátricos.* (Tesis Doctoral inédita). Universidad Autónoma de Madrid, España.

Del Olmo, M. J., Rodríguez, C. & Ruza, F. (2010). Music therapy in the PICU: 0- to 6-month-old babies. *Music and Medicine, 2*(3), 158-166.

Díaz, M. (2004). La educación musical en la etapa 0-6 años. *Revista Electrónica de LEEME (Lista Europea de Música en la Educación), 14,* 1-10. Obtained from http://musica.rediris.es/leeme/revista/diazinf.pdf

Dimitrova, N. (2012). *Développement de la communication intentionelle gestuelle á partir des usages culturels des objets dans l'interaction triadique enfant-objet-adulte* (Tesis Doctoral inédita). Université de Lausanne, Suiza.

Español, S. (2004). *Cómo hacer cosas sin palabras: gesto y ficción en la infancia temprana*. Madrid: A. Machado.

EUDICO linguistic annotator - Elan (Version 4.1.1) [Computational software] (2011). Nijmegen: Max Planck Institute for Psycholinguistics.

Freelon, D. G. (2010). ReCal: Intercoder reliability calculation as a web service. *International Journal of Internet Science, 5* (1), 20-33.

Futó, J., Téglás, E., Csibra, G. & Gergely, G. (2010). Communicative function demonstration induces kind-based artifact representation in preverbal infants. *Cognition, 117,* 1-8.

Hargreaves, D. J. (2002). *Música y desarrollo psicológico*. Barcelona: Graó.

Jaffe, J., Beebe, B., Feldstein, S., Crown, C. L., Jasnow, M. D., Rochat, P. & Stern, D. (2001). Rhythms of dialogue in infancy: Coordinated timing in development. *Monographs of the Society for Research in Child Development, 66* (2), 1-149.

Leavens, D., Hopkins, W. & Bard, K. (2008). The heterochronic origins of explicit reference. In Zlatev, J., Racine, T., Sinha, C. & Itkonen, E. (Eds.), *The shared mind: Perspectives on intersubjectivity*, (pp. 187-214). Amsterdam/Filadelfia: John Benjamins.

Liszkowski, U., Carpenter, M., Striano, T. & Tomasello, M. (2006). 12- and 18-months-olds point to provide information for others. *Journal Child Language, 7* (2), 173-187.

Liszkowski, U. & Tomasello, M. (2007). Pointing out new news, old news and absent referents at 12 months of age. *Developmental Science, 10* (2), F1-F7.

Lombard, M., Snyder-Duch, J. & Bracken, C. C. (2002). Content Analyses in Mass Communication. Assessment and Reporting of Intercoder Reliability. *Human Communication Research, 28* (4), 587-604.

Malloch, S. & Trevarthen, C. (Eds.) (2009). *Communicative musicality: Exploring the basis of human companionship.* Nueva York: Oxford University Press.

Moro, C. & Rodríguez, C, (2005). *L'objet et la construction de son usage chez le bébé. Une approche sémiotique du développement préverbal*. Bern-Nueva York: Peter Lang.

Palacios, P. & Rodríguez, C. (2014). The development of symbolic uses of objects in infants in a triadic context: a pragmatic and semiotic perspective. *Infant and Child Development.* DOI 10.1002-icd.1873.

Perinat, A. (1993). *Comunicación animal, comunicación humana.* Madrid: Siglo Veintiuno de España.

Piaget, J. (2007). *El desarrollo de la inteligencia en el niño*. Barcelona: Crítica.

Reddy, V. (2008). *How infants know minds.* Cambridge: Harvard University Press.

Rodríguez, C. (1996). *Usos de los objetos y mediación semiótica. Perspectiva semiótica y pragmática del desarrollo*. (Tesis Doctoral inédita). Universidad Autónoma de Madrid, España.

Rodríguez, C. (2006). *Del ritmo al símbolo: Los signos en el nacimiento de la inteligencia*. Barcelona: Horsori.

Rodríguez, C. (2012a). The functional permanence of the object: A product of consensus. In Martí, E. & Rodríguez, C. (Eds.). *After Piaget* (pp. 123-150). Brunswick, New Jersey: Transactions Publishers.

Rodríguez, C. (2012b). El adulto como guía: ¿El eslabón perdido del desarrollo humano? *Padres y Maestros, 344*, 23-26.

Rodríguez, C., Moreno-Núñez, A., Sosa, N. & Basilio, M. (*submitted*). First shared reference with pointing gestures or with ostensive gestures? Some developmental implications. *Monograph for Cognitive Development.*

Rodríguez, C. & Moro, C. (1996). *El mágico número tres. Cuando los niños aún no hablan.* Barcelona: Paidós.

Rodríguez, C. & Moro, C. (2008). Coming to agreement: Object use by infants and adults. In Zlatev, J., Racine, T., Sinha, C. & Itkonen, E. (Eds.), *The shared mind: Perspectives on intersubjectivity* (pp. 89-114). Amsterdam/Philadelphia: John Benjamins.

Rodríguez, C. & Palacios, P. (2007). Do private gestures have a self-regulatory function?: A case study. *Infant Behavior and Development, 30* (2), 180-194.

Rodríguez, C., Palacios, P., Cárdenas, K. & Yuste, N. (*en prensa* 2014). Les symboles: des formes de second ou de troisiéme sens? In C. Moro, & N. Müller-Mirza (Eds.). *Psychologie du développement, sémiotique et culture*. Villeneuve d'Ascq: Presses Universitaires du Septentrion.

Santiago, M. (2011). An embodied-socio-psychological perspective in health psychology?. *Social and Personality Psychology Compass, 5* (5), 220-230.

Sinha, C. & Rodríguez, C. (2008). Language and the signifying object: From convention to imagination. In Zlatev, J., Racine, T., Sinha, C. & Itkonen, E. (Eds.), *The shared mind: Perspectives on intersubjectivity* (pp. 357-378). Amsterdam/Philadelphia: John Benjamins.

Southgate, V., Van Maanen, C. & Csibra, G. (2007). Infant pointing: Communication to cooperate or communication to learn?. *Child Development, 78* (3), 735-740.

Tomasello, M. (2004). Learning through others. *Daedalus Winter, 133* (1), 51-58.

Tomasello, M. (2008). *Origins of human communication.* Cambridge: MIT Press.

Tomasello, M. & Carpenter, M. (2007). Shared intentionality. *Developmental Science*, *10* (1), 121-125.

Tomasello, M. & Hamann, K. (2012). The 37th Sir Frederick Bartlett Lecture Collaboration in young children. *The Quarterly Journal of Experimental Psychology, 65* (1), 1-12.

Trehub, S. (2003). The developmental origins of musicality. *Nature Neuroscience, 7* (6), 669-673.

Trevarthen, C. (1999). Musicality and the intrinsic motive pulse: Evidence from human psychobiology and infant communication. *Musicae Scientiae, Special Issue, 1999-2000,* 155-217.

Trevarthen, C. (2003). *Conversations with a two-month-old.* Philadelfia: Whurr Publishers.

Vygotski, L. S. (1984/1996). El primer año. In Vygotski, L. S., *Obras escogidas IV. Psicología infantil* (pp. 275-318). Madrid: Visor.

Wallon, H. (1972). *La evolución psicológica del niño*. Buenos Aires: Psique.

# Chapter III

## **Adult-baby-object interactions from 2 to 4 months old:** rhythmic aspects of adult's ostensive actions[6]

### 1. Foundations

#### 1.1. Triadic interactions: just at the end of the first year or from the beginning of life?

In last decades, it is settled down in Developmental Psychology, that the first triadic interactions adult-baby-object just appear at the end of the child's first year of life. This idea has been presented with different emphasis. Thus, according to the influential reasearch of Bates, Camaioni & Volterra, (1975) in this stage children procude their first intentional communicative behaviors with the other about the world. Trevarthen (1999, 2003) refers to secondary intersubjectivity: at the end of the first year, children interpret other social partners, in order to share attention and action about objects, besides affect and emotions (Hubley & Trevarthen, 1979; Malloch & Trevarthen, 2009; Trevarthen, 2008); before that, there would be only primary intersubjectivity, where the child related the other just in a dyadic manner. And for Tomasello (2004, 2008) it is about the "9 months Revolution" when children take the initiative to communicate intentionally, they are "attuned" with adult's attention and his behaviors, and they understand that other people are also intentional agents (ver see also Brinck, 2004; Goubet, Rochat, Maire-Leblond & Poss, 2006; Tomasello, Carpenter

[6] Moreno-Núñez, A., Rodríguez, C. & del Olmo, M.J. (*in prep*.). Adult-baby-object interactions from 2 to 4 months old: rhythmic aspect of ostensive gestures.

& Liszkowski, 2007; Zlatev & Andrén, 2009). Prior to the end of the first year, Tomasello distinguishes, along the line of Vygotski, between lower and higher psychological functions. What difference them is that to Tomasello, the natural line of development becomes cultural, not with language, like in Vygotski, but when the first triadic interactions with intentional communicative behaviors occur. Before that time, it would have a natural line of development (without culture), which displays a double problem (1) from a genetic order, what higher functions are rooted in, if all of what is flowing underneath is natural?, and (2) presumably the adult has some influence on the child from birth, that affects his/her cognitive development. If this assumption is reasonable, then we have to see what that "cognitive influence" is.

The common denominator of all these works is that before the triadicity appears, it is assumed that the child is related only in dyads: first with another, and from one point around four months old, with objects. So the adult and the object are never linked psychologically to the child *before* he/she is able to communicate with intention about something.

However, this situation has not always met such unanimity in Psychology. It is as simple as consider the thesis of some classical authors that refer, in one way or another, to triadic interactions from the first months of life. Obviously this would not be the triads we just referred to, where the child intentionally communicates with the other about the object, but they are "more basic" triadic interactions where the subject that, intentionally, meets the child and the world in a communicative act, is the adult.

In this sense, Vygotski's theses are not always loyal to the distinction between lower (natural) and higher (cultural) psychological functions (see discussion in Rodríguez, 2006). In a very few cited work, *The first year* (1984/1996), Vygotski refers to the "total biological incapacity" of the baby:

> “[…] child's first contact with reality (even when it meets the most elementary biological functions) is socially mediated. [...] Objects appear and disappear from the visual field of the child by will of adults, is moved through space in the arms of others. Any change in

> posture, and even simply turn him around, is intertwined with social situation […]" (1984/1996, p. 285).

Thus the adult would be from the beginning of life an ambassador between the child and the world. Culture would exercise its role without having to wait for the entrance of language.

Charlotte Bühler's studies also argue that the newborn is already heavily social, being immersed from birth in certain routines proposed and still controlled by the adult (e.g., food situations, bathing or changing diapers) (see Piaget, 1936/2007). Also interesting is Bronckart's reflexion (2012), when evidenced that in the Piaget's studies of sensorimotor, so neat in child-object interactions, the adult was present in almost all observations. However, neither communication nor the adult's role as a guide was ever considered in his analyses.

For contemporary authors such as Alan Fogel or Alan Costall, there would be no doubt that there are early triadic interactions. For Fogel (1993), from very early age the child is immersed in webs of communication with others, where co-action in relation to the object plays an important role. The object favors interaction, as a shared referent between mother and child. In the first months of life, the mother will be who acts on the object, while the child is receiving her proposals. Later on, the child will progressively acquire the necessary skills in order to act the object, becoming the intentional agent of the communication. In both cases, what they have in common is that adult and child share the same focus of attention (hence, of communication): the object as a referent. Furthermore, Costall (2013) claims the place that object occupies in the interactions between subjects. Traditionally ignored, or relegated to the background in its entry in human communication, the object occupies a privileged place in the first months of life in the different daily routines. In these routines, initiated by the adult, children are active participants, and not mere passive recipients. This implies that, from early on, children are immersed in niches of interaction, where people not just communicate with him, but the objects act as a vehicle for it.

Therefore, there are various classic and contemporary voices that refer to *other kind of triadic interactions* that appear much earlier in development, from the first months of life. This implies then to consider the communicative mediators used by adults to communicate with the child with and about the objects. This will be discussed in the next section.

### 1.2. Ostensive gestures and ostensive uses of objects as a mediator for early triadic interactions

At this point, it seems evident to think that children do not suddenly understand other's intentions, but there is a whole niche of influences in which the baby is gradually introduced through the action of the adult.

From the Pragmatic of Object perspective (Rodríguez & Moro, 1999) the role of the adult as a mediator between the child and the world has been emphasized. Based on this perspective, the signs constitute a leading role in the adult-child interaction, where the object also has a prominent place as a communication tool. In this line, a range of studies have been developed, analyzing the construction of different semiotic systems: with children from 7 to 13 months about the first canonical uses of objects (Rodríguez & Moro, 1999; Moro & Rodríguez, 2005), the first symbolic uses between 9 and 15 months (Palacios & Rodríguez, 2014), the first productions of symbols from 12 months in a girl with Down Syndrome (Cárdenas, Rodríguez & Palacios, 2014), the origin of gestures with an interrogative function (Sosa, 2010), self ostensive gestures with a self-regulatory function (Moro & Rodríguez, 2005; Moro, Dutrannois & Béguin, 2014), ostensive and pointing private gestures with a self-regulation function (Rodríguez & Palacios, 2007), gestures and uses with a self-regulatory function in interaction with complex objects between 11 and 15 months (Basilio & Rodríguez, 2011), or the origins of numerical concept's use as a semiotic system between 24 and 36 months also in triadic interaction (Cavalcante & Rodríguez, 2015 *in press*).

Dimitrova & Moro (2013) highlight how shared canonical uses between child and adult allow a child's better understanding of the adult's communicative intention related to the use of complex objects.

All these studies agree that the entrance of children in the different systems of signs is produced in interaction with others, to use them later by themselves. Note that these works only addressed ages from 7 months. To study semiotic systems that are possibly more basic than the ones addressed for now, we designed a pilot study with babies from 2 to 6 months of age, in interaction with the adult and an object with sonorous possibilities (Moreno-Núñez, Rodríguez & Del Olmo, *submitted*). That study shows that from the earliest months of life the adult is an intentional agent that introduced the world to the baby: he/she segments the context in different objects when shows them to the child, bringing him the world when it is still out of his reach. Children, from 2 months, are already sensitive to ostensive actions (gestures and uses of objects) proposed by adult with a mediator object. This sensitivity is demonstrated by child's sustained attention to the adult's action, a steady eye contact, or emotional elements as smiles or body movements.

Hence, speaking about triadicity in the first months of life also implies to grant a major status to adult's ostensive gestures (Rodríguez, Moreno-Núñez, Basilio & Sosa, *submitted*). According to Eco (1977), ostensive gestures (those in which the hand is occupied by the object) would be the first instance of active significance, the first gestures that allow the establishment of an intentional relationship between the world and the other. In addition, ostensive gestures have lower semiotic complexity –given that sign and referent coincidence– than pointing gestures that have received so much attention from developmental psychology as the gesture of shared reference –sign and referent differ.

From the results found in the pilot study, it is conceivable that the first triadic interactions are most probably "made" by rhythm. Rhythm could be one of the most basic semiotic systems that allow child-adult-object interaction.

Rhythm and sonority in early ages have been extensively studied by authors interested in mother-infant interactions. We will address this below.

### 1.3. Rhythm and sonority in first mother-baby interactions

Some papers (Nelson, 2001) have provided empirical evidence of the presence of rhythm in biology, such as respiration, heart rate regulation and blood pressure, or the improvement of homeostasis of the nervous system. Within these "natural" rhythms there is not any intentionality, but they conform an important element in baby's development. Already from prenatal stage, rhythm is the first thing to listen, through the mother's own voice and biological rhythms. For Wallon (1951/1985) biology is socially oriented. He dealt with emotions and, closely connected with them, with body and postures as privileged places where the former appear and the first newborn emotions are expressed. He speaks about tonic-postural dialogue where emotion plays a functional role, when it is caused at the beginning by postural impressions, and it is in turn the basis of baby's posture, used to express himself (see the studies of Santiago, 2010). At the beginning of human life emotional sensitivity apparently connects with the motor reactions, and increases in arousal are solved in movements, screams or vocalizations of the baby. Thereby, these tonic-emotional reactions of the baby become in the first signs of mental development (Rodríguez, 2006) supporting the theories of embodiment, who understand development as a process from which the social world "enters" into the individual, with the body acting as a mediator in the socialization itself. It is not difficult to infer the importance of rhythm in the early adult-infant's tonic-postural dialogue.

From birth, rhythm is mantained (Lecanuet, Fifer, Krasnegor & Smotherman, 1995) through, e.g., baby's agitations or suction. This rhythm is no longer perceived just through the ear, but reaches the baby also in a multimodal way, through the sight and touch, emphasized by the actions addressed by adult. Piaget also speaks of rhythm in the first observations of his son Laurent after birth when he sucked to feed himself, or in vacuum (1936/2007). Nevertheless, rhythm would lose its ability to structure if it were not accompanied by pauses, that allow to open spaces of interaction between the two protagonists. In this line, note the importance that K. Kaye (1986) gives to the pauses during suction, in which "there would be rhythmic components prior [to other rhythmic actions listed below, e.g., in relation to the uses of objects], and could play a significant role in the origin of regularities that lead to the rules" (see discussion in Rodríguez, 2006, p. 47, clarification is ours). Thereby, adult incorporate pauses to his interaction with the baby, providing the space needed to promote shifts in the action, resulting in the establishment of conventions, that are fundamental to communication.

Colwyn Trevarthen's studies (1999, 2003, 2008, Fagen, 2010; Malloch & Trevarthen, 2009) about musicality in early interactions stand out by the impact they have had. In relation to rhythm –which dyes gesture production and other communicative expressions–, he affirms that the synchrony between rhythms of both protagonists allows interpersonal coordination. For Trevarthen (1998, Reddy &Trevarthen, 2004) from the first months of life, the playful interactions between adult and child are served by a series of rhythmic and musical components, greatly favoring that both of them get immersed in a same shared communicative process.

Clinical studies on musical mother-child interactions (Bergeson & Trehub, 2007; Jaffe et al., 2010; Trehub, 2003; Trehub, Unyk, Kamenetsky, Hill, Trainor, Henderson & Saraza, 1997, Smith & Trainor, 2008) observe that when mothers from different cultures sing to their babies, they share several features as repetitions, rhythmic

patterns, rhymes and alliterations. Infants showed extended periods of sustained attention and reduced their body movements. More recent studies in a hospital setting (Del Olmo, Ruza, Carrasco & Rodríguez, 2008) have shown that taking into account biological rhythms –e.g., respiratory and heart rate or the intensity of movements–, and acting consistently, helps to offer the appropriate stimuli and sound response to enable a better adult-infant communication.

Numerous studies consider rhythm as a constitutive element of the dyadic interaction itself (Brazelton, Kozlowski & Main, 1974; Bullowa, 1979). To Perinat (1993) rhythm includes the communication itself, setting such a basic level that would be the one in which both agents simply accepted each other as such. For Español (2007) rhythm not only provides, but also favors the organization of action, promoting a multimodal communication that conforms the basis of human interaction and communication.

Also from music, not just the studies on musical development (Corbalán, 2010; Tafuri, 2006) provide some clues about the social and musical beginnings of human beings, but the research about the benefits of music in hospital contexts with infants at risk do so (Del Olmo, Rodríguez & Ruza, 2010; Del Olmo, Rodríguez, Ruza & Carrasco, *in press*; Loewy, Stewart, Dassler, Telsey & Homel, 2013; Standley, 2002, 2006).

However, most of these studies address the subject-subject dyadic interactions. Nonetheless, if we consider early triadic interactions, rhythm could be a semiotic mediator that made it possible. Rhythmic-sonorous components would form part of adult's actions, probably forming one of the most basic semiotic systems, which seems to get organized in the first months of life (Moreno et al., *submitted*).

The objectives proposed in the present study are: (1) to determine if there is triadic interaction since the first months of life, from adult's communicative-educational intention; (2) to analyze what role ostensive gestures and uses of objects develop in

these early triadic interactions; and (3) to analyze rhythmic-sonorous components in these interactions.

## 2. Methods

### 2.1. Participants

Six typicaly-developing children are included: three girls and three boys. They were filmed at age 2, 3 and 4 months with their mothers. The six children are here called Tamara, Laura, Lucía, Javier, David and Gabriel (not their real names).

### 2.2. Procedures

The data analyzed for this study consists of longitudinal video recordings of triadic interaction parent-child-object at home. Children were contacted personally. Information about the study was distributed to families, and parents contacted us directly.

Each child was systematically recorded at three observational sessions by the same researcher and with the same object. Dyads were provided with the object to interact together 5 minutes. Parents were asked to place the child in a comfortable position, where child could look easily to adult's face. Mothers were instructed to "Play with your child as you normally would."

A formal authorization was required to parents in order to register the sessions and to spread and publish the results of the study. Parents also signed an informed acquiescence where the terms of their participation on the study were made explicit and the anonymity of the participants was guaranteed.

### 2.3. Materials

The object used in this study (see Table 3.1) was designed specifically for children, and it was bought at a specialized toys store. This object (in advance, MARACA) was chosen because it allows sonorous uses, according to its conventional use. This object was supposed to favor triadic interactions from adult's initiative (1) to produce demonstrations of uses of objects and (2) to perform communicative actions with rhythmic, sonorous and melodic components. Children's patterns of response to those adult's actions will be also analyze.

**Object:** MARACA

<table>
<tr><td>Description</td><td colspan="2">Small maraca. Its conventional use is to shake it as a rattle, making sound with it.<br>Its size and ergonomics make it easy to hold by the baby.<br>Could conform one of the first musical instruments for the baby, introducing him or her in a rhythmic and sonorous world.</td><td>  </td></tr>
<tr><td>Material:<br>ABS (thermoplastic)</td><td>Size:<br>• Width: 12,5 cm.<br>• Height: 5 cm.<br>• Depth: 5 cm.</td><td colspan="2">  </td></tr>
</table>

TABLE 3.1.

*Object description.*

### 2.4. Data Analyses

Microgenetic, qualitative analyses, frequencies and group comparison were conducted. For transcription ELAN (EUDICO Linguistic Annotator, 2011) was used. A transcription protocol series of adult-child-object interactions were categorized on the basis of previous semiotic categories (Moreno-Núñez et al., *submitted*). New emergent categories were added, considering the classification of adult's gestures and uses of

objects (see Table 3.2). Sequences of analyses were selected, considering a sequence the period of time when child and adult were acting together with the object, in a triadic interaction. To differentiate one sequence from another, the presence of a span of 3 seconds was determined, or a change in adult's action (e.g. using the MARACA in a different way, varying the sound that it produces).

Data analyses were performed using the following criteria:

(1) adult's uses of objects in triadic interactions,
(2) adult's gesture productions to the baby (which only turn to ostensive gestures due to adult's did not perform any indexical gesture in this study),
(3) children's response patterns to those adult's actions.

Frequencies were calculated using MSExcel. Coding process of 33% of videos was made by three independent coders. Intercoder reliability was evaluated using ReCal OIR calculator (Freelon, 2010) to obtain the agreement index of Krippendorff's Alpha.

We also used SPSS to perform Chi-square test to assess differences among frequencies distribution into a variable, and a proportion comparison among frequencies of uses of objects and gestures through the different participants and times studied.

## 3. Results:

According to the intercoder reliability performed, the value obtained of Krippendorff's Alpha was 0.832, which denotes an excellent level of reliability (Cicchetti, 1994).

| *ADULTS* | *CHILDREN* |
|---|---|
| | **Attends adult's action:**<br>Child looks (and listens) to adult's action with the MARACA. |
| | **Expression of emotions:**<br>- *Body movements:* description of baby corporal agitation, distinguishing when it is moderated or evident.<br>- *Smiles*<br>- *Laughs* |
| **Language:**<br>Just pointing when it is produced to accompany action with the object. | **Vocalizations** |
| **Uses of objects:**<br>With the object MARACA the following adult's uses of objects was described:<br>Demonstrations: Performing the conventional sonorous use of the MARACA in an organized manner. It has ostensive components and also incorpore rhythmic and sonorous characters. Types:<br>- *Inmediate*: When adult directed or introduced the use to child to perform a joint action. Adult introduced the child into the cultural use's space of the MARACA. Could be:<br>o *With child's hand*, in the same way that adult would do it.<br>o *Percussing* the MARACA *against* child's *body*.<br>- *Distant*: When adult performed a complete or incomplete conventional use of the MARACA. | **Uses of objects:**<br>With the object MARACA the following child's uses of objects was described, distinguished by complexity levels (from lowest to highest complexity):<br>- *Grabs by adult's initiative:* is the adult who places the MARACA in child's hands.<br>- *Tries to grab:* child anticipates grabbing the MARACA, directing his or her hands to the object held by the adult.<br>- *Grabs:* child grabs MARACA by its own initiative.<br>- *Shakes:* even children are not yet able to control their movements, child performs a preliminary use of the MARACA by him or herself. |
| **Ostensive Gestures:**<br>- *Showing:* Adult shows the object.<br>- *Giving:* Adult gives object to the child. | **Ostensive Gestures:**<br>Only *self-ostensive gestures* was observed, due to the very Young age of the participants. Child shows him or herself the object, but any conventional use is done after. This suggest just an exploration of the material object. |

TABLE 3.2.

*Categories description.*

### 3.1. Communicative mediators employed by adults

Taking in account the total frequencies of the adult's proposal in this study, some characteristics of adult's communicative proposals should be highlighted (see Table 3.3). It is outstanding how adults dismiss the indexical or symbolic interventions to focus on the material possibilities of the object itself –in the case of MARACA, the sound

it performs–, which points to the idea that the shared reference is not obtained basically with pointing, as repeatedly stated in the literature, but the adult first, and preferably, presents the object and/or offers it to the baby.

| | COMMUNICATIVE MEDIATORS | USES OF MARACA | | | OSTENSIVE GESTURES | |
|---|---|---|---|---|---|---|
| | Subcategory | ID Hand | ID body | DD | Showing | Giving |
| Age in months | 2 | 33 | 34 | 157 | 37 | 39 |
| | 3 | 47 | 7 | 108 | 37 | 43 |
| | 4 | 43 | 16 | 103 | 36 | 59 |

TABLE 3.3.

*Absolute frequencies of adults' uses of MARACA and ostensive gestures.*

The immediate demontstration of the object –produced either by placing it in the baby's hand or touching his/her body– are present and very frequent in the three sessions. Nevertheless, adults rely primarily on distant demonstration which, however, decreases over time.

Static showing gestures (non sonorous) are not central in the interaction since they are fewer produced by adults. Notwithstanding, they can be interpreted as pauses or silences that provide structure to adult´s action, helping to organize it and stimulating a space for baby's response. This is also reflected in an increasement of adult gestures, granting the use of the object to the child after her proposal.

This can be seen in more detail in Table 3.4, where we can also appreciate the individual differences observed among the participants. In this table we can also see how adult brings into play a series of communicative mediators when acts the MARACA in front of the baby. Among them, immediate demonstrations denote less complexity in order to have the child "connected" with them. Within these immediate demonstrations, adults place more often the MARACA on child´s hand rather than "strike" it against their body (except Lucia's mother). However, it is outstanding the fact that distant

demonstrations of MARACA's use are the most common proposals in adult and descend –to a greater or lesser extent– in time. We will focus on distant demonstrations later.

Regarding to ostensive gestures, both showing and giving gestures are present in adult´s interventions in a similar percentage, although showing static gestures are used in a lesser extent.

| | | Tamara´s mum | | | Laura's mum | | | Lucía's mum | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months |
| Uses of MARACA | Immediate Dem. with Hand | 2 | 3 | 1 | - | 8 | 13 | 4 | 5 | 3 |
| | Immediate Dem. against Body | 4 | - | 1 | 4 | 5 | 7 | 18 | 2 | 6 |
| | Distant Demonstration | 20 | 26 | 15 | 44 | 25 | 21 | 23 | 9 | 18 |
| Ostensive Gestures | Showing | 6 | 6 | 6 | 17 | 14 | 3 | 5 | 10 | 5 |
| | Giving | 6 | 4 | 6 | 1 | 6 | 17 | 9 | 4 | 13 |
| | | Javier's mum | | | David's mum | | | Gabriel's mum | | |
| | | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months |
| Uses of MARACA | Immediate Dem. with Hand | 6 | 11 | 10 | 2 | 3 | 1 | 19 | 17 | 15 |
| | Immediate Dem. against Body | 2 | - | 1 | 1 | - | 1 | 5 | - | - |
| | Distant Demonstration | 28 | 19 | 13 | 25 | 11 | 19 | 17 | 18 | 17 |
| Ostensive Gestures | Showing | 4 | 3 | 3 | 3 | - | 14 | 2 | 4 | 5 |
| | Giving | 11 | 9 | 11 | 3 | 2 | 3 | 9 | 18 | 9 |

TABLE 3.4.

*Adults' uses and ostensive gestures with object MARACA.*

Ostensive gestures, at 2 months of age, are not produced by adults anyway: they do not just place the object between own´s and baby´s gazes, but also places it in the convergence of semiotic networks –sing, move the object, use it and speak to the baby–, making them the center of attention. The object is not the context of the interaction, but part of it and placed as a communication tool with the other, helping this way to the origin of the first communication spaces between the child and the adult. We can observe also a general tendency to decrease the uses of objects, which coincides with a progressively more active participation of the baby throughout the three sessions.

Returning to distant demonstrations, as it is the use of the object that adults utilize more often in triadic interactions, we need to focus deeper to describe their characteristics. In this sense, we can see that distant demonstrations could be divided into two categories (Table 3.5) based on their structure. Thus, there are distant demonstrations with a complex structure level, to which adults incorporate frequent pauses, encouraging the child to pay attention more easily; and distant demonstrations not structured, due to the pauses just occur at the end of the performance, creating a presentation that extends so far in time, hindering the child to engage in the adult´s proposal.

In the first case, we would find the rhythmic-sonorous demonstrations par excellence, those that are effective to attract child's attention. Second distant demonstrations (not structured) are not effective, although also incorporate rhythm and sonority, because they do not incorpore an organized structure, so we consider important to distinguish them. The latter are less frequent, and generally decrease its presence along the three study sessions, which shows that adult is aware about they do not work the same way that rhythmic-sonorous distant demonstrations do.

All adults, to a greater or lesser extent, are active to provide the child of a significant context, regarding the conventional uses that he/she can perform with the MARACA. They offer the child a context of shared intentionality, which brings order to the reality from a rhythmic-sonorous and pragmatic point of view.

