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(Article begins on next page)

20

## BEFORE SINGING

The Role of Reflexivity during Vocal  
Interactions with Caregivers in Diaper  
Change Daily Routine

Anna Rita Addessi

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Singing is one of the child's most enduring and richest vocal experiences. To understand its development it is important to study the child's vocal experience even before its appearance. This chapter will present some hypotheses and reflections on what happens in infantile vocalicity before singing, through observations in naturalistic contexts during the daily routines. The topic will be approached according to a constructionist perspective concerning the vocal interaction of childhood with various adults. A research-action project was started at the University of Bologna (Italy), in the framework of the degree course for educators in childhood social services, with the participation of researchers, university students and nursery educators, having the aim of studying the musical dimension of daily routines with children from birth to four years, the role of the adult and the training of caregivers. We used the methodology of observation of children's musical conduct (Delalande, 2015). In particular, the studies carried out on the routine of diaper change allowed observation of the influence that the processes of imitation and variation had on the activity and vocal expressiveness of the child (Addessi, 2009). The subsequent studies of the interactions of children with interactive reflexive musical systems, which respond by mirroring with variations the user playing a keyboard (Pachet, 2003), have led us to outline the theoretical framework of the "reflexive interaction" paradigm. Addessi (2014) suggested that the idea of mirroring that originated in ancient Western culture, now resonates with the contemporary theory of musical embodiments, the link between action and perception, and the mirror system. In this chapter, the theoretical framework of the paradigm of reflexive interaction and four new case studies of infant-adult vocal interaction during the diaper change will be presented. The implications for children's daily life and vocal development will be discussed, with a particular focus on the role and education of the caregivers.

## **Reflexivity and Infant Musicality**

The paradigm of reflexive interaction arises in the context of human-machine interaction, but in fact it finds deep roots in Western culture and in human interactions. The paradigm refers to the topic of mirror, and its main characteristic is the mechanism of repetition and variation: something is repeated and varied during the interaction, by means of a continuous process of imitation and variation. This mechanism is recognized as one of the factors that characterize the origin of musical language (e.g., Margulis, 2014). We can find references in the myth of Echo and Narcissus (Ovid, 43 BC–AD18, *Metamorphoseon libri XV*), in the antiphonal echo effects of renaissance and baroque music, and in the *Teoria degli affetti* and the *Affektenlehre* (Kircher, 1650; Galilei, 1581) which emphasize the power of music to reflect the human affects. Studies in psychology and neurosciences increasingly suggested that the mechanism of repetition and variation plays an important role in infant musicality development (Gratier & Apter-Danon, 2008; Imberty, 2005; Malloch & Trevarthen, 2009; Papoušek, 1996; Parsons, Young, Stein, & Kringelbach, 2017; Stern, 2004), grounding the evolutionary and ontogenetic theories of human and human-machine communication (Braten, 2007; Mithen, 2005; Wachsmuth, Lenzen, & Knoblich, 2008). Between two and six months, the child is in full babbling mode: this phenomenon is caused by the child's exploration of her/his voice but also by the imitation of sounds heard from adults or other children. Anzieu (1996) suggested that the mother's voice, with its repetitions and echoing, represents a sort of sonorous mirror for the child, which reinforces her/his musical self. He calls this kind of infant experience the musical wrapping of the Self, in which the Self is described as the first embryo of the personality perceived as a unit, expressing one of the most archaic forms of repetition, namely the echo. This phenomenon of imitation is mainly a bidirectional phenomenon.

## **Self-imitation and Imitation Recognition**

The Piagetian concept of "circular reaction" is described as a self-imitation process: in babbling, children repeat their own vocal gestures, thereby developing the perception of relations between physiological sensations and the intrinsic quality of the emitted sound. Moreover, they learn how to modify the emitted sound by controlling their sensations and physiological processes. Imberty (2005) assumed that the "vocal scheme" that the infant builds by means of these complex processes of self-imitation and proprioception is an anticipation of the "body scheme". Self-imitation would serve primarily an ego function and could be said to be at the origin of "what is arguably one of the trademarks of human cognition: the capacity for self-reflection and ability to generate thoughts that fold back upon themselves" (Rochat, 2002, pp. 94–95). On the other hand, Nadel (2002) studied the processes of "imitation recognition" in early childhood and says that these processes appear first at a simple level not fully manifested until around 24 months, including the attribution of intentional imitation to the imitator.

