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PART I MUSIC

1. MUSICAL ABILITIES VERY EARLY IN LIFE

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Abstract: *Music-related skills are not always an effect of systematic music education. Many music perception acquisitions develop naturally due to children's exposure to melodic and rhythmical structures across their life. Experts found that even at very early stages of life, children are capable of identifying and differentiating musical structures. More so, they develop musical preferences closely related to certain biological features or certain emotional aspects regarding their relationship with their mother. The present study aims to review the latest findings associated to these musical skills that occur during the prenatal period and the first year of life.*

Key words: *music perception skills, prenatal period, first year of life*

1. Introduction

The ability to decipher complex sound messages from spoken language or from the musical language constitutes a human perceptive and cognitive capacity. Evolutionary psychology has discovered that, unlike monkeys who prefer silence to sounds, human newborns choose spoken language and especially music over silence (Trainor, 2010). The origin of this preference still remains unexplained, although some theories suggest its importance in social integration. Auditory skills are based on an innate potential to react to sounds, and they gradually develop through life. Their development starts as early as the prenatal period and continue during the first year of life, childhood and adolescence.

The children's cognitive progress and their exposure to music create the premises for natural evolution towards high performance in music perception. Constant and frequent perception of a certain musical type of expression determines enculturation (Juchniewicz & Silverman, 2011) that translates auditory expectations specific to a certain type of musical style, as well as higher perceptive and music performance abilities related to that style. For example, children from East European countries such as Macedonia or Bulgaria have no difficulties (that children from West European countries have) in reproducing complex and asymmetric rhythmic structures that can be found in folkloric music from their country (Trainor, 2010).]

The phenomenon of enculturation makes one's perceptive skills to reach a certain level of complexity in correspondence to a certain type of musical expression one is exposed to. It goes without saying that early musical training has a significant impact on acquisitions in music perception. But even without musical training there are a lot of perceptive skills that develop naturally, starting with the prenatal period. The aim of this study is to present these naturally occurred music perception

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acquisitions during early stages of life.

2. The prenatal period

Frances Rauscher and colleagues' experiment (Rauscher et al., 1993) made in octomber 1993 at The University of California constitutes a reference point in the effects of music perception on cognitive development, paving the way to a while industry organized around the so called "Mozart effect". The initial experiment and the ones that followed have confirmed in multiple contexts that, even at an early age, the cognitive system and music perception are intimately related by developing through mutual interaction. Here are some relevant experimental finding in this direction:

- the ability to hear appears after 20 weeks of pregnancy, and the auditory system is fully developed at 35 weeks of pregnancy (Gooding & Stanley, 2011);
- the fetus's response is firstly sensitive to low frequencies (500Hz at 20 weeks of pregnancy), as the sensitivity to high frequencies appears later (1000 at 33 weeks and 3000 Hz at 35 weeks); exposure to loud low sounds should be avoided by the pregnant woman, as it may harm the development of the baby (Hepper & Shahidullah, 1994);
- at 25-26 weeks of pregnancy, baby's cardiac rhythm tends to modify according to the tempo of music the mother listens to (McPherson, 2006); some authors (Trainor, 2010) even suggest that the baby prefers musical tempos that are similar to mother's cardiac activity while she is resting;
- during the first trimester of pregnancy the baby can hear and process musical structures (McPherson, 2006);

These findings show that there is a lot of music perception development even during the prenatal period, that creates the premises of complex musical acquisitions that may appear later in life.

3. The first year of life

The first year of life is an intense development period, as many researches demonstrate that the newborn's exposure to high quality musical experiences, and parents' involvement in music activities play a crucial role in the development of perceptive skills of any kind. Newborns manifest a variety of musical behaviors and most of them have a hereditary base that helps them organize the vast sound space that surrounds them. This hereditary component creates the premises of a good interaction with other people and helps them acquire the spoken native language. Here are some auditory behaviors that are specific to musical acquisitions that develop naturally during the first year of life:

- newborns turn their head towards the sound source immediately after birth, but their attentions span is approximatively 8-11 seconds (Stanley, 2003);
- after 4 months they can accurately locate the sound source that is in front of them or behind them, and at 7 months of age they can accurately locate sound sources from up or down (Gooding & Stanley, 2011);
- girls are more sensitive than boys to auditory stimuli (Cassidy & Ditty, 2001);
- newborns have a higher capacity to hear low frequencies (lower than 1000 Hz); these kind of sounds reflect the area of human spoken voice and newborns'

sensitivity to them constitutes the bases for language development; the efficiency in the perception of higher frequencies grows significantly at the end of the first year of life (Hepper & Shahidullah, 1994);

Newborns' musical preferences represent a research area with very interesting discoveries that have been made during the last two decades. These experiments use Head-turn Preference Procedure (HPP) as main research method. This procedure investigates the time the child maintains his or her attention to a musical stimulus in comparison with another musical stimulus. The child sits comfortably in mother's arms between three panels: one in front of the child (that records the child's behavior), one is on the right and another one is on the left (these panels include speakers where different musical fragments are played on). The researcher measures the attention the child gives to the musical fragment from one speaker in comparison to the musical fragment from the other speaker. Here are some discoveries found through the Head-turn Preference Procedure:

- the preference for a musical fragment develops gradually through mere exposure, as the children's attention span is higher for music they have listened to before (Trainor & Heinmiller, 1998); the mere exposure effect is also available in adults;
- newborns are attracted to the human voice; they firstly prefer their mother's voice, then a female voice and lastly a male voice (Stanley, 2003);
- newborns respond more intensely to their mother's singing in comparison to their mother's speech (Trehub & Hannon, 2006);
- in songs, newborns prefer children's voice than adults' voice, as well as songs with high frequencies (Trainor, 1996);
- an experiment done on children of 5, 8 and 11 months old have found that, when listening to a song performed in an unknown language (in this case Chinese language in a group of Canadian children), they preferred the unaccompanied version performed by a female version in comparison to the instrumental version (Ilari & Sundara, 2009); the researchers explain this finding through the children's affinity for simplicity due to their cognitive limitations;
- newborns are sensitive to timbre and musical style (Ilari & Polka, 2006); a study done on 30 eight-months-old children have compared their reactions about two musical fragments (*Prelude* and *Forlane*) taken from the same Impressionist work (*Le tombeau de Couperin* by Maurice Ravel); in order to investigate the effect of timbre, the two pieces have been performed in two versions: piano only and orchestral version; moreover, the two fragments have contrasting styles; results have shown that the piano version of the two fragments have maintained children's attention more than the orchestral version;
- a second experiment of the same study (Ilari & Polka, 2006) investigated children's long term memory for music; after a 10 days exposure of the same piece written by Maurice Ravel (*Le tombeau de Couperin*) and a two weeks pause, children attention was longer for the fragment they had been more exposed to; this may demonstrate children's long term memory for complex music;

In another experiment (Reigado et al, 2011) researchers have recorded children's vocalizations towards music and speech. A group of 21 Portuguese children of 9-11 months old have participated for a month to weekly sessions of exposure to live songs or to live poem recitations. During these sessions researchers

have recorded 93 vocalizations to speech and 104 vocalizations to music. The vocalizations to music included isolated sounds, melodic intervals, melodic contours, melodic explorations. Results have shown that the vocalizations to music have been significantly shorter (a mean of 1.60 seconds per vocalization) than the vocalizations to speech (a mean of 5.81 seconds). Moreover 98% of the vocalizations to music were related to the tonality of the song they listened to: most of the isolated sounds were in fact the keynote of the song and other sounds were the mediant of the tonality. Most of the intervals were descendent and were leading to the keynote. Most of the vocalizations to music appeared in certain moments of song performance, this maybe proving children's ability to use segmentation.

A series of experiments developed by Sandra Trehub and her colleagues (Trehub et al, 1985; Cohen, Thorpe & Trehub, 1987; Trehub et al, 1999; Trehub & Hannon, 2006) have demonstrated that children before the age of one have the ability to detect musical relationships between sounds. They used a slightly modified Head-turn Preference Procedure: a melody is played repeatedly with a pause of 1.5 seconds between repetitions. At a certain time, instead of repeating the song, a modified version of it is played. Children's 45 degrees head turn towards the speaker is considered a behavior of change detection in music. After 20 tries if the child was still not turning his or her head towards the speaker, researchers consider this an incapacity to detect change in a musical stimulus.

Results have shown that after a limited number of exposures to a melody (sometimes only 3 exposures), 5-10 months old children tend to consider transpositions of the song's tonality as being equivalent to the initial melody. If the change in music is represented by the modification of only one sound, children react to this change treating it like a new song. Children of 7-11 months old have differentiated between a major and a minor chord sequence. The same children, when the first stimulus was a major chord, they detected the chord's augmented version. But when the first stimulus was an augmented chord, they couldn't detect the major version of it. The when major and the augmented chord were presented in the first inversion, the children could differentiate between each other.

Trehub and Hannon (2006) also discovered perception abilities regarding rhythm in children younger than one-year-old. They saw that 8 months old children detect pauses with more difficulty in a rhythmic fragment with longer durations of sounds. Moreover, a rhythmical fragment may be considered by children as being the same, despite tempo, timbre or pitch changes. Also they detect change in a rhythmic fragment despite the variations in pitch or tempo.

4. Conclusions

Before the age of one, children demonstrate a vast area of musical abilities that adults are not always aware of. One of the most spectacular is the ability of 11 months old children to detect beat in a musical fragment. Using electroencephalogram, Winkler and colleagues (Winkler et al., 2009) have found brain activity that translated children's expectations regarding periodical accents during music listening. Other studies (Grahn și Rowe, 2009) have shown that beat perception is created even in the absence of external accents. In this case, researchers have discovered children's preference for organizing un-accentuated

sounds in groups of 1:2 or 1:4 more than in groups of 1:3 or 1:5 (Large și Snyder, 2009). In conclusion, exposure to music during prenatal period and the first year of life leads to certain perceptive skills that may be very useful later-on. Children tend to naturally develop many abilities in detecting change in music, whether these changes are melodic or rhythmic.

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