The adult is convinced that the child is sensitive to this type of presentations and structures, and hence she still uses them throughout the three sessions. Organizing rhythmically her action will be useful to attract baby´s attention to the action proposed, and she adjusts this action based on the baby's attention, movements and vocalizations. However, as the child grows up, the frequency of adult's interventions decreases, resulting in pauses that await a response from the child.

| | | Tamara | | | Laura | | | Lucía | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months |
| Distant Demonstrations | Rhythmic-Sonorous | 11 | 16 | 13 | 30 | 14 | 15 | 16 | 8 | 17 |
| | Rhythmic-Sonorous, not Structured | 9 | 10 | 2 | 14 | 11 | 6 | 7 | 1 | 1 |
| | | Javier | | | David | | | Gabriel | | |
| | | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months |
| Distant Demonstrations | Rhythmic-Sonorous | 12 | 14 | 9 | 19 | 9 | 17 | 12 | 12 | 12 |
| | Rhythmic-Sonorous, not Structured | 16 | 5 | 4 | 6 | 2 | 2 | 5 | 6 | 5 |

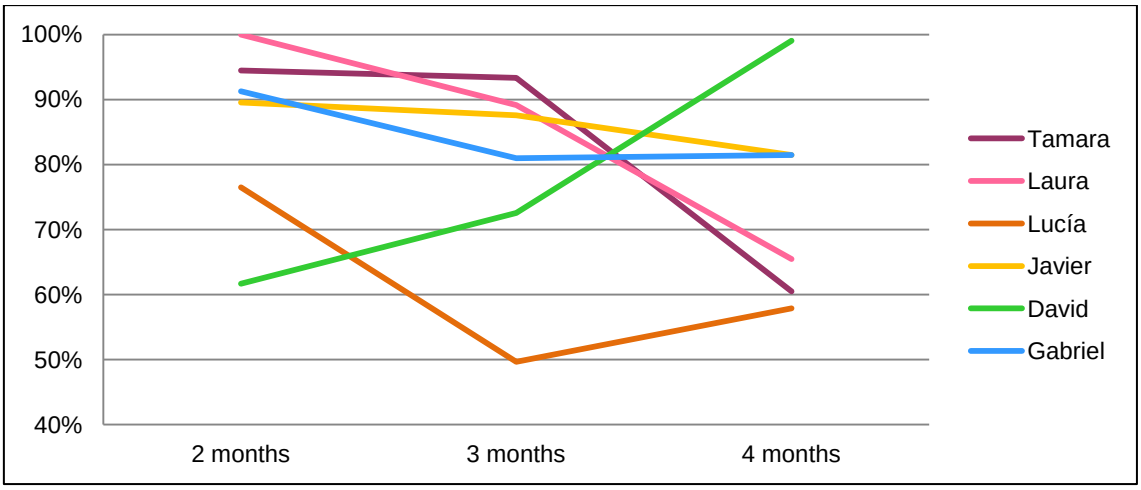
TABLE 3.5.

*Frequencies of Rhythmic-Sonorous Distant Demonstrations by adults: structured and not structured*

### 3.2. Children's patterns of response to the rhythmic and sonorous action of adults

A good indicator of the effectiveness of adult's actions that have been addressed in the previous section is the measure of child's attention to other´s communicative proposals. In Graph 3.1 we can observe the evolution of this category –understood as the child watching and hearing adult´s action– calculated based on the percentage of time the child attends adult's proposals, in relation to the total time of the session.

In this sense, we can observe a general tendency of baby's attention to decrease throughout the sessions, with some slight variation between T2 and T3 in some children, which depends on how attractive is what the other is presenting.




GRAPH 3.1.

*Percentage of children attention to adults' uses and gestures with the object MARACA.*

Nevertheless, we should highlight the case of David, whose levels of attention experience the opposite evolution than the other participants' ones. This fact can be explained in relation to the actions of his mother. In T1, distant demonstrations were not located between the gazes of child and adult –previously connected– and, therefore, they were not effective because David did not turn his head in the direction from where the sound came. Nonetheless, his mother becames aware of the type of actions which "connects" her to the child, promoting them and discarding the ineffective ones, which results in a significant increase of David´s attention towards her action.

As observed in Table 3.6, almost all adults place the MARACA on the child's hand from 2 months of age (T1), conforming baby´s first contact with the material world. Later, from T2, we can notice how children easily understand the meaning of adult´s ostensive gestures as "grasp it" and "do something" with the MARACA –showing it to themselves, or shaking it later. At 3 months it can be observed that some children extend their open hand towards the object handled by the adult, in a sort of anticipation of what happens after adult´s presentation. Some of these facts end effectively with the child holding the MARACA, but it depends of adult to yield or not the object to the child. Besides, we have observed some conventional uses of the MARACA in T2 (Javier,

David and Gabriel), performed by all children in T3. Regarding gestures, we have observed that showing ostensive gestures are only directed toward themselves. Among them, only Lucia performs self ostensive gestures on the three ages analyzed. Moreover, Tamara, Laura and Javier perform them in T3 (4 months).

At 4 months old, the adult is able to get the baby much more involved with the uses of the MARACA. In T3 children are able to perform uses for themselves, albeit in a very basic way –they require adult to yielde them the MARACA in order to shake it and sound it for themselves.

| | | Tamara | | | Laura | | | Lucía | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months |
| Uses of MARACA | Grabs by adult's initiative | 3 | 3 | 3 | - | 6 | 6 | 3 | 7 | 4 |
| | Tries to grab | - | - | 8 | - | - | 19 | - | - | 14 |
| | Grabs by own initiative | - | - | 7 | - | - | 18 | - | - | 10 |
| | Shakes | - | - | 5 | - | - | 4 | - | - | 5 |
| Gestures | Self ostensive gesture | - | - | 2 | - | - | 13 | 1 | 7 | 3 |

| | | Javier | | | David | | | Gabriel | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months | 2 months | 3 months | 4 months |
| Uses of MARACA | Grabs by adult's initiative | 1 | 3 | 5 | 1 | 2 | - | 9 | 12 | 4 |
| | Tries to grab | - | 4 | 13 | - | 3 | 10 | - | 1 | 2 |
| | Grabs by own initiative | - | 1 | 7 | - | 3 | 2 | - | 1 | 2 |
| | Shakes | - | 1 | 3 | - | 10 | 1 | - | 4 | 1 |
| Gestures | Self ostensive gesture | - | - | 2 | - | - | - | - | - | - |

TABLE 3.6.

*Children's uses and ostensive gestures with object MARACA.*

### 3.3. Proportion comparison of adults and children uses of object and gestures

We performed a proportion comparison for the interactions of adults and children throughout the three stages of study, related to both uses of the MARACA and gesture productions. After performing the Chi-squared test, the results show significant differences between interventions in adults and children over time. At 2 months of age, adults perform more uses of the MARACA than children ($p < 0.05$) and also perform more gestures ($p < 0.05$). Moreover, at 4 months the situation is reversed, with children performing more uses of objects than adults ($p < 0.05$) and more gestures ($p < 0.05$). These data statistically support the hypothesis that adults descend the uses of objects and gestures as children grow, coinciding with the latter increasing their uses of the MARACA and gestures (although these still are just gestures directed to themselves – self ostensive gestures). Therefore, adults progressively yield space of action to children, as they are acquiring cognitive and motor skills that allow them to participate actively in the interaction.

### 3.4. Microgenetic analyses of the interactions adult-baby-object

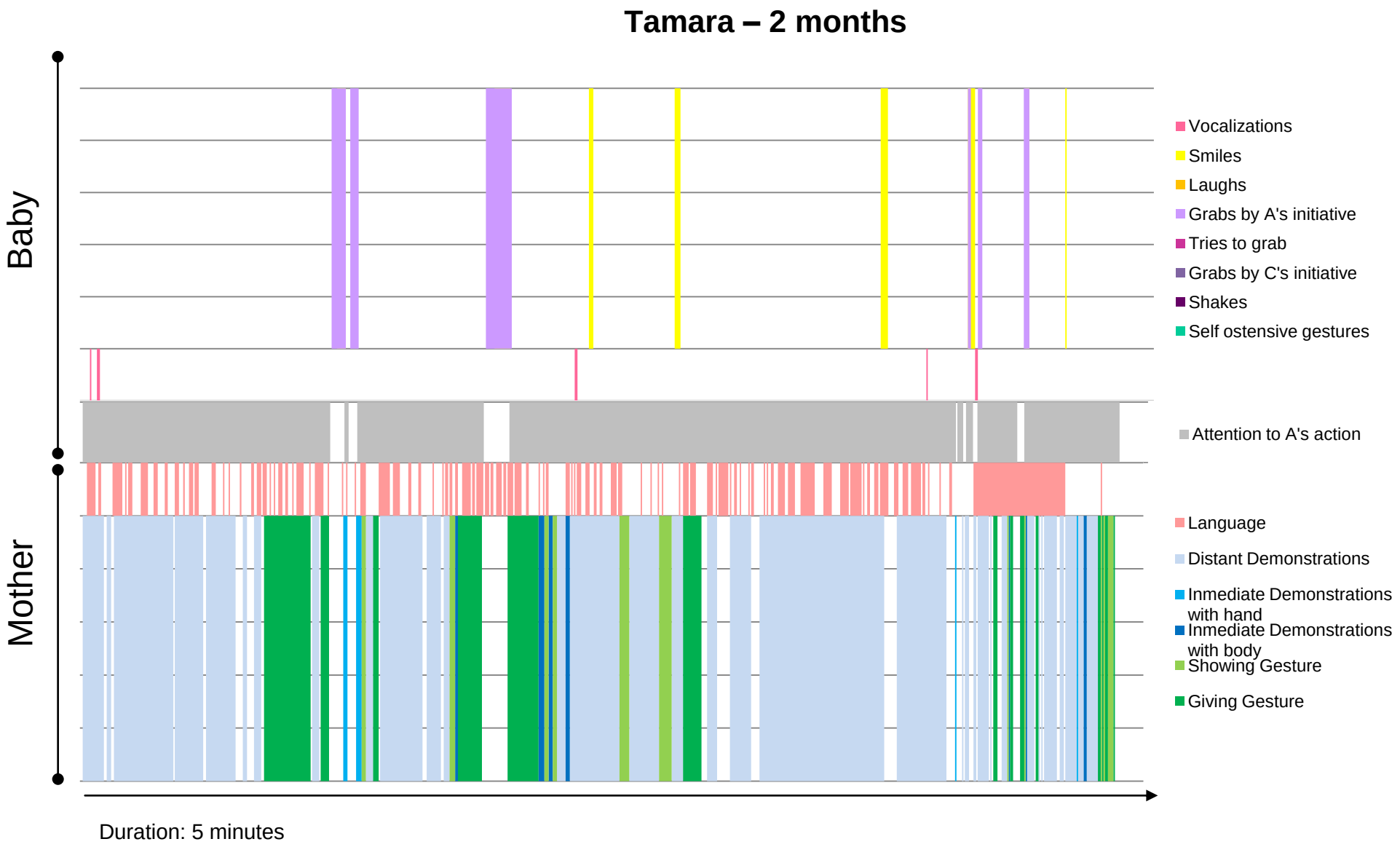
To analyze triadic interactions in more detail, we represent what happens in the three stages of study (2, 3 and 4 months) using microgenetic graphs. This type of figure can represent what happens by participants –both adult and child– in every second of the selected video stream, making us able to observe the response of the child when the adult performs certain action. From Graphs 3.2 to 3.7 we have shown the corresponding sequences of interaction of all participants with the MARACA in each time of observation analyzed (see Graphs 3.2 to 3.7). We have coded, according to the categories of the study, uses and gestures performed by adults: immediate demonstrations (with baby's hand and against his/herbody), distant demonstrations, and ostensive gestures of showing and giving. Baby's participations in his/her mother's action were coded based on the same categories, according to the uses of object – grasps by adult's initiative, tries to grasp (anticipation), grasp by his/her own initiative,

and shakes (conventional use of the object)– and gestures –self ostensive gestures. Also we indicated adult's language productions when accompanying action, and baby's vocalizations, emotional expression and attention to adult's action as well.

As has been seen throughout the results section, in these graphs we can observe how, at 2 months, children do not have many resources to participate in the interaction, but there is an almost continuous attention to adult's action. Some children, like Lucia, also smiles in several occasions at her mother, favoring the engagement between them. We can also observe the first grips of the object, by adult's initiative, who at certain point gave to the baby the MARACA, introducing him/her in the triadic situation. At this age, adults serve themselves of a variety of communicative mediators with ostensive components to present the object to their children, although in some cases, as occurs with Laura's mother, giving gestures are still largely absent, so the baby is not involved (but with vocalizations) throughout the whole session.

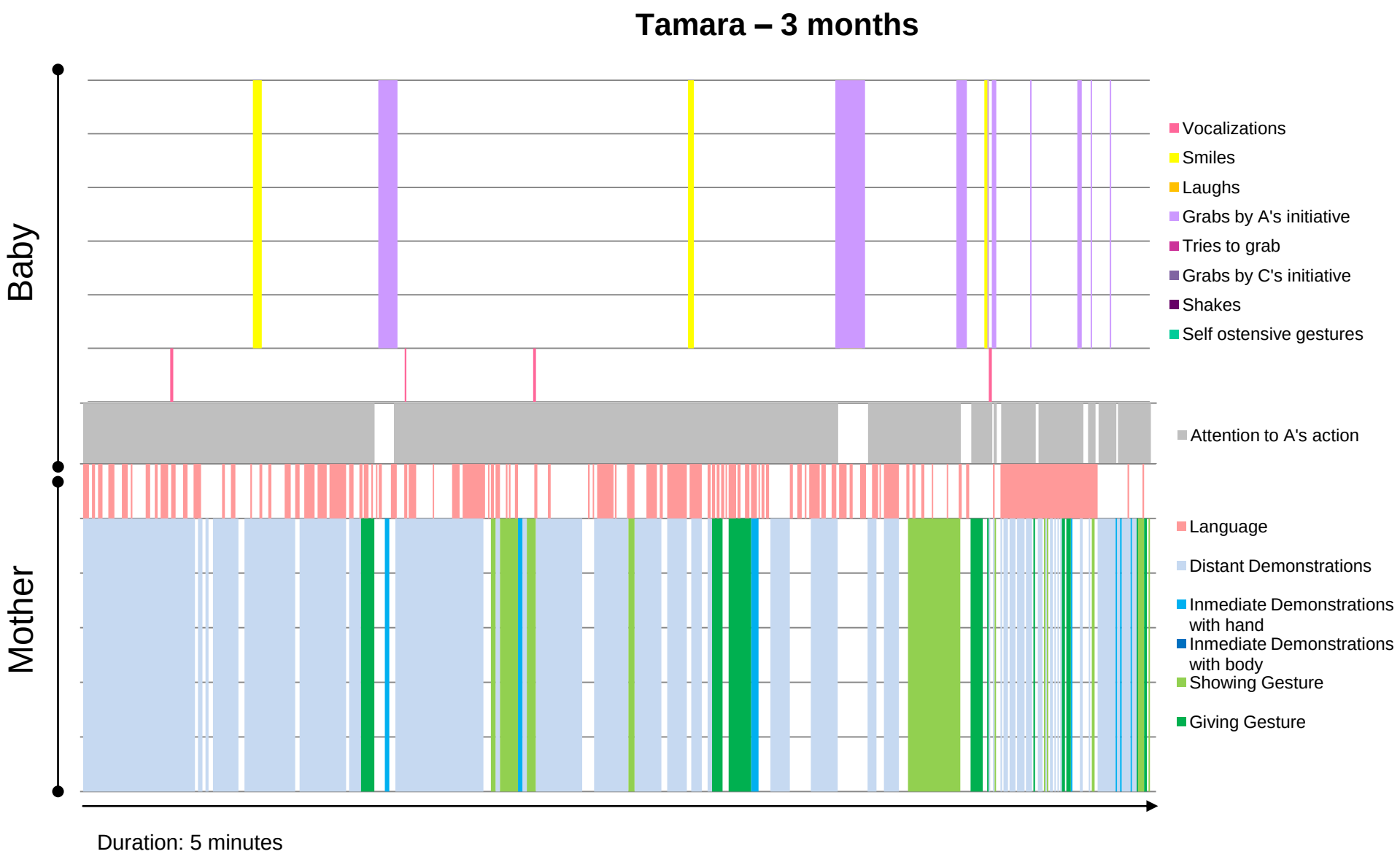
At 3 months, it is striking how adults begin to space their interventions. These pauses in the interaction result in children's interventions, but still very influenced by adults who should places the MARACA in his/her hand. In some cases, we observe the first self ostensive gestures, as part of the exploration of the material world. Generally, mothers start to reduce the production's frequency of immediate demonstrations.

Finally, at 4 months, these graphs clearly show how children begin to use the object more actively, anticipating adult's giving and, although still in a very basic way, shaking the MARACA, entailing a first entry into the conventional use of that object. Meanwhile, mothers act the object punctually, turning now their intervention into a support for children's active exploration.