## **Repetition and Variation**

According to Papoušek (2007), in baby-talk (parentese), the language characteristics that adults use when talking to very young children, common traits appear that have a universal basis: segmentation, repetition, syntactic simplicity, slow time, simplifying and amplification of the melodic contours. Alongside the principle of repetition that underpins baby-talk, a principle of concomitant variation exists that encourages the child to adaptation, constant enrichment of the basic repertoire and vocal creativity in the game. Repetition creates a pattern that allows the child to anticipate the course of time and thus, in a certain way, to master it. According to Stern (2004), more than half of the repetitions, whether vocal or verbal, involve changes. This mechanism creates a sequence of tension and relaxation, generated by the repetition of elements and the waiting for such repetitions. Affect attunement is the moment of greatest trade between the two partners, in which the rhythms, shapes and the intensity of the gestures, the voice and the gaze, are shared by both partners as in a mirror, carried out within affective and emotional conditions (the affective contours). Nadel (2002) underlines that children are aware that the social contingency is never perfect (p. 55). However, excessive variation was found to induce relaxation in the child and to produce systems of asymmetric co-regulation, if not breaking up the pattern of interaction completely (Fogel, 2000). In our studies on child-machine interaction, we observed that the system's reflexive response aroused curiosity and attention, causing children to dialogue with the system; when the system's responses were exactly the same or, on the contrary, too different, attention diminished, the dialogue tended to end, and the flow state lowered (Addessi, Anelli, Benghi, & Friberg, 2017; Addessi, Ferrari, & Carugati, 2015; Addessi & Pachet, 2005).

## **Modes of Interaction**

Turn-taking, regular timing of turns, temporal contingency, and co-regulation were observed during the interaction between children and reflexive systems, and it was argued that it is precisely the presence of these modes that enhances the musical creativity observed during the interaction (Addessi et al., 2017). Gratier et al. (2015) suggest that infants are active participants in turn-taking from the earliest age and that mothers adjust turn-taking formats to infants. The phenomenon of adaptation in real time is one of the most complex phenomena of human behavior and is based on a process of co-regulation between two or more partners (e.g., the attunement concept of Stern (2004); the relational coding system of Fogel (2000)). Reflexive interaction cannot be studied from a purely musical point of view but also on the basis of the interactive and communicative context between the partners, and in terms of social interaction characteristics, as observed in the collective musical performance (e.g., Pesquita, Corlis, & Enns, 2014).

## **Mirror Behavior and Action-based Approach**

The capacity to replicate the behavior of others is to some extent grounded on the nonconscious processing known as the "chameleon effect" (Chartrand & Bargh, 1999). Neuroscientific studies with non-human primates suggest rooting these non-conscious mechanisms in the mirror neuron system (MNS), a network of neurons which become active during the execution and observation of actions (Rizzolatti, Fadiga, Fogassi, & Gallese, 2002). The authors hypothesize that there is a very general, evolutionary ancient mechanism, named the resonance mechanism, a metaphor from the acoustic domain:

It is as if neurons in these motor areas start to "resonate" as soon as the appropriate visual input is presented. This "resonance" does not necessarily produce a movement or an action. It is an internal motor representation of the observed event which, subsequently, may be used for different functions, among which is imitation. (Rizzolatti et al., 2002, p. 253)

The human auditory mirror system also holds an abstract representation of the meaning of heard actions (Galati et al., 2008). In the field of studies of singing, it was suggested that the facial movements that accompany singing production are capable of eliciting facial mimicry in the observers/listeners (Chan, Livingstone, & Russo, 2013). Lévêque and Schön (2013) observed a stronger activity of the motor area of the brain during singing voice perception than during perception of non-vocal melodies. McGarry, Pineda, and Russo (2015) highlighted a relation between MNS activity and the perception of singing and emotion. These studies, therefore, show how MNS activity is related to emotional, empathic and interactional aspects, and offer an important contribution to explaining the mechanisms of understanding the sound actions of others, of communication and social interaction, and of the phenomena of empathy and imitation. Both mirror neurons and embodied cognition theories are linked to the common coding theory, which posits a shared representational domain for perception and action within the brain

(Prinz, 2008).

