

The development of early triadic interactions. The musical dynamics of interaction in the first year of life

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Abstract

The first year of life is crucial for child development. Infants develop basic cognitive skills that contribute to shaping their daily experiences with others and the material world, in which the action of adults is key. From birth, adults promote instances of triadic interactions (adult-baby-object) by using musically organised signs (e.g. gestures or demonstrations of the use of objects) that facilitate their psychological communication and co-regulation with the child. While the musical organisation of adult-baby dyadic interactions has been widely described from the theses on communicative musicality, its investigation under triadic interactions is yet limited. This paper discusses how the structure and musical dynamics of early triadic interactions could contribute to our understanding of early development, as well as the impact that adult mediation would exert on it.

Keywords: early triadic interactions | musical dynamics | adult mediation | materiality | early development.

El desarrollo de las interacciones triádicas tempranas: dinámicas musicales de interacción en el primer año

Resumen: El primer año de vida es crucial para el desarrollo del niño. En él se desarrollan habilidades cognitivas básicas que contribuyen a dar forma a sus interacciones diarias con los demás y con el mundo material, en las que la acción de los adultos es clave. Desde muy pronto, los adultos promueven instancias de interacción triádica (adulto-bebé-objeto) a través del uso de signos musicalmente organizados (e.g. gestos o demostraciones del uso de objetos) que facilitan su comunicación y co-regulación psicológica con el niño. Si bien la organización musical de las interacciones diádicas adulto-bebé ha sido ampliamente descrita desde las tesis sobre musicalidad comunicativa, su estudio en el marco de la triadicidad es aún limitado. Este artículo discute cómo la estructura y dinámicas musicales de las interacciones triádicas tempranas podrían contribuir a nuestra comprensión del desarrollo del niño, así como del impacto que supondría en él la mediación del adulto.

Palabras clave: interacciones triádicas tempranas, dinámicas musicales, mediación del adulto, materialidad, desarrollo temprano.

Desenvolvimento de interações triádicas iniciais: dinâmicas musicais de interação no primeiro ano de vida

Resumo: O primeiro ano de vida é crucial para o desenvolvimento infantil. Nele, os bebês adquirem habilidades cognitivas básicas que contribuem para moldar suas experiências diárias com os outros e com o mundo material, no qual a ação dos adultos é fundamental. Desde muito cedo, os adultos promovem instâncias de interação triádica (adulto-bebê-objeto) através de sinais organizados musicalmente (e.g., gestos ou demonstrações do uso de objetos), que facilitam sua comunicação e co-regulação psicológica com a criança. Embora a organização musical das interações diádicas adulto-bebê tenha sido amplamente descrita a partir das teses sobre musicalidade comunicativa, sua investigação no âmbito da triadicidade ainda é limitado. Este artigo discute como a estrutura e a dinâmica musical das interações triádicas iniciais poderiam contribuir para a nossa compreensão do desenvolvimento precoce e do impacto que a mediação adulta teria sobre ele.

Palavras-chave: interações triádicas iniciais, dinâmicas musicais, mediação do adulto, materialidade, desenvolvimento inicial.

Highlights

- Early triadic interactions have been particularly overlooked in developmental psychology.
- Early triadic interactions allow the co-construction of the first agreements about object meaning and use.
- Musical dynamics emphasise the structure of these interactions and facilitate the child's participation.
- Musical components in actions should be analysed from a pragmatic and functional approach.

