

Sound explorations from the ages of 10 to 37 months: the ontogenesis of musical conducts

François Delalande^{a*} and Silvia Cornara^b

^a*Groupe de Recherches Musicales (GRM), INA, Paris, France;* ^b*Centro Studi Musicali e sociali M. di Benedetto (CSMDB), Lecco, Italy*

(Received 23 May 2010; final version received 24 June 2010)

One of the forms of first musical conduct is the exploration of sound sources. When young children produce sounds with any object, these sounds may surprise them and so they make the sounds again – not exactly the same, but introducing some variation. A process of repetition with slight changes is set in motion which can be analysed, as did Piaget, as a circular reaction, but which can be seen, from a musical standpoint, as the development of a ‘sound discovery’ by repetition and variation. It is an elementary form of ‘musical idea’ which is a central moment in the process of invention in music.

Studying these first musical conducts was the aim of a three-year research project. The chief condition of observation consisted in analysing the behaviour of one child left alone in a room exploring the sound possibilities of an instrument (a zither or a pair of cymbals). Fifty-five children from the ages of 10 to 37 months were filmed twice in this situation of solitary exploration. The videos were transcribed and analysed from various points of view by a group of 15 musician-researchers.

Keywords: childhood; music; exploration; ontogenesis

The aim of this article is to explain the method and to present some of the results from a research study led by a group of 15 musician-researchers over a period of three years in several nurseries in the area of Lecco, North Italy (Delalande 2009a). This project, called ‘Nido Sonoro’, was organised by the Centro Studi Musicali Maurizio Di Benedetto.¹

The chief condition of observation consisted in analysing the behaviour of one child left alone in a room exploring the sound possibilities of an instrument (a zither or a pair of cymbals). When children produce a sound with any object this sound may surprise them and so they produce it again – not exactly the same sound, but introducing some variation. This interest for sound, determining repetition and variation, can be regarded as the starting point of a form of musical invention.

During the first year of research 55 children from the ages of 10 to 37 months were filmed in this situation of solitary exploration. The second and third years were used to study the effect of various ‘set-ups’ (e.g. amplification of the zither, two children exploring together one or several instruments) to observe the longitudinal evolution of behaviours and to find the best pedagogical follow-up to such situations.

*Corresponding author. Email: delalande.fr@wanadoo.fr

A pedagogical and anthropological objective

During the last 40 years or so we have come to know many types of world music, often differing greatly, and researchers and music theorists have asked the question ‘What is music?’ or ‘How musical is man?’ Among others, the famous paper by Molino (1975) begins with these words ‘Qu’est-ce que la musique?’ (what is music?), the first chapter of my book *Le condotte musicali* (1993) is called ‘Che cos’è la musica?’ (what is music?) and the general title of the second part of Nattiez’s (2007) book is ‘Qu’est-ce que la musique?’ (what is music?). We also should not forget the contributions of ethnomusicologists such as Blacking (1973) and Nettl (1984) whose first chapter is an analysis of the concept of music.

As a contribution to a possible reply, we are asking another slightly different question: ‘Why do humans have the sort of behaviour we call “musical”?’ which consists of producing, with hands or voice, sounds which have no obvious use and giving a meaning or a symbolic value to these sounds and organising them. Why do people do that? What are they looking for in behaving that way? What interest or pleasure do they find in the production of sound?

One way of replying to this question is to observe how it begins. Not ‘how it began in the history of humanity’ but ‘how it begins in early childhood’. The first question (how it began in the history of humanity) is of great interest but hardly amenable to empirical enquiry. On the other hand, ‘how the first behaviour that might be the origin of musical conduct appears in the child’ is a question that is perfectly open to observation.

In this article, according to a use inherited from Pierre Janet and transmitted in particular by Piaget (1945/1951), we shall prefer the word ‘conduct’ to ‘behaviour’ when we try to answer the question ‘why’; that is, when we are looking for finality or motivation behind a set of coordinated acts. We shall reserve the word ‘behaviour’ to directly observable gestures and acts.