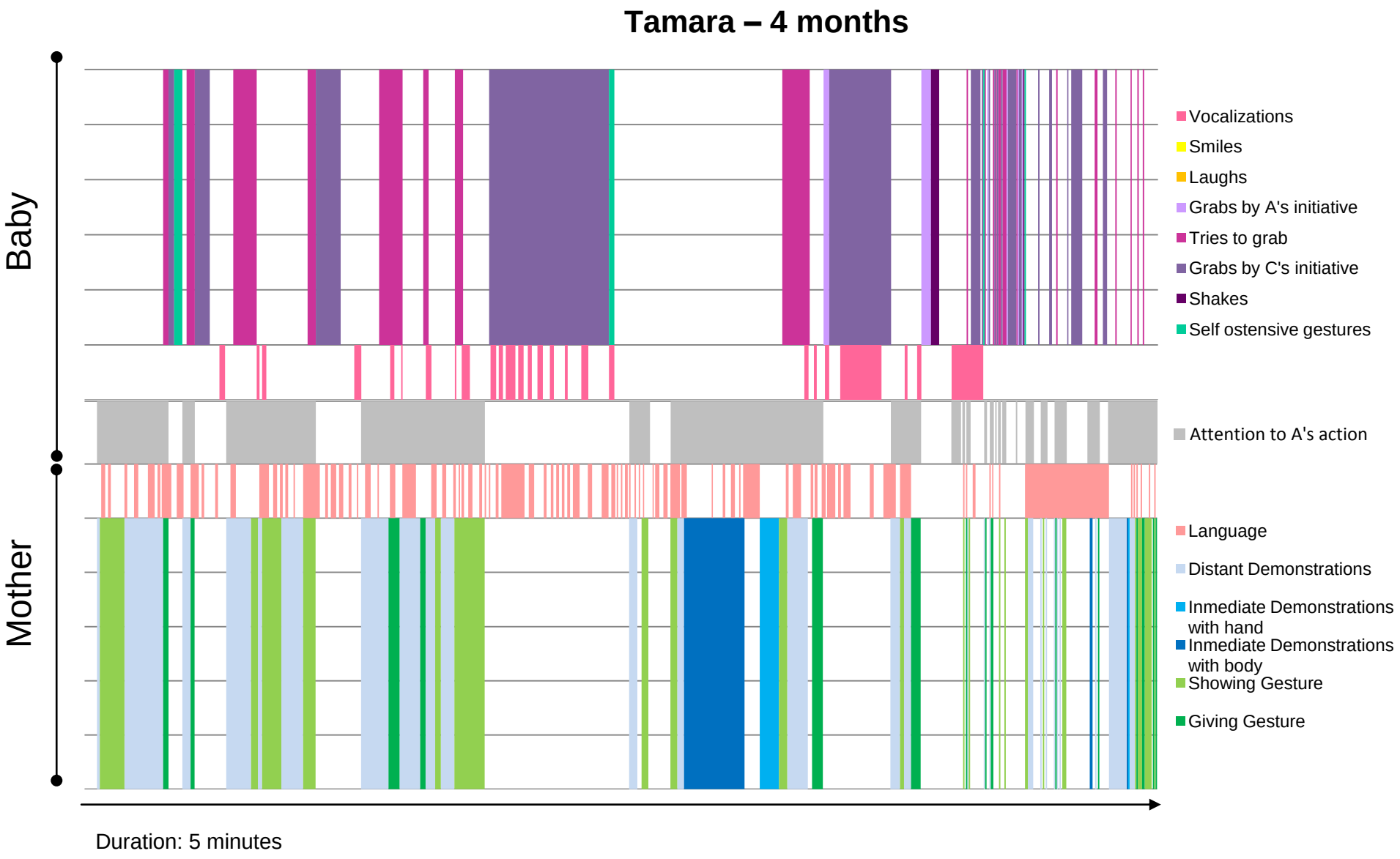

GRAPH 3.2. - A

*Microgenetic analyses*



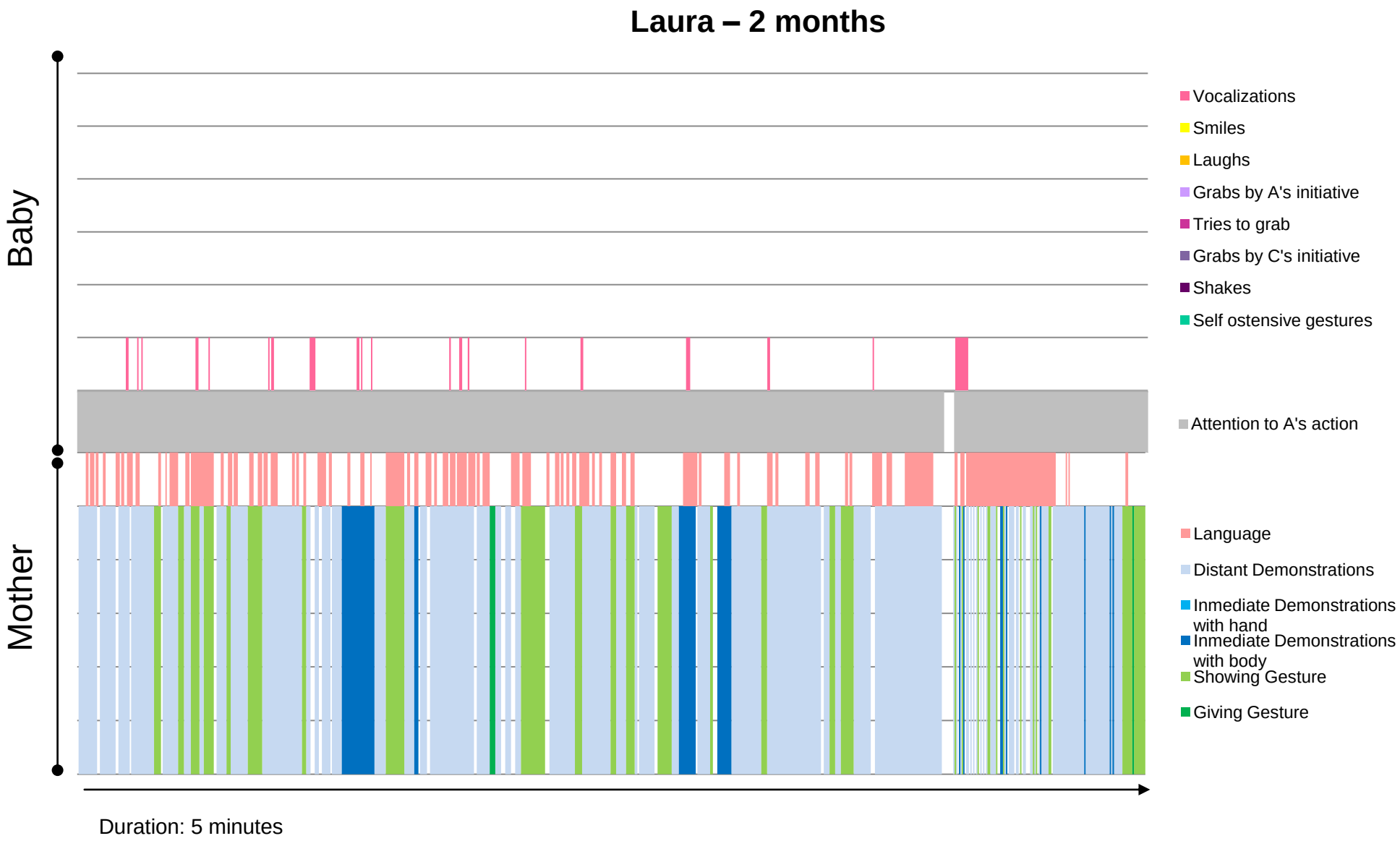

GRAPH 3.2. - B

*Microgenetic analyses*



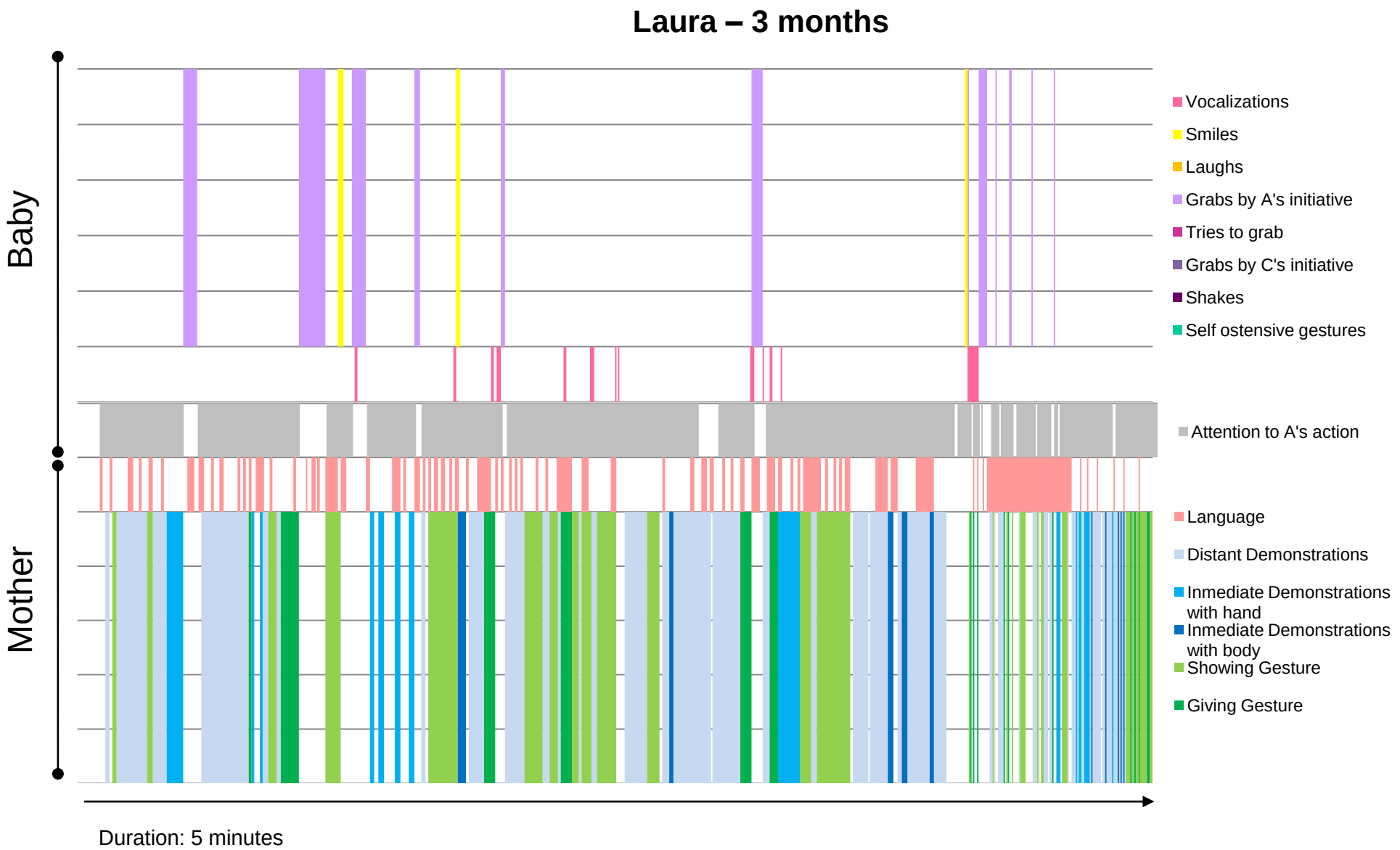

GRAPH 3.2. - C

*Microgenetic analyses*



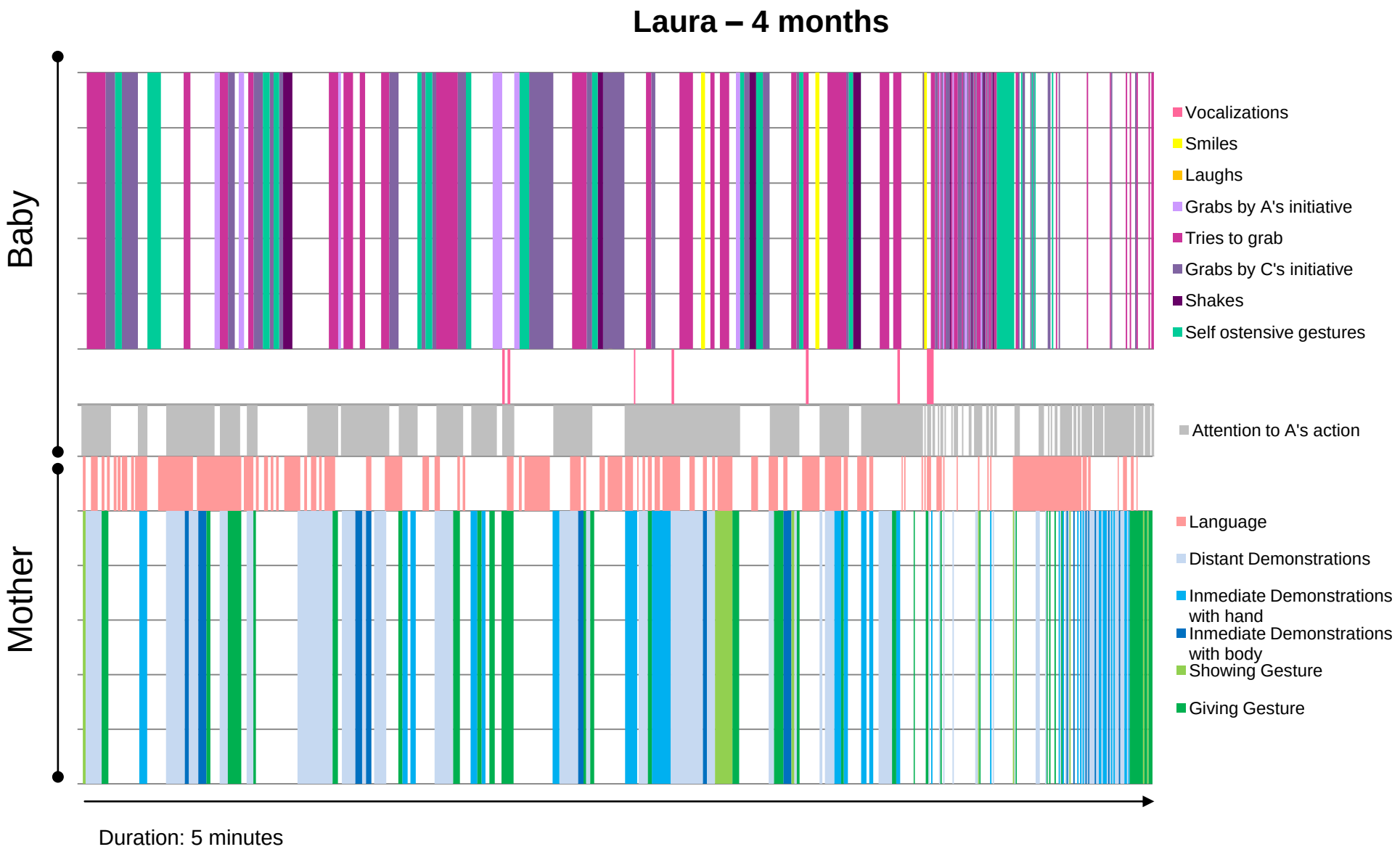

GRAPH 3.3. - A

*Microgenetic analyses*



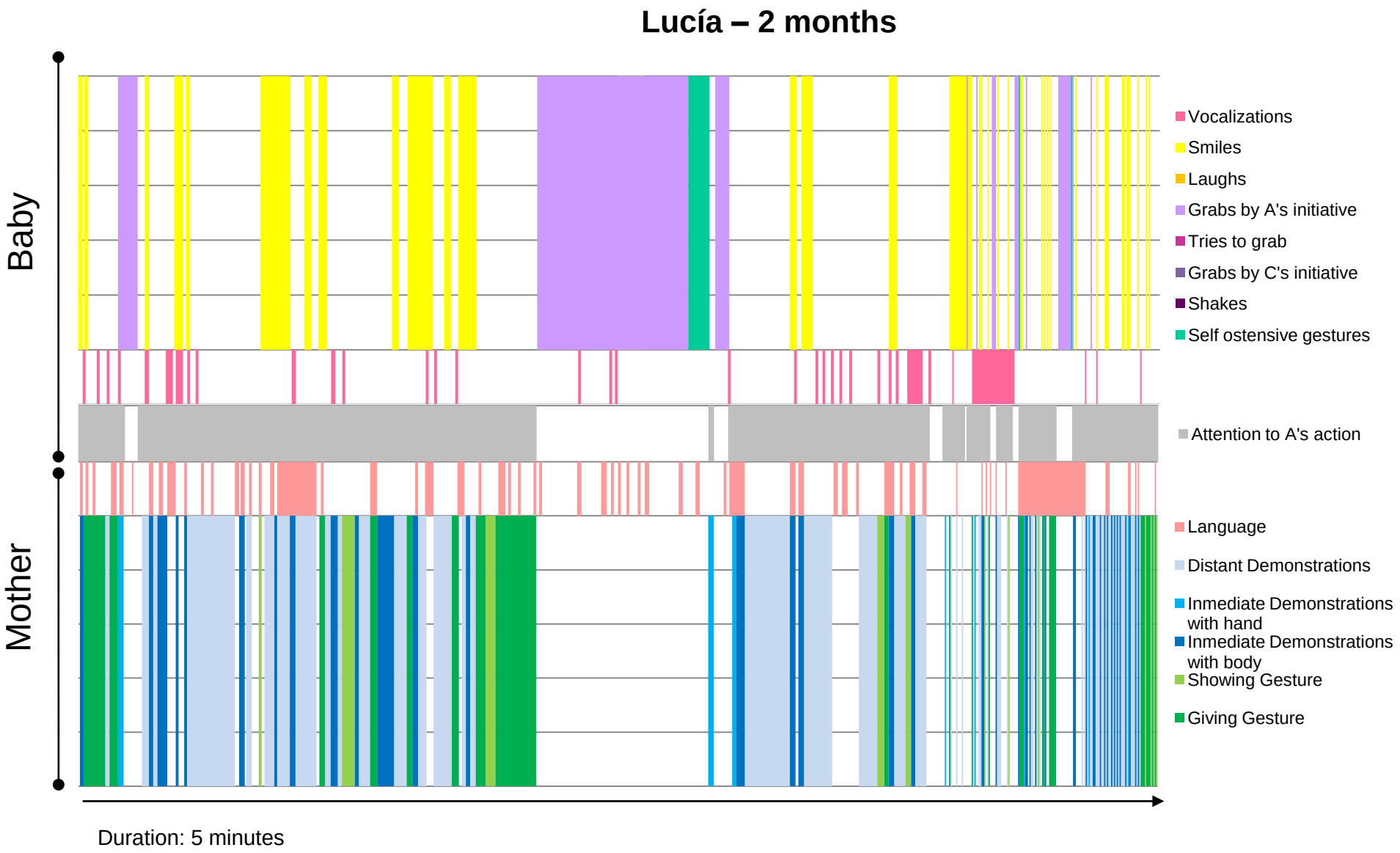

GRAPH 3.3. - B

*Microgenetic analyses*



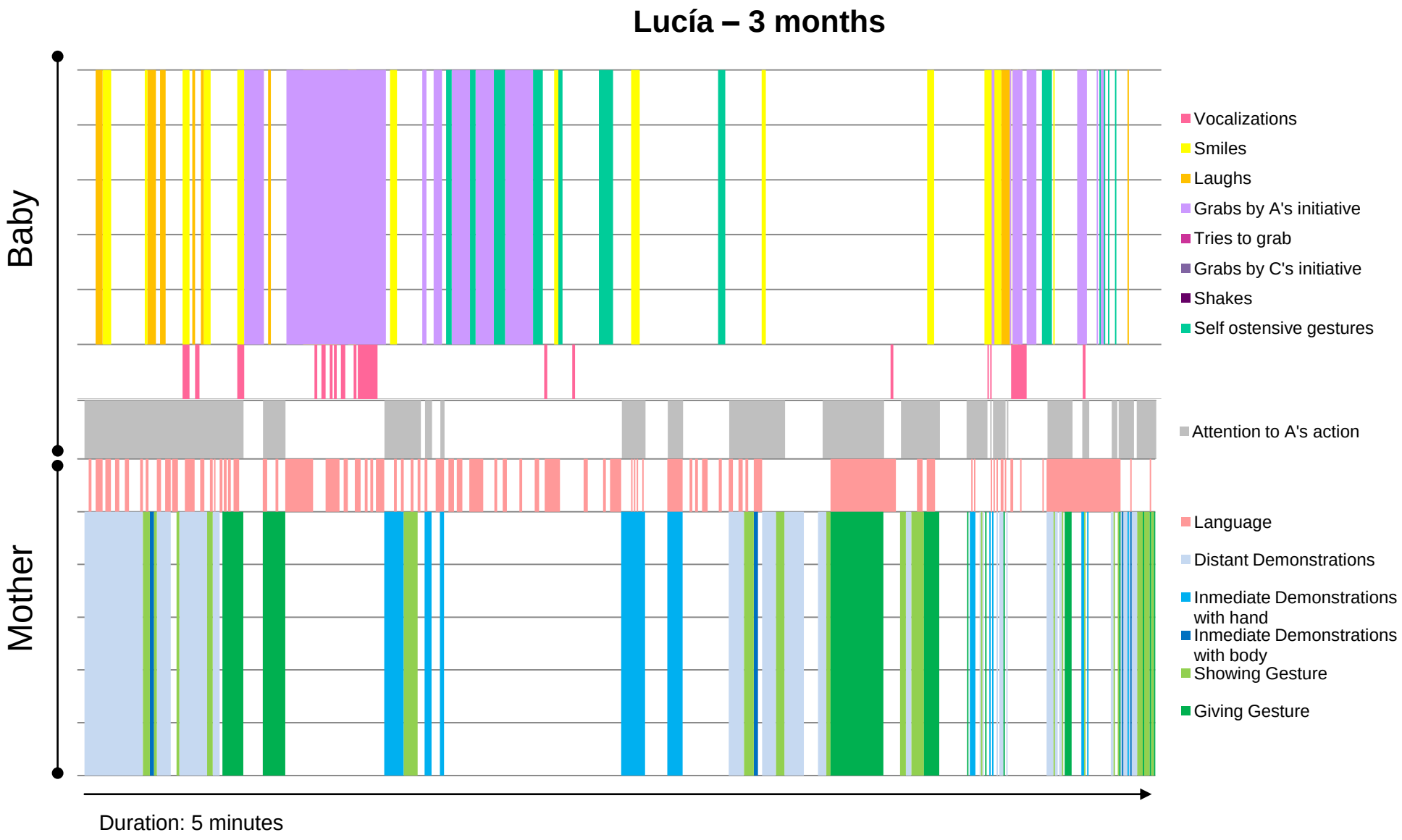

GRAPH 3.3. - C

*Microgenetic analyses*



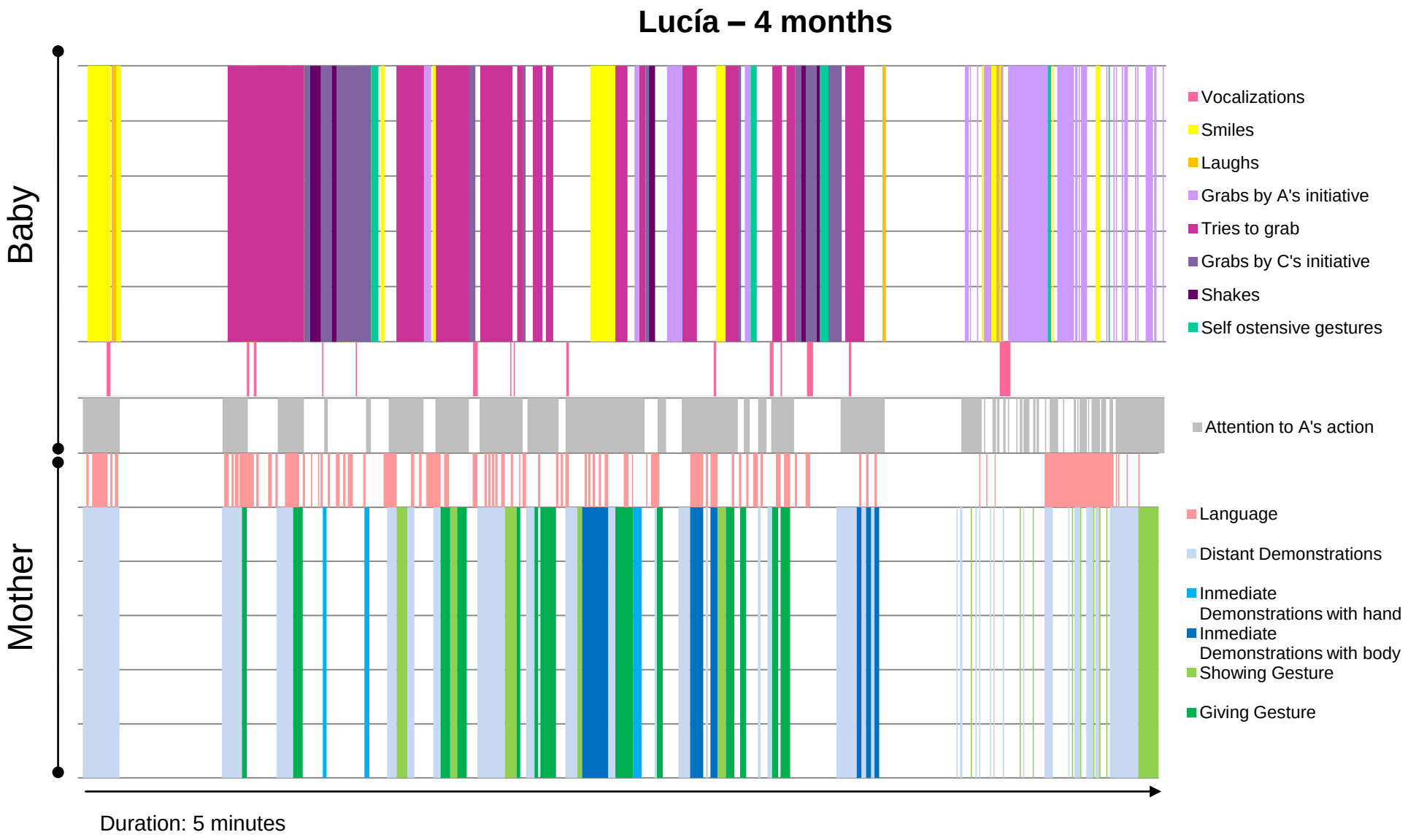

GRAPH 3.4. - A

*Microgenetic analyses*



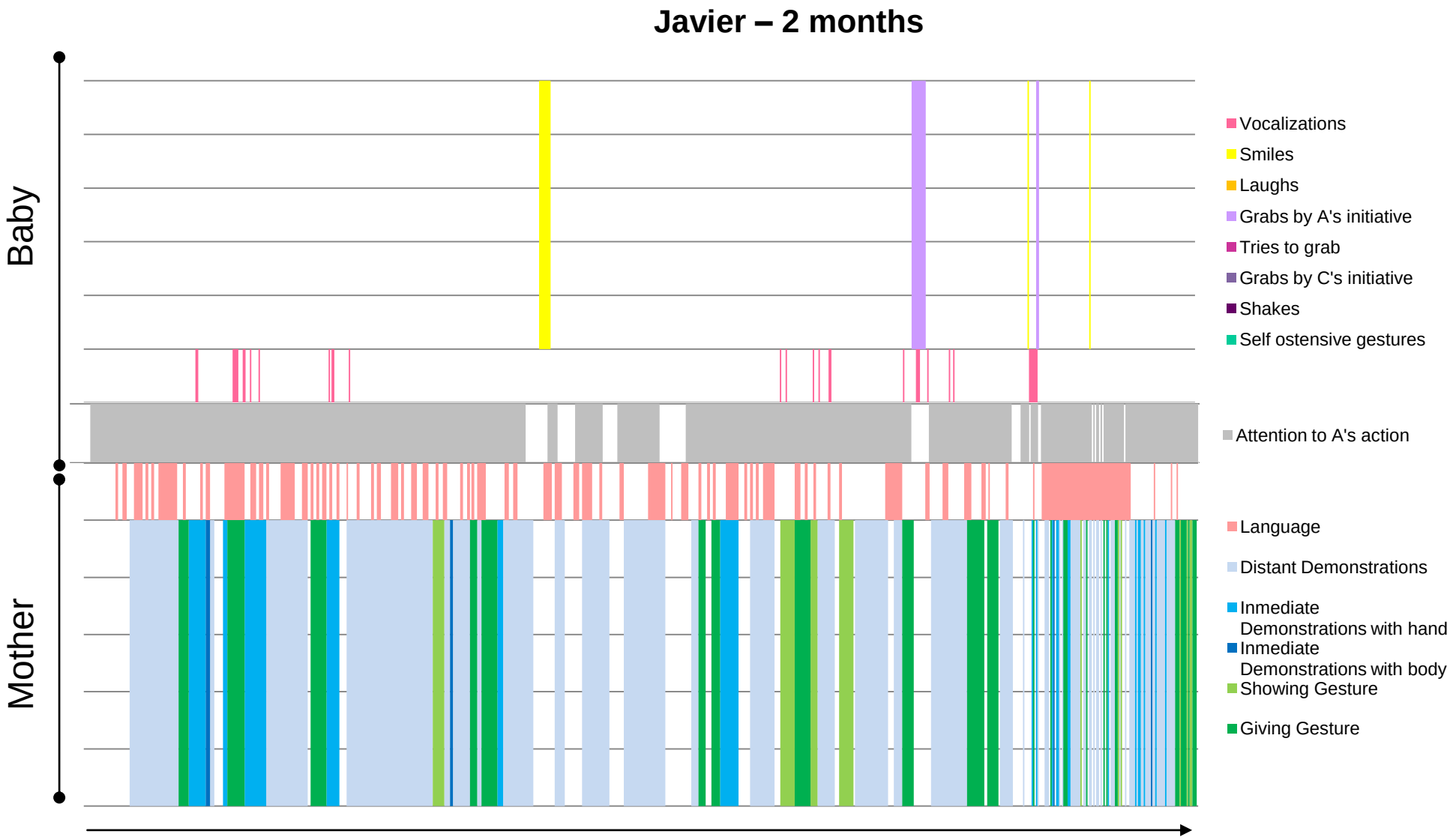

GRAPH 3.4.- B

*Microgenetic analyses*



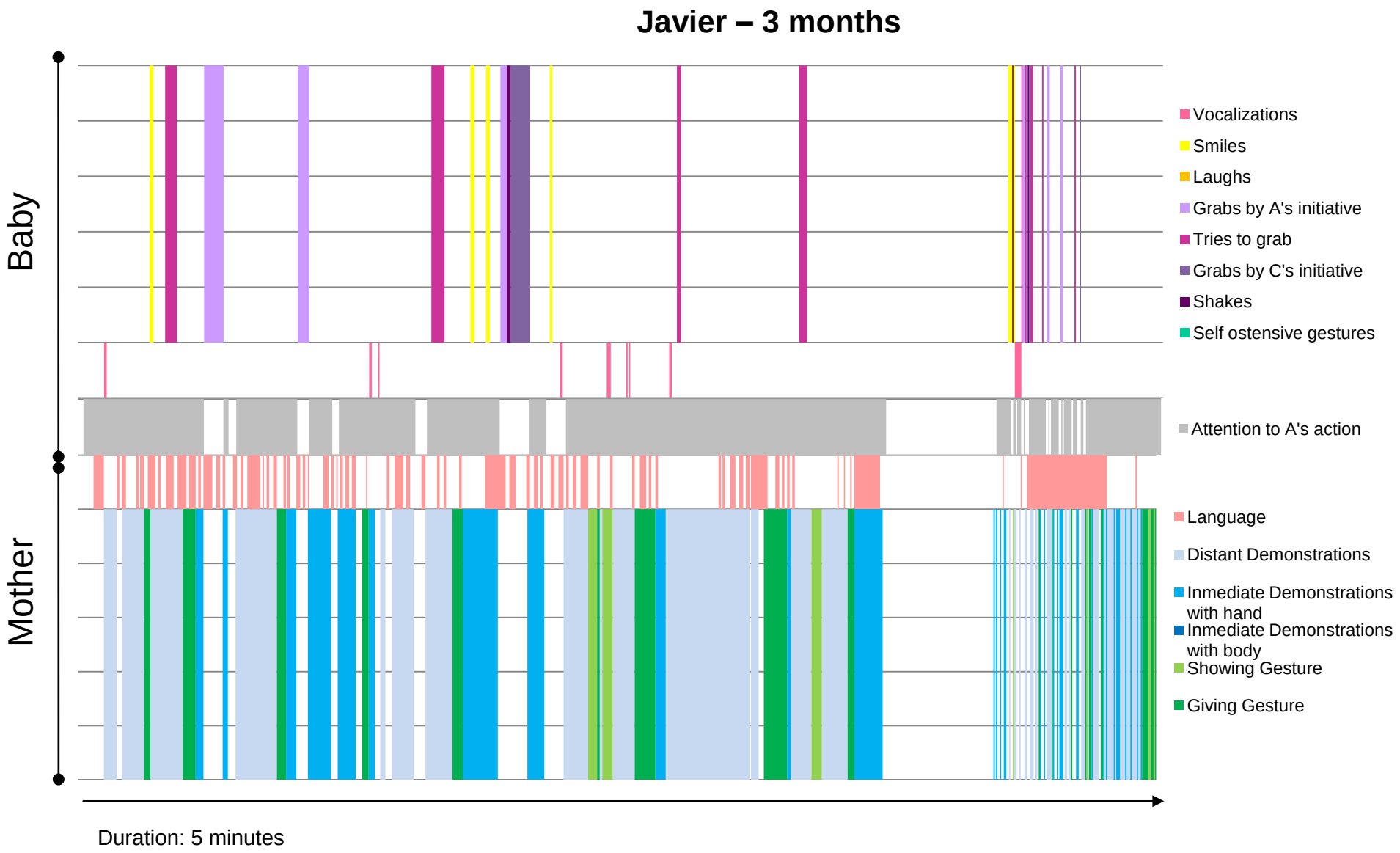

GRAPH 3.4. - C

*Microgenetic analyses*



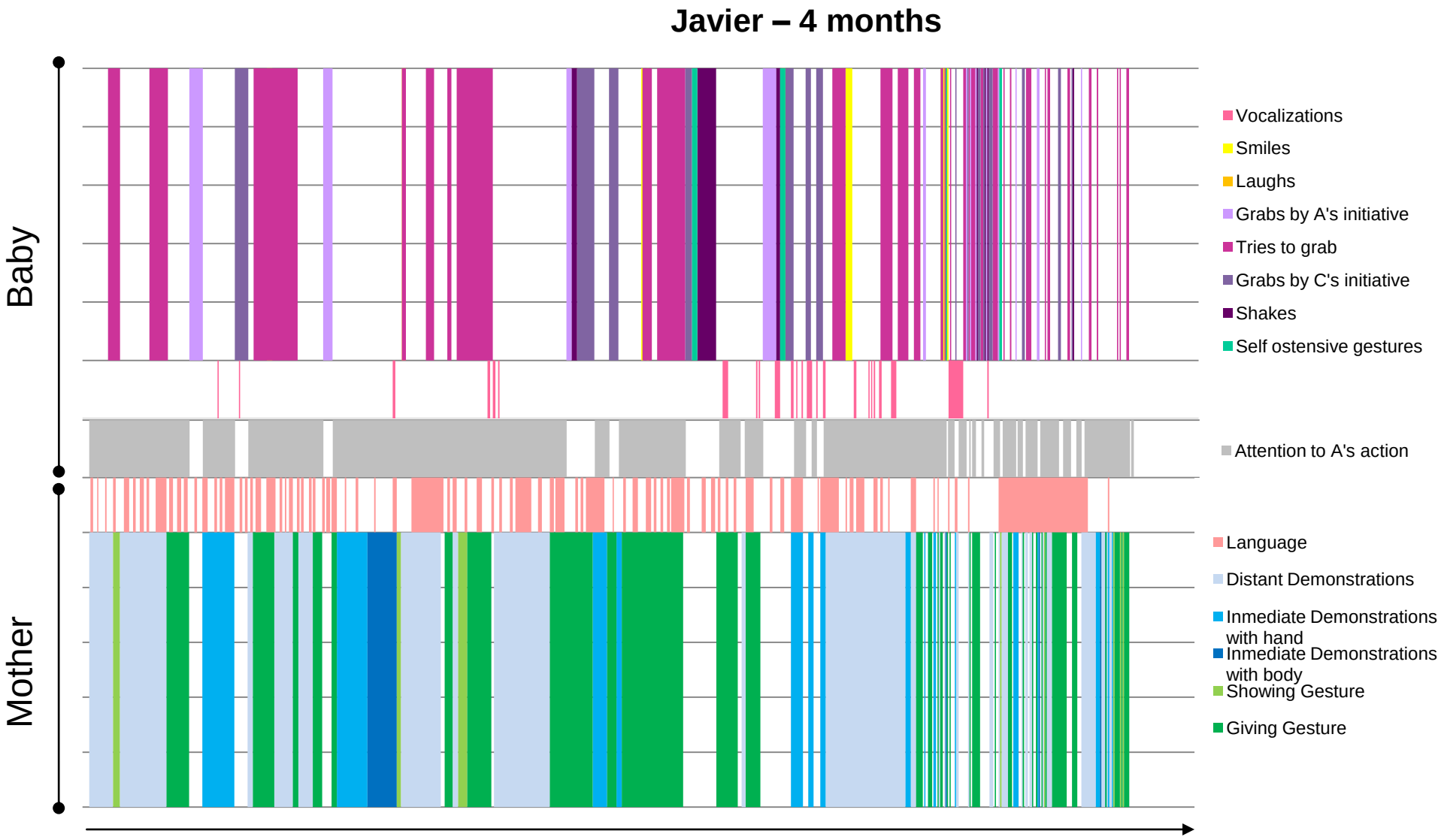

GRAPH 3.5. - A

*Microgenetic analyses*



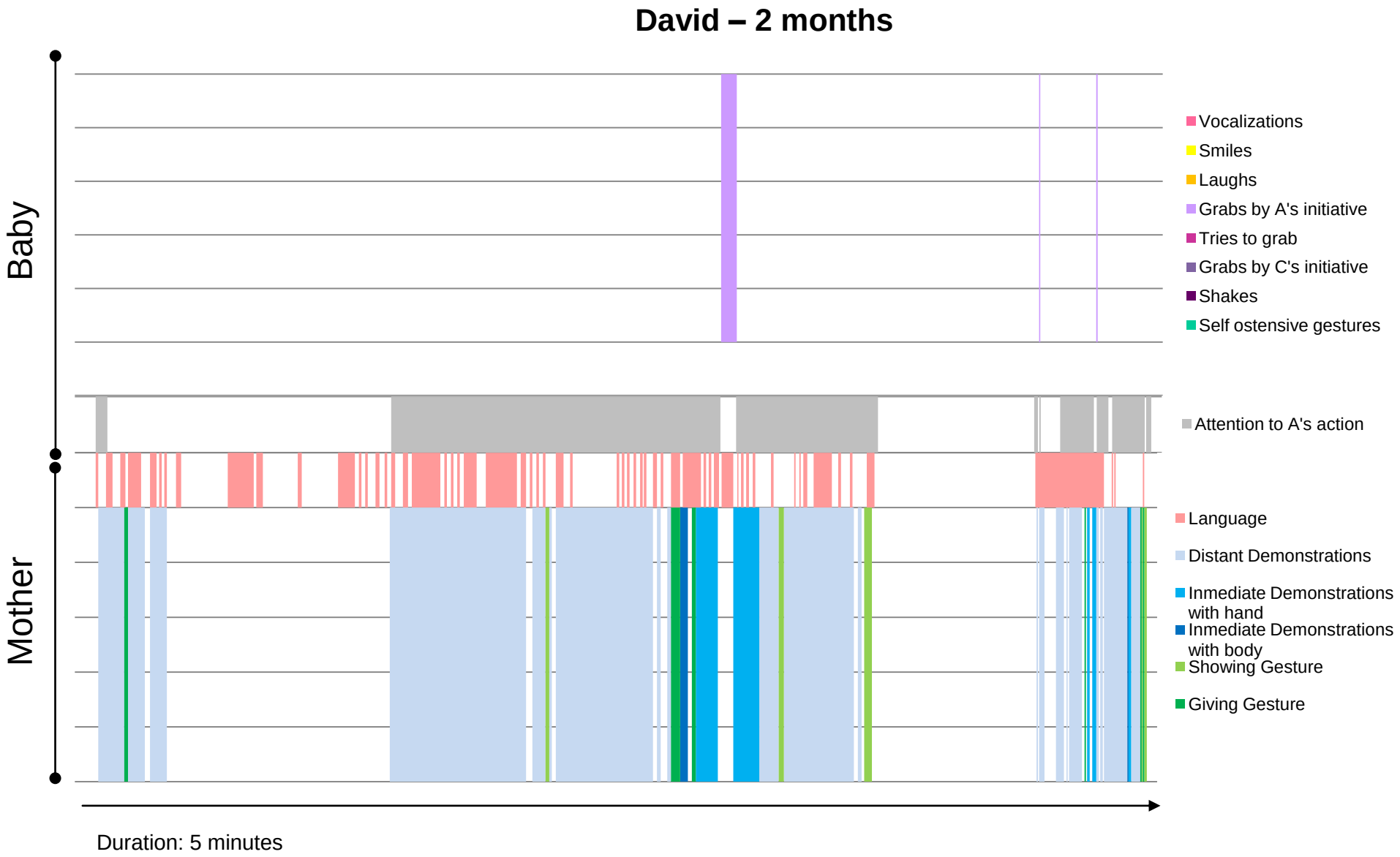

GRAPH 3.5. - B

*Microgenetic analyses*



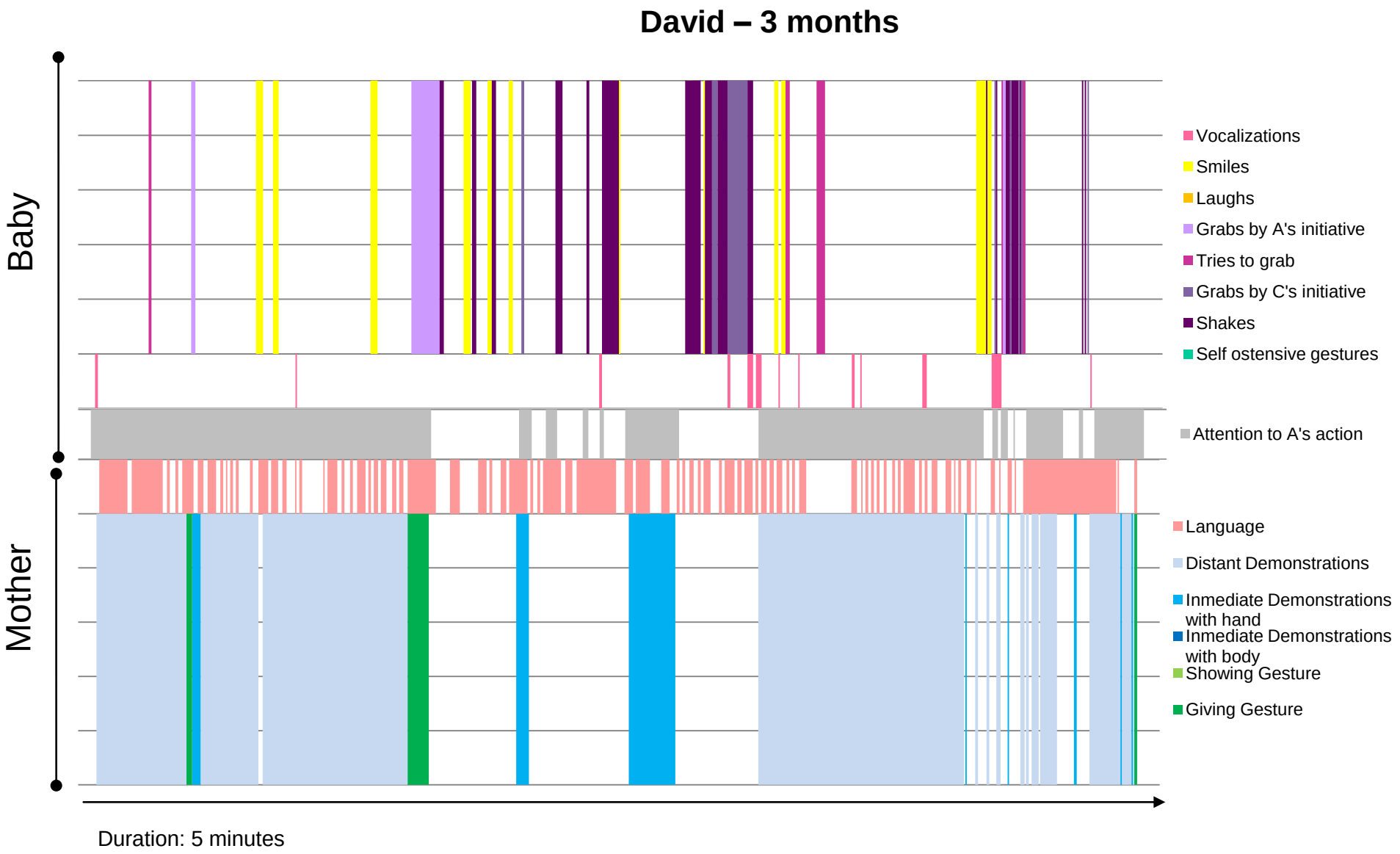

GRAPH 3.5. - C

*Microgenetic analyses*



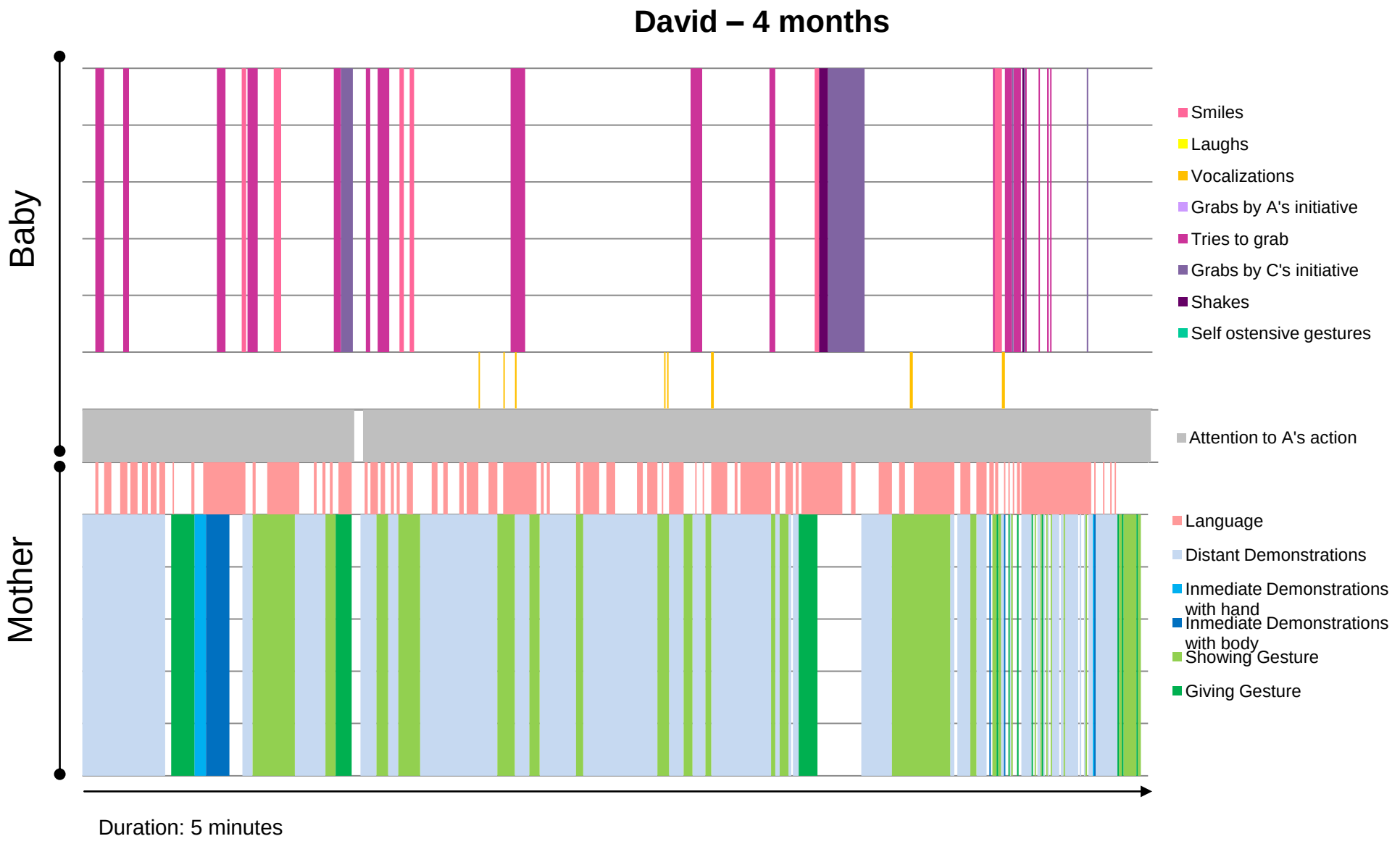

GRAPH 3.6. - A

*Microgenetic analyses*



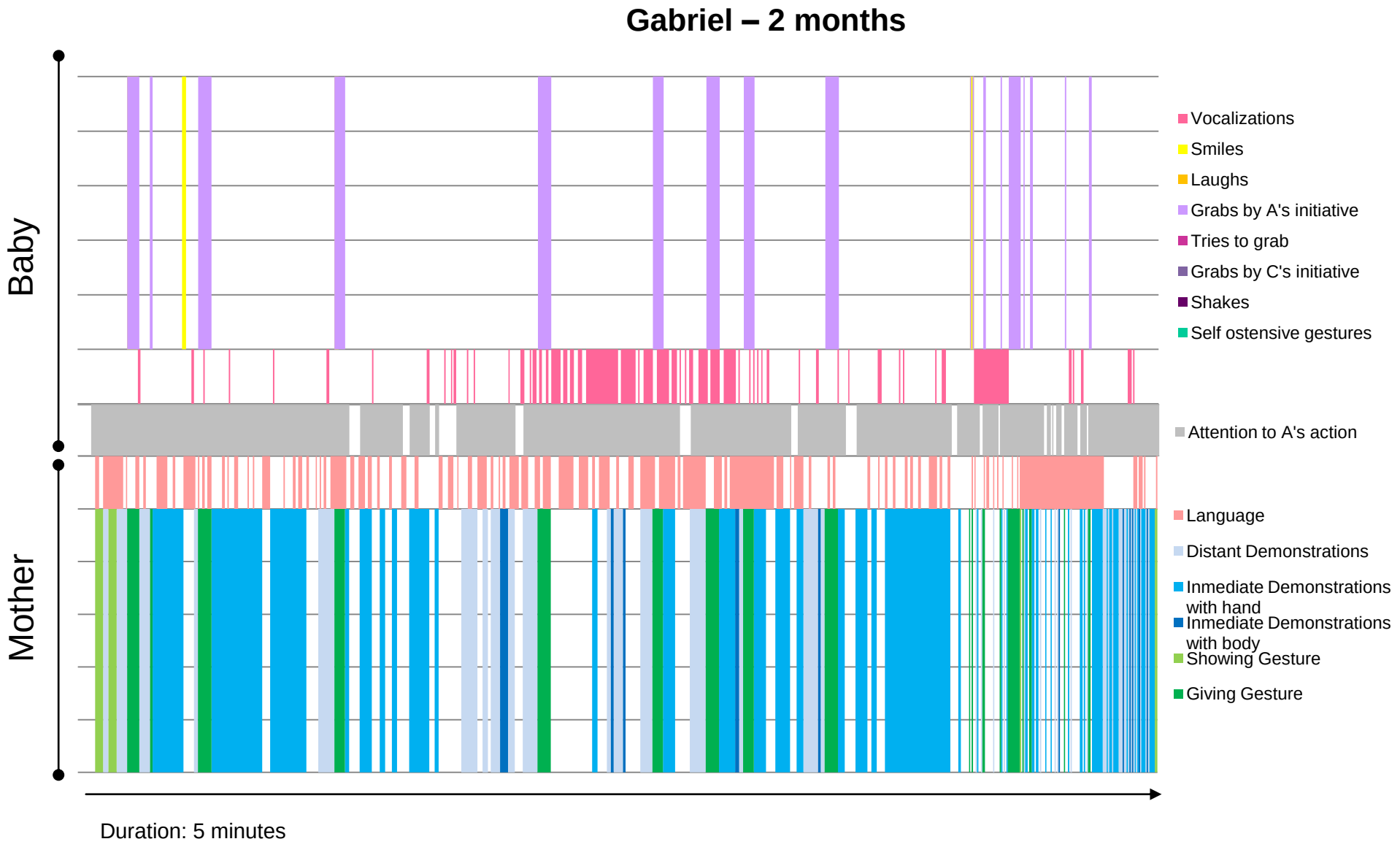

GRAPH 3.6. - B

*Microgenetic analyses*



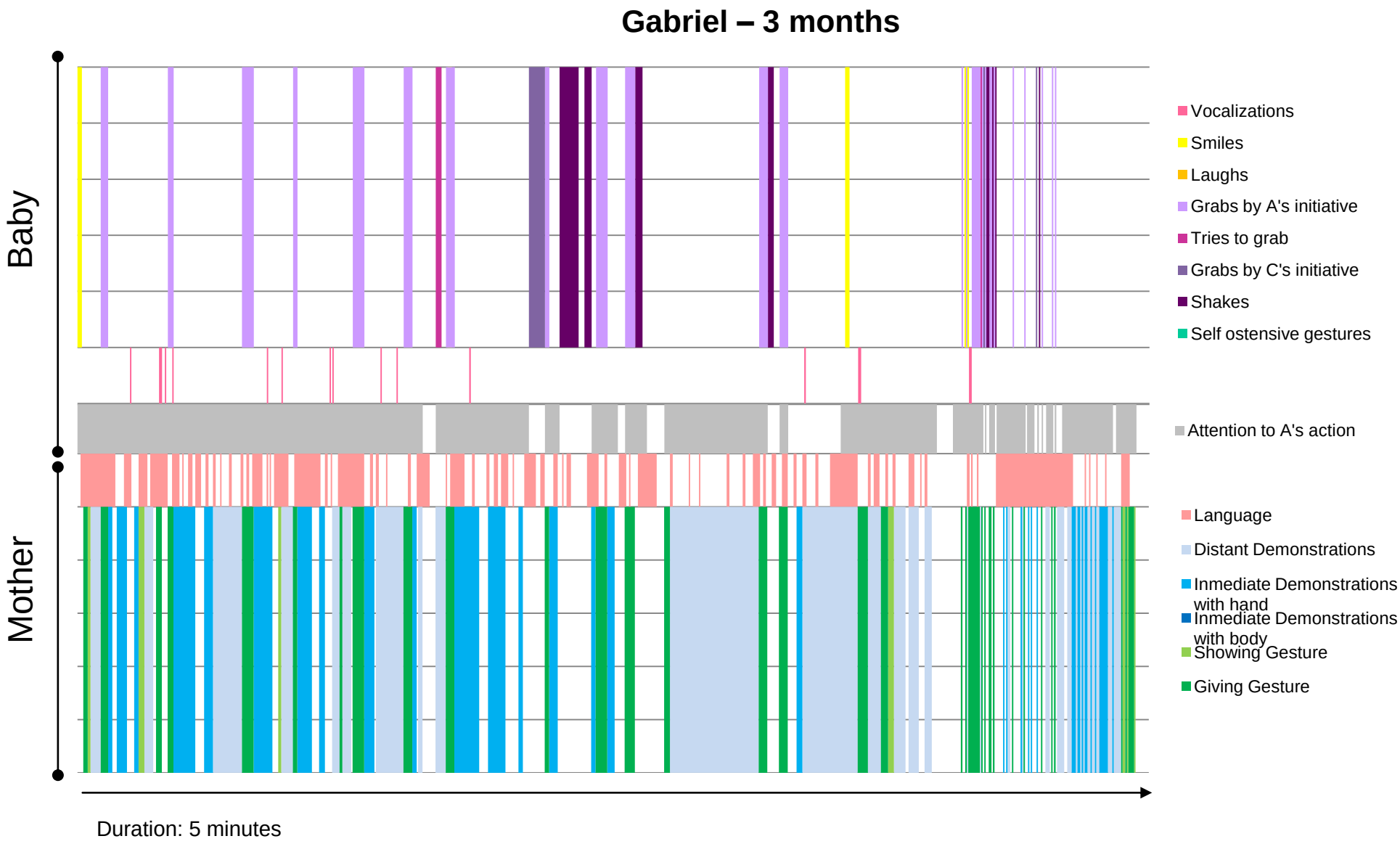

GRAPH 3.6. - C

*Microgenetic analyses*



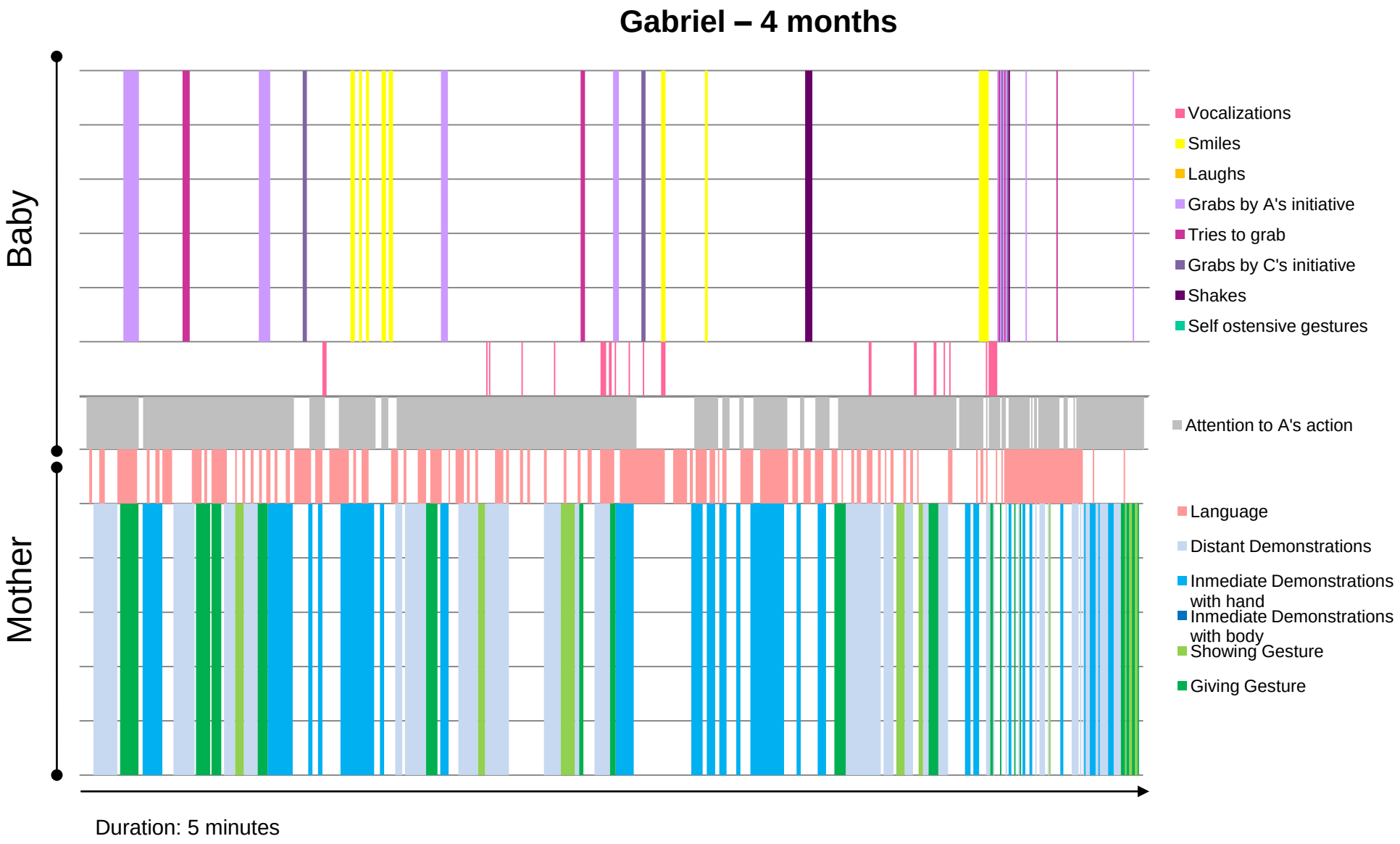

GRAPH 3.7. - A

*Microgenetic analyses*




GRAPH 3.7. - B

*Microgenetic analyses*




GRAPH 3.7. - C

*Microgenetic analyses*

## 4. Discussion and Conclusions

The results of this study highlight three fundamental aspects: (1) that there is another type of triadic interaction from the first months of life, different from which occurs by the end of the first year where the communicative intention comes from the adult, (2) that adult includes the baby in organized communicative niches based on ostensive actions, both through gestures of showing and giving, and through demonstrations of the use of objects. Adult never uses pointing gestures to generate shared reference with children at this age, which is striking if we consider the huge importance that has been given to pointing in recent years in Developmental Psychology. And (3) that these ostensive actions can have a marked rhythmic character, which proporcionate structure and facilitates child's interaction with the adult and an object.

Recently, ostensive gestures are no longer considered as a gesture, or when included in the "box" of deictic gestures, disappear against the privileged position given to pointing. However, in a developmental level, they are both located at very different times. The high frequency in our results of adult's ostensive productions, supports the thesis that ostensive gestures should be considered gestures in its own right, occupying a privileged place in development that precedes (in comprehension and production) to pointing gestures, which are completely absent in our data. We highlight the necessity to distinguish between ostensive and indexical gestures within the larger category that involves the concept of deictic gestures. Ostensive gestures allow adult to reduce ambiguity about the referent, since sign and referent coincide (the object occupies the own hand that performs the gesture). In addition, the fact that all uses of the MARACA that the adult performs to the child have a semiotic nature of ostensive character (as with the demonstrations) emphasizes furthermore this proposal.

Adult's ostensive gestures could get us closer to an explanation of how the first levels of agreement between adult and baby are established: before the child

understands what is the object, he/she establishes conventions with the adult at a much lower level, like it would be just to look what she is presenting. Notwithstanding, speaking in terms of joint attention alone becomes insufficient because such attention is essentially promoted by a joint action that the adult constantly proposes. It is adult's organized action which allows the child to attend, to be placed on the world around him/her.

At 2 months, adult places the object on the imaginary line that connects own's and baby's gazes, at the place where dyadic interaction was already established. When the adult amends where the object is acted to right or left, the child is barely sensible (what changes in the next sessions). Thereby, adult brings the child a space of possible action. As Reddy (2012) notes, the action and posture have much to do with the action that provokes in the other, helping to communication. Also, she cites the studies of Peter Wolff (1987) with two months old babies, showing that children smile more when they are directly watched by the other, than when they are not. This highlights the importance of the eye contact that adult pre-sets with the baby, placing the object in the center to present it to the child when she seems to notice that the place acted is extremely attractive for the baby.

At 3 and 4 months, adults increasingly spaces their actions in relation to the previous session, adding longer pauses to their interventions. They adjust themselves to children's responses, which entails some interpretation of baby's capabilities: the child can now grasp the object and, therefore, do something with it. The pauses in adult's action involve the cease to regulate the whole activity, giving the child space to control him/herself the action through the object. Joined to rhythm, silences derivated from pauses form some kind of rhythmic and structured action that would take place in an analogous manner to suction's cycles that Kaye described, being essential for the maintenance of rhythmic pattern and its structure.

Object sounds for its own characteristics, so when the adult makes a distant demonstration of the MARACA to the baby and stops it, also create rhythmic-sonorous sequences of interaction that are longer in time. They allow the baby to generate common grounds based on a very basic mutuality, forming a structure that during silences gives the child the space required to be included in the interaction.

Therefore, we can state that between 2 and 4 months of life, triadic interactions *are made of* rhythm, being the quintessential system of signs that the adult chooses to give structure to his intervention. Even when performing gestures –we only observed ostensive gestures of giving and showing–, adults incorporate tempo and intensity, which varies depending on the communicative intention.

The rhythmic structure that adult applies to her action with the MARACA, despite being spontaneous, follows the child's responses to make it effective and accessible. These patterns of interaction are always of a binary character and include pauses, varying depending on the chronometric density (depending on the age, attention or emotional responses of the child). The adult constantly connects with the responses that observed in children, producing a rhythmic-sonorous interaction against some baby's responses that were also originally rhythmic (heartbeat, breathing, body movements). Adult creates patterns of interaction where the rhythm is the organizer, leading triadic interaction to occur and to continue. Throughout the three sessions, adults rejects progressively the rhythmic-sonorous not estructured interventions, for which the child also seems to be less interested.

These adult ostensive actions are effective in children from very early: from 2 months, according to our results, children are in the interaction, do not cry and apparently are interested in the proposals of the adult. We could say that the child "understands" those adult's ostensive gestures as something that must be attended, resulting in long periods of sustained attention, smiles, and body movements. Later, from 3 months onwards, adult's ostensive actions also convert the object in something

to grasp. Children direct their open hand to the ostensive gestures and uses of the adult, in a way to anticipate that subsequently the adult will grant them the referent. At 4 months, the first canonical uses of the object were observed, shaking the MARACA but still in a fairly rudimentary way, because the motoric control of arms and hands is still in development.

These results challenge the widely accepted statements of Corbetta & Thelen (1999), who argue that the first intentional grasping motions occur from 5 months of age. Nevertheless, also support other thesis' which asserts that the referents are not naturally given in human communication, but they are necessary to being established in interaction with others (Moro & Rodríguez, 2005). Thus, we highlight the necessity of analyze the development from the interdependence between a child who actively perceives and acts, and the structured context that the adult presents.

Babies come into adult's presentations with a mediator object –with an important rhythmic and sonorous charge– from the first months of life, questioning the idea that there is a triadic interaction only from 9 months of age, when the child develops communicative intention. This study observes "other kind of triadic interaction" than the one defended in the literature, which from a coherent and structured action from adult's initiative, the first places of consensus between adult and baby are setted. Further investigation would be required to explore in more detail the nature and evolution of these early triadic interactions, until it is the child him/herself who assumes the communicative intention. Besides, more specifically musical research would be needed about how are the rhythmic and sonorous patterns in adult-infant-object interactions and how they evolve.

## 5. References

Basilio, M. & Rodríguez, C. (2011). Usos, gestos y vocalizaciones privadas. De la interacción social a la autorregulación. *Infancia y Aprendizaje, 34*(2), 181-194.

Bates, E., Camaioni, L. & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly, 21* (3), 205-226.

Bergeson, T. & Trehub, S. (2007). Signature tunes in mothers' speech to infants. *Infant Behavior & Development, 30,* 648-654

Brazelton, T.B., Kozlowski, B. & Main, M. (1974). The origins of reciprocity: The early mother-infant interaction. In M. Lewis & L. Rosenblum (Eds.). *The effect of the infant on his caregiver.* New York: Wiley.

Brinck, I. (2004). Joint attention, triangulation and radical interpretation: A problem and its solution. *Dialectica, 58,* 179-205.

Bronckart, J. P. (2012). Contributions of Piagetian Constructivism to Social Interactionism. In Martí, E. & Rodríguez, C. (Eds.). *After Piaget* (pp. 43-58). New Jersey: Transaction Publishers.