Early interactions are a prolific source of information to understand when and how babies build up their interaction with others and the material world. Such interactions, namely the exchanges in which adults show through their actions that they understand the child's behaviour (Álvarez, 2006), have become a popular field of study in developmental psychology over the last decades. This has been shown in a series of studies aiming to describe how these interactions arise and evolve during children's early years, and the possible implications deriving therefrom in later stages of development. Among these approaches, the theory of communicative musicality (Malloch, 1999; Malloch and Trevarthen, 2009) proposes that certain musical components may act as facilitators for early interactions and contribute to the establishment of a communicative bond between the baby and an adult. Subsequently, other studies corroborate that mothers often incorporate these musical components to their communicative repertoires when interacting with their young babies, through voice, intonation, or rhythmic features (Trehub et al., 1993a, 1993b; Trehub and Schelleberg, 1995). Interactive musicality also enhances synchrony with the infant, who usually follows the adult's proposals in a sustained manner. Whereas a large part of the mentioned studies is based on an exclusively dyadic conceptualisation of interactions within a child's first few months (i.e., adult-baby or baby-object) (Tomasello, 2019; Trevarthen, 2003), recent proposals challenge the existence of a 'pure' dyadicity occurring on the sidelines of everyday sociocultural practices (Costall, 2013; Moreno-Núñez et al., 2015, 2017).

From this critical viewpoint, exchanges among adults, babies and objects may occur from birth in the form of early triadic interactions, prior to the classic conceptualisation of triadicity that is placed toward the end of the first year. Although it is true that at these ages babies have not yet acquired the necessary capabilities (for instance, motor development) to independently explore the material world, adults frequently include them in interactive practices to which social and/or material references are added (Cárdenas et al., 2020; Rossmanith et al., 2014). In these early stages of development, the communicative intention does not stem from the child, but from an adult who 'lends' their intention in interactive niches of shared actions (Rodríguez and Moro, 1999; Valsiner, 2000, 2014). It is remarkable, however, that classic studies on early psychological development have rarely shown an interest in this kind of interactions at an early age (Costall, 2013). Such poor

representativeness in the specialised literature may be explained, at least in part, by the fact that the development of triadic interactions is neither linear nor gradual (De Barbaro et al., 2013; Striano and Reid, 2009). Their frequency seems to decrease toward the middle of the first year, when it coincides with the baby's increasing autonomy, and reappears at around nine months on the child's own initiative.

There is a need for further study of these early forms of interaction from a more comprehensive approach, paying special attention to triadic adult-baby-object occurrences (Dimitrova, 2020; Rossmannith and Reddy, 2016), as well as the everyday socio-material significance these carry (Español, 2011). The proposals posited by the theory of communicative musicality may lie beyond the dyadic world and serve as a baseline structure for the first interactions in which infants are led to participate by adults (Alessandroni et al., 2020). This paper aims to identify some of the key points we find essential in the design of future research in this respect.

Triadic interactions: meeting points between adults, babies, and objects

The key role of triadic interactions during the cognitive and communicative development of children is undeniable. Thanks to these, children broaden their knowledge of the world around them in reciprocal exchanges with others, characterised by the establishment of joint attention, social references and the development of a full range of communicative gestures (Bates et al., 1975; Tomasello, 2004, 2008), among other relevant accomplishments. Their emergence marks a turning point in the development of infants who, at around nine months, understand and assume the roles of others as intentional subjects with whom to interact, and to whom to talk to (Tomasello, 1995).

This idea is reflected in numerous studies and classic theories in infant development, from the proposals on sociocultural mediation of Vygotsky (1984/1996) to the revolutionary work by Bates et al. (1975) or Tomasello (1995) on the origins of intentional communication in children, especially before the appearance of oral language. Many such studies stem from the idea that, prior to the emergence of communicative intentionality, children only interact in dyads, either with an adult or with an object. Thus the distinction made between primary intersubjectivity and secondary intersubjectivity, that denotes a clear division in the way babies engage with their environment. Following this premise, babies in their first months only engage in dyadic interactions (primary intersubjectivity), first with an adult and, from approximately four months of age, with objects (Tomasello, 2004, 2008; Trevarthen, 2003; Trevarthen and Hubley, 1978).