At the moment, there are two major fields of study in the ontogenesis of musical conducts. One of them is the voice, the vocal intonations and pre-verbal modalities of communication, notably between mother and baby, which use sound (for example, Gratier 2007; Papousek 1995). The second is the exploration of sound sources – which can be the voice or the mouth – which produces very interesting sounds; the source can also be any object which comes to hand and which produces sound. This second line of enquiry has, curiously, so far been less explored from a musical point of view. A related study in the French literature is that by Mialaret (1997) who devoted a book to studies of instrumental explorations of young children. But the children he observed were older (aged three to five years) and the instrument he used, a xylophone, favours one gesture (hitting). The zither allows for more open exploration, with hands as well as with objects; to hit, to rub, to pluck, to slip between the strings and to bounce. I say ‘curiously’ because for a musician who is interested in the process of invention in music it would seem fairly obvious that invention in music derives directly from the explorative conduct of early childhood. That is what I aim to explain, and it is on this hypothesis that a large part of the programme of observation that we are going to present is built.

From circular reactions to the process of invention

Exploration begins in the first year of life, according to Piagetian theory, in the form of sensory motor behaviour known as circular reactions (Piaget 1945/1951). It is a process of discovery that involves several successive stages:

- The child makes a chance gesture that gives him/her an agreeable sensation, for example, a sound.
- He/She feels curiosity and interest.
- So he/she wants to do it again.
- He/She starts again, but from a certain age (about seven months) he/she restarts but makes changes to maintain curiosity and interest.

It is in this last stage, where there is repetition and variation, that we would say there is exploration.

This sequence of chance discovery and exploration of its possibilities is closely linked to the process of invention in general and particularly in music. What is a 'musical idea'? It is a sound form, found by chance, that is retained because it has something original or new (Delalande 2001, 2007). The musician is attracted by this sound configuration that she has discovered – by actually producing it or by imagining it in his/her head – and he/she wants to use it. It can be a theme, a rhythmic pattern, a timbre . . . I will say 'a sound configuration'. In order to find out how to use it, to extend its possibilities, he/she repeats it, but alters it slightly, introducing variations. This process of invention that takes place during the weeks of composition, or in the real time of an improvisation, follows the same path as the circular reactions of seven- or eight-month-old children who find, then exploit, their discovery by repetition and variation.

In this process, how much is universal, biologically determined behaviour and how much is determined by culture? This question pits the answer according to Piaget, who studied *The formation of symbol 'in the child'*, *The birth of intelligence 'in the child'* and who supposed that his observations had universal impact against the answer according to Bruner (1990) who claims that the formation of human mind is mainly the consequence of immersion in a culture. We prefer to try to know *what* is universal in development and *what* depends on material and cultural context.

The first sensory motor features, like sucking, are obviously universal. The same is true of grasping and a whole range of basic sensory motor features. But circular reactions enrich this range through contact with the environment. The environment is, on the one hand, the physical surroundings, that which comes to hand to which the child must adapt his gestures by assimilation and accommodation and also, on the other hand, the human factor which can reinforce positively or negatively. This temporal sequence which consists of discovering, repeating and altering, is probably universal but what is discovered, what is chosen to be repeated or altered, obviously depends on the physical and cultural environment.

The same can be said of the other facets of the conducts we call 'musical'. Using sound for representing, expressing or symbolising seems to be universal but what we represent, express or symbolise depends on culture. Giving ourselves rules of organisation is general, but the rules that we give ourselves are specific. This is not the place to develop a theoretical proposition already presented elsewhere (Delalande 1984,1993) but we will mention it briefly. The musical conducts appear as a combination of three main components: a sensory motor component (producing sound with one's hands or mouth), a symbolic one (expressing, evoking and representing) and the pleasure of following rules of organisation. One can see the parallel with the three main forms of play studied by Piaget (1945/1951): sensorimotor play, symbolic play and play with rules. This is the basis of thought for the study of the ontogenesis of musical conducts and its pedagogical consequences.

An example of a 'discovery'

To illustrate this behaviour of discovery and exploitation of the discovery, let us consider Giulia who is 25 months old. It is the second time she has explored the zither. The first time, two months earlier, she first reproduced the gesture which had been demonstrated by the adult – rubbing the strings with a spoon. After about a minute, when the adult had left her on her own, she happened to touch a string with her hand and that gave her the idea of touching the strings, not with the spoon but with her fingers. So she discovered pizzicato.