Bullowa, M. (1979). *Before speech: The beginning of interpersonal communication.* Cambridge: Cambridge University Press.

Cárdenas, K., Rodríguez, C. & Palacios, P. (2014). First symbols in a girl with Down syndrome: a longitudinal study from 12 to 18 months-olds. *Infant Behavior and Development, 37* (3), 416-427.

Cavalcante, S. & Rodríguez, C. (*in press* 2015). Los primeros usos del número: la comprensión del dado como objeto con funciones numéricas en niños entre 24 y 36 meses. Monográfico: Conocimiento matemático temprano. *Estudios de Psicología, 26* (1).

Cicchetti D.V. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. Psychological Assessment, *6*(4), 284-290.

Corbalán , M. (2010) Relations Between Cognitive Psychology and Music Memory: And Empirical Approach. *SONUS, 31* (1), 1-13.

Corbetta, D. & Thelen. E. (1999). Lateral biases and fluctuation in infant's spontaneous arm movements and reaching. *Developmental Psychobiolog, 34,* 237-255.

Costall, A. (2013). Things that help make us what we are. In G. Sammut, P. Daanen & F. M. Moghaddam (Eds.), Understanding the self and others: Explorations in intersubjectivity and interobjectivity (pp. 66-76). Oxford: Wiley/Blackwell.

Del Olmo, M. J., Ruza, F., Carrasco, P., & Rodríguez, C.(2008). Musicoterapia en Cuidados Intensivos Pediátricos. *Anales de Pediatría., 68* (2), 112-113

Del Olmo, M. J., Rodríguez, C. & Ruza, F. (2010). Music therapy in the PICU: 0- to 6-month-old babies. *Music and Medicine, 2* (3), 158-166.

Del Olmo, M.J., Rodríguez, C., Ruza, F. & Carrasco, P. (*en prensa*). The effects of music therapy intervention in PICU as measured by the test Comfort Behavior Scale. *Music and Medicine.*

Dimitrova, N. & Moro C. (2013). Common ground on object use associates with caregivers' gesturese. *Infant Behavior and Development, 36*, 618-626.

Eco, U. (1976). *A Theory of Semiotics*. Bloomington: Indiana University Press.

Español, S. (2007). Lenguaje, comunicación e intersubjetividad: una aproximación desde la psicología del desarrollo. *Subjetividad y procesos cognitivos,* 13-28.

EUDICO linguistic annotator - Elan (Version 4.1.1) [Computational software] (2011). Nijmegen: Max Planck Institute for Psycholinguistics.

Fagen, R. M. (2010). Play and development. In Pellegrini, A. D. (Ed.), *The Oxford handbook of the development of play*, (pp. 83-100). Oxford: Oxford University Press.

Fogel, A. (1993). *Developing through relationships.* Chicago: Chicago University Press.

Freelon, D. G. (2010). ReCal: Intercoder reliability calculation as a web service. *International Journal of Internet Science, 5* (1), 20-33.

Goubet, N., Rochat, P., Maire Leblond, C. & Poss, S. (2006). Learning from others in 9-18-month-old infants. *Infant and Child Development, 15,* 161-177.

Hubley, P. & Trevarthen, C. (1979). Sharing a task in infancy. In I. Uzgiris (Ed.). *Social interactions during infancy: New Directions for Child Development,* (pp. 57-80). San Francisco: Jossey-Bass.

Jaffe, J., Beebe, B., Feldstein, S., Crown, C. L., Jasnow, M. D., Rochat, P. & Stern, D. (2001). Rhythms of dialogue in infancy: Coordinated timing in development. *Monographs of the Society for Research in Child Development, 66* (2), 1-149.

Kaye, K. (1986). *La vida mental y social del bebé: Cómo los padres crean personas.* Barcelona: Paidós.

Lecanuet. J. P., Fifer, W. P., Krasnegor, N. A. & Smotherman, W. P. (1995) (Eds.). *Fetal Development: a psychological perspective.* Nueva Jersey: Lawrence Erlbaum.

Loewy, J., Stewart, K., Dassler, A. M., Telsey A. & Homel, P. (2013). The Effects of Music Therapy on Vital Signs, Feeding, and Sleep in Premature Infants. *Pediatric, 131* (5), 902-918.

Nelson, W. E. (2001). *Tratado de pediatría.* Madrid: McGraw-Hill.

Malloch, S. & Trevarthen, C. (Eds.) (2009). *Communicative musicality: Exploring the basis of human companionship.* Nueva York: Oxford University Press.

Moreno-Núñez, A., Rodríguez, C. & del Olmo, M.J. (*submitted*). The rhythmic, sonorous and melodic components of adult-child-object interactions between age 2 and 6 months.

Moro, C., Dutrannois, V. & Béguin, M. (2014). *Object pragmatics, communicative and language development.* Symposium at the Jean Piaget Society Annual Meeting: Rethinking language and communicative development. San Francisco, USA.

Moro, C. & Rodríguez, C, (2005). *L'objet et la construction de son usage chez le bébé. Une approche sémiotique du développement préverbal*. Bern-Nueva York: Peter Lang.

Palacios, P. & Rodríguez, C. (2014). The development of symbolic uses of objects in infants in a triadic context: a pragmatic and semiotic perspective. *Infant and Child Development.* DOI 10.1002-icd.1873.

Perinat, A. (1993). *Comunicación animal, comunicación humana.* Madrid: Siglo Veintiuno de España.

Piaget, J. (1936/2007). *El desarrollo de la inteligencia en el niño*. Barcelona: Crítica.

Reddy, V. (2012). Moving others matters. In A. Foolen, U.M. Lüdtke, T.P. Racine & J. Zlatev (Eds.). *Moving ourselves, moving others: motion and emotion in intersubjectivity, consciousness and language* (pp. 139-163). Amsterdam/Philadelphia: John Benjamins.

Reddy, V. & Trevarthen, C. (2004). What we learn about babies from engaging with their emotions. *Zero to Three, 24* (3), 9-15.

Rodríguez, C. (2006). *Del ritmo al símbolo: Los signos en el nacimiento de la inteligencia*. Barcelona: Horsori.

Rodríguez, C., Moreno-Núñez, A., Basilio, M. & Sosa, N. (*submitted*). First shared reference with pointing gestures or with ostensive gestures? Some developmental implications. *Monograph for Cognitive Development.*

Rodríguez, C. & Moro, C. (1999). *El mágico número tres. Cuando los niños aún no hablan.* Barcelona: Paidós.

Rodríguez, C. & Palacios, P. (2007). Do private gestures have a self-regulatory function?: A case study. *Infant Behavior and Development, 30* (2), 180-194.

Smith, N. A. & Trainor, L. (2008). Infant-directed speech is modulated by infant feedback. *Infancy, 13* (4). 410-420.

Sosa, N. (2010). Comunicación intencional prelingüística: ¿Qué pasa con la función interrogativa?. Diploma de Estudios Avanzados (inédito). Universidad Autónoma de Madrid.

Standley, J. (2002). A meta-analyses of the efficacy of music therapy for premature infants. *Journal of Pediatric Nursing, 17* (2), 107-113.

Standley, J. (2006). Musical Med. *Research in Review, Florida State University, 2,* 10-23

Tafuri, J. (2006). *¿Se nace musical?.* Barcelona: Graó.

Trehub, S. (2003). The developmental origins of musicality. *Nature Neuroscience, 7*(6), 669-673.

Trehub, S. E., Unik, A. M., Kamenetsky, S. B., Hill, D. S., Trainor, L. J., Henderson, J. L. & Saraza, M. (1997). Mother's and father's singing to infants. *Developmental Psychology, 33* (3), 500-507.

Trevarthen, C. (1998). The concept and foundations of infant intersubjectivity. In Bråten, S. (Ed.), *Intersubjective Communication and Emotion in Early Ontogeny,* (pp. 15-46). Cambridge: Cambridge University Press.

Trevarthen, C. (1999). Musicality and the intrinsic motive pulse: Evidence from human psychobiology and infant communication. *Musicae Scientiae, Special Issue, 1999-2000,* 155-217.

Trevarthen, C. (2003). *Conversations with a two-month-old.* Philadelfia: Whurr Publishers.

Trevarthen, C. (2008). Shared minds and the science of fiction: Why theories will differ. In Zlatev, J., Racine, T., Sinha, C. e Itkonen, E. (Eds.), *The shared mind: Perspectives on intersubjectivity,* (pp. VII-XIII). Amsterdam/Philadelphia: John Benjamins.

Tomasello, M. (2004). Learning through others. *Daedalus Winter, 133*(1), 51-58.

Tomasello, M. (2008). *Origins of human communication.* Cambridge: MIT Press.

Tomasello, M., Carpenter, M. & Liszkowski, U. (2007). A New look at Infant Pointing. *Child Development, 78* (3), 705-722.

Vygotski, L. S. (1984/1996). El primer año. In Vygotski, L. S., *Obras escogidas IV. Psicología infantil* (pp. 275-318). Madrid: Visor.

Wallon, H. (1951/1985). *La evolución psicológica del niño*. Buenos Aires: Psique.

Zlatev, J. & Andrén, M. (2009). Stages and transitions in children's semiotic development. In J. Zlatev, M. Andrén, N. Johansson-Falck & C. Lundmark (Eds.). *Studies in Language and* Cognition (pp. 380-401). Cambridge: Cambridge Scholars Publishing.

# Chapter IV

## Ostensive gestures come first:

## Their role in the beginning of shared reference[7]

### 1. Introduction: Why pointing gestures cannot be the basic form of gestural reference

In developmental psychology primacy is traditionally assigned to the pointing gesture as *the* gesture that *par excellence* allows shared reference (Cyrulnik, 2002; Liszkowski et al., 2006; Matthews, Behne, Lieven & Tomasello, 2012); "pointing serves to refer as precisely as possible to objects for joint attention" (Butterworth, 2003, p. 29). This idea is also widely accepted among primatologists: "the basic form of gestural reference" (Pika, 2008, p. 165); "the quintessential example of nonverbal explicit reference" (Leavens et al., 2008, p. 187). In other words, two people share the same referent due to the pointing gesture that one of them intentionally produces, in the distance, to communicate something to the other person in relation to an object, an action or an event. Twelve-month-old children already evidence this skill. Understanding pointing gestures implies that children are already capable of shared experience "[…] a mental level involving an understanding of the intentions, attention, and knowledge of their partner" (Tomasello, Carpenter & Liszkowski, 2007, p. 720). The most highlighted communicative functions, since the classic works of Bates et al. in the '70s, have been the declarative and the imperative functions (Brinck, 2004). However, this has been recently challenged in the literature. Pointing gestures can in

[7] Rodríguez, C., Moreno-Núñez, A., Basilio, M. & Sosa, N. (*submitted*). Ostensive gestures come first. Their role in the beginning of the shared reference. Special Issue: Semiotic Development. *Cognitive Development.*

fact fulfil more than just these two functions. Pointing gestures can be used to point to absent referents, to communicate with adults in order to share attitudes, to inform them of something they wish to know (Liszkowski, Carpenter & Tomasello, 2007), or with an interrogative function (Southgate, van Maanen & Csibra, 2007). Additionally, pointing gestures can also be used as a tool to regulate one's own behaviour (Rodríguez & Palacios, 2007; Delgado, Gómez & Sarriá, 2010).