However, this approach relegates to obscurity any potential mediation an adult may exercise during early cognitive-communicative development. It recognises no evidence of psychological links between the infant, the adult and objects until the appearance of the first intentional communicative behaviours, referred to by Tomasello as 'the nine-months revolution' (1995, 2019). This designation, heavily charged with metaphoric symbolism, underscores the major change infants undergo from this age and its implications in subsequent stages. Nevertheless, and despite the dominant role such stances have played in this field, they have also given rise to the debate over whether the recognition of triadic interactions should exclusively focus on the origins of children's communicative intention.

According to this, triadic interactions might be examined from a different angle, being seen to arise from birth drawn by adults' intentionality and implying relevant undertones in understanding the beginnings of social and communicative learning. While it is true that during their first few months babies do not have the necessary strategies and capabilities enabling them to include another person and an object in a single communicative act, they do begin to take a growing interest in their surroundings and to take an active part in shared, structured activities proposed by adults (Rossmannith et al., 2014).

However, whereas some classic studies have already stressed the potential importance of adults and objects from early ages (Vygotsky, 1984/1996; Wallon 1972), empirical studies of early triadic interactions, as they are known, is much more recent (see Moreno-Núñez, 2021). In these interactions, the adult acts as a mediator between materiality and the infant (Rodríguez and Moro, 1999) before the latter has developed intentional communicative or representational capabilities. Early triadic interactions originate, therefore, from the intentionality of adults who 'lend' the infant its first intentions (Rodríguez et al., 2018), such as by presenting or offering them objects with which to interact (Rodríguez et al., 2015). Objects occupy a central space in these communicative exchanges, through actions in which adults actively promote the establishment of shared references with the infants (Dimitrova, 2020; Dimitrova and Moro, 2013; Moreno-Núñez et al., 2015, 2017). The outcome are engagements in which the body is the main channel for baby-adult interaction, enhancing mutual regulation and giving meaning, through each action, to the infant's progressive understanding of the world (Thelen et al., 2001; Varela et al., 1991). The embodied actions chosen by adults often place an object at the heart of their interaction with an infant (Moreno-Núñez, 2021), thus reducing ambiguity in the referent and enhancing a multimodal engagement with children (Alessandroni et al., 2020).

Adults scaffolding occur within sociocultural practices (Kärtner, 2015, 2018), thanks to which children learn to coordinate their actions with others in patterns of increasing complexity. The cultural meaning of the material world hinges, therefore, on interactions, rendering objects and their use as key elements to psychological development (Rodríguez, 2006). This means that, without the mediation by adults, infants would be unable to achieve the conventional use of objects on their own (that is to say, its social function in a given context), but they rather build up a shared knowledge gained from interactive exchanges from a very early age (Moro, 2016). In these exchanges, adults underscore the sociocultural function of materiality (Dimitrova, 2020) via communicative mediators that progressively raise the complexity and add structure to interactions (Alessandroni et al., 2020; Moreno-Núñez et al., 2017).

Communicative mediation by adults during interactions

The arguments put forward above are founded on evidence that suggests that infants' participation in early triadic interactions with adults allow them to adopt recurrent patterns of engagement. This will lead, later on, to children's development of expectations regarding shared actions and the ability to attract and share the attention of others toward something in their environment. Within the

framework of each action, these temporal infant-adult alignments are reflected in exchanges similar to those produced in language, but cannot be restricted solely to these. Foreseeably, there are other communicative mediators such as the shared gaze, that will help us understand what kind of interactive bond is established between an adult and a baby, as well as how it is reached and how it is developed (Dimitrova, 2020). These are simultaneously a 'link' to the other and a communication booster.

For example, in a study based on everyday mother-baby interactions while nappy-changing in home settings, Nomikou et al. (2016) analysed the role of the gaze as a communicative medium. This was achieved by encoding infants' and mothers' gazes according to whether these were directed toward the other participant's face, a part of their interlocutor's body other than the face, an object, or another point outside the camera framing. The results suggest that at three months, it is still the adult who sets the pace for interaction, guiding the infant's gaze toward the relevant reference(s) at a particular moment. The infants, for their part, were focused on their mothers' face for half of the interaction time. However, as the infants become more interested in their surroundings and what is going on there, the time spent observing their mothers decreases, showing how they gradually participate more actively in these interactive dynamics.