## **Creativity and Reflexivity**

In our studies on children interacting with a reflexive system, a higher percentage of a flow state (Csikszentmihalyi, 1990) arose when children played with the reflexive system than without it, and when the reflexive system was programmed with a more reflexive set-up (Addessi et al., 2015). Addessi et al. (2017) demonstrated that the use of reflexive interaction with a reflexive system increases children's musical creativity and ability to improvise and dialogue musically with other companions. These various results support the hypothesis that reflexive interaction could enhance the emotional flow state in children and thus their creative music-making experience. It was observed that repetition-variation action during the explorations of sound objects allows the child to know a sound, to share it with others, and to invent music (Delalande, 2015); in children's musical improvisation, repetition and mirroring becomes a principle of invention (Tafari, 2006). Recent studies in neuroscience underline the neural and cognitive mechanisms that allow us to transform and manipulate existing musical representations by means of continuous changes: Zatorre (2012) suggests that the dorsal pathway of auditory processing performs equivalent operations on musical inputs.

## **The Role of Reflexivity in Infant–Adult Vocal Interaction during Daily Diaper Change**

The diaper change represents an excellent occasion to observe adult–child face-to-face interactions. The observations made during case studies highlighted certain important aspects of the reflexive mechanisms present in vocal interaction in early infancy and how these might have a positive influence on the vocal activity of the child and therefore on her/his future singing experiences.

## **The Pilot Study**

The exploratory study of the diaper change was carried out in a family at home with a nine-month-old child and his parents: the mother, 31 years old, and the father, 32 years old. Several diaper changes with the mother and with the father were video-recorded in the bathroom of the house, where the child was usually changed, in the morning, consecutively with one of the parents (one week with the mother, one week with the father). A fixed video-camera was positioned opposite the changing table. The participants were filmed in profile, in order to record as many of the various movements occurring during the change as possible. The first recordings began some months before the actual data collection: this allowed the parents to become accustomed to the presence of the video-camera. The video-analysis of the first session with the mother and the first session with the father showed several interesting results. In particular, it was possible to observe the strong presence of vocal play between adult and infant, episodes of imitation/variation, as well as turn-taking, attunement, vocalization, singing and speaking, and games in which the rhythm of the interaction was gradually modified. The father/child interaction was characterized by greater vocal play which led the two partners toward frequent affect attunement; the father used greater temporal fluidity, melodic and rhythmic variety, and was more expressive, preferred games, to play with the son, and looked for more intimacy. During interactions with the mother, there appeared to be fewer moments of attunement; the mother used more repetitive vocalizations with culturally codified rhythms and pitch or she sang well-known songs and lullabies; she appeared more functional and efficient, concentrating on the diaper change operation and on teaching songs and words. The child was vocally more active when the frequency of the adult vocal products was lower, when the adult sang and vocalized less, spoke more (speech + IDS), imitated and varied the child's vocalizations, and showed a higher presence of turn-taking (see Addessi, 2009).

## **The Case Studies**

On the basis of the results of the exploratory study, new data were collected following the same procedure. Here we present the results of four new case studies at home, with children 36 to 48 weeks old and their parents (case studies 1, 2 and 3) or grandmothers (case study 4). The participants were chosen from among relatives and friends of the students who participated in the research-action project. This allowed the students to collect data in spontaneous and daily situations, minimizing the invasiveness of the technology and the presence of strangers. Preliminary meetings were held with the participants to introduce them to the general principles of the project,

to define the calendar and test the video recording and the logistic organization. All participants signed a consent form prepared by the University of Bologna on the basis of Italian and international privacy laws.

### Procedure

For each dyad we video-recorded seven diaper changes on seven consecutive days, with the same procedure as in the exploratory study. The video-recordings were made at home, in the bathroom or bedroom.