Two months later the adult brought her into the room and again rubbed the strings with a spoon producing a loud ringing sound. But that is not what interested Giulia. What interested her, once she was alone, was to reproduce what she had discovered on the first occasion: pizzicato sounds. We can see how in the course of the session she improved the control and variety of her gestures² (Delalande 2009a, 2009b) (Figure 1).

Several points need to be made. Firstly, it is a very good example of variation within repetition, that is to say the development of a discovery. Secondly, we can see that on the second occasion the little girl takes up what she had found the first time: it is a process of capitalisation which contributes to the creation of a style. Finally, what interests her is what she found herself (pizzicato), not the ringing sounds that the adult had shown her.

Studying the solitary exploration: method and a few results

Observations in the first year were done in two nurseries located in two small towns in the Lecco area. Nursery practitioners took part in the preparation and discussion sessions with the research team. Most of the children attended the nursery full-time. Three other smaller childhood services (among them a family-nursery) joined the project for the second and third year of observations. There were a number of practical questions for carrying out the research. How could we study the children's spontaneous musical conducts? How could we carry out individual observations without putting the children in an unnatural situation? So we established a protocol applied in the first year of the research which enabled us to collect a considerable amount of data.

The protocol was subdivided into the following three phases.

Phase 1

An educator invited each child, individually, to go and discover a 'surprise' in a room. Here the child found an instrument. All the other objects were removed from the room. For the first phase, the adult and the child were together in the room. The educators were instructed to interact with the children as little as possible but to leave them free to discover and explore the object and the room.

Phase 2

After one or two minutes, when the child felt comfortable, the educator left the child alone, giving a reason to leave. In this second phase the child could explore the object on their own.

Child code: VCOGIF0101 20/02/2003 hour 9.16											
Time	No sounding behaviours	Sound exploration								Notes on sound gestures	
		hitting		rubbing				plucking			bouncing
		l.h.	r.h.	l.h.	r.h.	l.h.	r.h.	l.h.	r.h.		
		>	<	>	<	><	<>				
					A						large gesture, ringing sound with metal spoon
	A goes out										
1'10											
		w									very little sound with wood spoon
								w			
										v	
1'20											
										v	
										vv	Succession of delicate sounds in the high pitch

Figure 1. An example of transcription: a section of the beginning of the second exploration by Giulia.

Phase 3

In the third and last phase, the adult came into the room again when the child seemed to be tired or the exploration was over.

The sample consisted of 55 children subdivided in two groups:

- 35 children exploring a zither twice (Z1–Z2); and
- 20 exploring at first a couple of cymbals and then a zither (C–Z3).

Group 1 (n = 35)	Group 2 (n = 20)
Zither 1	Cymbals
Zither 2	Zither 3

The second exploration was performed after approximately two months. Every exploration was videotaped by two cameras: one wide-angle camera to record the

whole room and a narrow-angle camera focused on the child and the instrument in order to record the children's gestures and facial expressions.

After a first review of the data we divided the children's experiences into three categories related to the level of exploration: many, few or none. The most interesting explorations (category: many) were recorded second-by-second in a table (as seen above) so that they could be analysed and compared.

The first year of work enabled us to collect a considerable amount of data due to the use of different methods: 120 individual explorations recorded on 30 hours of videotape; 120 reports including educators' comments; 46 second-by-second transcriptions displayed in a table; and 46 analytic descriptions of the 'good' explorations. Finally, we also had questionnaires completed by the children's parents.

The following sections explain how we analysed these data: first adopting a transversal analysis (called 'focus') about some specific and relevant aspects of the children's activity and second comparing some variables to obtain quantitative data about the children's activity.

Focus

Some of the research team focused their attention on aspects which were considered to be particularly interesting. These we named 'focus'. Hereafter we summarise the meaning of each 'focus', acknowledging each to a member of the research team (see also Delalande 2009b for a more extensive discussion of each focus).

