ARTS AND CHILDHOOD: CHILDREN'S MUSICAL STYLES IN A "REFLEXIVE" ENVIRONMENT

ARTES E INFÂNCIA: ESTILOS MUSICAIS DE CRIANÇAS NUM AMBIENTE "REFLEXIVO"

Anna Rita Addessi[1]**, Jean Felipe Pscheidt**[2] **Et Rosane Cardoso de Araújo**[3]
[1]*University of Bologna (Italy)*
[2 & 3]*Federal University of Paraná, Brazil*

Email: annarita.addessi@unibo.it[1], pscheidtjean@gmail.com[2], rosanecardoso@ufpr.br[3]
ID. ORCID: https://orcid.org/0000-0002-3663-3673[1], https://orcid.org/0000-0002-0365-6502[2], https://orcid.org/0000-0002-3676-1042 [3]

ABSTRACT:
In this article the concept of "musical style" is introduced as a tool to study the relationship between children and art, and the paradigm of "reflexive interaction" as a "device" to enhance the child's musical style. The concept of musical style will be introduced as a representation of the child's identity, a way of expressing her/his self with sounds and music, and to be in communication with others. We will introduce the paradigm of "reflexive interaction", a particular tool that proved able to support and reinforce the individual musical style of each child, in both child-machine and child-adult interaction. Some scenarios of reflexive interaction both in everyday life and music lessons will be introduced and discussed.

Keywords:
children' musical styles; MIROR platform; music education; reflexive interaction; teacher-pupil interaction

RESUMO

Neste artigo, o conceito de "estilo musical" é introduzido como uma ferramenta para estudar a relação entre a criança e a arte, e o paradigma da "interação reflexiva" como um dispositivo para melhorar o estilo musical da criança. O conceito de estilo musical será apresentado como uma representação da identidade da criança, uma maneira de se expressar com sons e música e estar em comunicação com os outros. O paradigma da "interação reflexiva" será introduzido como uma ferramenta particular, que se mostra capaz de apoiar e reforçar o estilo musical individual de cada criança, tanto na interação criança-máquina quanto na interação criança-adulto. Alguns cenários de interação reflexiva, tanto da vida cotidiana quanto da aula de música, também serão apresentados e discutidos.

Palavras chave:
educação musical; estilos musicais infantis; interação professor-aluno; interação reflexiva; plataforma MIROR

Introduction

Research on the relationship between childhood and music understood as "art" has turned mainly towards the investigation of three areas concerning respectively aesthetic judgment education (see Hargreaves 1986, Nieminen, et al. 2012), musical preferences (see Hargreaves, 1986, Zenatti, 1991, Lamont, 2008), and children's musical stylistic listening competences (see Gardner, 1972; Addessi, Baroni, Luzzi, Tafuri, 1996; Marshall, Shibazaki, 2011). In these studies, the child is seen above all as a listener or user of music. In fact, little space has so far been dedicated to the child as a producer of musical art. In this latter area, most studies were oriented towards the identification of the compositional principles present in children's musical productions (instrumental and vocal) (see Imberty, 1990; Mialaret, 1996; Sundin, 1998; Tafuri, 2006). The question that arises is what it means to talk about art in children's productions and whether it is legitimate to look at the musical products of children through the lens of the concept of "artwork", which is historically and geographically determined. Here it is useful to recall the well-known model of Delalande (1993), which answered this question by proposing to use the concept of "conduct", that is, following Jean Claparède, Pierre Janet and Jean Piaget, a set of actions coordinated by a finality. According to Delalande, what is common to adults and children are not the "contents" of the musical products but

rather the three "musical conducts", inspired by Piaget's theory: the sensory-motor conduct, that is the manipulation of sound and of the objects that produce it; the symbolic conduct, that is the attribution of meanings to sounds; the conduct of rules, that is the compositional and organizational play with sounds.

In this article we propose a new approach to musical art in childhood that goes through the concept of "musical style". We will talk about the musical style of each child as a representation of her/his identity, her/his way of expressing her/himself with sounds and music, and to be in communication with others. We will introduce the paradigm of "reflexive interaction", a particular tool that proved able to support and reinforce the individual musical style of each child, in both child-machine and child-adult interaction. Some scenarios of reflexive interaction will be introduced and discussed.