### Data Analysis

An audiovideo-analysis was carried out by applying the grid of vocal activity, which allows registration of the duration of the following behaviors, for each partner and dyad, second by second: vocal productions, imitation/variation and turn-taking. Furthermore, three different vocal behaviors of the adults were registered, as follows: vocalization, that is, the vocal productions which are neither singing nor speech, nor infant-directed speech; singing, that is singing and infant-directed singing; speech+IDS, that is, both speech and infant-directed speech, including a sort of intoned speech, or speech/singing. The total duration of each session was calculated. Then the relative duration of each behavior was calculated as a percentage of the total duration of the sessions of each dyad. A t-test was performed between the average of the relative durations for each behavior of all dyad sessions, comparing the results of each session of the child with the father and the results of each session of the child with the mother, and the results of each session of the two adults (the fathers and the mothers in case studies 1, 2 and 3, and the maternal and paternal grandmothers in case study 4). In addition, several microanalyses of significant moments of the musical dialogue were also performed.

## Case Study 1: Diaper Change at Home, with Mother and Father

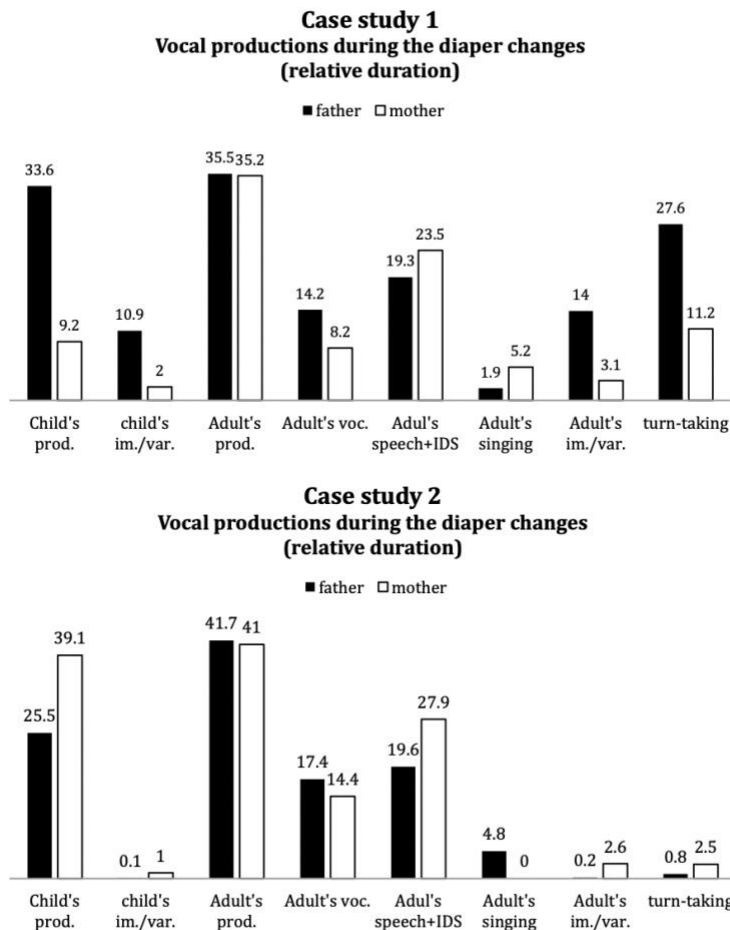
Ten sessions were analyzed with the same dyads as in the exploratory study: five sessions with the mother and five sessions with the father. The total duration of the sessions with the father (51.3 min) was longer than with the mother (46.95 min). As can be seen in Table 20.1, the child vocalizes and imitates/varies significantly more with his father (33.6%; 10.9%) than with his mother (9.2%; 2.1%); ( $p = .015$ ;  $p = .010$ , respectively). The father uses more “vocalization”

**Table 1:** Results of the case studies 1, 2, 3, and 4. The vocal productions during the diaper changes at home, with parents and grandmothers. The table shows the relative duration of each behavior for each participant, as a percentage of the total duration of all sessions for each dyad.