(1) Long explorations of a discovery (Manuela Filippa)

Sometimes a child discovered an interesting sound gesture. Eight 'discoveries' were analysed in detail. A sound gesture was called 'discovery' when:

- The adult had not made the gesture – it had been discovered by the child.
- The sound gesture had been repeated many times during the first exploration, often alternately with another sound gesture. It may have been observed that the discovery found during the first session was repeated and deepened during the second one (see Figure 1, Giulia).

(2) Children's style in exploration (Cecilia Pizzorno and Luisella Rosatti)

Every child approached the instrument in a personal way. Could it be said that children have a personal style? Style was defined from three points of view, each of them characterised by a few indicators:

- Cognitive style (strategy of exploration, length of time before beginning and looking for approval from the adult).
- Instrumental style (type of sound gesture and motor behaviour).
- Compositional style (During the exploration a musical form was performed. For instance, one child produced alternations, another one an 'organised sequence',

that is, a sequence which had a particular form, for example, a long sound followed by a short one which is repeated three times, followed by a variation.).

(3) Adult–child relationship (Davide Donelli)

In the first and third phases of the protocol, the educator and the child were together. How can we describe their relationship? Even if the protocol had said that the adult should not influence the exploration of the child, some strategies were more successful than others. Silence, not speaking but exchanging glances or smiles was one of them. It was found that a third of the children did not begin their exploration when the adult was present in the room. They began when they were alone.

(4) Sound-gesture transfer (Giorgio Minardi)

Sometimes children transferred the gesture used on an instrument to other objects. Why did they behave in this way? Three kinds of transfer have been observed:

- Applying the same sensory motor schema to various material objects, by assimilation.
- Extending the exploration of sonorities from the instrument.
- Using the difference of sonority between the instrument and other objects, to obtain alternations or organised sequences.

(5) Sound-gesture pleasure (Silvia De Carlini, Nadia Ongarato, Rosangela Truscello, Katia Zucchi)

During the exploration one child laughed, another stopped, listening with attention to the resonance, another felt the vibrations on the strings of the zither. A list of signs of pleasure was proposed on the basis of video observation.

(6) Gender difference (Giulianna Gatti)

The sample was made up of female and male children. Was there a difference between male and female exploration? From our observations we proposed that there is a more feminine and a more masculine strategy. One kind of gesture was preferred by the boys (hitting with a spoon) and other kinds by the girls (using the hand to rub or pluck).

Comparative analysis

This section presents some quantitative findings based on the analyses of some variables, such as the children's age, length of explorations, level of activity (see below for the definition) and variability in sound gesture.

(1) The children's age at the first exploration

- First group (Z1): from 10 to 37 months; average: 24 months and nine days.
- Second group (C): from 10 to 37 months; average: 23.9 months.

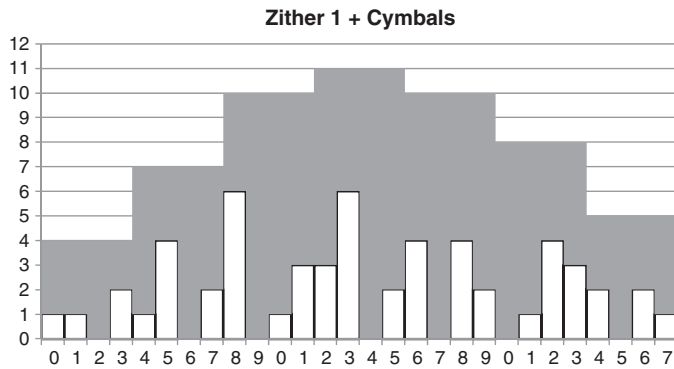


Figure 2. The distribution of age in the whole sample.

We can see a symmetric distribution around the average age of 23 months (Figure 2).

(2) Length of explorations

Two measures can be considered:

- The length of the entire session (from the moment of entering the room to the end) from one minute to 20 minutes; average: seven minutes 50 seconds.
- The length of solitary explorations (when the adult leaves the room), excluding those when children do not explore or explore only when the adult is present (Figure 3).

The measures of the length of time spent in solitary exploration highlight the fact that 75% of the explorations are distributed according to a bell-shaped curve around the average timing of four minutes eight seconds with a median of four minutes. The children’s solitary explorations have a duration of between two and seven minutes.