By emphasizing the focus of attention, adults' mediation clearly aims to generate instances of shared references with the infant. Nonetheless, Dimitrova (2020) suggests that, to analyse the function of shared gaze in depth, the following three basic aspects must be considered: (a) the object that acts as the communicative referent during the interaction, (b) the existence of a *common ground* shared by adult and child, and (c) adults' interpretations of the various exchanges taking place in the course of the engagement. The first premise stems from the conviction that objects fulfil a catalyst function during baby-adult communication (Rodríguez and Moro, 1999). As for the second premise, the fact that babies share with adults a "common ground" that becomes gradually wider with the establishment of routines and shared meanings contributes to increasingly fluent communicative interactions. In this vein, Dimitrova and Moro (2013) stress that the greater the shared knowledge on a given referent is, the higher the frequency and complexity observed in the gestures used by adults when interacting with their babies. Lastly, the third premise emphasizes that adults, very often, assign meanings according to sociocultural norms that are contextualised during the interaction. In other words, they give meaning to their children's vocalisations, gestures and actions before the infants have the necessary tools to convey such meaning of their own accord, contributing to a communication that gradually becomes more functional (Bornstein et al., 1999; Tamis-LeMonda et al., 2001).

The above notwithstanding, studies in early interactions have not always taken into account the vertebrating effect of sociocultural aspects underlying adults' mediation. In recent decades, several studies have given evidence of the strong influence on infants' development exerted by the cultural world in which they are born and raised (Kärtner, 2015, 2018). This includes how the infant meets and relates to objects, whose conventional uses cannot be separated from the cultural context in which they acquire meaning (Moreno-Núñez et al., 2017). Viewed from

this cultural and communicative stance, objects become key resources for development through adult-baby engagements, allowing the child to achieve the learning steps it needs to understand its environment and its relationships with the world and with others (Rodríguez et al., 2015).

Part of the effectiveness of adults' mediation seems to stem from the ostensive nature of their actions, that help attract the other's attention toward the referent (Csibra, 2010; Moreno-Núñez et al., 2020; Rodríguez et al., 2015). In ostention, sign and referent coincide, that is, they occupy the same space (Eco, 1976), for example when offering and/or showing an object to a baby. They thus reduce ambiguity with regard to the referent (the latter being held in the hand), and communication is made simple as neither participant expects complex inferences over the item in question. We should not forget that, to understand a gesture, the child needs to identify the joint focus of attention, the gesture itself and the object acting as the referent. Consequently, adults' ostensive actions may be especially appropriate in engaging infants at a very young age, when other communicative mediators such as pointing may still be too complex for the baby's level of development, too immature for exchanges of this nature.

In early exchanges, the adult is the agent introducing the baby to the material world, while infants respond to such proposals with periods of sustained attention, some degree of stability in eye contact, and responding with positive emotional signals such as smiles, body agitation and vocalisations (Moreno-Núñez et al., 2015). The rhythm and regularity given by adults to these early interactions enhance both their initiation and their continuity, contributing –as we shall see in the next section– to forming an interactive structure that encourages infants to increasingly active participation (Moreno-Núñez et al., 2017).