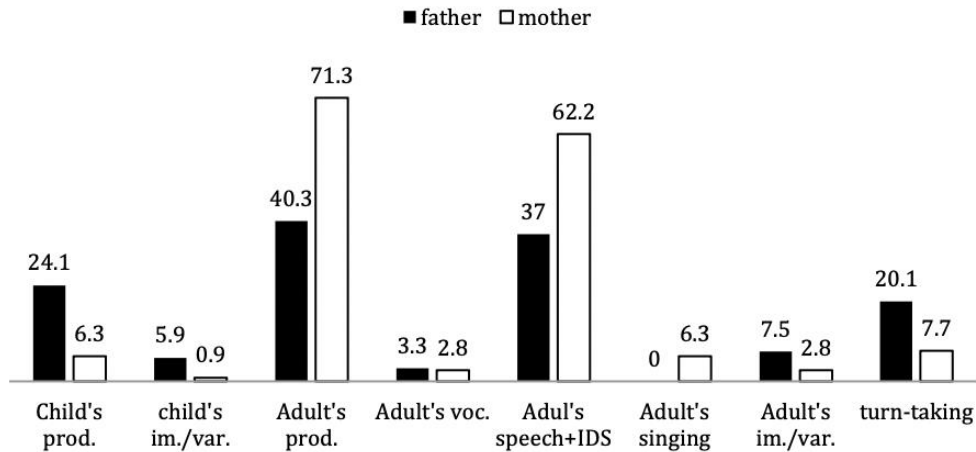
Case-study	Changing sessions	Dyad	Total duration (min)	Child's vocal production (%)	Child's imit./variation (%)	Adult's vocal production (%)	Adult's vocalization (%)	Adult's speech+IDS (%)	Adult's singing (%)	Adult's imit./variation (%)	turn-taking (%)
1	5	child-father	51.3	33.6	10.9	35.5	14.2	19.3	1.9	14	27.6
	5	child-mother	46.95	9.2	2.1	35.2	8.2	23.5	5.2	3.1	11.2
				$p = .015$	$p = .010$	$p = .336$	$p = .159$	$p = .168$	$p = .133$	$p = .009$	$p = .145$
2	7	child-father	14.3	25.5	0.1	41.7	17.4	19.6	4.8	0.2	0.8
	7	child-mother	11.35	39.1	1	41	14.4	27.9	0	2.6	2.5
				$p = .35$	$p = .05$	$p = .554$	$p = .389$	$p = .416$	$p = .275$	$p = .054$	$p = .405$
3	7	child-father	52.63	24.1	5.9	40.3	3.3	37	0	7.5	20.1
	7	child-mother	45.12	6.3	0.9	71.3	2.8	62.2	6.3	2.8	7.7
				$p = .000$	$p = .012$	$p = .000$	$p = .744$	$p = .001$	$p = .014$	$p = .038$	$p = .028$
4	5	child-grandmother/m	17.65	10.7	0.2	64.1	0	63.5	0.7	1.8	1.1
	5	child-grandmother/p	13.33	23.9	3.9	67	1.9	59.6	8	2.5	16.4
				$p = .056$	$p = .051$	$p = .686$	$p = .194$	$p = .352$	$p = .047$	$p = .673$	$p = .006$

Note. The t-test was performed between the average of the relative durations for each behavior of all dyad sessions, comparing the results of each session of the child with the father and the results of each session of the child with the mother, and the results of each session of the two adults (the fathers and the mothers in case studies 1, 2, and 3, and the maternal and paternal grandmothers in case study 4).

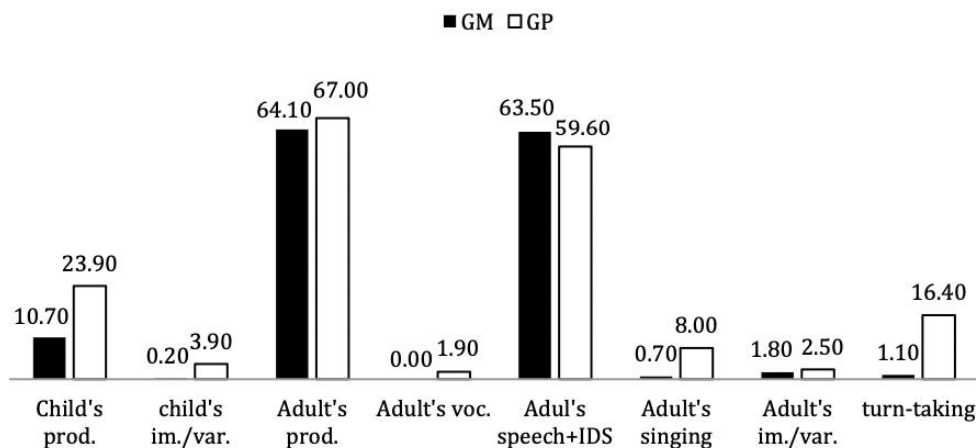
(14.2%), imitates/vars the child's productions (14%) and uses turn-taking (27.6%) more than the mother does (8.2%; 3.1%; 11.2%, respectively). The mother sings more than the father (5.2%; 1.9%). The difference between father and mother is statistically significant in the case of imitation/ variations ( $p = .009$ ) (see Table 20.1 and Figure 20.1). In conclusion, the child shows more vocal activities with the adult (his father) who uses more vocalizations than singing, imitates/ varies the child more and uses turn-taking.