(3) Comparison of different sessions

The question raised was do the children behave in a more active way when comparing the two sound explorations of the zither (Z1–Z2)? In 61% of the cases analysed, the children belonged to the same category of exploration results, namely: many, few or none, depending on their personal style. The most active children

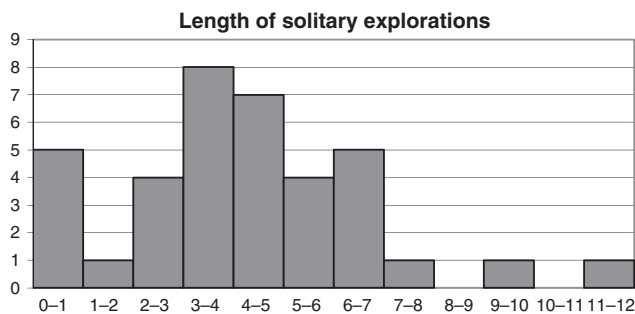


Figure 3. Length of solitary explorations.

repeated the same sound gestures. We asked the question: do the Z1 findings repeat in Z2? When children had found a sound ‘individuality’, they explored it in depth during the first exploration. In the second exploration they sought to enhance their ability to master it. We also asked whether there was any progress from one exploration time to the other, or did tiredness prevail? What we found was that the level of activity did not change significantly from one time to the other. The analysis of the solitary exploration time highlights the fact that the average value passes from 5’12” to 4’08” (-20%). The average activity rate value moves from 0.80 to 0.77 (-4%); the rate is maintained at a high level and the children allow themselves few breaks.

Z1-C: first explorations

The general activity level is similar (see Table 2).
The cymbals encourage beating actions (see Table 3).

Exploration time. The average session duration is Z1 = 10’50” and C = 11’30”. In particular, the average session duration during the phase when the children are alone is Z1 = 5’21” and C = 4’33”. The cymbals and zither keep the children’s interest alive, even if they trigger very different sound gestures.

C-Z3: first exploration of a couple of cymbals and second exploration of zither

The question was asked: do the children behave in a more active way? Two-thirds of the children did not change their activity level. It was found that a general behaviour style emerges, rather than a preference for one instrument or the other.

Z2-Z3: second explorations

Does starting with cymbals facilitate the activity with the zither? No, the proportion of ‘none’ is larger for Z3 than for Z2. Is there any transfer to zither of the sound gestures experienced in cymbals? The main result is that the children perform more beating in Z3 than in Z2.

	None	Few or a lot
Z1	11 (31%)	24 (69%)
C	8 (40%)	12 (60%)

	Beating	Other sound gestures
Z1	601 (36%)	1082
C	499 (91%)	49

Quantitative and qualitative: measuring the 'level of activity'

We have shown above a portion of the second-by-second transcription of Giulia's session. As with all transcriptions there is obviously some loss. The left-hand column gives a brief description of non-sounding behaviour and the right-hand column gives a description of some specific sounds. In the central column are four types of sound gesture – hitting, rubbing, plucking and bouncing an object on the strings. We noted what we thought would be useful to inform the comparisons that had been planned in the observation project.

It is easy to count the sound gestures and follow their development. However, counting sound gestures is not the only way of measuring the level of activity. Sometimes we saw one child hitting the zither very rapidly, for example, striking the strings twice a second, and another child producing only one sound every three seconds, listening carefully to the resonance. Can we say that the first is exploring more actively than the second; six times more? In reality, it is not the same type of activity and the second interests us at least as much as the first. In addition, we have often used another variable. There are moments of 'pause' during which a child interrupts their exploration. We consider that a pause begins when the child has not produced a sound for more than five seconds. The time genuinely devoted to exploration can then be calculated by subtracting the pauses.

As an aside, we would like to point out that even the measurement of an indicator like the level of activity is based on an interpretation. We wanted to quantify the level of activity, but what form of activity – that of the child who strikes while being carried away by his gesture, or that of the one who listens attentively? The construction of the variable depends on an interpretation which is first of all qualitative. This research has been constantly guided by the complementarity of qualitative and quantitative; the measurements and statistical treatment giving precision to the qualitative observations.