The paradigm of reflexive interaction

The paradigm of reflexive interaction was originally born in the field of human-machine interaction studies; however, we can find traces of this paradigm in Western culture since the myth of Echo (Ovid, 43 B.C.-18, *Metamorphoseon libri XV*). We suggested that the idea of mirroring originated in ancient Western culture and now resonates with the contemporary psychological theory of musical embodiments, the link between action and perception, and the mirror system (Addessi 2014). This paradigm describes a particular type of interaction based on the mechanism of repetition and variation: when a human being plays an instrument connected to a computer, the system responds by imitating and varying the user's input, as in a sound mirror. The basic way of playing with this kind of system involves a particular type of turn alternation between the user and the system, governed by three fundamental principles (Pachet, 2003, 2006): 1. automatic detection by the system of the end of the musical phrase played by the user; 2. the duration of the phrase generated by the system is equal to the duration of the last phrase played by the user; 3. priority is given to the user, in the sense that if the user starts playing while the system is still playing, the system stops and resumes from point 1 listed above. The first interactive reflexive musical system was implemented for adult musicians (the

Continuator: Pachet, 2003). We experimented it with children (Addessi & Pachet 2005) and on the basis of the positive results proposed to apply this paradigm for implementing a new platform for children's musical and body creativity: the MIROR platform (Addessi et al. 2013).

Starting from the observation and empirical results with children, we considered different theories to explain human behavior during the interaction with reflexive systems and thus trace a theoretical framework of reflexive interaction, both in child-machine and child-adult interaction (Addessi, 2014; 2019). The main characteristic of reflexive interaction is the mechanism of repetition and variation: something repeats itself and varies during the interaction, through a continuous process of imitation and variation. Recent studies in psychology and neuroscience suggest that this mechanism plays an important role in the development of childhood musicality and represents one of the ontological foundations of human musicality (see, M. Papoušek, 1997; Dissanayake, 2000; Gratier & Apter-Danon, 2008; Imberty, 2005).

Imitation processes, recognition of imitation, self-imitation, repetition and variation develop in the first months of life and structure the child's Self and its interaction with the environment. Anzieu (1996) defines this type of childhood experience as the "sound envelope of the Self", where the Self is described as the first embryo of personality perceived as a unity and the expression of one of the most archaic forms of repetition: the echo. The experience of repetition and variation is realized within emotional conditions that Stern (2004) defined with the term "affective contours". These studies lead us to the concept of style where style is understood as the identity built by the child through mirroring with the other. Reflective technologies, in fact, generate very complex reactions, during which children are led to formulate different judgments about their "self" and "the other". By means of their "mirror effect", reflexive technologies contribute to the construction of a "musical ego".

The ability to replicate the behavior of others can find its neuroscientific foundation in the mechanism of the mirror neuron system, a network of neurons that become active during the execution and/or observation of actions (Rizzolatti et al., 2002). These researchers hypothesize that there is an evolutionary

mechanism, called "resonance", through which the visual descriptions of motor behaviors are directly matched with motor representations of the observer who is observing those same behaviors. In the field of embodied music cognition, Leman (2007) emphasizes that "there is evidence, (...), that mirror neurons are amodal in the sense that they can encode the mirroring of multiple sensory channels" (p. 91).

Therefore, a reflexive interaction through the auditory canal, as occurs during the interaction with the MIROR applications, would stimulate a resonance mechanism in the child in the motor areas of the brain. This field of study and its application in the educational sciences is still largely unexplored. *Turn-taking* and *co-regulation* are further important features of reflexive interaction. We can observe them both during the interaction of children with the MIROR applications and with adults, as for example in vocal infant-adult interaction in the early months of life.