### Case study 3 Vocal productions during the diaper changes (relative duration)



### Case study 4 Vocal productions during the diaper changes (relative duration)



**Figure 20.1** Results of case studies 1, 2, 3 and 4. The graphs show the relative duration of the child's vocal productions, the frequency and relative duration of adult's total vocal production, the relative duration of adult's vocalizations, singing and speech+IDS, and the relative duration of adult's imitation/variation and turn-taking.

#### Case Study 2: Diaper Change at Home, with Mother and Father

Fourteen sessions were analyzed with another child, 39 weeks old: seven sessions with the mother (36 years old) and seven sessions with the father (40 years old). The total duration of the sessions with the father (14.3 min) was higher than with the mother (11.35 min). The child's vocal productions and imitation/variations are more numerous with the mother (39.1%; 1%) than with the father (25.5%; 0.1%). The difference is statistically significant in the case of imitation/variations ( $p = .05$ ). The mother's total vocal productions (41%) and vocalizations (14.4%) are lower than the father's (41.7%; 17.4%). The father sings more (4.8%) than the mother, who does not sing at all. The mother imitates/varies the child (2.6%) and respects the turn-taking (2.5%) more than the father (0.2%; 0.8%). The difference between father and mother is statistically significant in the case of imitation/variations ( $p = .054$ )<sup>1</sup> (see Table 20.1 and Figure 20.1). In conclusion, in case study 2 the child shows more vocal activity and imitation with the adult (his mother) who vocalizes and sings less, imitates/varies more, and uses more speech, IDS, and turn-taking.



### **Case Study 3: Diaper Change at Home, with Mother and Father**

Fourteen changing sessions with a girl, 38 weeks old, and her mother (27 years old; seven sessions) and father (30 years old; seven sessions). The duration of all sessions with the father (52.63 min) was higher than with the mother (45.12 min). The child's vocal productions and imitation/variations are more numerous with the father (24.1%; 0.1%) than with the mother (6.3%; 0.9%). The differences are statistically significant ( $p = .001$ ;  $p = .012$ ). The father's total vocal productions (40.3%) and speech (37%) are lower than the mother's (71.3%; 62.2%). The mother sings more (6.3%) than the father, who does not sing at all. The father imitates/ varies the child (7.5%) and respects the turn-taking (20.1%) more than the mother does (2.8%; 7.7%). The differences are statistically significant, except for the vocalizations (see Table 20.1 and Figure 20.1). In conclusion, in case study 3 the child is vocally more active and imitative with the adult (her father) who vocalizes and sings less, imitates/ varies more, and uses more turn-taking.

### **Case Study 4: Diaper Change at Home, with the Grandmothers**

Case study 4 involved ten changing sessions with a girl, 48 weeks old: five sessions with her maternal grandmother (62 years old) and five sessions with her paternal grandmother (59 years old). The total duration of the sessions with the maternal grandmother (17.65 min) is higher than with the paternal grandmother (13.33 min). The child's vocal production is greater with the paternal grandmother (23.9%) than with the maternal grandmother (10.7%); the difference is marginally statistically significant ( $p = .056$ ). The frequency and total duration of the vocalizations are almost equal between the two grandmothers, as well as the use of imitation/variation and speech-IDS. Instead we observe that there is a statistically significant difference in the use of singing ( $p = .047$ ) and turn-taking ( $p = .006$ ): the paternal grandmother sings and uses turn-taking more than the maternal grandmother (see Table 20.1 and Figure 20.1). In conclusion, the girl imitates/ varies more and is more vocally active with the grandmother who vocalizes, sings, and imitates/ varies more and uses more turn-taking. These results confirm those obtained with the parents regarding imitation/variation and turn-taking. On the other hand, with the grandmothers the girl seems to be more stimulated by the singing and not by the intoned speech as observed in the dyads with the parents.