Some 'set-ups': various 'musical experiences' and pedagogical application

Thus far we have only talked about one situation; a child enters a room accompanied by the adult and finds an instrument, either a zither or a pair of cymbals. After one or two minutes when the child feels secure, the adult leaves the child on his own and it is then a solitary exploration which is filmed. Fifty-five children were placed in this situation twice.

But we also wanted to have some propositions for what might happen in other pedagogical situations. We supposed, for example, that if instead of a single instrument, 10 or so were placed in a semicircle in the room then the explorations would take different forms. They would involve movement; the child might go from one instrument to another. This is what we call a 'set-up', by which we mean a physical organisation of the space and a choice of instruments which is a way of encouraging – consciously and deliberately – a type of behaviour.

The semicircular arrangement could be further complicated if instead of making a single child enter the room, we brought in two to discover the instruments together.

What might we observe? Obviously interaction between the two children; and this too could take different forms, firstly imitation of movements (one child follows the other from one instrument to another) and then imitation of gesture (one strikes and the other strikes). This imitation of actions and gestures brings about imitation of sounds. One of the children might produce a rhythmic sequence and the other child imitate it on another instrument.

Imitating each other, responding, is a very different type of 'musical experience' to the solitary exploration which leads to extended discoveries, but it is just as important from a musical point of view. Much Western art music calls for imitation from the simplest canon to the art of the fugue. These imitations which are often played by a solo instrumentalist, on an organ for example, were first imitations of one musician by another. The Renaissance polyphonic song was sung by four people sitting around a table, as shown by the make-up of any scores. The melody passed from one to another. So here we are witnessing a process which is globally widespread and which consists of replying and imitating, first in behaviour, then in sound. It is a second 'musical experience', not to be confused with the first that we discussed and which consists of discovering, alone with an instrument, a 'sound configuration' and developing it by repetition and variation.

We would like to mention a third. A three-year-old child was left alone in a room with a big drum and several drumsticks. First he struck softly, then, gaining confidence, accompanied his arm movements with movements of the shoulders and became immersed in the production of increasingly loud sounds. When the adult came back after eight minutes of solitary playing a conversation began and the child explained to the adult, 'when I hit hard, I feel it in my tummy'. This musical experience is different to the first two.

Thus we can see several distinct types of musical experience appearing. The individual development of a sound discovery by repetition and variation which can be the origin of a process of invention, imitation in a game between two individuals and strong sensations which are felt when certain sounds are produced. Listing the different forms of experience that we call 'musical' and observing them appearing in early childhood is one of the current objectives of musical anthropology. Rather than trying to define music in abstract terms, we set up a typology of the types of experience that distinguish the sorts of behaviour that we call 'musical' from other activities producing sound.

It is also the basis of pedagogy. These experiences are those that have to be maintained, prolonged and made to 'live' for the children. This must be done with deliberation, by inventing 'set-ups' which encourage them, and by listening from a musical point of view to the children's sound production.

Notes

1. More information about the Centro can be found at <http://www.csmdb.it>
2. Examples to illustrate this article can be found in the two DVDs which accompany the book *La Nascita della musica* (Delalande 2009a). This one is 'trovata 1' in the first DVD.

Notes on contributors

François Delalande was, until 2006, head of theoretical research of the GMR (Musical Research Group), specialising in studying musical production and listening behaviour, particularly in children. He was one of the instigators of the renewal of musical pedagogy, oriented towards creative practices starting with very young children. He often works with the Csmdb (Centro studi musicali e sociali M. di Benedetto), Lecco, Italy.

Silvia Cornara was born in Lecco, Italy, in 1974. She took a MSc degree in psychology and a diploma in music-therapy. She has been working in the social field for several years, in continuous and consolidated collaboration with a number of cooperatives of the region (particularly being involved in the psychiatric field and in activities with old persons). She is a teacher at the “Centro di Formazione nelle Artiterapie” (Centre for Art-therapy Formation) in Lecco, with whom she has been working for several years. She is a member of the “Centro Studi Musicali e Sociali Maurizio Di Benedetto” (Music and Social Study Centre Maurizio Di Benedetto); in particular, she is involved in the research-experimentation project “Nido Sonoro” and in some music-based activities for primary schools.

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