Observation of child-machine interaction in a reflexive environment

To understand how reflexive interaction works, we describe a brief session of an 8-year-old girl playing a keyboard connected to MIROR-Impro, a reflexive application of the MIROR platform which "answers" by imitating with variation the inputs played by the user:

"The little girl plays two consecutive notes, C2 and A2, and then stops to wait for the response of the system. The system responds by repeating the same notes. The child then plays a single note, G2, and the system responds with a single note, but this time introduces a variation: she plays C3, thus introducing a higher register. The girl, following the change introduced by the system, moves toward the higher register and plays a variant of the initial pattern, namely: D2-A2-E2-C3, and introduces a particular rhythm pattern. This "reflexive" event marks the beginning of a dialogue based on repetition and variation: the rhythmic-melodic pattern will be repeated and varied by both the system and the child in consecutive exchanges, until acquiring the form of a complete musical phrase. At some point in the dialogue, the child begins to accompany the system's response with arm movements

synchronized with the rhythmic-melodic patterns, creating a kind of music-motor composition." (Addessi, Anelli, Benghi, Friberg 2017, p. 4)

In this example it is possible to observe the fundamental elements of reflective interaction:

• interaction is based on turn-taking

• the response of the system lasts as long as the last phrase played by the child, thus giving rise to a regular timing of the turns

• the child's attention increases when the system imitates the phrase played by the child

• the dialogue that emerges between the child and the MIROR-Impro is not predetermined by the machine and is not only realized by the child, but is co-constructed by the child together with the system

• this co-regulation is based on a mechanism of repetition and continuous variation between the phrases played by the child and by the system

• the two partners are able to imitate each other

• the child recognizes that she is being imitated.

These observations show us how the reflexive system is able to imitate and change the girl's proposals and how this behavior provokes in the child surprise, curiosity and interest, which encourage her to pass from the casual execution of two notes to an elaborate sequence of rhythmic-melodic patterns and musical invention, also interpreted through the movement of the body.

The MIROR platform as a "device" for children's musical and motor creativity

The MIROR platform is an innovative system created to promote skills and creativity in the field of improvisation and the musical and motor composition of children. The platform was implemented within the European project MIROR-Musical Interaction Relying On Reflexion (FP7-ICT).[1] The MIROR platform is based on the reflective interaction paradigm.

The first prototype of a reflective interactive system was implemented for adult musicians (Pachet, 2003). We decided to

experiment with children and the positive results of this experimentation (Addessi & Pachet, 2005) led us to conceive, and therefore to implement, the MIROR platform as an educational "device" composed of a series of softwares that use the reflective paradigm in the field of improvisation (MIROR-Impro), composition (MIROR-Compo) and motor creativity (MIROR-Body Gesture) in children (Addessi et al., 2013). The MIROR platform was designed for children between 2 and 10 years of age, for formal and informal learning settings, in therapeutic and rehabilitation contexts and as an instrument for inclusion. From a pedagogical point of view, the MIROR platform can be defined as a "device" (see Delalande, 1993), that is a concrete mediation that the teacher identifies with reference to a specific situation, in order to allow children to concentrate their attention on the sound, the movements and their characteristics. In other words, a tool to motivate and strengthen children's musical and creative motor experiences (Addessi, 2015).

The relation between the concept of style and reflexive technologies

The concept of style is fundamental in reflective technologies. In fact, in principle, during the reflective interaction, the machine does not imitate exactly what the user is playing, but her/his musical style. We can identify two elements in common between reflexive interaction, interactive reflexive musical systems (IRMS) and the concept of style, which are: the mechanism of repetition and variation (in terms of rhetorical concepts such as "rule and deviation": Segre, 1982) and the concept of style as a representation of identity and a phenomenon of meaning, as developed above all in the context of modern stylistics (Molino, 1994).

Pachet defined musical style as the "statistical distribution of notes, chords and musical elements in general, as well as their order "(Pachet, 2004, p. 3). Style is therefore understood here in an informatic sense, as a statistical occurrence of traits.

In our previous study, we investigated the stylistic competence of children and we defined style as the representation of the identity and values of an individual, or community, or historical period (Addessi, Baroni, Luzzi, & Tafuri 1996). We demonstrated

how 8 to14 year-old children are able to recognize the musical style of a composer and that this ability improves with age and with familiarity with the repertoire. Instead, in the study introduced in this article, we observed the stylistic competence of children from the point of view of their own production.

During the exploration and musical improvisations of children with reflexive interactive systems, we observed the presence of individual musical styles, both in the way of producing sounds and the manipulation of the instrument, and in the personal way of setting goals and finding strategies to achieve them. The applications of the MIROR platform, thanks to their mirror behavior, can reinforce these individual musical styles and stimulate their development and evolution. We attributed the aesthetic framework of reflexive systems to a particular "intertextual" stylistic perspective (see Barthes, 1982), due to the fact that both the child and the machine produce musical "citations" of their own performances, during which the machine puts the child in the condition of listening and manipulating self-citations.