Nevertheless, it is not easy either to use or to understand a pointing gesture. Children at 6 to 8 months old, instead of looking at the *direction* that the pointing gesture indicates, look at the *finger* itself (Butterworth, 2003). Therefore, the understanding that pointing gestures refer to distal objects emerges relatively late in development. If we consider the production of pointing gestures, they require the mastery of several aspects: (1) the *gesture itself* (2) the understanding that it refers to *something* that is (3) located *in the distance*. It is necessary to coordinate all this, besides, (4) the *other person's attention*, that also occurs in the distance, and also, (5) the child points *for a reason*, the gesture has a *function*, and the child expects to be understood by the other. The communicative function of the gesture can change depending on (6) the *thing* being pointed at: it is easy to conclude that the pragmatic effects of communication can change dramatically depending on whether the child points at the moon, the chimney, or at a cake that a sibling is eating (Rodríguez, 2006). Therefore, apart from the complexity emphasised by other researchers, we also include the complexity derived from considering 'what in the world' is indicated. Otherwise, it would be impossible to determine the *purpose* of the child's pointing, what his/her expectations are, or how he/she is intending to affect the other person. In other words, it would be impossible to know its pragmatic dimension.

It is not clear how children manage to achieve such a complex degree of communication *with* somebody *about* something, in a *distal* way –characteristic of pointing gestures– if, during the first year of life, they have not acquired *previous* intentional behaviours. That is, they must have acquired behaviours which already

imply shared reference in basic communicative situations, with less complex semiotic systems than pointing gestures, which can serve as the basis in which pointing gestures can develop. It seems reasonable to think that in such situations of shared reference, it is necessary to *approach the object*. This implies that the 'common agreement' does not occur with an empty hand in the distance, as it is the case of pointing gestures, but in a *proximal space* involving the *object itself*, i.e., with the hand occupied by the object.

This is precisely the main feature of *ostensive gestures* –the presence of an object which facilitates understanding in the absence of spoken language and pointing. We need to highlight that we prefer the general term 'ostensive gesture', although in the psychological literature, since the works of Bates, Camaioni & Volterra (1975) these gestures have been referred to as 'giving' or 'showing' (both, together with pointing, are "deictic gestures"). However, giving or showing the object is, in our view, insufficient to determine the *function* of the gesture: *why and for what* is the child giving or showing something? In our view, it is more accurate to say that the child produces ostensive gestures and, only later, comes to intend their particular function. Furthermore, we propose three possible functions of ostensive gestures beyond those typically referred to as imperative and declarative, (1) an *exploratory* and/or *contemplative* function, (2) a *self-regulatory* function in order to solve a problem, and (3) an *interrogative* function.

From a semiotic perspective, the explanation of why ostensive gestures are easier to understand is clear. In the case of pointing gestures, sign and referent –what is being pointed at– do not coincide. It is a *heteromateric* sign. The child must learn that in relation to a pointing gesture, the relevant content is *not found in the finger*, but in what is pointed at*, in the distance*. However, in case of ostensive gestures, with the hand occupied by the object, the gesture is sign and referent simultaneously. Ostensive signs are *homomateric*. Therefore, it is easier for the child to understand that the meaning concerns *this* which is being shown.

A further point to make about ostensive signs is concerned with their diverse pragmatic complexities. If we consider the communicative actions of both the adult and the child throughout the first year of life, it is necessary to distinguish between ostensive and indexical gestures. As indicated before, they entail different semiotic complexities. Ostensive gestures are clearly understood and produced before pointing gestures (Rodríguez & Moro, 2008). When exploring developmental processes during the first year, it is imperative to consider that, according to semiotic theorists, ostensive gestures are the most basic form of active signification. We will come back to this important point later on. In developmental psychology, meanwhile, these types of gestures are not distinguished as clearly as they should be. Since Bates et al. (1975), 'deictic gestures', that is, gestures used to communicate referentially, have included both pointing and giving or showing, or, as recently stated by Liszkowski: 'intentionally communicative gestures have been classified into deictic and representational gestures […] Deictic gestures show or *present* a referent in the environment […], the most prominent gesture being pointing' (Liszkowski, 2010, p. 38, underlined in the original). Representational gestures are those that stand for an absent referent.

Furthermore, to our knowledge there is no research concerning the effect of the adult's ostensive gestures on children during the first months of life. To understand how adult's ostensive gestures affect children would also allow an understanding of how children come to produce them and with which function(s).

## 2. Ostensive gestures: the first form of shared reference

We propose that ostensive gestures constitute the first form of shared reference. This proposition has three significant implications for psychological research:

1. Accepting that ostensive gestures are gestures on their own right.

2. Adopting a developmental perspective, given that children understand and produce ostensive gestures before pointing gestures. The *decalage* between both of them during the first year is obvious.
3. Accepting that objects have cultural and public properties and that communication occurs with and about objects. Objects are the key to understanding the functions of gestures.

Let us consider these three points in more detail.

### 2.1. Ostensive gestures are gestures

When considering research on gestures, it is important to know what developmental stage studies focus on. As pointed out by Andrén "[T]he question of how to handle the upper and lower limits of gesture is clearly at the same time difficult and central to understanding the nature of gesture" (2010, p. 14). Before explaining why ostensive gestures are gestures in their own right, we will describe research traditions that do not study, or do not consider, ostensive gestures as gestures.

In the field of pragmatic linguistics, there is an increasing interest in gesture-speech integration in early language acquisition (Murillo & Belinchón, 2012). In relation to adult communication, Kendon's works are specially relevant. For him, gestures are regarded as part of language itself and it is used: "[…] as a mode of symbolic representation, just as spoken language is" (2000, p. 50). Also, according to McNeill "[…] language and gesture are integral parts of a whole", where gesture and speech form a "multimodal unit that is considered as language itself" (2000, p. 9). In the field of second language acquisition, gestures "should be seen both as a resource in learning and as a component of language proficiency in its own right" (Gullberg, de Bot & Volterra, 2010, p. 11). In addition, spatial gestures (Dasen, Changkakoti, Abbiati, Niraula, Mishra & Foy, 2009) in different linguistic traditions reflect "people's representations of the spaces they inhabit, know, and talk about" (Haviland, 2000, p.

13). These studies are positioned at the upper limit, where gestures and language form a consolidated, unified and significant whole.

In a different research area, a study with 6 year old children on gestures by Susan Goldin-Meadow et al. (2012), shows that doing a particular gesture has a bigger effect on learning than only seeing that gesture. Depending on the task, a pointing gesture might not be the most appropriate. A 'move gesture' involving mental rotation might be required instead.

Representational gestures, such as gestures of affirmation and negation, with or without accompanying speech, have been studied during the second and third year of life (Guidetti, 2003). In adults, these gestures refer to emblematic gestures in different cultures (Matsumoto & Hwang, 2013). In this research field ostensive gestures do not play any role, due to the predominant idea that when a hand is not empty there is no gesture, but only solitary action.

The interesting work of Morris, Collett, Marsh & O'Shaughnessy (1979) proposes that some highly symbolic gestures could have had a close relationship in the past with different types of action with the material world or with animals having certain attributes. For instance, the horizontal horn-sign, with the hand pointed forward and the forefinger and the little finger extended horizontally with the meaning of "protection". This gesture originated in pre-Roman times, and in its earliest role, the gesture was essentially a device for self-protection: the horns were being used as "representing the defensive power of a great horned animal, almost certainly the bull" (p. 137). Another very nice example is the gesture of "no" by shaking the head from side to side or by the head-toss gesture. They refer to the explanation given by Darwin in his book *The Expression of the Emotions in Man and Animals*. According to Darwin, the "no" gestures originated in the infant's primary act of food rejection. The authors add that the head toss for negation "can therefore be derived from any small, incipient movement of head `retreat" (p. 162-163).

A third group of studies seems to challenge the status of ostensive gestures as gestures. Mats Andren's work illustrates this position. Andrén studies gestures between 18 and 30 months of age, where the material –that is, object– world is often involved. However, when considering the first productions, he distinguishes between 'social actions' and 'gestures': "[…] First intentional gestures appear, around the end of the first year when one finds the first pointing gestures *and some other social actions* such as GIVE and SHOW" (2010, p. 6, our emphasis, capitals in the original). The distinction between 'social actions' for showing and giving *versus* pointing gestures, questions the status of ostensive signs as gestures.

We find the same uncertainty in Nicla Rossini's work when she distinguishes deictics (pointings) from "[…] reaching towards objects and extending objects to others […]" (2012, p. 34), which she does not considered to be deictics. Rossini explains this categorization, based on the classic works of Werner and Kaplan, Bruner or Bates et al., by stating that: "The first studies exclusively focused on pointing gestures, or deictics […] since their *object-distinguishing function* was considered a precursor to verbal naming" (Rossini, 2012, p. 34, our stress). Liszkowski adopts a similar position concerning ostensive gestures: "infants from around 9 months also pick up objects and hold them out with an outstretched arm […]" (2010, p. 39). Based on Clark's work, he refers to 'placing' when the child places an object on the parent's lap. Both of these gestures are considered deictic: "*showing and placing are thus good candidates for crediting infants with intentional deictic referential communication* and may reflect foundations of uniquely human communication" (*ibid*., our emphasis). However, the possibility of objects being part of intentional communication is then denied when he asserts:

> "However, it is not clear precisely how these gestures work from the infants' point of view. There are no experiments to my knowledge, which have directly tested referential intent underlying infants' showing or placing. *Since these gestures involve objects at hand, a leaner interpretation is that they originate from individualistic object-directed actions.* For example, infants may shake objects as an exploratory activity, while parents interpret this as communicative object exposure" (p. 39, our emphasis).

In spite of the fact that Bates et al. did not question the intentional and communicative status of gestures with objects –defining the declarative function as "the use of an object (through pointing, *showing, giving*, etc.) as the means to obtaining adult's attention" (1975, p. 209, our emphasis)– in recent years, the idea that when an object is placed in the hand of the child a solitary action is being performed rather than a communicative act has gained acceptance. This reasoning assumes that action (with objects) and communication (necessarily *without* objects) develop through completely parallel lines that never converge.

In order to understand the communicative status of a gesture (see discussion in Rodríguez, 2009), one must consider at least three aspects: (1) the *gesture* itself. Which type of gesture is it –ostensive, indexical or symbolic/representational? (2) what part of the *world* is being referred to or represented by the gesture? Gestures cannot be interpreted, especially ostensive and indexical ones that operate with a present referent, without considering in pragmatic terms what part of the world they are referencing. Therefore, one must consider the functions of objects, beyond their physical properties, and (3) in which specific communicative circumstances (after and before which actions) in relation to the uses of objects, situation, etc., is the gesture produced?

According to Clark (2003), in adult communication, not only is pointing a communicative act, but so also is placement. He concludes that we must "revise our views of both communication and context. Much of what is now called *context* are really acts of communication" (p. 244).

In semiotics, ostensive gestures serve the purpose of intentional communication. Given the fact that objects can also operate as signs, the fact that the hand is holding an object is not an issue. Thus, for Osolsobè, an ostensive gesture can be defined as "a type of communication where the reality itself, the thing, the situation, or event itself functions in the role of message" (1971, p. 35). Communication through

ostensive gestures as used in semiotics was originally adapted from Wittgenstein and Russell (Dégh & Vázsonyi, 1983). In *A theory of semiotics,* Eco states:

> "Ostension represents the most elementary act of *active* signification and it is the one used in the first instance by two people who do not share the same language; sometimes the object is connected to a pointer, *at others it is regularly picked up and shown*: in both cases the object is disregarded as a token and becomes, instead of the immediate possible referent of a mention, the expression of a more general content" (1976, p. 225, our emphasis).
> Ostension occurs when a given object or event produced by nature or human action (intentionally or unintentionally and existing in a world of facts as a fact among facts) is 'picked up' by someone and *shown* as the expression of the class of which it is a member (1976, 224-225 stressed in the original).
> […] if I show a packet of brand X cigarettes to a friend who is going shopping, this ostension can mean two different things: either "please buy some cigarettes" or "please buy this brand of cigarettes". *Maybe in this latter case I would have to add certain indexical devices, such as tapping with the finger on the part of the packet* which bears the name of the brand […]
> At other times ostension may suggest an entire discourse, as when I show my shoes to someone not in order to say "shoes", but rather "my shoes are dirty" or "please shine my shoes". In these latter cases the *object* is not only taken as a *sign* but also as a *referent* and the indication constitutes an act of mentioning […]" "[…] the shoes are first of all viewed as an expression which is made with the same stuff as its possible referent. (p. 225, our emphasis)

We believe these ideas should be of great interest to developmental psychology for three reasons. First of all, as Eco emphasizes, ostensive gestures are the most basic resource when people lack a shared communicative code. Ostensive signs that are homomateric –expression and referent consist of the same object– are interpreted more easily than other more complex signs, such as pointing, in which gesture and referent are different. This distinction is very relevant in relation to early communicative development. The second reason is that, according to Eco, there is an ostensive gesture when the object is in somebody's hand as well as when an object is connected with a 'pointer', or when indexical devices are added. This is relevant to early communicative development because both the adult, when communicating with the child, and the child herself, when producing his/her first pointing gestures, sometimes produce *mixed gestures* with ostensive and indexical elements. Lastly, the fact that the object is part of the gesture itself does not imply that the expression is not part of a broader content. Eco further explores the idea that an object is an expression of the class of objects to which it belongs. Presenting something as the expression of a class

to which it belongs with communicative purposes requires a certain level of abstraction. Therefore, Eco seems to emphasize the more abstract aspects to which the object refers. This is relevant for early development, when, since the end of the first year of life, children have begun to consider objects as part of a class and not as unique specimens (see discussion in Rodríguez, 2012). This is a realm in which children with autism seem to have serious difficulties (Benassi & Valdez, 2012; Sterner & Rodríguez, 2012).

Semiotics, then, has no difficulties in accepting that a hand occupied by an object can act as a gesture that communicates referentially –the object acts simultaneously as sign and referent. There is no doubt then about the intentional communicative nature of ostensive gestures, which are similar to pointing gestures or any other intentional gesture of a more complex representational status, such as the symbolic.

In contrast, in developmental psychology, the resistance to accept ostensive gestures as gestures has to do with (1) the difficulty in accepting that intentional communication, especially in the early developmental stages, also occurs *with* and *through* material objects in their twofold status as signs and referent, which is a necessary requirement for the development of shared reference; and (2) that the object cannot be reduced to a uniform, transparent and literal 'physical reality', and that what defines the object relates to its uses in everyday life. In the following sections, we will analyse these aspects from a developmental point of view.

### 2.2. Developmental perspective: ostensive gestures are produced and understood first

Children produce their first ostensive gestures to communicate with others at around nine months of age (Dimitrova, 2012; Reddy, 2008; Palacios, 2009), but the first pointing gestures are only produced at around 12 months of age (Butterworth,

2003). This seems reasonable if we consider that ostensive gestures are semiotically less complex than pointing gestures.

When adults attempt to establish shared reference with the child in their first months of life, they do not begin by pointing at something in the distance, but rather they first use ostensive gestures, showing something nearby. Pointing gestures begin to be efficient only later in development. The difference between the comprehension of ostensive and pointing gestures by children is notorious. Children understand adult's ostensive gestures with no difficulties very early on, especially if the object is presented at a short distance. This means that when an adult presents an object to a 2, 3 or 4 month old baby, the baby, from the beginning (1) *looks at* what is being presented; at 3 months old also (2) *grabs* the object or *tries to grab* it; at 4 months old also (3) *anticipates* when an object is presented by an adult that it may also be offered. Adults often accompany their ostensive gestures by rhythmic and sonorous components (Rodríguez & Moro, 2008; Moreno-Núñez, Rodríguez & Del Olmo, *submitted*), and sometimes they also add melody (Del Olmo, Rodríguez & Ruza, 2010). These are redundancies that help ostensive gestures to be truly effective for the baby.

We have also observed a phenomenon that we call the *magnet effect* (efecto imán), which refers to the reaction of the child to the adult's ostensive gesture or ostensive action on the object in a proximal space of joint action. The *magnet effect* consists of the immediate reaction of the child (like a magnet, hence its name) *in the place where the adult is doing an ostensive gesture or acting on the object.* The child (1) looks at the *adult's action/gesture* and (2) directs his hands towards the *place where* the adult is acting/doing something. This reaction by the child implies a selection of a *significant (meaningful) place*. It implies a convergence with the object-place acted by the other. Seven-month-old children evidence this magnet effect behaviour, although at 13 months of age it is highly reduced (Rodríguez & Moro, 1998). In an ongoing longitudinal study with 9, 11 and 13 month olds (Moreno-Núñez, Rodríguez & del Olmo, *submitted*), we observe: (1) 9-month-olds still produce the *magnet effect*:

they abandon (or put on hold) their own action with the object they are *currently* handling *when the adult produces an ostensive gesture*, or an *ostensive action* with another object. This reaction is immediately after the adult's action, as if the adult's action on the object was a magnet, (2) the effect decreases by 11 months and (3) it continues to do so at 13 months.

The interest of the child on the adult's ostensive action, which compels her to act on the same place acted upon by the adult, does not occur in relation to pointing gestures. In a longitudinal study, 7 month olds did not interpret immediate pointing gestures produced by adults as indexical gestures in a context of joint action. Children looked at the adult's pointing gesture in 34.6% of the cases and only acted according to the adult's intentions in 7.6% of the cases, and then only in cases when the gesture was accompanied by actions that facilitated their comprehension. However, at age 10 months children looked at pointing gestures in 56.4% of the cases and used objects in a conventional way in accordance with the adult's intention in 33.3% of the cases. At age 13 months children conventionally used objects after a pointing gesture by the adult in 64.7% of the cases (Rodríguez & Moro, 1998). As pointed out above, Eco considers both a distal and a proximal pointing gesture (e.g. touching part of the packet of cigarettes) as 'indexical devices' (Eco, 1976, p. 225). In the study above, the adult repeatedly points and touches the object in most of the cases (multiple immediate pointing gestures). Interestingly, in joint action and joint problem solving situations (not just joint attention) in home settings, pointing gestures are often immediate, i.e. physically touching the referent (Carpendale & Carpendale, 2010). This type of gesture becomes a *mixed* gesture, half way between an ostensive and an indexical gesture, which helps to make explicit the adult's intentions as it offers a more direct connection with the referent, accomplishing, therefore, an educative purpose.

In the same period that children produce their first ostensive gestures to communicate intentionally with others, around the 9th month, they also produce immediate pointing gestures directed to themselves (see also, Bates et al. 1979, and

Delgado, Gómez & Sarriá, 2010, with older children). By immediate pointing gesture, we mean a pointing gesture touching the referent, the object being pointed to. It is directed to themselves because the gesture does not have an intentional communicative function to the other. The function of these immediate pointing gestures seems to be an 'exploration' of a part of the object, or 'specification of the referent' to the self. For example, children point to a *certain part of the object* as a form of selection of "what I am exploring". This part could be a hole in a construction game cube, the head of an articulated dog figure, or the key of a wind-up toy (Moreno-Núñez, Rodríguez & del Olmo, *submitted*). This behaviour rarely occurs in laboratory settings, where stimuli are distally located, especially in studies focused in eliciting pointing gestures, in which children and adults are not involved in a *joint action* situation.

In conclusion, this *decalage* between the child's *early understanding* of ostensive gestures *versus* the *late understanding* of pointing gestures has been largely neglected in the literature on early development. The reason for this is quite simple. Almost no attention has been paid, in early development studies, to contexts of triadic interaction where adults *communicate* intentionally, establishing shared reference with the child through the *mediation of objects, often accompanied with rhythmic and sonorous components* (components added to the object itself), long before the child communicates intentionally with objects at the end of the first year.

### 2.3. If objects are used for doing things, then, ostensive gestures can fulfil more functions than just giving and showing

Vygotski emphasized the functional diversity of language; and Wittgenstein, as well as Austin, referred to the multiple uses of language. By contrast, with gestures only two functions have been considered. As noted above, since the '70s, based on the work of Bates et al., the two main functions of prelinguistic gestures have been taken to be the declarative and the imperative. However, it seems reasonable to conclude that if

objects are used for different purposes in everyday life, ostensive gestures produced by children from 9 months old may also have different purposes or functions. We propose three different types of ostensive gestures: (1) Directed to the self: self directed and private gestures (2) Directed to others.

(1.a) Self-directed ostensive gestures: situations in which the child does not use the object according to its conventional function. Instead of acting with it, the child shows the object to him/herself in a *contemplative* act, whose function appears to be only *exploratory* (Moro & Rodríguez, 2005; Dimitrova & Moro, 2013).

(1.b) Private ostensive gestures with a *self-regulatory function*: these gestures occur in problem-solving situations with complex objects. The child shows the object to him/herself in order to regulate his/her own behaviour in relation to the uses of the object. The child identifies a problem and attempts to solve it him/herself by showing the object to him/herself with the apparent purpose of updating his/her mental representation about the object. This type of behaviour was first described in a case study with an 18-month-old girl with Down syndrome. In this case, the girl knew *what* to do with the object, that is, she understood its conventional function –to place rings on a post– but she appeared to have difficulties with *how* to achieve it by herself. She developed several strategies in order to achieve her goal, such as following with her gaze the trajectory of the ring as she moved it, or carefully studying the ring's position *before* trying to place the ring onto the post. She carefully regulated her own use of the object using the object itself, which is what is required to solve a problem (Rodríguez & Palacios, 2007)[8]. In a separate longitudinal study with typically developing children at ages 11, 13 and 15 months, we also observed children producing private ostensive gestures with a tool in the context of its conventional use *before* proceeding with their action. The ostensive gesture with the tool was produced in a very precise moment of

[8] The girl also used private immediate pointing gestures in the same problem-solving situation. We do not elaborate on this idea here because we are specifically focusing on ostensive gestures.

difficulty (see other examples of private productions in Basilio & Rodríguez, 2011). Private ostensive gestures are produced when the child already possesses knowledge of the conventional uses of objects (or tools) –but has difficulties with *how* to achieve that use. Using this type of gesture can be considered as a form of 'materialisation of consciousness through the notion of sign […]' (Bronckart & Bota, 2011, p. 63), due to the meaningful presence of the material world. We consider that these behaviours constitute evidence that children are capable of self-regulation before language by using prelinguistic semiotic systems, where the object plays a key role. Self-directed private gestures are situated in the same continuum of communication with the self brought to light by Vygotski in relation to private speech (Winsler, Fernyhough & Montero, 2009). In a study underway (Basilio & Rodríguez, 2011), again in situations that require self-regulation, we observed that children also use ostensive gestures (either directed to the self, or to the other) with an *evaluative* function. After completing a conventional use of the object, children are 'satisfied' with their own actions.

(2) Protointerrogative gestures: the child produces an ostensive gesture towards somebody in order to 'ask for information or help', requesting their intervention/regulation in relation to their own actions. The child's actions will, therefore, be affected by the adult's reactions, whose intervention was explicitly requested by the child (Moro & Rodríguez, 1991; Rodríguez, 2006, 2007, 2009; Sosa, 2010). Protointerrogative gestures may be accompanied by vocalisations with an ascending tone. Normally, the child produces a protointerrogative when encountering a difficulty in a specific task and attributes to the other person the *skills* she lacks, or explicitly requests their *opinion* before proceeding with her actions. The child explicitly requests the other's regulation through an ostensive gesture.

Self-directed ostensive gestures, private ostensive gestures with a self-regulatory function, and ostensive gestures with a protointerrogative function are ostensive signs in which expression and referent coincide. Ostensive signs present this twofold quality and are functional in communication (with others or the self) providing

that objects are considered, (beyond their narrowly defined 'physical reality'), in terms of their shared norms of use. And if language –paraphrasing Wittgenstein– possesses infinite uses, so do objects.

None of these functions could have been identified without placing objects under a pragmatic lens, meaning that they are used everyday in multiple ways and they are subject to collective norms of use which children progressively acquire in interaction with others, in communicative-educative situations (Sinha & Rodríguez, 2008). The object finally becomes the 'sign of its use' when it becomes a member of a class (Rodríguez, 2012). In this meaning-making process the object acts as a sign thanks to multiple and rich communicative interactions with another person. Without the continuous presence of the signifying material world, and not only as an external referent of communication (Barthélémy-Musso, Tartas & Guidetti, 2013), it would be impossible to understand the functions of communicative signs before language.

## 3. Conclusion

We began this paper by emphasising the striking contrast in developmental psychology between the status of (a) the pointing gesture being the prototype communicative tool that allows shared reference, and (b) the absence of status of ostensive gestures, characterized by the hand being *occupied by a material object*. The underlying reason for this contrast lies in the difficulty within developmental psychology of accepting that objects can be protagonists, a part of the interaction and not just of the context, in interpersonal communication, and especially so during the first years of life.

In reviewing various well-known positions in developmental psychology and semiotics the contrast between them became evident. In the former, in early communicative development the term deictic gesture comprises ostensive gestures (giving and showing) as well as pointing gestures. Furthermore, in recent years a viewpoint that doubts the gestural status of a hand holding an object is gaining

acceptance. Only ‘empty handed’ gestures are considered truly gestures, whereas if the hand holds an object, the communicative and intentional nature of the gesture is challenged and is considered instead a “non communicative” solitary action.

From a pragmatic perspective, however, which recognises the semiotic complexity of the different uses of objects, we argue that three essential issues must be reconsidered. The first issue is that ostensive gestures are intentional communicative tools on their own right. The second is that evidence from development during the first and second year shows a *decalage* between the early comprehension and production of ostensive gestures versus late comprehension and emerging use of pointing gestures. This finding is mirrored when observing child-directed adult communicative utterances. They produce ostensive gestures to communicate with children early in development (in triadic educative interactions), which are effective because infants can interpret these gestures, to some extent, even in the first months of life. However, children can only interpret pointing gestures as a distal indication at the end of their first year of life. This developmental gap can be explained by the different semiotic complexity of ostensive and pointing gestures; the former being less complex, as the material object as sign coincides with its referent, and the latter being more complex, as the referent is distally indicated by the gesture.

Finally, in this paper we attempt to go beyond the two *classic* functions of prelinguistic communicative gestures –imperative and declarative– proposing other functions that ostensive gestures fulfil in early development, by taking into account to whom the gesture is directed and what its communicative purpose is. We identify (1) *self-directed ostensive gestures* with an exploratory/contemplative function and *private ostensive gestures* with a self-regulatory purpose and (2) an *interrogative function* of other-directed ostensive gestures. These are not the only possible functions of ostensive gestures, and therefore more research is needed in order to understand their complexity and their role in early development.

The multiplicity of functions of ostensive gestures can only emerge when one considers the pragmatics of objects, acknowledging their multiple uses in everyday life in accordance with public, conventional, norms shared by a community. Without considering this added cultural dimension of objects, it is not possible to determine the functions of children's prelinguistic communicative signs.

In summary, and in the light of the arguments presented in this paper, we challenge the notion that pointing gestures are the first shared reference tool, and instead we propose that ostensive gestures are primary. The emergence of shared reference early in life is far from being understood, but if we aim to advance our knowledge in this area, we must consider the central role of ostensive gestures by putting them onto the agenda of the emergence of shared reference.

## 4. References

Andrén, M. (2010). *Children's Gestures from 18 to 30 months*. Lund: Lund University.

Barthélémy-Musso, A., Tartas, V. & Guidetti, M. (2013). Prendre des objets et leurs usages au sérieux: aproche développementale de la co-construction de conventions sémiotiques entre enfants. *Psychologie Francaise, 58,* 67-88.

Basilio, M. & Rodríguez, C. (2011). Usos, gestos y vocalizaciones privadas. De la interacción social a la autorregulación. *Infancia y Aprendizaje, 34* (2), 181-194.

Bates, E., Camaioni, L. & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merril-Palmer Quarterly, 21*(3), 205-226.

Bates, E., Benigni, L, Bretherton, I., Camaioni, L & Volterra, V. (1979). *The emergence of symbols: Cognition and Communication in Infancy*. New York: Academic Press.

Benassi, J. & Valdez, D. (2012). Ayudas para construir significados compartidos. Uno se materiales visuales en la intervención psicoeducativa en niños con trastornos del espectro autista. In D. Valdez & V. Ruggieri (Comps.). *Autismo. Del diagnóstico al tratamiento* (pp. 241-271). Buenos Aires: Paidós.

Brinck, I. (2004). The Pragmatics of Imperative and Declarative Pointing. *Cognitive Science Quarterly, 3* (4), 429-446.

Bronckart, J. P. & Bota C. (2011). *Bakhtine démasqué. Histoire d'un menteur, d'une escroquerie et d'un délire collectif*. Genève: Librairie Droz.

Butterworth, G. (2003). Pointing is the Royal Road to language for babies. In S. Kita (Ed.). *Pointing. Where language, culture and cognition meet* (pp. 9-33). New Jersey: Lawrence Erlbaum Associates.

Carpendale, J. & Carpendale, A. B. (2010). The Development of Pointing: From Personal Directedness to Interpersonal Direction. *Human Development*, *53*, 110-126.

Clark, H. (2003). Pointing and Placing. In S. Kita (Ed.). *Pointing. Where Language, Culture and Cognition Meet*, (pp. 243-268). Mahwah, New Jersey: LEA.

Cyrulnik, B. (2002). De la conscience émergente à la conscience partagée. In F. Rastier & S. Bouquet. *Une introduction aux sciences de la culture* (pp. 81-90). Paris: PUF.

Dasen, P. R., Changkakoti, N., Abbiati, M., Niraula, S., Mishra, R. C. & Foy, H. (2009). Geocentric gestures as a research tool. In A. Gari & K. Mylonas (Eds.). *Quod Erat Demonstrandum: From Herodotus' ethnographic journeys to cross-cultural research* (pp. 115-121). Athens: Pedio Books.

Dégh, L. & Vázsonyi, A. (1983). Does the Word « Dog » Bite ? Ostensive Action: A Means of Legend-Telling. *Journal of Folklore Research, 20* (1), 5-34.

Delgado, B., Gómez, J-C. & Sarriá, E. (2010). Funciones tempranas del gesto de señalar privado: La contemplación y la autorregulación a través del gesto de señalar. *Acción Psicológica*, *VII* (2), 59-70.

Del Olmo, M. J., Rodríguez, C. & Ruza, F. (2010). Music Therapy in the PICU: 0 to 6 Month-Old Babies. *Music and Medicine*, *2* (3) 158-166.

Dimitrova, N. & Moro C. (2013). Common ground on object use associates with caregivers' gesturese. *Infant Behavior and Development, 36*, 618-626.

Eco, U. (1976). *A Theory of Semiotics*. Bloomington: Indiana University Press.