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The four case studies showed that the child is vocally more active when the adult's imitation/ variation and turn-taking are higher, both with the parents and the grandmothers. These observations support and expand previous research conducted on infant-adult vocal interaction in the daily life of children and their caregivers. It is interesting to note that the children were seen to be more active and more imitative with the adult who sings less and produces less vocalizations in the dyads with the parents, while in the dyad with the grandmothers the girl shows more vocal activity and imitates more with her paternal grandmother, who sings and vocalizes more. Due to the multiple statistical tests, the significance values should be interpreted with some caution and should be viewed only as an overall indication of the correspondence.

### **Reflexivity, Imitation/Variation and Turn-taking**

Regarding imitation, it is important to underline that it is not a question of the child's imitation of a model given by the adult, but rather of the adult's imitation of the child's vocalizations. It is therefore more likely that the child's vocalizations are stimulated by the child's perception of "being imitated". At the same time, we observed that the child who was more imitated by the adult also imitates more, and together with the adult explored intervals, rhythms, sonorities, physiological sensations and auditory perceptions, in an emotional and intersubjective context, paving the way for the creation of new musical ideas. Several studies have highlighted the effects of this adaptive and intuitive interaction, in which reflexive behavior is spontaneously present in neural mechanisms of the parents (Parsons et al., 2017). Further investigation of the vocal interaction of the educators with several children during the diaper change in the nursery could provide new information on the effects of reflexive vocal interaction on the adults.

Turn-taking is fundamental in reflexive interaction. Neurobiological studies have highlighted the close link between turn-taking and the processes of imitation and suggest that "simulation is a foundational mechanism underlying the temporal dynamics of joint action" (Gratier et al., 2015; Hadley, Novembre, Keller, & Pickering, 2015, p. 19516). The rules of reflexive interaction (turn-taking, repetition and variation, co-regulation) become the rules that build the musical conversation of the dyad. In case study 1, the father and son "played" at improvising like

two musicians/singers playing together, displaying remarkable anticipation and synchrony. Their eyes were focused and directed toward the partner, while imitation further encouraged interaction and, above all, affect attunement. We observed how the situation is co-constructed over time as a result of co-regulation. The father and son reached attunement step by step, constructing a series of shared and co-regulated actions, day by day, which allowed them to learn to anticipate the other's gestures and to regulate their own actions in relation to their expectations of their partner. This is precisely the function of routine and reflexivity: to construct a type of format, or "frames" (Bruner, 1983), allowing children to control time and its content made up of gestures, emotions and actions.

### **Role of the Adult: Parents and Grandmothers**

Several differences were observed between the child–parent dyads and the child–grandmother dyads. With the two grandmothers, the child was more vocally active with the adult who vocalized and sang more. With the parents, however, the child was more active with the adult who vocalized less and used speech more than singing, using infant-directed speech and speech/singing. These observations are interesting because, on the one hand, they suggest the researcher should look more deeply into the relationship between singing and vocalization in early childhood: for example, it was observed that a happy voice quality in either vocal mode (speech or singing) could improve infant attention (Corbeil, Trehub, & Peretz, 2013). On this issue, more recent studies are introduced in this volume (e.g., Chapter 13 by Falk and Tsang, and Chapter 19 by Trehub and Russo). On the other hand, they also suggest further investigations, both psychological and sociological, should be carried out on the different role played by the different caregivers who alternate in the daily care of the child. The analysis of more cases of children with different adults (parents, grandmothers, educators), at home and in the nursery, will be able to give further data and results on these issues.