Pedagogical implications

Generally speaking, it is possible to affirm that reflexive interactive technologies are placed in a socio-constructivist perspective of learning, but at the same time they propose a new pedagogical perspective in the field of child-computer interaction. Reflexive interaction stimulates the subject to undertake a dialogue during which the repetitions and variations trigger a cognitive conflict that the child solves "musically" during the interaction, giving rise to both training and problem solving. In practice, reflexive systems exploit the Vygotskian concept of "proximal development zone" (Vygotsky, 1962), establishing a learning interaction between children and the system itself.

However, these systems do not play the role of a "more competent partner" because they do not have a musical competence greater than that possessed by the children. The interaction that is established between the child and an IRMS is more similar, therefore, to the model of peer interaction. The "learning method" with the IRMS is based not on *imitation* but on *being imitated*, therefore on turn-taking, the regularity of the turn, on the strategies of

mirroring, modeling and scaffolding, on intrinsic motivation, on collaborative play and joint attention. In this regard, we emphasize that, unlike other educational software, in which the objectives are predetermined by the machine, with the MIROR applications the objectives are not established by the machine or the user, but by the interaction in real time between the child and the system. This type of interaction, which makes the machine "adaptive" and constantly evolving based on the specific subject with which it is interacting, allows *children* to always be placed at *the center of the learning process*, in particular facilitating interaction for younger children. This type of interaction promotes prolonged attention spans and particular learning patterns such as *self-learning*, *self-regulation* and *self-initiative*.

The pedagogical effectiveness of reflective technologies is based above all on the fact that they help children to "express" themselves through sounds and their body, to give voice to their emotions, to their imagination and need for communication and socialization. In other words: this kind of interaction allows children to express themselves by means an individual musical style. For this reason, we believe that these systems can be an effective tool for music and motor learning because, in agreement with Baroni, we believe in the "absolute need for pre-eminence of the moment of expression over that of learning: and this not only because the construction of expressive objects can be considered as the main goal, but also because it is the only valid and persuasive motivation for learning activities "(Baroni , 1997, p. 141).

With the MIROR platform, children learn to improvise and compose by interacting with a computer, and this may be helpful if their teacher can not or does not want to teach improvisation. Children explore the keyboard and produce musical ideas in a myriad of different ways: with their elbows, head, buttocks, or forearm, with one finger, several fingers, the palm of the hand. The analysis of their musical improvisations highlighted rhythmic and melodic patterns, formal structures, forms of singing and accompaniment, styles of individual improvisation, and formal constructions based on imitation, repetition, alternation and contrast. Both in exploration and in improvisations, the individual styles of

each child are strengthened and at the same time re-launched by the mirror response of the system.

A very important aspect is that the main channel of interaction between children and the machine is *listening*: this encourages children to think "in sounds" (McPherson, 2005) and to listen to their own sound productions, of fundamental importance for musical learning (Delalande, 1993). The listening conducts of children during the interaction with MIROR-Impro are particularly rich and varied: "surprise", concentrated and analytical, but also symbolic, aesthetic, empathetic, collaborative, bodily, autotelic, multimodal. In particular, the dialogue with a MIROR application generates a type of "intertextual" listening, during which the children are called to interactively build and reconstruct the fragments of their musical discourse.

The results of our studies have shown that the reflexive interaction with the use of MIROR-Impro increases the experience of *flow* (Csikszentmihalyi, 1996), and therefore of well-being and creativity (Addessi, Ferrari, Carugati, 2015), creative and improvisational skills (Addessi et al., 2017), motor creativity (Addessi, Anelli & Maffioli 2017), and self-regulation of the group (Ferrari & Addessi 2014), and enhances and stimulates expressive behavior and communication in situations of disability and inclusion (see Bonfiglioli & Addessi, 2017; Ferrari & Addessi, 2016).