Goldin-Meadow, S., Levine, S., Zinchenko, E., Yip. T., Hemani, N. & Factor, L. (2012). Doing gesture promotes learning a mental transformation task better than seeing gesture. *Developmental Science, 15* (6), 876-884.

Guidetti, M. (2003). *Pragmatique et psychologie du développement. Comment communiquent les jeunes enfants*. Paris: Belin.

Gullberg, M., de Bot, K. & Volterra, V. (2010). Gestures and some key issues in the study of language development. In M. Gullberg & K. de Bot (Eds.). *Gestures in Language Development* (pp. 3-33). Amsterdam: John Benjamins.

Haviland, J. B. (2000). Pointing, gesture spaces, and mental maps. In D. McNeill (Ed.). *Language and gesture* (pp. 13-46). Cambridge: Cambridge University Press.

Kendon, A. (2000). Language and gesture: unity or duality?. In D. McNeill (Ed.). *Language and gesture* (pp. 47-63). Cambridge: Cambridge University Press.

Leavens, D., Hopkins, W. & Bard, K. (2008). The heterochronic origins of explicit reference. In J. Zlatev, T. Racine, C. Sinha & E. Itkonen (Eds.). *The shared mind: Perspectives on intersubjectivity*, (pp. 187-214). Amsterdam/Filadelfia: John Benjamins.

Liszkowski, U. (2010). Before L1. A differentiated perspective on infant gestures. In M. Gullberg & K. de Bot (Eds.). *Gestures in Language Development* (pp. 35-51). Amsterdam: John Benjamins.

Liszkowski, U., Carpenter, M. & Tomasello, M. (2007). Reference and attitude in infant pointing. *Journal of Child Language, 34*, 1-20.

Liszkowski, U., Carpenter, M., Striano, T. & Tomasello, M. (2006). 12-and-18-months-olds point to provide information for others. *Journal Child Language, 7* (2), 173-187.

Matsumoto, D. & Hwang, H. C. (2013). Cultural similarities and differences in emblematic gestures. *Journal of Nonverbal Behavior*, *37*, 1-27.

Matthews, D., Behne, T., Lieven, E. & Tomasello, M. (2012). Origins of the human pointing gesture: a training study. *Developmental Science*, *15* (6), 817-829.

McNeill, D. (2000). Introduction. In D. McNeill (Ed.). *Language and gesture* (pp. 1-10). Cambridge: Cambridge University Press.

Moreno-Núñez, A., Rodríguez, C. & del Olmo, M.J. (*submitted*). The rhythmic, sonorous and melodic components of adult-child-object interactions between age 2 and 6 months.

Moreno-Núñez, A., Rodríguez, C. & del Olmo, M.J. (*submitted*). Development of ostensive and pointing gestures to the others and towards oneself in triadic interactions in 9 to 13 month olds.

Moro, C. & Rodríguez, C. (1991). ¿Por qué el niño tiende el objeto hacia el adulto? La construcción social de la significación de los objetos. *Infancia y Aprendizaje, 53*, 99-118

Moro, C. & Rodríguez, C. (2005). *L'objet et la construction de son usage chez le bébé. Une approche sémiotique du développement préverbal*. Berne-New York: Peter Lang.

Morris, D., Collett, P., Marsh, P. & O'Shaughnessy, M. (1979). *Gestures, their origins and distribution*. London: Jolly & Barber Ltd. Rugby.

Murillo, E. & Belinchón, M. (2012). Gestural-vocal coordination. Longitudinal changes and predictive value on early lexical development. *Gesture, 12,* 1, 16-39.

Osolsobè, I. (1971). The role of models and originals in human communication (the theory of Signs and the Theory of Models). *Language Sciences, 14,* 32-36.

Palacios, P. (2009). *Origen de los usos simbólicos de los objetos en los niños en contexto de comunicación y de interacción triádicos*. Tesis Doctoral inédita. Facultad de Psicología. Madrid: Universidad Autónoma de Madrid.

Pika, S. (2008). What is the nature of the gestural communication of great apes? In J. Zlatev, T. Racine, C. Sinha & E. Itkonen (Eds.) *The shared mind: Perspectives on intersubjectivity*, pp. 165-186. Amsterdam/Philadelphia: John Benjamins.

Reddy, V. (2008). *How infants know minds*. Cambridge: Harvard University Press.

Rodríguez, C. (2006). *Del ritmo al símbolo. Los signos en el nacimiento de la inteligencia.* Barcelona: ICE Universitat de Barcelona/Horsori.

Rodríguez, C. (2007). Object use, communication and sings. The triadic basis of early cognitive development. In J. Valsiner & A. Rosa (Eds.). *The Cambridge handbook of socio-cultural psychology* (pp. 257-276). New York: Cambridge University Press.

Rodríguez, C. (2009). The 'circumstances' of gestures: Proto-interrogatives and private gestures. *New Ideas in Psychology, 27*, 288-303.

Rodríguez, C. (2012). The functional permanence of the object: A product of consensus. In Martí, E. & Rodríguez, C. (Eds.). *After Piaget* (pp. 123-150). Brunswick, New Jersey: Transaction Publishers.

Rodríguez, C. & Moro, C. (1998). *El mágico número tres. Cuando los niños aún no hablan.* Barcelona: Paidós.

Rodríguez, C. & Moro, C. (2008). Coming to Agreement: Object use by Infants and Adults. In J. Zlatev, T. Racine, C. Sinha & E. Itkonen. (Eds.). *The shared mind: Perspectives on intersubjectivity*, (pp. 89-114). Amsterdam/Philadelphia: John Benjamins.

Rodríguez, C. & Palacios, P. (2007). Do private gestures have a Self-Regulatory function? A Case study. *Infant Behavior & Development, 30,* 180-194.

Rossini, N. (2012). *Reinterpreting Gesture as Language.* Amsterdam/Berlin: IOS Press.

Sinha, C. & Rodríguez, C. (2008). Language and the signifying object: From convention to imagination. In J. Zlatev, T. Racine, C. Sinha & E. Itkonen. (Eds.). *The shared mind: Perspectives on intersubjectivity*, (pp. 357-378). Amsterdam/Philadelphia: John Benjamins.

Sosa, N. (2010). *Comunicación intencional prelingüística: ¿Qué pasa con la función interrogativa?* Diploma de Estudios Avanzados inédito, Facultad de Psicología, Universidad Autónoma de Madrid.

Southgate, V., van Maanen, C. & Csibra, G. (2007). Infant Pointing: Communication to Cooperate or Communication to Learn? *Child Development, 78* (3) 735-740.

Sterner, A. & Rodríguez, C. (2012). Valoración de signos de alarma en autismo entre los 9 y los 16 meses de edad. *Psicología Educativa, 18* (2), 145-158.

Tomasello, M., Carpenter, M. & Liszkowski, U. (2007). A New look at Infant Pointing. *Child Development, 78* (3), 705-722.

Winsler, A., Fernyhough, C. & Montero, I. (2009). *Private Speech, Executive Functioning, and the development of verbal self-regulation*. Cambridge: Cambridge University Press.

# Chapter V

## Development of ostensive and indexical gestures and their functions in children from 9 to 13 months old.[9]

### 1. Some theoretical foundations

#### 1.1. Why pointing gestures cannot be par excellence the gesture of shared reference

The classical classification in Psychology of the first intentional gestures is into: (1) deictic, with the referent present (Capirci, Contaldo, Caselli & Volterra, 2005; Capirci & Volterra, 2008; Gliga & Csibra, 2009; Gullberg, de Bot & Volterra, 2010; Iverson, Capirci, Volterra & Goldin-Meadow, 2008; Tomasello & Camaioni, 1997), and (2) symbolic, where the referent is absent (Camaioni, Aureli, Bellagamba & Fogel, 2003; Cárdenas, Rodríguez & Palacios, 2014; Guidetti, 2002; Liszkowski, Schäffer, Carpenter & Tomasello, 2009; Inhelder, Lézine, Sinclair & Stambak, 1972). Within deictic gestures it is necessary to distinguish between ostensive and indexical gestures. Today pointing is the most studied deictic gesture in research about intentional communication and shared reference in nonhuman primates (Leavens, Hopkins & Bard, 2008) and in humans (Andrén, 2010; Liszkowski, Carpenter, Striano & Tomasello, 2006; Liszkowski & Tomasello, 2011; Tomasello, 2004, 2008, 2014). It is highlighted because of its predictive value in language acquisition (Gullberg & de Bot, 2010; Murillo & Belinchón, 2012). Pointing, like language, allow children to: (1) interact

[9] Moreno-Núñez, A., Rodríguez, C. y Miranda-Zapata, E. (*submitted*). Development of ostensive and indexical gestures and their functions in children from 9 to 13 months old. *Gesture.*

with adults, and (2) communicate their intentions, feelings and requests about present but distant referents. This predominance of attention to pointing means that the development of intentional communication in daily interactions, where children and adults communicate with each other about and with closer referents has tended to be overlooked

Furthermore, this general classification of deictic gestures does not sufficiently take into account the underlying semiotic diversity that exists in these gestures. Although in both ostensive and indexical gestures the referent is present, their meanings occur in a very differentiated manner. In ostensive gestures, sign and referent coincide, so they are homomaterics, whereas in pointing sign (gesture) and referent do not coincide, they are heteromaterics (Eco, 1976). Without this differentiation the understanding of the different levels of semiotic complexity gets more difficult for both types of gesture, a particularly important issue when approaching the origin and development of intentional communication in children. Therefore, it is necessary to divide the range of deictic gestures in to at least two subcategories according to their semiotic complexity: (1) *ostensive gestures*, and (2) *indexical gestures*. If ostensive gestures are less complex than indexical ones, children might be expected to understand and produce the former *before* pointing (Rodríguez, Moreno-Núñez, Basilio & Sosa, *submitted*).

### 1.2. Ostensive gestures appear first

According to some authors (Csibra, 2010; Parise & Csibra, 2010, 2013), babies have an innate ability to attend to certain ostensive signals of adults in situations of dyadic interaction. Thanks to these signals children develop a relation with stable and independent objects that introduces them in turn to possible places of action, initially supported by adults. As J. C. Gómez (2009, 2010) points out in relation to nonhuman primates, if ostensive productions are performed intentionaly, they must be understood

as mutual meaning attributions realized by a specialized mechanism that is more closely comparable to emotion than to cognition.

For the semiologists anchored in the Peircian tradition (1987, 1988), ostensive gestures are considered the first instance of active signification (Eco, 1976), and indexical signs are not limited to pointing, but exist in a huge variety of indexical signs that, moreover, can be manifested in several ways, a view which collides in part with more restrictive conceptions characteristic of Evolutionary Psychology. A good example is the studies of Butterworth (1998), who understands the pointing gesture as a natural product (see also Tomasello, 2014) that has to fulfill certain characteristics: it is solely produced with the index finger extended in opposition to the rest of the hand, without touching the referent pointed at, so morphological aspects have a big relevance.

If we consider children's productions, ostensive gestures (give and show) are considered to be intentional and communicative gestures in the classic studies of Bates, Camaioni & Volterra in the 70's (Bates, 1976; Bates, Benigni, Bretherton, Camaioni & Volterra, 1979; Camaioni, Volterra & Bates, 1976). There is neither doubt nor ambiguity. However, as we suggested in the previous section, not only has pointing become the gesture of shared reference par excellence, but even the status of ostensive gestures as being intentional is questioned (Gräfenhain, Behne, Carpenter & Tomasello, 2009; Grosse, Moll & Tomasello, 2010). This is paradoxical if we consider that the latter studies are grounded in the research of Bates, Camaioni and Volterra. It is not an isolated fact if we consider the lack of consensus as to how to define a gesture, probably provoked because its conceptualization has "blurred boundaries" (F.G. Rodríguez, 2012), which make the generation of a definition that satisfies the interests of all authors concerned with communication difficult.

The view continues to gain ground that when there is an object in the hand, there is no longer a gesture, but an action (Andrén, 2010; Goldin-Meadow, Levine,

Zinchenko, Yip, Hemani & Factor, 2012; Liszkowski, 2008), provoking a considerable lack among the vast amount of pointing studies and the minimum references that we have found in the specialized literature regarding ostensive gestures (Clark, 1996, 2003; Dimitrova & Moro, 2012; Moro & Rodríguez, 2005; Mount, 2008; Rodríguez & Moro, 1998). In this sense, it is Clark's classic complaint referring to placing, which he considers a gesture that some aspects by being considered simply as "context" have most likely been left out of the communicative core.

Otherwise, first gestures that allow shared reference between adult and child are not pointing gestures, but ostensive ones, when the adult takes the initiative and presents to the child something of the world. Thanks to ostensive gestures, first triadic interactions are clearly produced at the beginning of life (see at Rodríguez & Moro 2008 ostensive gestures performed by adults from babies two months of age), which allow the child to come to a shared understanding with the other about the external world, and to gain different communicative resources. Ostensive gestures performed by adults are essential in the establishment of shared reference. If in addition these gestures are accompanied of rhythmic components the organization of the interaction is facilitated (Moreno-Núñez, Rodríguez & del Olmo, *submitted*).

From the Pragmatics of the Object perspective (Moro & Rodríguez, 2005; Rodríguez, 2006; Rodríguez & Moro, 1998), ostensive gestures are indeed considered to be gestures. Furthermore, objects are considered complex referents subject to rules, and not a mere "physical reality". This is central to understanding the communicative function of gestures (see discussion in Rodríguez, 2014). From this perspective, the importance of considering the circumstances around gesture production, including objects as a referent, to assess the communicative function that they are performed for is highlighted, especially in the prelinguistic stage of development. This idea leads us to wonder about the possibility of the existence of other communicative functions besides those of the classic imperative and declarative, as we state in the next section.

### 1.3. Functions of gestures: beyond the imperative and declarative

The imperative and declarative functions proposed by Bates, Camaioni & Volterra (1975) have already become classical, and they have been widely accepted. Although the original studies by these authors considered ostensive gestures, it is pointing which is now privileged. In gestures with an imperative function, the adult is used as a way to achieve an end, whereas in gestures with a declarative function it is the child who uses something in the world to attract the adult's attention. Thereby, gestures with a declarative function imply social aspects and cognitive abilities needed for more complex processes such as language development and theory of mind (Liszkowski, 2008).

However, the majority of recent studies that analyzed the communicative function of gestures have been concerned with pointing, while ostensive gestures have been almost completely ignored. This is the case with Max Planck Institute, and by Tomasello and his team (Behne, Carpenter & Tomasello, 2005; Matthews, Behne, Lieven & Tomasello, 2012; Tomasello, Carpenter & Liszkowski, 2007), where it is suggested that the roots of declarative and imperative functions are ontogenetically different (see also Cochet & Vauclair, 2010; Pika, 2008). The declarative function in pointing gestures shows early ways of psychological understanding, since they use other's attention related to referents for reasons that are not purely egocentric. Thus, the child comprehends the other as an attentional and intentional agent. This has important implications for atypical development, e.g. for children with autism, who produce gestures with an imperative function but have difficulty producing gestures with a declarative function (Belinchón & Rivière, 2000; Camaioni, Perucchini, Muratori & Milone, 1997). This would support the thesis that their roots are ontogenetically different.

Beyond the classic functions imperative and declarative, more studies have recently emerged which support the idea that these two do not exhaust all the possible

functions that may occur in intentional prelinguistic communication. Racine & Carpendale (2007) argue that early pointing gestures are used to try to raise a positive emotional reaction in the adult, through directing her attention to external entities. They highlight that it it is to be expected that there is a function related to emotional aspects, a dimension that it is completely absent in Bates' research and that has been barely focused on in recent studies, such as Tomasello's, owing to the focus of attention being centered in socio-cognitive aspects more than in emotional ones.

In more recent studies by Tomasello, with older children than we have discussed so far, a distinction is also made between the declarative expressive and the declarative informative functions (Liszkowski, Carpenter, Striano & Tomasello, 2006; Liszkowski, Carpenter & Tomasello, 2007a, 2007b). The former would be the classic function to share with the other something from the world, either an object or an action; while the latter would consist in the child cooperating with adults, providing them the information that they need and that the child knows they do not have, assuming a much greater scope and complexity from a cognitive point of view.

Likewise, Southgate, van Maanen & Csibra (2007) propose, from the description by Tomasello and his team of the two types of "declarative" pointing, that both are acts of requesting: children point to a specific referent about which they want to obtain information. Pointing gestures would not be either proto-imperatives or proto-declaratives, but seem to have a proto-interrogative nature, whose functions apparently manifest knowledge about what the adult can be expected to know. According to these authors, the data shown by Tomasello's team, more than being motivated by the desire of the child to share or help, seem to show a powerful mechanism of cultural learning because of what information children can obtain from adults, being aware that they are well-informed about the referent.

This interrogative function need not just be performed with pointing, but also with ostensive gestures directed to the adult in contexts of conventional uses of objects. In

these cases, it could imply a child's intention to “question”, requiring the intervention or regulation of the adult in his own actions. In studies performed in natural contexts, with adults and children that interact in a real situation and around a specific task, it has been found that children performed ostensive proto-interrogative gestures expecting regulation from the adult. The subsequent action of the child may be affected, depending on the adult’s reaction. Particularly, these studies provide data of a 15-month-old girl in a triadic interaction with an adult and complex objects, who explicitly requires the adult’s intervention (Moro & Rodríguez, 1991), and with girls between 13 and 16 months old in triadic interactions in a situation with a difficulty in a specific task (Rodríguez & Moro, 1998; Rodríguez, 2006; Sosa, 2010), from which it is concluded that children attribute to adults the capabilities which they themselves lack, or ask explicitly for “the other’s opinion” about how to continue with their own action.

Furthermore, some authors have theoretically argued and adduced evidence of prelinguistic semiotic mediators which may perform functions of self-regulation, such as private pointing gestures (Delgado, Gómez & Sarriá, 2010, 2011) or recognition gestures (Español, 2003, 2007). From the Pragmatics of Objects perspective, self ostensive gestures (Moro & Rodríguez, 2005; Moro, Dutrannois & Béguin, 2014), ostensive and pointing private gestures (Rodríguez & Palacios, 2007), have been identified, and to the latter are added the ostensive gestures directed to the other, accompanied of vocalizations, with a self-regulation function (Basilio & Rodríguez, 2011). From these studies emerges the importance of taking into account the uses of objects and/or instruments, when these kinds of gestures are produced by the child as a way to inform themselves about an event or a state of the world, to complete a certain task, or to help themselves keep their attention on the matter at hand.

Following this argument, in this paper we stress the idea that the object *is part of* the gesture as an *instrument* of communication. A functional explanation of for what purpose the gesture is produced cannot be given without a certain comprehension of

the object referenced in its complexity of use(s), and involving at the same time the circumstances of production (what happened before, during and after). Therefore, it is necessary to emphasize the role of the object used in intentional communicative situations in order to report on the functions that the gesture involved can present.

## 2. Methods

### 2.1. Participants

Six typicaly-developing children were included: three girls and three boys. They were filmed at age 9, 11 and 13 months together with their mothers. The six children are here called Claudia, Gabriela, Diana, Iván, Marcos and Matías (not their real names).

### 2.2. Procedures

The data analyzed for this study consists of longitudinal video recordings of triadic interaction parent-child-object at home. Children were contacted personally. Information about the study was distributed to nursery schools and families, and parents contacted us directly.

Each child was systematically recorded at three observational 10-minutes sessions by the same researcher and with the same 8 objects. Dyads were provided with all the objects together in a box, and parents were asked to sit the child in the middle between the box full of objects and the adult. They were instructed to “Play with your child as you normally would.”

A formal authorization was required to parents in order to register the sessions and to spread and publish the results of the study. Parents also signed an informed acquiescence where the terms of their participation on the study were made explicit and the anonymity of the participants was guaranteed.

| Object | Object in use | Description of the objects |
|---|---|---|
|  |  | CUBES:<br>Four pieces of a construction game, which can be fitted together. The four cubes are large in size (10x6 cm), so the children cannot hold two cubes in one hand at the same time. |
|  |  | PUZZLE:<br>Puzzle (22x22 cm) with four big pieces representing a dog (head, front body, back body) and food, and a knob on top of each one that facilitates children in grasping them. |
|  |  | WIND-UP LADYBUG:<br>Wind-up toy. To use it is necessary to wind the right spring. Its movement and behavior is random, so children are not able to predict where it will go. It also tumbles in the course of its behavior, and this tumbling is also unpredictable. |
|  |  | PUPPY AND KITTY:<br>This item consists of two different articulated figures. The parts that can be moved are head, paws and tail.<br>They make a sound when these parts are rotated. |
|  |  | BUBBLE MAKER:<br>This item consists of two different pieces: a bottle filled with liquid soap and a bubble-wand and cap. In the top of the cap there is also a little plastic ball so it sounds like a rattle when shaken. |
|  |  | SUNNY GEAR:<br>This toy acts as a gear since the two “sunnies” cannot be detached. When one of them is grasped, the other one falls down.<br>They are also filled with small plastic balls, so when shaken they sounded like a rattle. |
|  |  | COW:<br>Small cylinder that reproduces the “moo” of a cow when it is turned upside down. |

TABLE 5.1.

*Objects description.*

### 2.3. Materials

The eight objects (see Table 5.1) were designed specifically for children, and they were from a specialized toy store. They were chosen because they are (1) easy to grasp (given their weight and size), (2) diverse in their possible uses, and (3) these objects, given their complexity of uses, favor children requesting intervention from adults since they meet, at least, one of the following premises: (a) the objects have characteristics of uses that the children are not able to produce on their own, the best example is the case of the WIND-UP LADYBUG, with self-motion (b) three objects (SUNNY GEAR, COW and the small ball inside the top of the BUBBLE MAKER) allow also a sound-making use, so children could ask the adult to act on the object to make a sound.

### 2.4. Data Analyses

Microgenetic, qualitative analysis, frequencies and group comparison were conducted. For transcription ELAN was used (EUDICO Linguistic Annotator, 2011). A transcription protocol series of adult-child-object interactions were categorized on the basis of previous semiotic categories (Rodríguez & Moro, 1998; Rodríguez & Palacios, 2007; Basilio & Rodríguez, 2011). New emergent categories were added, considering the classification of children's gestures and its functions (see Table 2). Sequences of analysis were selected, considering a sequence the period of time when child and adult were acting together with one or more of the objects, in a triadic interaction. To differentiate one sequence from another, the presence of a span of 3 seconds was determined, or a change in the focus of the joint action.

| Semiotic Status | Specific Gestures | Directed To | Gestures Functions |
|---|---|---|---|
| **Ostensive**<br><br>Sign and referent coincide. These are homomateric gestures. Gesture is produced with the same object. The hand is occupied by the object. | Showing<br><br>Child shows the object. | To Self | Explorative<br>Child shows himself the object, but any conventional use is done afterwards. This suggests just an exploration/contemplation of the object. |
| | | | Private<br>Child shows himself the object, and uses it conventionally immediately afterwards. The ostensive gesture is considered private because the child performs a conventional use. The private use implies, then, some "reflection" *with* and *about* the object itself before going back to the conventional use. |
| | | To Other | Imperative<br>Child shows the object to the adult, still grasping it, requesting the other to do something while she controls the action. The child is still keeping control over the object.<br>E.g.: Child dips the wand of the BUBBLE MAKER into the pot, holding the object all the time. Child places the wand in front of adult's mouth for her to blow "bubbles", not releasing it. When adult blows, the course of the action continues. |
| | | | Declarative<br>Child shows the object to the adult to *obtain her attention over his action with the object*.<br>E.g.: Child shakes the COW, making it sound, and then shows it to the adult to *share* his own *action* with the object. |
| | Giving<br><br>Childs gives object to adult. | *To Self* | *It does not exist by definition, the child cannot "give himself"* an object. |
| | | To Other | Declarative<br>*Not found.* |
| | | | Imperative<br>Child gives the object to adult to intervene in some way. Child does not keep controlling the object, giving it totally to the adult.<br>E.g: Child shows himself the PUPPY and gives it to adult, waiting for her to do something. |
| | | | Phatic<br>Child gives the object to adult to include her in his own plan of action, but without subordinating his following acts to adult's answer. Even if adult's answer is positive, child continues playing with another object. It is called phatic in an analogy with the function of language, since it also does not imply informative content.<br>E.g: Child gives *any object* to adult, going back to his own action and not waiting for her to do anything. |

| | | | |
|---|---|---|---|
| **Indexical**<br><br>Sign and referent does not coincide. The referent is distant but present. These are heteromateric gestures. | Touching-Pointing<br><br>Pointing gesture touching the object. This makes the gesture easier to understand, since the referent is clearer. | To Self | Explorative<br>Child points for himself to some *specific* part of the object through his exploration of it, but he does not perform any conventional use after that. It allows children to focus their attention in a specific part of the object. |
| | | | Private<br>Child points for himself to some part of the object to: (1) use it after that, or (2) as an answer to an adult's question.<br>E.g.: Adult turns PUPPY's head as if it was saying "no" and says 'no'. Then, she gives it to child and asks "What is the PUPPY saying?"<br>Child answers pointing PUPPY's head and shaking with his own head. |
| | | To Other | Imperative<br>Child points touching the object that adult is touching for her to act on or with it.<br>E.g: Child points touching the BUBBLE MAKER that adult is holding for her to make bubbles. |
| | | | Declarative<br>Child points touching and looks to adult to share a part of the object. |
| | Pointing<br>Child points a distant referent. | To Self | Explorative<br>*It does not exist by definition.* |
| | | | Private<br>Child points at something distant as if telling himself something.<br>E.g.: Child points the WIND-UP LADYBUG when it is moving away, but he does not look at the adult at any time. |
| | | To Other | Imperative<br>Child points at something distant for adult to do something with it. |
| | | | Declarative<br>Child points at something distant and looks to adult to share the attention with her. |

TABLE 5.2.

*Categories description.*

Data analysis was performed using the following criteria:

(1) children's gesture production, distinguishing ostensive gestures from indexical gestures,

(2) to whom the gesture directed: to themselves or to the adult,

(3) and their functions (explorative and private in the case of gestures directed to self; declarative, imperative and phatic in the case of gestures directed to other).

Coding of 33% of the videos was made by three independent coders. Intercoder reliability was evaluated using ReCal OIR calculator (Freelon, 2010) to obtain the agreement index of Krippendorff's Alpha.

Frequencies and proportion comparison were calculated using SPSS. Categories of functions hierarchically organized were used as dependent variables to compare the complexity of gestures at three different moments of observation. Data were ranked (Conover & Iman, 1981) by the complexity variable and an ANOVA of repeated measure were performed, considering the viability establish by Tanizaki (1997).

## 3. Results

Regarding intercoder reliability, the value obtained for Krippendorff's Alpha was 0.86, which denotes an excellent level of reliability (Cicchetti, 1994).

### 3.1. Total frequencies of global data

Total frequencies of all children's gesture productions in this study are show in Table 5.3. It should be highlighted that from Time1 (T1) self-directed gestures are statistically more frequent than other-directed ones, but progressively this trend is less evident, turning to the opposite tendency at 13 months ($p$<.05). Note that in Table III the columns referred to as gestures to self include productions with two different functions (exploratory and private), the levels of complexity of which are quite different, as we will see further on (section 3.2).

Some characteristics of children's production of gestures are highlighted. On the one hand, *ostensive* gestures are frequently produced compared with *indexical* gestures, this difference is higher at 11 months ($p$<.05). Within ostensive gestures, *showing* is more frequent than *giving* at 9 and 11 months (p<.05) and mainly occurs before. Although *showing* gestures stands out from T1 (9 month olds), they slightly increase ($p$>.05) at T2 (11 month olds) and start to decrease ($p$<.05) by T3 (13 month olds). *Giving* gestures increase greatly at T3 presenting a proportion statistically higher ($p$<.05) than T2 and T1 separately. Giving gestures to self do not exist by definition – since it is not possible to "give things to self"–.

In the other hand, two types of *indexical* gestures were found: *pointing* and *touching- pointing*. The latter is an immediate gesture that is produced in contact with the referent. Classic *pointing* (to a distant referent) is less frequently produced by children at T1 ($p$<.05).

| | Semiotic Status | Ostensive Gestures | | | | Indexical Gestures | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Children Gestures | Showing | | Giving | | Touching-Pointing | | Pointing | |
| | Directed to | Self | Other | Self | Other | Self | Other | Self | Other |
| Age in months | 9 | 101 | 13 | | 1 | 11 | 0 | 0 | 4 |
| | 11 | 117 | 34 | | 6 | 5 | 0 | 1 | 5 |
| | 13 | 72 | 43 | | 37 | 10 | 5 | 4 | 12 |

Table 5.3.

*Absolute frequencies of children's gesture production classified by self or other directed.*

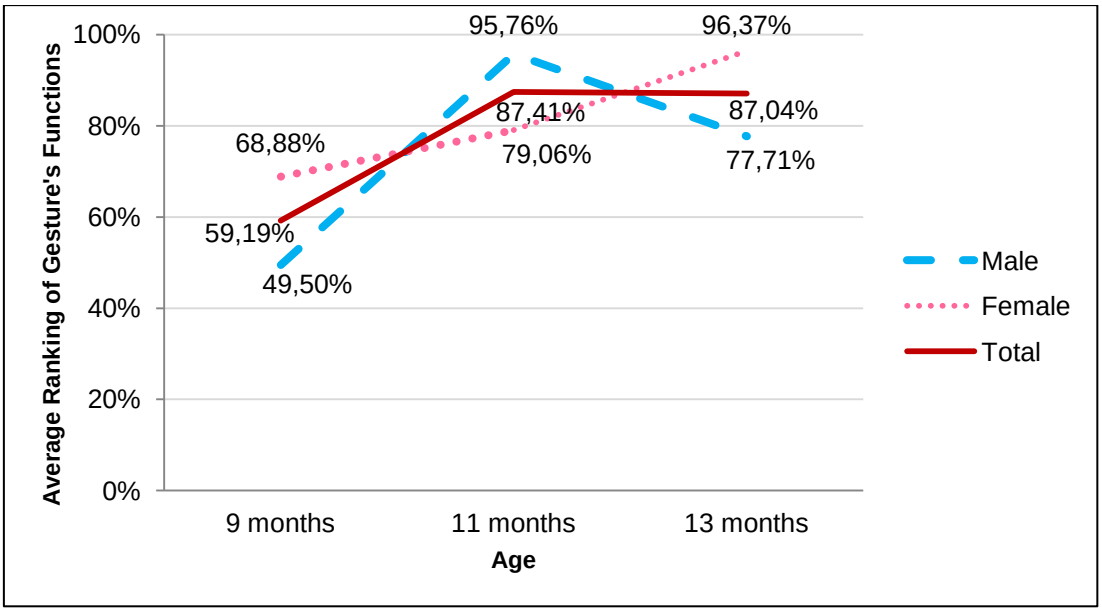
### 3.2. Functions of gestures

An analysis to describe the sort of communicative functions used by children through gestures was performed. According to the categories of the study, five different functions of gestures were found in this study. These five functions can be organized

hierarchically in order to establish different levels of complexity in their production. The categorization is as follows:

- Level 1: *Gestures to self with an explorative/contemplative function.* These gestures form the lowest level. They are directed to self, in a rudimentary way, in the exploration of the object.
- Level 2: *Gestures to other with an imperative function*. Gestures produced to ask the adult to make a change in the object/use (e.g. blow, wind the key, etc.).
- Level 3: *Gestures to other with a declarative function*. Gestures produced to share attention with other around an object/event/situation.
- Level 4: *Gestures to other with a phatic function*. This function was only observed in giving gestures. Children did not look at the adult, did not smile at her, and did not wait for an answer from the adult, they just gave them an object or objects one after the other. These gestures were considered purely communicative. The object is here *the* communication vehicle.
- Level 5: *Gestures to self with a private function*. These imply self-regulation since they are performed in order to consider the object, its properties and possibilities of use. After the gesture, children perform the canonical use of the object or ask the adult to help them to perform it.