Musical dynamics in the ecological study of early development

As mentioned in the previous section, adults' actions and proposals have a determinant effect on engaging infants, from birth, in interactive experiences that involve their shared material and cultural environment. This becomes especially significant in stages of development in which the infant still lacks the necessary autonomy to access such experience on their own, and in which adults play a mediating role. An example of this is found in the study conducted by Rossmannith et al. (2014) involving reading sessions shared by adults and babies aged three to nine months. The results show that babies actively participate in these interactions from three months of age, contributing with increasing autonomy as they acquire and consolidate new communicative skills. At around six months, infants proved able to explore the books by themselves, but engaged in this 'solo' until approximately nine months, when they recovered an interest in this as a joint activity. However, such progress would be difficult to understand in its full complexity without considering the role played by adults throughout this period. Adults frequently deploy a number of interaction dynamics that contain a significant rhythmic, sonorous, and musical baseline, allowing them to structure reciprocal exchanges with infants and to flexibly adjust their action as the infant grows and takes a more active part (Moreno-Núñez et al., 2015).

The study of this musicality and its role in releasing intersubjective relationship processes has been addressed from many perspectives. For instance, Trevarthen (2003, 2009; Trevarthen and Hubley, 1978) points out that musical components are actively present in dyadic interactions between adults and babies from the time of birth, considering these as an innate human cognitive domain. 'Communicative musicality' is characterised by three main elements: pulse, referred to a succession of expressive events in time; quality, which encompasses melodic and timbric features of vocalisations, and the outline and velocity of gestures; and narratives, arising from the combination of the first two elements, that generate instances of synchrony and a shared sense of time between adult and infant (Malloch, 1999). These make it possible to organise and conduct mother and baby interactions (Malloch and Trevarthen, 2009), enabling interpersonal understanding and cohesion, and giving meaning to systems of culturisation (Tropea et al., 2014).

The musical structure of these joint actions proposed by the adult limits and clarifies the characteristic materials to the culture in which the interaction takes place. In such engagements we commonly observe certain musical components, such as rhythm, tone or the melodic features of infant-directed speech, all of which form part of the stock of mediators that adults naturally use in their exchanges with an infant (Dissanayake, 2008; Malloch and Trevarthen, 2009). Musicality thus works as a facilitator for early social interaction, by endowing the latter with a basic structure on which to establish an organisational pattern in which both participants meet.

Traditionally, studies based on the postulates of communicative musicality have been centred on examining innate dyadic interactions, and on the psychomorphological reactions prompted by music. For example, we know that from a very early age infants are able to distinguish these musical components in the proposals offered by adults (Papoušek, 1996), showing a preference for the musical over speech, especially their mothers' singing (Nakata and Trehub, 2004). On this evidence, further exploration has been conducted, for instance on the role of musicality in establishing interactive synchronies between mother and baby, and the underlying temporal structures (Longhi, 2009). These studies show that mothers often produce tactile, kinesthetic, vestibular and visual stimuli while singing to their babies, and that these are rhythmically organised. Interestingly, the precise synchrony between the adult's actions and the pulses in the song varied with the age of the infant: while at three and four months mothers tended to group their synchronous behaviour at the beginning and at the end of the phrases, by seven and eight months this was distributed throughout the song, in agreement with different rhythms. These findings suggest that musical interactions among parents and offspring are not perceived solely on an aural level, or through oral productions, but also involve rhythmic, tactile and visual aspects (Papoušek, 1996), whose synchronic pattern may enhance attention, participation and, as a consequence, infants' acquisition of learning (Vosoughi et al., 2010). Similarly, experimental work in clinical contexts has demonstrated how musicality, presented in a multi modal manner, may give rise to significant benefits in children who have endured long-term hospitalisation (Del Olmo et al., 2010; Longhi and Pickett, 2008), such as increasing blood oxygen levels and slowing the heart rhythm and the breathing rate.

However, some recent studies based on non-participant observations of early interactions have allowed the study of infant development from a realistic approach, that reaches beyond the limitations inherent to research conducted in clinical or laboratory settings. The observational analysis of developmental changes offers –especially at early ages– certain advantages with regard to laboratory research when examining everyday and spontaneous interactions between adults and babies (Alessandroni et al., 2020; Shifres and Español, 2014; Moreno-Núñez et al., 2015, 2017; Rossmannith et al., 2014). In this sense, ecological observations may lead to the identification of certain culturally significant patterns of interaction, such as the use of communicative redundancies, or the organisation, segmentation and complexisation of adult proposals (Shifres, 2007, 2008; Español and Shifres, 2009).