Children's aesthetic judgment and the "surprise"

The "surprise", or "Aha effect", is the first observable reaction in children when they hear for the first time the "mirror" response of the system: surprise and subsequent excitement. "The central element of aesthetic experience", writes Dallari, "(...) is (...) amazement: something amazes me, strikes me, causes an oscillation in my moods, an alteration of emotional balance" (Dallari, 1996, p. 11). The aesthetic experience aroused in children by reflexive systems is also manifested through verbal expressions such as: "It's beautiful!", accompanied by motor excitement or, on the contrary, by phases of ecstatic and autotelic concentration, *flow*, absence from everything around them (see Figure 1). If on the one hand a sense of amazement is engendered, on the other, the

children are able to interrupt the game with MIROR technologies when they want, thus preserving the *distance factor* (Bertolini & Dallari, 2003) between the child and the machine, considered fundamental for the aesthetic experience of the child.

Figure 1. Two 2-year-old children playing together with the MIROR platform (as from Addessi, 2015, p. 53).

Reflexivity in infant-adult vocal interaction

Reflexive interaction, based on repetition/variation, turn-taking, and co-regulation, is not only a phenomenon linked to new technologies. In infant-adult vocal interaction it was observed that reflexive interaction enhances the vocal experiences of children. In our previous study, we observed how this paradigm can be functional to the child's vocal development during the interaction with adults in the first months of life and how reflexive interaction can reinforce the vocal activism of the children (Addessi, 2019). Four case studies of infant-adult vocal interaction during diaper changes at home showed that the children are vocally more active when the adult's imitation/variation, co-regulation, and turn-taking are higher, that is when the adult is more "reflexive". The study shows us 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. Reflexive interaction can

therefore play an important role in creating contexts of wellbeing and inclusion and in this sense can be learned and used also as a professional strategy (mirroring, turn-taking, co-regulation) by educators during their experiences in communities for infants.

What IRMS teach to teachers

So, what can a teacher learn from the MIROR applications? First of all, to discover, observe and enhance the musical style of each child. To dialogue with the children through sounds: the sounds of the voice, of instruments, of objects, of the body. To respect the alternation of turns and act like a mirror, as suggested by the children when they say "Teacher, look at me!". To let the goals arise during the sound dialogue, together with the children. To favor situations in which children can experience the pleasure of not knowing what is going to happen, their surprise, curiosity and autonomy. To not give ratings during the interaction. To stimulate communication and sound dialogue, develop child-centered learning, adapt methods and practices to children's musical styles. To give immediate feedback to children, as well as emphasize the process of creation rather than the final product and prioritize the child's musicality and body expressiveness. Many examples of practical experiences with MIROR applications are described in Addessi (ed., 2015).

An experience of "reflexivity" between a teacher and a girl in a drum lesson

In this section we will present a new experience in which a music teacher decides to use reflexive interaction with a 6-year-old girl. The experience was carried out in Curitiba, in the south of Brazil, in a drums course at a music education school (Pscheidt & Cardoso de Araújo, 2017). In the classroom two batteries of drums were placed opposite each other, and two cameras to videotape the two positions respectively (see Figure 2). The activities were organized with the aim of creating a "reflective" environment between the teacher and the child. A 30-minute session was held, divided into three phases: 1. *exploration*, 2. *implementation*, and 3. *synthesis*.

During the *exploration*, the girl was invited to play both batteries freely and to choose which one she would use in the following phases. In the *implementation* phase, the teacher proposed the game of the "defective mirror", in which the teacher would imitate the phrases played by the child but with some imperfections. In the *synthesis* phase, the child was encouraged to create a soundtrack for a story told by the teacher.

In the implementation phase it was observed that:

- the girl showed more interest in the answers played by the teacher, through attentive listening, only from the moment in which she acknowledged being imitated;

- from this moment on, the girl started to wait for the teacher's answer, respecting the turn-taking with temporal regularity

- during this process, the child began to imitate something that had previously been played by the teacher, thus showing the beginning of co-regulation behavior

- when the teacher answered with many variations, the girl answered with apparently random phrases, unrelated to the phrases played by the teacher and without showing co-regulation.

It was therefore observed that the "reflexive" process was more effective when the child understood better the teacher's response, and this happened when the teacher's answers did not contain a high degree of complexity and variability. However, the turn-taking was not interrupted even when the teacher performed more complex responses, although the child's phrases became shorter and less exploratory.