Data were sorted according to the ranking of complexity of the gesture's function (see Graph 5.1). An ANOVA of repeated measure were performed to compare the complexity of gestures performed by children in the different moment of observation (T1, T2 and T3).




GRAPH 5.1.

*Interaction of age and gender according to children's gestures complexity.*

The multivariate test of Pillai's Trace shows an interaction effect of age (in months) and gender ($F(2,3)=9.65$, $p=.049$). The sphericity is proved through Mauchly's test ($p>.05$). Also, the test of Within Subjects Effects shows a statistical significance effect of interaction between gender and age ($F(2,8)=638.32$, $p=.006$). This means that boys and girls present statistical differences in the complexity of their gestures within the different periods of observation (T1, T2 and T3). Girls present more complex gestures than boys at T1. However, even when the complexity of both boys and girls increase at T2, boys present a higher complexity of gestures than girls at that time. At T3, girls *increase* and boys *decrease* the complexity of their gestures, to a value below the complexity of girls' gestures.

### 3.2.1. *Ostensive Gestures*

Ostensive gestures (sign and referent coincide) are produced with the object occupying the hand. Children's production of gestures to *show* and to *give* objects to self or to the adult was included in this category.

*Showing Gestures:*

Showing gestures are frequently produced by children at all the ages studied. However, these gestures are shorter in duration in T2 and T3, than in T1, probably because once the adult's attention is caught children turn back to their action and continue doing it. Also, from T2, children do not just show objects, but also the uses of them (e.g. sound the COW, and then show it to the adult). It is more complex to show the use than merely the object, since it implies a greater knowledge about the object and its function.

Many individual differences were founded in showing gestures (see Table 5.4), Four different functions were found in them: exploratory, imperative, declarative and private. An *exploratory function* is present in most productions of self directed showing gestures (self-ostensions). Performances of self-ostensions with an exploratory function were found with all the objects used by the participants.

An *imperative function* was present in showing gestures by just one girl (Claudia, T3), and she did it with the BUBBLE MAKER. She offered the item to her mother to make bubbles, while she held the object herself. She did not give the object to the adult, she just showed the object by placing it in front of her mother's mouth, asking her to blow.

All children frequently used a *declarative function* in other-directed showing gestures, but boys produced them less frequently. These gestures were performed with all the objects.

Fourthly, a *private function* in showing gestures increased progressively in all the children except one (Diana), and these were performed with all the objects.

| SHOWING functions | | | Claudia | | | Gabriela | | | Diana | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months |
| | self | Explorative | 23 | 21 | 4 | 18 | 19 | 10 | 21 | 25 | 6 |
| | other | Imperative | - | - | 8 | - | - | - | - | - | - |
| | | Declarative | 7 | 15 | 15 | 1 | 3 | 7 | 5 | 5 | 9 |
| | self | Private | 2 | - | 9 | 4 | 6 | 8 | 8 | 8 | 4 |

| SHOWING functions | | | Iván | | | Marcos | | | Matías | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months |
| | self | Explorative | 14 | 8 | 4 | 3 | 5 | 6 | 5 | 15 | 12 |
| | other | Imperative | - | - | - | - | - | - | - | - | - |
| | | Declarative | - | 8 | 2 | - | 2 | - | - | - | 2 |
| | self | Private | - | 2 | 1 | - | 3 | 3 | 3 | 5 | 5 |

TABLE 5.4.

*Children's showing gestures with regard to their functions.*

*Giving Gestures*

By definition, giving gestures (see Table 5.5) are always directed to the other person. Two functions were found in giving gestures: imperative and phatic. In this study, there was no giving with a *declarative* function. It is striking that only one production of a giving gesture was found at T1, performed by Claudia with a phatic function (see below).

Only three children used giving with an *imperative* function: Claudia, T2 (with PUZZLE) and T3 (with COW, WIND-UP LADYBUG and BUBBLE MAKER); Iván, T3 (with COW, BUBBLE MAKER and CUBES); and Marcos, T2 and T3 (all with BUBBLE MAKER).

A giving gesture with *phatic function* was produced by the three girls at T3, and in Claudia also at T1 and T2. Among the boys, only Marcos used giving with a *phatic* function, in T2 and T3. It seems that the functional aspects of the objects use were not

important in these giving gestures (children gave *anything*). Objects were pure signs of *communicative intention*, and not a sign of a particular use as it is often the case.

| | | | Claudia | | | Gabriela | | | Diana | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months |
| GIVING functions | other | Imperative | 0 | 1 | 8 | - | - | - | - | - | - |
| | | Phatic | 1 | 1 | 7 | - | - | 5 | - | - | 4 |
| | | | Iván | | | Marcos | | | Matías | | |
| | | | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months |
| GIVING functions | other | Imperative | - | - | 9 | - | 1 | 3 | - | - | - |
| | | Phatic | - | - | - | - | 4 | 1 | - | - | - |

TABLE 5.5.

*Children's giving gestures with regard to their functions.*

### 3.2.2. *Indexical Gestures*

Indexical gestures are those where sign and referent do not coincide. All indexical gestures found in this study are *pointings*. These gestures are produced with an empty hand, but as we will see, the object is not always at a distance.

*Touching Pointing Gestures*

Touching-pointing (see Table 5.6) was distinguished from classic distal points as it was considered that, from a semiotic perspective, it has some ostensive components that help to understand the sign. Touching-pointing removes ambiguity as to the intended referent, since the referent is touched, which makes it easier to understand than pointing to a distal referent.

Not all the children used touching-pointing, however, in those that did, they used them with four functions: explorative, imperative, declarative and private. There are some differences between them that need to be stressed. Firstly, self-directed

touching-pointing was performed at T1 by the three girls, but none of the boys, and always with an *explorative function*. The objects used were the PUPPY, KITTY, CUBES, LADYBUG and COW. Gabriela and Diana keep doing it in T2 and T3 (but not Claudia), with the DOGGY, CUBES and BUBBLE MAKER.

Secondly, other-directed touching-pointings with an *imperative function* were produced in a very specific situation: while the adult was holding the BUBBLE MAKER, the child points at the object touching it as an order to the adult to "keep going with the action" (blow bubbles). This was performed by Claudia (twice at T3), and by Marcos (once at T3).

Thirdly, other-directed touching pointing with a *declarative function* was only used by Claudia (at T3, and just once with the PUZZLE). In this case, this girl, while she was holding a piece of the PUZZLE, points at the base of the object as an answer to the question of the adult ("Where it should be placed?").

| TOUCHING-POINTING functions | | | Claudia | | | Gabriela | | | Diana | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months |
| | self | Explorative | 8 | - | - | 2 | 2 | 4 | 1 | 1 | 4 |
| | other | Imperative | - | - | 3 | - | - | - | - | - | - |
| | | Declarative | - | - | 1 | - | - | - | - | - | - |
| | self | Private | - | 1 | 1 | - | - | - | - | 1 | - |
| | | | Iván | | | Marcos | | | Matías | | |
| | | | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months |
| | self | Explorative | - | - | - | - | - | - | - | - | - |
| | other | Imperative | - | - | - | - | - | 1 | - | - | - |
| | | Declarative | - | - | - | - | - | - | - | - | - |
| | self | Private | - | - | 1 | - | - | - | - | - | - |

TABLE 5.6.

*Children's touching-pointing gestures with regard to their functions.*

Touching pointing with a private function was only performed by Claudia (T2 and T3 with the BUBBLE MAKER), Diana (T2 with the BUBBLE MAKER) and Iván (T3 with the PUZZLE).

*Pointing Gestures*

Despite the low amount of pointing gestures by children (see Table 7), three functions were found: imperative, declarative and private.

Only Claudia performed pointing to other with an *imperative function* at T1. Claudia and Marcos performed some imperative pointings at T2. At T3, imperative pointing was only produced by Gabriela and Marcos.

Once again only Claudia performed pointing to other with a *declarative function* at T1. At T3, declarative pointing was only produced by Diana and Marcos.

Self-directed pointing only occurred with a *private* function. With the exception of Claudia, who did it at T2 with the BUBBLES, all the other instances were performed at T3 by Gabriela (to the box and to something distant), Diana (to the KITTY, the BUBBLES held by the mother and to a fly that entered the room) and Iván (to the BUBBLES).

| POINTING functions | | | Claudia | | | Gabriela | | | Diana | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months |
| other | sel | Explorative | - | - | - | - | - | - | - | - | - |
| other | | Imperative | 2 | 2 | - | - | - | 2 | - | - | - |
| other | | Declarative | 2 | - | - | - | - | - | - | - | 4 |
| sel | | Private | - | 1 | - | - | - | - | - | - | 1 |
| | | | Iván | | | Marcos | | | Matías | | |
| | | | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months | 9 months | 11 months | 13 months |
| other | sel | Explorative | - | - | - | - | - | - | - | - | - |
| other | | Imperative | - | - | - | - | 3 | 5 | - | - | - |
| other | | Declarative | - | - | - | - | - | 1 | - | - | - |
| sel | | Private | - | - | 1 | - | - | - | - | - | - |

TABLE 5.7.

*Children's pointing gestures to distal referents with regard to their functions.*

## 4. Discussion and Conclusions

In view of the results presented here, the first issue to highlight is that from 9 months old children produce many ostensive gestures (showing and giving) with objects and with a communicative and intentional goal. However, the low frequency of indexical gestures (pointing and immediate pointing) is striking.

The imbalance between these types of gestures shows several things: (1) pointing is not the gesture par excellence of shared reference, as is often stated in the literature (Gullberg & de Bot, 2010; Tomasello, 2014; Liszkowski & Tomasello, 2011). This status belongs to ostensive gestures, especially when objects are in a proximal interaction space, as in this study. (2) If we consider the progression of semiotic complexity (Eco, 1976; Peirce, 1987, 1988), ostensive gestures are easier to interpret and to produce given that gesture and refernt coincide (Rodríguez et al., *submitted*), while in indexical gestures, gesture and referent clearly differ and they relate to each other in a distal mode, which requires a greater effort of interpretation and coordination with the other. All of this supports the contention that children communicate with ostensive gestures before pointings. As a consequence, we now have to debate whether ostensive gestures might play a role in the later development of pointing. (3) In this study we present a type of pointing that is not distal, but touches the referent: *touching-pointing.*This gesture incorporates both indexical and ostensive gesture at the same time, which reduces ambiguity as to identification of the referent, reducing the gesture's semiotic complexity. The general lack of interest in this type of gesture in the literature is striking, when, as shown here, children produce them from 9 months of age, and when, as previous studies have shown (Rodríguez & Moro, 1998; Cárdenas et al., 2014), adults also produce them frequently with pre-linguistic children, in communicative-educational situations of task resolution.

Otherwise, in this study we found that children direct their gestures to the other with diverse communicative functions. In addition to the classic *protoimperative* and

*protodeclarative* (Bates et al., 1975), we observed a function that does not fit in any of the descriptions listed in the literature so far. It is a *giving* gesture, but contrary to the other functions found in this study, the pragmatic aspects of the object do not seem to play any role (the child gives *any object*). Thus, the object becomes a pure sign of intentional communication, and not a sign of its use. Given that we have not found similar references in the literature, we have proposed a new category, at a more complex level, as a new communicative function of the giving gesture, which we called the *phatic function*, covering the same function as in language (Jakobson, 1988) when the message has no informative content. The child does not use any other system to show his communicative intention with the adult such as look at the other, smile at her, or wait for her reaction, but seems to make use of the adult simply as a support for his own action, using the object as a communicative vehicle to convey, for example, "I hope that you hold the objects that I am giving to you", "hold on while I am doing things", or "I can do it by myself, but is better if you are there".

We also found gestures directed to self with (1) a basic *exploratory* function where the child shows himself the object, although nothing denotes that he knows the conventional use (Moro & Rodríguez, 2005), and (2) a *private* function when the self-directed ostensive gesture (Basilio & Rodríguez, 2011; Rodríguez & Palacios, 2007) or the pointing (Delgado et al., 2011) are produced *about* the canonical use of the object. We did not find gestures with an interrogative function, in either ostensive gestures (Moro & Rodríguez, 1991; Rodríguez, 2009) or pointings (Southgate et al., 2007; Begus & Southgate, 2012), which could be because the objects used were not complex enough to favor this kind of function.

Considering the type of gestures analyzed in this study, we observe that when children perform an ostensive gesture they *show* more than *give*, and, moreover, show with four functions: (1) *exploratory*, which has been called *self ostensive gestures* in previous studies (Moro, Dutrannois & Béguin, 2014); (2) *declarative*, the high frequency

of showing gestures with this function contradicts the widely accepted idea in the literature according to which the imperative function appears first and is less complex than the declarative (Behne et al., 2005; Cochet & Vauclair, 2010; Pika, 2008; (3) *imperative*, with low frequency could have a self-regulatory function because although it is a gesture directed to the other (a command) the child does not give the object to the mother to control the action at any time, but it is the child who decides what, where and when the adult should act (see also Basilio & Rodríguez, 2011); and (4) *private*, when after showing the object to himself, the child performs a conventional use, which denotes a certain reflection or knowledge about how to use it (Rodríguez & Palacios, 2007).

In relation to the functions of giving gestures, in the literature the idea predominates that the child gives to the other for her to do something with the object (Bates et al., 1975; Capirci et al., 2005) or their functions are not specified (Liszkowski, 2010). Furthermore, we have not found references to giving gestures with a declarative function beyond the studies of Bates et al. (1979) where they talk about give and show as a whole, without any distinction between these gestures. However, it is necessary to analyze *for what* the child *gives* (or shows) the object to the adult, *what is the former expecting* from the latter? Is the child implying that the other as simply a subject that *holds* the object while the action is performed by himself, or as a subject to *share* with, or is it a *request for help* to see or to use something together. Just saying that it is a giving (or a showing) is, according to these results, insufficient to understand the communicative intention of the child (and, hence, the gesture's function).

In this study we observed how children performed giving gestures with two functions: (1) *imperative,* to request an adult to act upon the referent, and (2) *phatic*, a pure communicative situation in which any object will serve the purpose. The child disregards what the other does after that, and seems not to be requesting her regulation. It is not declarative, because the child does not want to just share attention

to the object given, and it is not to cooperate either (Liszkowski et al., 2006, 2007a, 2007b), because the child is not trying to perform an action together with the adult. In the phatic function the object becomes a *pure instrument of communication*, where there are no other indicators of the maintenance of the interaction, such as a gaze to the other or waiting for the adult's reaction.

In relation to indexical gestures (in most cases the literature is referring to pointing), the studies interested in its communicative functions are much more numerous than those concerned with the functions of ostensive gestures. For example, for Vauclair and his team (Vauclair, 2002; Vauclair & Cochet, 2013) the differences on the morphology of the hand could anticipate diverse functions. Imperative pointing gestures would have a morphology closer to grasping the object, while declarative ones would be closer to the morphology of classic pointing. The gesture of "anticipation" of grasping the object, precedes, then, the development of the pointing gesture with an imperative function (on the same line as Camaioni et al., 1976, 1997, postulated about imperative pointing gestures, arguing that they derive from an instrumental action such as an attempt to grasp the object, which is, cognitively less demanding than declarative pointing). Then, imperative pointing arises from an action, while a declarative point would be communicative from its origin.

These ideas, having settled into the literature from Vygotski, who was inspired by Wundt (see discussion in Rodríguez, 2006) are still in force (Cochet & Vauclair, 2010; Liszkowski, 2008). Curiously, the fact that the child is born into a world where adults point repeatedly is ignored (Wilkins, 2003, 2006 even though logic suggest this should play an important role in the genesis of the pointing gesture itself.

Lastly, as we emphasize, to analyze the functions of gestures in the prelinguistic stage it is necessary to consider three aspects (see Rodríguez, 2009): (1) the *type of gesture* according its semiotic complexity (ostensive or indexical), (2) the *object referred to by the gesture*, taking into account that objects have their own pragmatic

properties, and that they are complex referents that could be used to perform very diverse things in daily life. They are not interchangeable, hence the communicative intention changes if the object changes as well. For example, the child that raises the wand of the BUBBLE MAKER to the adult, is requesting her to *blow* (in accordance with its canonical use), or, if the object presented to the adult is the WIND-UP LADYBUG the child is requesting the adult to *wind it up*, and (3) the *circumstances*, which imply the analysis of the specific communicative niche where the gesture is produced. It is not the same to first hear a scream and a shot afterwards rather than the reverse. In the first case the person who screamed could be dead, in the second case they would be the witness.

When children do not yet have elaborate representational semiotic systems, the objects presented through ostensive gestures perform an essential role as *complex referents* and as *instruments of communication*, and they cannot be ignored or trivialized as a mere and evident physical reality. Given that communication is rooted in shared actions through signs in a concrete reality and in concrete contexts, the object acted with is influenced by culture, education and communication itself. To determine the communicative function in gestures, for what purpose children point, show or give an object, we should necessarily consider the object in question, and what its public rules of use are.

In this study we found that children share referents with the other even when they did not yet point, through ostensive gestures. With this predominance of ostensive gestures two things are highlighted: (1) that object can fulfill an intentional communicative function and (2) that this function should be read considering the specific object in question. In this sense, to include gestures with a mixed semiotic status, as in the case of immediate pointing, can help to understand early communicative development. Touching-pointing could be a bridge between the ostensive and indexical worlds. If this is the case, we should analyze if pointing is

developed from ostensive gestures, which would emphasize its importance for the development of intentional communication before language. More research is needed to explore this point.

However, we can state that the ostensive gesture is a gesture in its own right, because it meets the requirements necessary to be considered an instrument of intentional communication. That is, ostensive gestures involve (1) communicating with other about a concrete material referent, and (2) gathering the other and the world together in the same communicative act. The comprehension and production of ostensive gesture develops before pointing, which it is explained if we consider their different semiotic complexity in relation to the referent. To determine the function of gestures (for what purpose children produce them), is to consider the cultural specificity of the use of objects. The difficulty Psychology has to consider the object as material culture and as an instrument of communication should be debated.

## 5. References

Andrén, M. (2010). *Children's gestures from 18 to 30 months*. Lund: Lund University.

Basilio, M. & Rodríguez, C. (2011). Usos, gestos y vocalizaciones privadas. De la interacción social a la autorregulación. *Infancia y Aprendizaje, 34* (2), 181-194.

Bates, E. (1976). *Language and context: The acquisition of pragmatics.* London: Academic Press.

Bates, E., Benigni, L., Bretherton, I., Camaioni, L. & Volterra, V. (1979). *The emergence of symbols: Cognition and communication in infancy.* New York: Academic Press.

Bates, E., Camaioni, L. & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merril-Palmer Quarterly, 21*, 3, 205-226.

Begus, K. & Southgate, V. (2012). Infant pointing serves an interrogative function. *Developmental Science, 15* (5), 611-617.

Behne, T., Carpenter, M. & Tomasello, M. (2005). One-year-olds comprehend the communicative intentions behind gestures in a hiding game. *Developmental Science, 8* (6), 492-499.

Belinchón, M. & Rivière, Á. (2000). El lenguaje autista desde una perspectiva correlacional. *Estudios de Psicología*, *21* (1), 17-37.

Butterworth, G. (1998). Origins of joint visual attention in infancy. *Monographs of the Society of Research in Child Development, 63,* 144-166.

Camaioni, L., Aureli, T., Bellagamba, F. & Fogel, A. (2003). A longitudinal examination of the transition to symbolic communication in the second year of life. *Infant & Child Development, 12,* 1-26.

Camaioni, L., Perucchini, P., Muratori, F. & Milone, A. (1997). Brief report: A longitudinal examination of the communicative gestures deficit in young children with autism. *Journal of Autism and Developmental Disorders, 27* (6), 715-725.

Camaioni, L., Volterra, V. & Bates, E. (1976). *La comunicazione nel primo anno di vita.* Torino: Boringhieri.

Cárdenas, K., Rodríguez, C. & Palacios, P. (2014). First symbols in a girl with Down syndrome: a longitudinal study from 12 to 18 months-olds. *Infant Behavior and Development, 37* (3), 416-427.

Capirci, O., Contaldo, A., Caselli, M.C. & Volterra, V. (2005). From action to language through gesture: A longitudinal perspective. *Gesture, 5* (1), 155-177.

Capirci, O. & Volterra, V. (2008). Gesture and speech: The emergence and development of a strong and changing partnership. *Gesture, 8* (1), 22-44.

Cicchetti D.V. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. Psychological Assessment, *6*(4), 284-290.

Clark, H. (1996). Arranging to do things with others. In Various Authors, *Conference Companion on human factors in computing systems* (pp. 165-167). New York, ACM.

Clark, H. (2003). Pointing and placing. In S. Kita (Ed.). *Pointing. Where language, culture and cognition meet*, (pp. 243-268). Mahwah, New Jersey: LEA.

Cochet, H. & Vauclair, J. (2010). Pointing gestures produced by toddlers from 15 to 30 months: Different functions, hand shapes and laterality patterns. *Infant Behavior and Development, 33,* 431-441.

Conover, W. J., & Iman, R. L. (1981). Rank transformations as a bridge between parametric and nonparametric statistics. *The American Statistician, 35*(3), 124-129.

Csibra, G. (2010). Recognizing communicative intentions in infancy. *Mind & Language, 25* (2), 141-168.

Delgado, B., Gómez, J.C. & Sarriá, E. (2010). Funciones tempranas del gesto de señalar privado: La contemplación y la autorregulación a través del gesto de señalar. *Acción Psicológica, 7* (2), 59-70.

Delgado, B., Gómez, J.C. & Sarriá, E. (2011). Pointing gestures as a cognitive tool in young children: Experimental evidence. *Journal of Experimental Child Psychology, 110*, 299-312.

Dimitrova, N. & Moro C. (2013). Common ground on object use associates with caregivers' gesturese. *Infant Behavior and Development, 36,* 618-626.

Eco, U. (1976). *A theory of Semiotics*. Bloomington: Indiana University Press.

Español, S. (2003) De la emoción al espíritu metafórico. Semiosis e intersubjetividad en el desarrollo humano. *Estudios de Psicología, 24* (3), 277-311.

Español, S. (2007). Lenguaje, comunicación e intersubjetividad: una aproximación desde la psicología del desarrollo. *Subjetividad y procesos cognitivos,* 13-28.

EUDICO linguistic annotator - Elan (Version 4.1.1) [Computational software] (2011). Nijmegen: Max Planck Institute for Psycholinguistics.

Freelon, D.G. (2010). ReCal: Intercoder reliability calculation as a web service. International *Journal of Internet Science, 5* (1), 20-33.

Gliga, T. & Csibra, G. (2009). One-year-old infants appreciate the referential nature of deictic gestures and words. *Psychological Science, 20* (3), 347-353.

Goldin-Meadow, S., Levine, S., Zinchenko, E., Yip. T., Hemani, N. & Factor, L. (2012). Doing gesture promotes learning a mental transformation task better than seeing gesture. *Developmental Science, 15* (6), 876-884.

Gómez, J. C. (2009). Embodying meaning: Insights from primates, autism, and Brentano. *Neural Networks, 22* (2), 190-196.

Gómez, J. C. (2010). The emergence of eye contact as an intersubjective signal in an infant gorilla: implications for models of early social cognition. *Acción Psicológica, 7* (2), 35-43.

Gräfenhain, M., Behne, T., Carpenter, M. & Tomasello, M. (2009). One-year-olds' understanding of nonverbal gestures directed to a third person. *Cognitive Development, 24,* 23-33.

Grosse, G., Moll, H. & Tomasello, M. (2010). 21-Month-olds understand the cooperative logic of requests. *Journal of Pragmatics, 42,* 3377-3383.

Guidetti, M. (2002). Pragmatique et psychologie du développement. Comment communiquent les jeunes enfants. Paris: Belin.

Gullberg, M. & de Bot, K. (Eds.) (2010). *Gestures in language development*. Amsterdam: John Benjamins.

Gullberg, M., de Bot, K. & Volterra, V. (2010). Gestures and some key issues in the study of language development. In M. Gullberg & K. de Bot (Eds.). *Gestures in Language Development* (pp. 3-33). Amsterdam: John Benjamins.

Inhelder, B., Lézine, I., Sinclair, H. & Stambak, M. (1972). Les débuts de la function symbolique. *Archives de Psychologie, 41,* 187-243.

Iverson, J.M., Capirci, O., Volterra, V. & Goldin-Meadow, S. (2008). Learning to talk in a gesture-rich world: Early communication in Italian vs. American children. *First Language, 28,* 164-181.

Jakobson, R. (1988). *Obras selectas.* Madrid: Gredos.

Leavens, D., Hopkins, W. & Bard, K. (2008). The heterochronic origins of explicit reference. In Zlatev, J., Racine, T., Sinha, C. e Itkonen, E. (Eds.), *The shared mind: Perspectives on intersubjectivity,* (pp. 187-214). Amsterdam/Filadelfia: John Benjamins.

Liszkowski, U. (2008). Before L1. A differentiated perspective on infant gestures. *Gesture, 8* (2), 180-196.

Liszkowski, U., Carpenter, M., Striano, T., & Tomasello, M. (2006). 12-and-18-Months-Olds point to provide information for others. *Journal Child Language, 7* (2), 173-187.

Liszkowski, U., Carpenter, M. & Tomasello, M. (2007a). Reference and attitude in infant pointing. *Journal of Child Language, 34,* 1-20.

Liszkowski, U., Carpenter, M. & Tomasello, M. (2007b). Pointing out new news, old news, and absent referents at 12 months of age. *Developmental Science, 10* (2), F1-F7.

Liszkowski, U.; Schäffer, M., Carpenter, M. & Tomasello, M. (2009). Prelinguistic infants, but not chimpanzees, communicate about absent entities. *Psychological Science, 20* (5), 654-660.

Liszkowski, U. & Tomasello, M. (2011). Individual differences in social, cognitive, and morphological aspects of infant pointing. *Cognitive Development, 26,* 16-29.

Matthews, D., Behne, T., Lieven, E. & Tomasello, M. (2012). Origins of the human pointing gesture: a training study. *Developmental Science, 15* (6), 817-829.

Moreno-Núñez, A., Rodríguez, C. & del Olmo, M.J. (*submitted*). The rhythmic, sonorous and melodic components of adult-child-object interactions between age 2 and 6 months.

Moro, C., Dutrannois, V. & Béguin, M. (2014). *Object pragmatics, communicative and language development.* Symposium at the Jean Piaget Society Annual Meeting: Rethinking language and communicative development. San Francisco, USA.

Moro, C. & Rodríguez, C, (1991). ¿Por qué el niño tiende el objeto hacia el adulto? La construcción social de la significación de los objetos. *Infancia y Aprendizaje, 53,* 99-118.

Moro, C. & Rodríguez, C, (2005). *L'objet et la construction de son usage chez le bébé. Une approche sémiotique du développement préverbal.* Bern-Nueva York: Peter Lang.

Mount, A. (2008). Intentions, gestures, and salience in ordinary and deferred demonstrative reference. *Mind & Language, 23* (2), 145-164.

Murillo, E. & Belinchón, M. (2012). Gestural-vocal coordination. Longitudinal changes and predictive value on early lexical development. *Gesture, 12,* 1, 16-39.

Parise, E. & Csibra, G. (2010). How 5-month-old infants integrate ostensive signals: An ERP study. *International Journal of Psychophysiology, 77*, 239-287.

Parise, E. & Csibra, G. (2013). Neural Responses to multimodal ostensive signals in 5-month-old infants. *Plos One 8* (8), 1-9.

Peirce, C. S. (1987). *Obra lógico-semiótica.* Madrid: Taurus.

Peirce, C. S. (1988). *El hombre, un signo (el pragmatismo de Peirce).* Barcelona: Crítica.

Pika, S. (2008). What is the nature of the gestural communication of great apes? In J. Zlatev, T. Racine, C. Sinha & E. Itkonen (Eds.). *The shared mind: Perspectives on intersubjectivity* (pp. 165-186). Amsterdam/Philadelphia: John Benjamins.

Racine, T., & Carpendale, J. (2007). The role of shared practice in joint attention. *British Journal of Developmental Psychology, 25,* 3-25.

Rodriguez, C. (2006). *Del ritmo al símbolo: los signos en el nacimiento de la inteligencia.* Barcelona: Horsori.

Rodríguez, C. (2009). The 'circumstances' of gestures: Proto-interrogatives and private gestures. *New Ideas in Psychology, 27,* 288-303.

Rodríguez, C. (2014). The Connection Between Language and the World: A Paradox of the Linguistic Turn?. *Integrative Psychological and Behavioral Science.* DOI 10.1007/s12124-014-9274-2

Rodríguez, C., Moreno-Núñez, A., Basilio, M. & Sosa, N. (*submitted*). Ostensive gestures come first: their role in the beginning of shared reference. *Cognitive Development*.

Rodríguez, C. & Moro, C. (1998). *El mágico número tres. Cuando los niños aún no hablan.* Barcelona: Paidós.

Rodríguez, C. & Palacios, P. (2007). Do private gestures have a self-regulatory function?: A case study. *Infant Behavior and Development, 30* (2), 180-194.

Rodríguez, F.G. (2012). El hermano menor de la palabra. Panorámica de los estudios sobre el gesto. *Psiencia, Revista Latinoamericana de Ciencia Psicológica, 4* (1), 43-56.

Sosa, N. (2010). Comunicación intencional prelingüística: ¿Qué pasa con la función interrogativa?. Diploma de Estudios Avanzados (inédito). Universidad Autónoma de Madrid.

Southgate, V., Van Maanen, C. & Csibra, G. (2007). Infant Pointing: Communication to Cooperate or Communication to Learn?. *Child Development, 78* (3), 735-740.

Tanizaki, H. (1997). Power comparison of non-parametric tests: Small-sample properties from Monte Carlo experiments. *Journal of Applied Statistics, 24*(5), 603-632.

Tomasello, M. (2004). Learnig throug others. *Daedalus Winter, 133* (1), 51-58.

Tomasello, M. (2008). *Origins of human communication.* Cambridge: MIT Press.

Tomasello, M. (2014). *A natural history of human thinking.* Cambridge: Harvard University Press.

Tomasello, M. & Camaioni, L. (1997). A comparison of the gestural communication of apes and human infants. *Human Development, 40,* 7-24.

Tomasello, M., Carpenter, M., & Liszkowski, U. (2007). A new look at infant pointing. *Child Development, 78,* 705-722.

Vauclair, J. (2002). The emergence of a new paradigm in ape language research. *Behavioral and brain sciences, 25,* 605-656.

Vauclair, J. & Cochet, H. (2013). Hand preference for pointing and language development in toddlers. *Developmental Psychobiology, 55,* 757-765.

Wilkins, D. (2003). Why pointing with the index finger is not a universal (in sociocultural and semiotic terms). In S. Kita (Ed.). *Pointing: where language, culture, and cognition meet* (pp. 171-215). Mahwah, N.J.: Lawrence Erlbaum Associates.

Wilkins, D. (2006). Adam Kendon (2004). Gesture: Visible action as utterance. *Gesture, 6,* 119-119.