### **Developmental Implications**

The results suggest that in order to enhance vocal production of the child and her/his ability to imitate and participate in vocal and musical conversation, adults/educators should find a balance between their vocalization and the vocalization of the child, leaving the child time to produce vocalization, respecting turn-taking, imitating the child rather than trying to be imitated, following the nuances of children's voice, and giving preference to musical play and the pleasure of musical vocal interaction. These reflexive activities are important not only for vocalizations but also for the child's development of singing. Studies have shown how singing stimulates the facial muscles in the mimicry of emotions (Chan et al., 2013). These studies may help to better understand the processes of empathy and brain processes, which underlie reflexive and co-regulated interaction.

In the future it would be interesting to study the relation between the child's vocal production and the emotional features of the voices during infant–adult vocal interaction. The observations of the case studies presented here could have some importance for the development of singing, namely the acquisition of conventional songs as well as the invention of songs (Cohen, 2011; Ilari, 2014), because a child who is vocally active and empathic creates the basis for a child who is also active in singing, who imitates and stimulates the partner to imitate her/him, and participates in the musical and vocal play of the interaction, whether it is singing or vocalization. We observed that reflexivity also implies a continuous exploration of melodic and prosodic production by the child who imitates, repeats, varies, proposes and is imitated, co-regulating her/his voice with the adult. For example, in case study 1, during the moments of "attunement" between the child and the adult, the two partners imitate each other in real time, and the child repeats and modifies together with the father the melodic profile of their vocalizations: what better exercise to learn how to sing and invent new songs? It is important to emphasize the connection of music education with interaction (Marjanen, 2012): in a particular way, reflexive interaction reinforces the effects of intuitive parental behavior, and serves to enhance engagement between infant and caregiver, to provide appropriate stimulation and to scaffold the infant's developing vocal and singing competences.

### **Implications for Society or for Increased Basic Knowledge**

Because the diaper activity takes place daily for every infant, the results of our study have great generality and highlight the influences on infant vocal learning in everyday activities. The presented study shows us above all, the importance of the musical dimension in the everyday life of children and how this can be supported by "reflexive" adults who listen, react and imitate before expecting to be imitated, who interact by setting up a game and playing with their own voice. It

further highlights how contexts and “roles” can influence these sound–musical relations, also in terms of wellbeing. Reflexive interaction can therefore play an important role in creating contexts of wellbeing and inclusion and, in this sense, can be learned and used as a professional strategy (mirroring, turn-taking, co-regulation) by educators during their experiences in communities for infants.

The video-analysis proved to be a valid tool both for research and for the training of the students and educators involved. The method adopted involving observation of daily routines allowed the students and educators, as well as the parents and adults who took part in the project, to discover the great value of the sound-vocal experience of children and the infinite variety of “musical” behaviors that both the child and adult experience on a daily basis, revealing a rich musical experience (see Ilari, 2017), sometimes richer than what the same protagonists would report if interviewed (e.g., listening to music and singing, as reported by parents in the study of Fancourt & Perkins, 2017).

## Conclusion

In this chapter we presented the paradigm of reflexive interaction, a scientific paradigm that focuses on mirroring conversation, on the mechanisms of repetition and variation, turn-taking and co-regulation. We have observed how this paradigm can be functional in the study of the child’s vocal development during the interaction with adults in the first months of life, and how reflexive interaction can reinforce the vocal activity of children. The results suggest that daily routines can represent cognitive and affective frames for young children’s musical and vocal development. These observations in daily routines can have important implications in the vocal and singing education of the child. The research-action approach highlighted the importance, in the training of caregivers, of learning to observe the vocal conducts of children and creating a vocal and “sound” relationship with them, both in the context of the family and of care and education.

## Glossary

**Flow** The state of flow can be defined as the psychological state of maximum optimism and satisfaction that a person perceives during the course of an activity and it is closely related to the concept of creativity (Csikszentmihalyi, 1990).

**Musical conducts** Piaget defines conducts as the “behaviours, including the conscience” (Piaget & Inhelder, 1966, p. 7). In the musical field the concept has been used by Delalande (2015): When someone picks up their instrument, prepares to play and then plays, what are they looking for, what do they expect from this set of coordinated actions? Observing the children from the point of view of their conducts, means concentrating on their motivations and not on their behavior.

## Note

1 It is recognized that the conventional level of statistical significance is .05, and .054 is outside this limit; however, given that the data are pilot data, and rounding would produce the .05, it seems fair, though not conservative, to refer to this as statistically significant.

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