Both in the *implementation* and *synthesis* phases, the musical quality of the phrases played by the child seemed to depend on the degree of reflexivity of the interaction with the teacher. In this sense, the game of the "defective mirror" turned out to be more effective than the activity of soundtracking in the story to stimulate the child to produce a greater number of rhythmic variations, and timbric and dynamic explorations. During the moments of reflexive interaction, the child appeared confident and controlled both the conclusion of the interaction and the proposal of new sentences. In this sense, the reflexive interaction launched by the teacher gave rise to a creative improvisation that encouraged and strengthened the child's musical vocabulary and thus her musical style.

The results of this brief exploratory study indicated that the interaction between the teacher and the child was supported by the fundamental behaviors of the "reflexive" interaction, ie imitation / variation, co-regulation, turn-taking and temporal contingency. These mechanisms influenced the improvisation process and strengthened the musical creative dialogue between the child and the teacher (see Addessi, 2015).

This learning situation, based on being imitated, reverses the teacher / student relationship that we normally encounter in the teaching of music and musical instruments, giving more space to the musical style of the child stimulated by the "reflexive" action of the teacher.

Figure 2. The setting of the "reflexive" drum lesson (Curitiba, 2017).

Conclusions

In this article we addressed the problem of the relationship between musical and artistic productions in childhood, through the lens of the concept of style, and we introduced the paradigm of reflexive interaction as a "device" that stimulates and reinforces the individual musical style of children.

Reflexive interaction, based on the mechanism of repetition and variation, mirrors the child's musical style, that is, her/his musical identity, supporting and reinforcing it, allowing children to play with their own style, to learn a musical language to express themselves, alone and with others. Children in a reflective environment listen to

themselves and construct musical "intertexts" on multiple compositional levels, with the system and with other companions or adults. And it is precisely the recognition of these musical fragments and the presence of variations that motivate the child to produce and develop new musical ideas.

As Baroni wrote: "Individual identity becomes style only when it is recognized as such by the group to which it belongs" (Baroni, 1996, p. 21). For this reason, we believe that each child has the right to have her or his musical style recognized, both by machines, as can happen with the MIROR technologies, and by the people who surround them, their teachers, parents, friends, wherever it is expressed - at school or in the family. Further studies and practical sessions are planned to take place, in music schools' kindergarten and primary schools, involving both teachers and students. This will enable us to fully explore the potential of a reflexive music environment, to study the role of the adults/teachers, and to assess the use of the reflexive environment in inclusive contexts.

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To know more about the authors…

Anna Rita Addessi
Associate professor in Musicology at the University of Bologna, where she teaches Music Education. She holds her Phd in Systematic Musicology and a Post-Doc in Psychology of Music, University of Bologna. She promoted and coordinated the EU project *MIROR-Music Interaction Relying On Reflexion* (ICT-FP7). Her main research topics are music teacher education, infant musicality, social representations of music, auditive music analysis, intertextuality, contemporary music, the mandolin in Naples in XVIII Century. Vice-President of ESCOM (2010-12), member of ICMPC-Advisory Committee and MERYC Board, she published Italian and English books and many academic articles on topics which reflect her wide range of interests across systematic musicology and music education.

Jean Felipe Pscheidt
Percussionist, PhD student in Music Education, Federal University of Paraná, Curitiba (Brazil). Graduated in music from the School of Music and Fine Arts of Paraná (EMBAP/BRAZIL) and Master in Music from the Federal

University of Paraná (UFPR/BRAZIL). He holds a doctorate in music from the Federal University of Paraná (UFPR/BRAZIL) in the line of Cognition / Music Education. He is a collaborating professor in the undergraduate courses in Music at the Pontifical Catholic University of Paraná (BRAZIL).

Rosane Cardoso de Araújo
Post-doctoral degree from the University of Bologna (Italy), PhD in Music from the Federal University of Rio Grande do Sul (Brazil). Associate professor at the Federal University of Paraná (Brazil)/ Department of Arts. Researcher of the National Council for Scientific and Technological Development (CNPq). Vice-president of the Brazilian Association of Cognition and Musical Arts.

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[1] For more information on the project, the reader can visit the official website: www.mirorproject.eu.