This is seen to be especially significant when examining the origin of triadic interactions. The musical structure adults set up in an infant's early months might constitute one of the baby's first semiotic systems, as it favours communication and the establishment of mutually shared references. Adults and babies musically co-construct their interactions with and through materiality, thus supporting the infant's access to objects and their conventional uses within a culturally relevant context (Rodríguez and Moro, 1999). For instance, at two months, infants pay attention to adults' various rhythmic, sonorous, and melodic actions, and at around six months they typically explore the sound-producing properties of objects as part of their interaction with materiality and its possibilities for action (Moreno-Núñez et al., 2015, 2017). Stated differently, infants participate more actively in the interaction as they gain better motor, cognitive and communication skills.

Moreover, in these first encounters between the baby and materiality, adults' mediation by means of musical components is presented through a range of communicative mediators, such as language, gestures or demonstrations of objects' uses, which gradually diversify and complexify the interactive engagement. The relationship among gestures, objects' uses and musicality might, therefore, throw light on the origin and unfolding of the first triadic interactions, and likewise on their role in the complex gearing that is infant development. However, this analysis cannot be addressed, or would be incomplete, without a longitudinal view of the construction and progression of these interactions.

Although some of the microgenetic analyses conducted to date have yielded an exhaustively detailed characterisation of early triadic interactions, the degree of detail in the musical analysis may be enhanced with a quantitative view to show how these dynamics are interrelated intrasequentially (in a single observation session) and intersequentially, over the course of the period studied (Alessandroni et al., 2020). A further complementary analysis of the musical components of such interactions, namely rhythm and meter (rhythmic accents, patterns and motifs, with and without silence), their temporal arrangement (stability of tempo, or relationships of isochrony) and other musical parameters (such as the organisation and synchronisation of pauses, tone or alternate phonetic cells) would allow a description of how adults progressively add complexity to their musical proposals within the interaction, adapting easily to the infant and its development.

Conclusions

In developmental psychology early triadic interactions (that is, those that commence from birth resulting from intentional proposals made by adults) have received little attention in recent years. This places some limitations on understanding the situations on which infants' build their comprehension of the world and on how people relate to each other in the material world; a key issue in the communicative development that commences more or less in the last third of infants' first year. Adults, in these early stages, act as mediators between the infant and objects, organising, structuring, and giving meaning to early triadic interactions, on which they build the initial agreements regarding objects, their meaning and their use. These communicative adult-baby engagements are enhanced by the incorporation of musical components, that help to emphasize their structure and to facilitate infants' participation according to their ability at each stage in their development.

In consequence with these facts, there is a need to conduct studies incorporating interdisciplinary, sophisticated, and innovative analyses, using tools to examine in depth the various elements that are characteristic to early triadic interactions. For example, adopting a pragmatic and functional researching approach would sidestep the limitations of studies that describe the musical components in human interactions but fail to analyse the specific actions containing them within each interaction, whether in children or in adults. Furthermore, framing this approach in a longitudinal methodology comprising mixed and ecological analyses would facilitate the study of the complexity within interactions taking place in young infants, overcoming the limitations affecting experimental studies in the laboratory. This would disclose the developmental change taking place during an infant's first year, from its early months –in which interactive participation lays on the initiative of an adult–, to the end of its first twelve months –when children gain more clearly elaborate communicative skills.

In sum, there is a pressing need to increase the number of studies examining in greater depth the role played by musical components in the complexisation of interactive engagements among infants, others, and objects, especially given the present scarcity of research addressing the origin and development of musicality in the framework of early triadic interactions. This would allow us to recognise the important contribution of the material world in an ecological context of interaction to psychological development in general, and during early infancy in particular.

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