# Chapter IV

## Conclusions

This thesis aims to highlight the importance to reconsider triadic interactions (child-adult-object) beyond the classical view that places them by the end of the first year, when the child is already able to intentionally communicate about the world. In this line, we propose that there might be other kind of triadic interaction, where the intention does not come from the child, but from an adult with a clear communicative-educational goal, who introduces the child from the first months of life in situations of interaction with objects. Early in life, adult plays an essential role in children development, approaching them the world in an organized communicative context, and allowing them to get progressively involved in the interaction. The adult promotes child's first contacts with the world at two months of age long before there will be any communicative purpose by the baby. In response to adult's action, children pay attention to the interaction, returning their interest in adult's proposals through the (still few) resources they have: emotional expression, vocalizations or bodily movements. These responses, as shown in the microgenetic graphs presented in Chapter III (Graph 3.2 to 3.7), will become more complex as the child grows and acquires new skills, which, added to the fact that adult gives him/her more often the object, allow the entrance in the uses of objects –even though he/she still does it in a very basic way.

From this broader conception of triadic interactions between adult, baby and objects, the protagonist in this thesis corresponds to ostensive actions (both gestures and uses of objects). Throughout the three studies we conducted, it has been shown that ostensive actions are intentional communication tools that allow the establishment

of shared reference from the first months of life, due to adult's intention. Respecting to children, we also observed they understand adult's ostensive gestures and uses from 2 months (indicated by emotional responses, sustained attention, and from 3 months, anticipations to grip the object), and how they produce ostensive gestures from 9 months of age, before pointing. The answer to these differences in both comprehension and production may reside, following the semiotic thesis (Eco, 1976; Peirce, 1987), in their also different semiotic complexity. As we indicated above, ostensive gestures, where sign and referent coincide, are more "readable" to the other since there is no ambiguity about the referent, as occur with distal pointing gestures. This is probably the reason that makes them so frequent in adult's actions directed to the baby in the first months of life, also reinforced because its effectiveness in attracting the attention/action of the child. For these triadic interactions to occur, the presence of rhythm as an organizer of the interaction is required. This could conform one of the first systems of meanings that allow the establishment of shared reference.

The pilot study conducted as a first step of this research has opened the way to investigate the importance of the communicative and educational role of adult's interaction proposals (see Chapter II). The microgenetic analysis of the presentations that the adult performed with two objects (sonorous and non sonorous) for the baby at 2, 4 and 6 months of age, revealed the importance that adults brin to the rhythmic, sonorous and melodic components as a semiotic system, ensuring that the child is included in the interaction, and preferably selecting this type of uses over other less organized, which help her to organize the action directed to the child. Already in this exploratory study, rhythm emerged as a key element in adult-infant-object relationship. Thanks to rhythm, not only converge the interest and attention of children for the object, but also their action, becoming a powerful medium where the first triadic interactions take place. Rhythm helps the adult to provide the child with objects and a communicative and educational intention, generating interesting spaces of

performance for the baby, which favor his/her entry into the first meanings related to objects. Meanwhile, the child is constantly paying attention from 2 months, acquiring skills that will allow him/her to perform the first uses of objects. Thus, we observe some precursors to conventional uses of objects at 4 months of age, as well as the first conventional uses of the sonorous ring at 6 months. In addition, at 6 months, children exploration of objects includes different types of rhythms and sonorities that they obtain from the percussion of the rings with different surfaces. This study concluded that rhythmic-sonorous components could be one of the first semiotic systems observed in development, and also they were related to the use of the object. Furthermore, these results suggested that the entry of children in triadic interactions could occur when the adult introduces him to his own course of action, and not just at the end of the first year of life as it is often defended in early development literature.

Relative to the first thesis study (see Chapter III), with children from 2 to 4 months old, several aspects need to be highlighted. As showed in the results, the objects are shown, given and used in an ostensive way by adult long before the child takes the initiative or is able to use it independently. Moreover, the adult did not present the objects in any way, but she incorporates rhythmic and sonorous components along the three observation times. Arguably the object is "musicalized", contributing to to structure the interaction. The child is in contact with objects from the beginning of the study through the action of the adult, but the organization of the interaction changes in the three ages. So at 2 months adults perform immediate demonstrations (directly touching the body of the child), which gradually disappear from the repertoire of communicative mediators of the adult over the three sessions, in favor of an increasement of distant demonstrations. These, in turn, have a strong presence at two months, going accompanied by rhythmic and sonorous components. These presentations are characterized by a binary character, short duration, and include frequent pauses (silences in musical language), making them clearly structured and

favoring the child to "engage" to them easily. Nevertheless, not all cases in which these components are include, result in a structured action of the adult: sometimes, the adult does not include pauses, provoking a very prolonged action hard to follow by the child at this age. From 3 months the adult prolonged her pauses and gradually spaces her actions, consequently giving the scope of action necessary for the child to also use the object. Note that no adult performs pointing gestures to communicate with children in this age, at least not before 4 months of age.

In turn, the child, at two months, maintains a steady attention to adult's action throughout most of the session, only interrupted in further sessions when is the baby who grasps MARACA (either by adult's initiative or by his/her own). The baby is able from two months to grasp things if the adult gives it to him/her, but he/she could not join the action with the object if the adult does not favor it. From 3 months we observed how the child directs his/her open hand to adult's showing of the MARACA, which may involve some anticipation from the child to adult's action, as ostensive actions of adults are often followed from 2 months of a giving gesture. This anticipated "attempt to grasp" , that already occurs from 3 months old, would question that this rest solely on children's solitary activity, but rather may be initially supported by an intentional communicative act promoted by an adult (when gets the object and offers it to the baby). The attempt to grasp could arise from the anticipation of the child, which in turn is originated in the realization that the adult will give him/her the object after the use. This, at the same time, could lead to the bases of the child's first uses of objects, which take place around 4 months of age, when children shake the MARACA, as shown in the results.

Regarding the second study of thesis (see Chapter V), on it we emphasizes the high frequency of ostensive productions by children from 9 months of age, compared to little or no frequency of pointing gesture in these contexts. Furthermore, considering the semiotic status of the gesture, we distinguishe gestures with mixed character. That

is the case of touching-pointing (with ostensive and indexical components, because the gesture touches the referent). This gesture originally seems to act as part of children's exploration of the object, which could be related to how adults use objects to the child (what is pointed, is often the part of the object acted previously by adult). We could say that the first gesture productions of children probably proceed from the type of action where adults include them from many months before. From 9 months old, children communicate with ostensive gestures to show and to give to the adult, rather than with indexical gestures (immediate and distal pointing gestures), which are produced less and later (between 11 and 13 months old). This inequality of production of both gestures question that pointing gesture is the gesture of shared reference, corresponding this status to ostensive gestures. It has been evidenced once again that objects can be instruments of communication itself.

We should dedicate some space in this thesis conclusions to the importance of analyze the communicative functions that children incorporate to their first productions of gestures. In this thesis we observed that children produce gestures with different functions. These, which include the classic imperative and declarative, are extended when considering what kind of gestures is, what part of the world acts as a referent, and the specific production circumstances. Thus, we have also described the functions of gestures directed toward themselves, distinguishing between an exploratory function, which does not indicate that the child knows the conventional use of the object, and a private function when the gesture occurs in relation to the canonical use of the object. In addition, we added to functions directed to the other the phatic function of giving gestures, in an analogy to the function of language, in which the pragmatic characteristics of the object did not fulfill any role.

The results described here support the thesis that, when children do not have more elaborated representational systems, the objects presented (more often through

ostensive gestures) play an essential role as complex referents and communication tools. These referents are shared by adults in the first months of life with the child, and by the child with the adult later, long before pointing gestures are involved in the interaction. The ostensive gestures that the child begins to produce around 9 months cannot be considered as the first contact he/she has with such gestures, since the adult used them (and no others) to present him/her different objects in the first months of life. These presentations repeatedly are wrapped by bunches of sign systems, within the rhythmic and sonorous stand out, but they can also be attached to others (from emotional components, to others more complex as language). The ideas widely accepted in the literature about the origin of shared reference seem to be still far away from explaining the process of how it emerges, for which ostensive gestures and uses should be located in the center of attention, both in adult's productions in the early months, and children's around the end of the first year.

## The microgenetic analysis as a method of study: a qualitative perspective

Although, as seen previously large part of the current research in cognitive and communicative development are based on the important foundations laid by Bates and her team in the 70s, the methodological tradition focused on studies in natural settings has gradually disappear until now, while the studies conducted in laboratory settings have been gaining ground. This fact could be causing the elimination of aspects also important for the analysis. The recent studies used to control excessively what is intended to elicit in the child, barely considering the communicative functions of gestures. The control of the variables has been emphasized in the analyses, ignoring the plurality that characterizes the interactions.

In this thesis we adopt the methodological perspective from classical European trend of research (Bates et al., 1975; Lock, 1978; Lock & Strong, 2010; Trevarthen,

2003), where the data is collected in natural contexts following a Piagetian tradition of human development. Nevertheless, epistemologically we adopt an opposite position of this classic works, that part from a naturalized view of development, while here we defend its social and cultural construction through interactions with others and with the world.

We have adopted a microgenetic approach to development that allows us to observe child-object-adult interactions from a sufficiently exhaustive level of detail, to determine the communicative niche in which the first communicative gestures are developed (both by the adult in the first months of life, as by the child around the end of the first year). Only then we can focus on how the adult gradually introduces the child into the material world. This allows the child to appropriate of different communicative resources that the other already have, and offered him/her since early on in situations of communicative and educational interaction.

This thesis has important implications not only for a better understanding of what happens before the development of language in typically developing children, but also to reach a better understanding of how to improve interventions with atypically developing children.

Studies like the ones presented here could (and should) make us think about the psychological evaluations conducted nowadays, especially those related to communicative development, which do not consider the signs in relation to their function and in interaction with the other, regarding the referents included in the scene. This has important implications for atypical development, as is the case for example of children with autism, where have been observed great difficulties related to intersubject agreements about the referents.

## Constraints

Ultimately, it is necessary to refer to some of the constraints that emerge from this thesis. Mainly, more research is required on these "other" triadic interactions advocated here and that differ from the classic conception. Although it is true that for adults such situations are "more triadic" than for the child, that does not prevent that interaction changes when change the object, as showed in several data from the results (see Chapters II and III). The nature of communication varies if the object that acts as a referent does so.

Also, in this thesis we focused on how the first intentional triadic interactions arise in children: about 9 months, as we have seen, children launched without difficulty a range of communication tools, so they must begin to build them before. It is necessary, therefore, more research on how is produced the transfer of intenttion from adult to infant, for what we would have to extend the age of study, including the period between 5 and 8 months, which in this thesis has not been addressed for exceeding the limits of the research objectives. However, this thesis itself possibly supplies some clues to their origin, heavily mediated by the adult, and where the transfer of adult to child intentionality could occur sometime between 5 and 8 months.

A more thorough analysis of how are the rhythmic-sonorous interactions could also be done, for which possibly newborn babies should be included in the analysis, to allow us to assess whether, indeed, the rhythmic and sonorous are the first semiotic systems that appear in development. In addition, efforts should be made to increase the sample size, since the current prevents inferences, involving bias due to their own individual differences. However, in that case we should also adapt the method of analysis, since the exhaustive level of detail that is required for microgenesis is hardly applicable to large population samples. It is also necessary a better suitability of the objects presented to the child, so different objects, sonorous and non sonorous, should

be selected, to have a collection that includes appropriate objects for the different ages studied.

Future research should address the nocessity to continue developing studies that investigate the importance of rhythmic and sonorous components in adult-infant interaction during the first year of life. It is necessary to conduct a more thorough project of research, which includes ages that for various reasons have not been addressed in this one. The possible research would be targeted in further deepen analysis of the development of ostensive gestures, as well as the transfer of intention from adult to child in the first year of life. This thesis could lead to studies concerned about analyze musically adult's rhythmic-sonorous performances, in order to determine if any common rhythmic patterns may occur between participants. Also, if after 4 months of age we introduce a sonorous object, it could analyze whether these rhythmic and sonorous components are also present in the earliest uses of the children. Obviously, we do not expect intentional rhythms in very young children, at least as deliberate as the rhythms observed in adults.

Notwithstanding, according to our epistemological concepts, future studies will also follow a design of research in natural settings, putting the interaction in sufficiently broad contexts that allow us to observe genuine communicative situations with and in relation to objects.

## References

Bates, E., Camaioni, L. & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly, 21* (3), 205-226.

Eco, U. (1976). *Tratado de semiótica general.* Barcelona: Lumen.

Lock, A. (1978). *Action, gesture and symbol: The emergence of language.* London: Academic Press.

Lock, A & Strong, T. (Eds.) (2010). *Social constructionism: Sources and stirrings in theory and practice.* Cambridge: Cambridge University Press.

Peirce, C. S. (1987). *Obra lógico-semiótica.* Madrid: Taurus.

Trevarthen, C. (2003). *Conversations with a two-month-old.* Philadelfia: Whurr Publishers.

# Capítulo IV

## Conclusiones

Esta tesis pretende poner de relieve la importancia de reconsiderar las interacciones triádicas (adulto-niño-objeto) más allá de la concepción clásica que las sitúa hacia el final del primer año, cuando el niño ya es capaz de comunicarse intencionalmente acerca del mundo. En esta línea, se propone que podría existir otro tipo de interacción triádica, donde la intencionalidad no proviene del niño, sino de un adulto con un objetivo comunicativo-educativo claro, que introduce al niño desde los primeros meses de vida en situaciones de interacción con objetos. En los primeros meses de vida el adulto jugaría un papel esencial en el desarrollo de los niños, acercándoles el mundo en un contexto comunicativo organizado, y permitiéndoles involucrarse en la interacción progresivamente. El adulto promueve de este modo los primeros contactos del niño con el mundo desde los dos meses de edad, mucho antes de que exista intencionalidad comunicativa por parte del bebé. En respuesta a la acción del adulto, los niños se muestran atentos a la interacción, devolviéndole interés por sus propuestas a través de los (aún pocos) recursos de los que dispone: expresión emocional, vocalizaciones o agitación corporal. Estas respuestas, como muestran las gráficas microgenéticas recogidas en el Capítulo III (Gráficas 3.2-3.7), se van complejizando a medida que el niño crece y adquiere nuevas habilidades, lo que, sumado a que el adulto cede cada vez en más ocasiones el objeto al niño, permite que éste comience a usar los objetos –aunque aún lo haga de una manera muy básica–.

Partiendo de esta concepción más amplia de las interacciones triádicas entre adulto, bebé y objetos, el protagonismo en esta tesis corresponde a las ostensiones

(tanto gestos, como usos de los objetos). A lo largo de los tres estudios desarrollados, se ha mostrado que las ostensiones son instrumentos de comunicación intencional, que permiten el establecimiento de la referencia compartida desde los primeros meses de vida gracias a la intención del adulto. En lo que respecta a los niños, se ha observado además cómo comprenden los gestos y usos ostensivos del adulto desde los 2 meses (indicado mediante respuestas emocionales, atención sostenida y, desde los 3 meses, anticipaciones al agarre del objeto), y cómo producen ostensiones desde los 9 meses de edad, antes que los gestos de señalar. La respuesta a estas diferencias tanto en comprensión como en producción podría encontrarse, siguiendo las tesis semióticas (Eco, 1976; Peirce, 1987), en su también distinta complejidad semiótica. Como ya se ha indicado anteriormente, las ostensiones, donde signo y referente coinciden, son más “legibles” para el otro puesto que no existe ambigüedad acerca del referente, como ocurre con los gestos de señalar distales. Esto es posiblemente lo que las haga tan recurrentes en las acciones del adulto cuando se dirige al bebé en los primeros meses de vida, reforzándose además por su eficacia a la hora de atraer la atención/acción del niño. Para que estas interacciones triádicas ocurran, se requiere la presencia del ritmo como organizador de la interacción. Todo esto podría conformar uno de los primeros sistemas de significados que permiten el establecimiento de la referencia compartida.

El estudio piloto desarrollado como primer paso de esta investigación ya abrió el camino para indagar en la importancia del papel comunicativo y educativo de las propuestas de interacción del adulto con el niño y los objetos (ver Capítulo II). El análisis microgenético de las presentaciones que el adulto realizaba de dos objetos (sonoro y no sonoro) para el bebé a los 2, 4 y 6 meses de edad, puso en evidencia la importancia que otorgaba a los componentes rítmicos, sonoros y melódicos como sistemas semióticos que aseguraban que el niño se incluyese en la interacción, seleccionando preferentemente este tipo de usos sobre otros menos organizados y

ayudándose de ellos para organizar la acción dirigida al niño. Ya en este estudio exploratorio, el ritmo se erigió como un elemento clave en la relación adulto-bebé-objeto. Gracias al ritmo no solo convergen el interés y la atención de niño y adulto sobre el objeto, sino también su acción, convirtiéndose en un potente medio donde las primeras interacciones triádicas tienen lugar. El ritmo ayuda al adulto a proveer al niño de objetos con una intención comunicativa y educativa, generando espacios de actuación interesantes para el bebé, que favorecen su entrada en los primeros significados en relación a los objetos. El niño, por su parte, además de la atención sostenida que ya se observa desde los 2 meses, va adquiriendo habilidades que le permiten realizar sus primeros usos de objetos. De este modo, se observaron premisas a los usos convencionales de objetos a los 4 meses de edad, así como los primeros usos convencionales del ARO SONORO a los 6 meses. Además, a los 6 meses, la exploración de los objetos por parte de los niños ya incluía diferentes tipos de ritmos y sonoridades que obtenían a partir de la percusión de los AROS con distintas superficies. De este estudio se concluyó que los componentes rítmico-sonoros podrían constituir uno de los primeros sistemas semióticos observados en el desarrollo, y que además éstos estaban relacionados con el uso del objeto. Asimismo, estos resultados sugerían que la entrada de los niños en las interacciones triádicas podría tener lugar cuando el adulto le introduce en su propio curso de la acción, y no únicamente al final del primer año de vida como a menudo se defiende en la literatura en desarrollo temprano.

En relación al primer estudio de tesis (ver Capítulo III), con niños de 2 a 4 meses, varios aspectos requieren ser destacados. Como muestran los resultados, los objetos son mostrados, dados y usados de manera ostensiva por el adulto mucho antes de que el niño tome la iniciativa o sea capaz de hacerlo de manera independiente. Además, el adulto no le presenta los objetos de cualquier manera, sino que incorpora componentes rítmico-sonoros a lo largo de los tres tiempos de observación. Podría

decirse que el objeto “se musicaliza”, lo que contribuye a la estructuración de la interacción. El niño está en contacto con objetos desde el principio del estudio gracias a la acción del adulto, pero la organización de la interacción cambia en las tres edades. Así, a los 2 meses abundan las demostraciones inmediatas (tocando directamente el cuerpo del niño), que van desapareciendo del repertorio de mediadores comunicativos del adulto a lo largo de las tres sesiones, en favor de un aumento de las demostraciones distantes. Éstas, por su parte, tienen una fuerte presencia desde los dos meses, yendo acompañadas por componentes rítmico-sonoros. Estas presentaciones se caracterizan por tener un carácter binario, ser de corta duración, e incluir frecuentes pausas (silencios en lenguaje musical), lo que las hace claramente estructuradas y favorece que el niño se “enganche” a ellas con facilidad. No obstante, no todas las ocasiones en las que estos componentes se incluyen, resulta en una acción estructurada del adulto: a veces, el adulto no incorpora pausas, lo que resulta en una acción muy prolongada difícil de seguir por el niño a estas edades. A partir de los 3 meses el adulto prolonga sus pausas, espaciando así paulatinamente sus acciones, y por consiguiente cediendo el espacio de acción necesario para que el niño también use el objeto. Cabe destacar que ningún adulto realiza gestos de señalar para comunicarse con los niños en estas edades, al menos no antes de los 4 meses de edad.

Por su parte, el niño, desde los dos meses, mantiene una atención sostenida hacia la acción del adulto a lo largo de casi toda la sesión, viéndose únicamente interrumpida en edades posteriores cuando es él mismo quien agarra la MARACA (bien por iniciativa del adulto o propia). El bebé es capaz desde los dos meses de agarrar cosas si el adulto se las da, pero su incorporación a la acción con el objeto sería imposible si el adulto no lo favoreciese. Desde los 3 meses se ha observado como el niño dirige su mano abierta hacia la ostensión que el adulto realiza de la MARACA, lo cual podría suponer cierta anticipación del niño ante la acción del adulto, ya que las

ostensiones frecuentemente están seguidas desde los 2 meses de un gesto de dar el objeto. Ese “intento de agarrar” anticipado, que ya ocurre desde los 3 meses de edad, cuestionaría que esto repose únicamente sobre su actividad solitaria, sino que más bien podría estar apoyándose inicialmente en un acto comunicativo intencional promovido por el adulto (cuando coge el objeto y se lo ofrece al bebé). El intento de agarrar podría nacer de la anticipación del niño, que a su vez se origina en la comprensión de que el adulto le va a dar el objeto tras su uso. Esto, a su vez, podría suponer las bases de los primeros usos de objetos del niño, los cuales como muestran los resultados tienen lugar en torno a los 4 meses de edad, cuando los niños agitan la MARACA.

En relación al segundo estudio de tesis (ver Capítulo V), destaca la alta frecuencia de producciones ostensivas por parte de los niños desde los 9 meses de edad, frente a la poca o nula frecuencia del gesto de señalar en estos contextos. Además, el considerar el estatus semiótico del gesto, permite distinguir gestos de carácter mixto. Ese es el caso del pointing inmediato (con componentes ostensivos e indiciales, ya que el gesto toca el referente), que en su origen parece actuar como parte de su exploración del objeto, lo que podría estar relacionado con cómo los adultos usan los objetos para el niño (lo que señala, es frecuentemente la parte del objeto que el adulto ha actuado). Podríamos decir que, probablemente, las primeras producciones de los niños proviniesen del tipo de acción en la que el adulto le incluye desde muchos meses antes. Desde los 9 meses los niños se comunican con gestos ostensivos de mostrar y de dar hacia el adulto, antes que con gestos indiciales (gestos de señalar distales e inmediatos), los cuales son producidos menos y más tarde (entre los 11 y los 13 meses). Esta desigualdad de producción de ambos gestos cuestiona que el gesto de señalar sea el gesto de la referencia compartida, siendo los gestos ostensivos a quienes corresponde este estatus. Se pone en evidencia una vez más que los objetos sí pueden ser instrumentos de comunicación.

Cabe dedicar un espacio en estas conclusiones a la importancia de analizar las funciones comunicativas que los niños incorporan a sus primeras producciones de gestos. En esta tesis se ha observado que los niños producen gestos con diversas funciones. Éstas, que incluyen las clásicas imperativa y declarativa, se amplían al considerar qué tipo de gestos es, así como qué parte del mundo actúa como referente y sus circunstancias concretas de producción. De este modo, se han descrito también las funciones de los gestos del niño dirigidos hacia sí, distinguiendo entre una función exploratoria, que no indica que el niño conozca el uso convencional del objeto, y una función privada, cuando el gesto se produce en relación al uso canónico del objeto. Además, a las funciones dirigidas hacia el otro se ha añadido la función fática del gesto de dar, en analogía con la función del lenguaje, en la que las características pragmáticas del objeto no cumplían ningún papel.

Los resultados aquí descritos apoyan la tesis de que, cuando los niños no disponen de otros sistemas representacionales más elaborados, los objetos presentados (más frecuentemente a través de gestos ostensivos) juegan un papel esencial como referentes complejos e instrumentos de comunicación. Estos referentes son compartidos por los adultos desde los primeros meses de vida con el niño, y por el niño con el adulto desde mucho antes de que los gestos de señalar sean involucrados en la interacción. Los gestos ostensivos que el niño comienza a producir alrededor de los 9 meses no pueden ser considerados el primer contacto que el niño tiene con este tipo de gestos, ya que el adulto recurre a ellos (y nunca a otros) en los primeros meses de vida para presentarle diferentes objetos. Estas presentaciones en numerosas ocasiones van arropadas por racimos de sistemas de signos, de entre los que destacan los rítmico-sonoros, pero que también pueden ir unidos a otros (desde los componentes emocionales hasta otros más complejos como el lenguaje). Las ideas tan ampliamente aceptadas en la literatura acerca del origen de la referencia

compartida parecen estar aún lejos de explicar el proceso de cómo emerge, para lo cual los gestos y usos ostensivos deben ser situados en el centro de atención, tanto en las producciones de los adultos en los primeros meses, como en las de los propios niños en torno al final del primer año.

## El análisis microgenético como método de estudio: una perspectiva cualitativa

A pesar que, como se ha visto anteriormente, gran parte de los estudios actuales en desarrollo cognitivo y comunicativo parten de las importantes bases sentadas por Bates y su equipo en los años 70, la tradición metodológica centrada en estudios en contextos naturales ha ido paulatinamente desapareciendo hasta la actualidad, a la vez que han ido ganando terreno los estudios realizados en contextos de laboratorio. Este hecho podría estar provocando que se eliminen del análisis aspectos que también resultan importantes, al controlar en exceso qué es lo que se pretende elicitar en el niño, tomando en consideración pocas veces las funciones comunicativas de los gestos. El control de las variables ha sido tan acentuado en los análisis, que se han dejando de lado la pluralidad que caracteriza a las interacciones.

En el presente trabajo se adopta una perspectiva metodológica que parte de la clásica tendencia europea de investigación (Bates et al., 1975; Lock, 1978; Lock y Strong, 2010; Trevarthen, 2003), donde los datos se recogen en contextos naturales, siguiendo una tradición piagetiana del desarrollo humano. No obstante, epistemológicamente se adopta una postura opuesta a los trabajos clásicos que parten de una visión naturalizada del desarrollo, mientras que aquí se defiende la construcción social y cultural del mismo a través de las interacciones con los otros y con el mundo.

Hemos adoptado un enfoque microgenético del desarrollo, que nos permite observar a un nivel de detalle lo suficientemente exhaustivo las interacciones adulto-

niño-objeto, para determinar cuál es el nicho comunicativo en el que se desarrollan los primeros gestos comunicativos (tanto por parte del adulto en los primeros meses de vida, como por parte del niño hacia el final del primer año). Sólo así se puede poner el foco en cómo el adulto introduce gradualmente el mundo material al niño. Esto permite al niño apropiarse de diferentes recursos comunicativos de los que el otro ya dispone, y que le ofrece desde el principio en situaciones de interacción comunicativo-educativas.

Este trabajo tiene importantes implicaciones, no sólo para una mejor comprensión de lo que ocurre antes de que el lenguaje oral emerja en niños de desarrollo típico, sino también para el desarrollo de una mejor comprensión de cómo mejorar las intervenciones ante niños de desarrollo atípico.

Estudios como el que aquí se presentan podrían (y deberían) hacernos reflexionar acerca de las evaluaciones psicológicas que se realizan, sobre todo, en desarrollo comunicativo, las cuales no consideran los signos en relación a su función y en interacción con el otro respecto a los referentes que se incluyen en la escena. Esto supone importantes implicaciones para el desarrollo atípico, como es el caso por ejemplo del autismo, donde se observan grandes dificultades en relación a los acuerdos intersujeto acerca del referente.

## Limitaciones

En última instancia, es necesario hacer referencia a algunas de las limitaciones que se desprenden de esta tesis doctoral. Principalmente, se requeriría más investigación acerca de esas “otras” interacciones triádicas que aquí se defienden y que difieren de la concepción clásica. Si bien es cierto que para el adulto este tipo de situaciones son “más triádicas” que para el niño, eso no impide que la interacción entre ambos cambie cuando cambia el objeto, como así mostraron algunos de los resultados

de los estudios (ver Capítulos II y III). La naturaleza de la comunicación varía si así lo hace el objeto que actúa como referente.

Asimismo, en este trabajo nos hemos ocupado de cómo se originan las primeras interacciones triádicas intencionales del niño: alrededor de los 9 meses, como hemos visto, los niños ya ponen en marcha sin dificultad toda una serie de herramientas de comunicación, por lo que deben de empezar a construirse con anterioridad. Se hace necesaria, por tanto, más investigación acerca de cómo se produce el trasvase de intencionalidad del niño al adulto, para lo que habría que ampliar las edades de estudio e incluir el periodo comprendido entre los 5 y los 8 meses, que en esta tesis no ha sido abordado por exceder los límites de los objetivos de investigación. Sin embargo, posiblemente esta tesis sí aporte algunos indicios acerca del origen de las mismas, fuertemente mediado por el adulto, y donde el trasvase de intencionalidad de adulto a niño podría producirse en algún momento entre los 5 y los 8 meses.

Podría realizarse también un análisis más exhaustivo de cómo son las interacciones rítmico-sonoras, para lo cual posiblemente habría que incluir en el análisis a bebés recién nacidos, que nos permitan evaluar si, efectivamente, los rítmico-sonoros son los primeros sistemas semióticos que aparecen en el desarrollo.

Además, se debería tratar de aumentar el tamaño de la muestra, ya que el actual impide que puedan realizarse inferencias, unido al sesgo que suponen las propias diferencias individuales. No obstante, en ese caso debería adaptarse también el método de análisis, puesto que el exhaustivo nivel de profundización que la microgénesis requiere es difícilmente aplicable a muestras poblacionales grandes. Se hace necesaria, además, una mayor adecuación de los objetos presentados al niño, por lo que deberían ser seleccionados diferentes objetos, sonoros y no sonoros, que resulten apropiados para las diferentes edades de estudio.

Las investigaciones en un futuro próximo deberían responder a la necesidad de continuar desarrollando estudios que indaguen en la importancia de los componentes

rítmicos y sonoros en la interacción adulto-bebé a lo largo del primer año de vida. Es necesario realizar un trabajo de investigación más exhaustivo, que comprenda las edades que por diversos motivos no han podido abordarse en el presente proyecto. Las posibles líneas de investigación irían dirigidas a profundizar aún más en el análisis del desarrollo de los gestos ostensivos, así como en el trasvase de intención del adulto al niño en el primer año de vida. Esta tesis podría dar lugar a estudios interesados por analizar musicalmente las actuaciones rítmico-sonoras del adulto, con el objetivo de determinar si existiesen patrones rítmicos comunes que se puedan dar entre participantes. Asimismo, si en edades posteriores a los 4 meses se introdujera un objeto sonoro, podría analizarse si estos componentes rítmico-sonoros se encuentran también presentes en los primeros usos de los niños, aunque obviamente no fuesen ritmos intencionales, o al menos tan deliberados, como los que aquí se han observado en el adulto.

No obstante, de acuerdo a nuestras concepciones epistemológicas, los futuros estudios seguirán también un diseño de análisis en contextos naturales, situando la interacción en contextos lo suficientemente amplios que permitan observar situaciones genuinas de comunicación acerca y en relación a los objetos.

## Referencias

Bates, E., Camaioni, L. y Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly, 21* (3), 205-226.

Eco, U. (1976). *Tratado de semiótica general.* Barcelona: Lumen.

Lock, A. (1978). *Action, gesture and symbol: The emergence of language.* London: Academic Press.

Lock, A y Strong, T. (Eds.) (2010). *Social constructionism: Sources and stirrings in theory and practice.* Cambridge: Cambridge University Press.

Peirce, C. S. (1987). *Obra lógico-semiótica.* Madrid: Taurus.

Trevarthen, C. (2003). *Conversations with a two-month-old.* Philadelfia: Whurr Publishers.