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Theoretical Aims on Music for Prosody in Speech Therapy Setting

An Evolutionary Perspective

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This lecture is focused on an important skill. We will try to understand the reason why studying music can be relevant during a speech therapy setting. Actually, many researchers want do discover why music is present in all human cultures of the world. We think music is directly connected with language, especially with spoken language. According to a phylogenetic investigation we believe that verbal language is an evolution consequence of gesture and sound. In our opinion we face three-points of the same structure of evolution: gesture-sound-word (Napoli Marcello, Bertirotti A., 2004, in print). This research context, studying music role inside language and especially spoken language is at least asking ourselves what music is. Music has an ambivalent relationship with human language. Every question on sound and its role for human evolution involves the two major vocal communication systems: music and spoken language. The language/music relationship can be considered on many levels of analysis. Music and language are connected to each other on evolutionary terms. We have three possible interpretative theories on evolution both on music and on language: • Music evolved from speech; • Speech evolved from music; • both evolved from common ancestor. Spencer (1857) considered singing as an emotional way to intensify speaking. Richard Wagner believed music and language had a common source, like a sort of speech-music origins. Actually we are too far from a complete solution on this matter. We think that an evolutionary consideration of music will be very important to any future study of spoken language and for some therapy settings. On this point of view, we can remember at least five theoretical aims: a) the evolution of human vocal tracts thought on the basis on speech evolution are just relevant to the evolution of human singing. The difference between speaking and singing is a best probably distinction in a degree rather than in a

kind of vocal tracts. For example, this is demonstrated nicely with the recitative of Italian Melodrama, or with prosody of poetic discourse. In other words, it is not curious to think that evolutionary changes in human vocal tracts are an adaptation of musical and linguistic vocalization processes in the form of tone and pitches languages. b) When we compare our human brain with the previous hominid one we can note a visible expansion in size, especially for the human cerebral cortex. Deacon (1992) thinks that some of this expansion is driven by the evolution of human linguistic capacity. However, it is possible to think to an alternative interpretation. Maybe music, due to it‘s structural complexity, acoustically varied, syntactically rich and culturally meaningful human activities, has driven this brain expansion. Therefore and first, it becomes essential to discover the relationship between cerebral localisations of music and language. This way we could understand the evolutionary roles of these kinds of human communications. Language like a semantic communication and music like non-semantic. Falk (1987) discovered that: a. language and music share cerebral representation; b. they have overlapping representation in the same hemisphere; c. they have homologous localization in the opposite hemisphere. c) Furthermore, Falk points out that lateralization effects for music and language differ between men and women: men have greater degrees of lateralization in their brain in comparison with women's. Furthermore, we believe that is in accordance with some theories on language evolution and with structural accounts that present two kinds of consideration. Researchers present language as a final product of gestural origins; others believe that language comes from a vocal articulation as a replacement for gesturing (Corballis 1991; Rizzolatti and Arbib, 1998). On this point of view, we can consider music as a theoretical help to link gestural output and vocal performances. We can find a link between music and movement, especially between their structures: rhythm. Rhythm is a sequence of chronological order of sounds with tactus. "The acquisition of a power on rhythm and, as a result, its management facilitates a tendency to use a cognitive procedural order. To this a gradual and constant improvement of a child linguistic and movement capabilities is to be added. It has been empirically demonstrated that to a major motorial coordination (big and small arts) corresponds a neuron muscular improvement able to create little movement, language and creativity. The last one is characterized by divergent thinking" (Napoli Marcello, Bertirotti A. et al., 2004). This happens in the context of most groups of rituals. In some sector of musical rituals, vocalizing and gesture do not serve as a sequential or an alternative performance of communicative intentions, but as functions mutually coordinated. In these cases gesture and movement stimulate a good sense-motorial self-perception, which can be assumed as a cultural and symbolic meaning in the future. These ideas might offer relevant insight into the origins of a language-based communication. It seems plausible to believe that gesturing and vocalizing occurred in parallel way during language evolution, as well as for the music evolution, where gestures, movements and sounds belong to a unique frame and pattern. d) Ujhely and Richman (2000) make the explicit reference to the role of language for improving social interaction capacities. On functional accounts of language evolution we can say that language is useful not only to an individual-level representational capacity. Language evolution is the result of social status of man, with relation to the evolution of human group structure. The same occurred for social level of music performance. There is an evident relationship between social structure of society and musical pattern of expression (Lomax A., 1968). Many functional accounts for the origins of music have been proposed. It is likely that music is useful in promoting domestication of animals and coordinating human social activities. Probably it is useful in sexual roles and for parental care. We have many hypotheses on the origins of music. Several authors (Darwin C., 1871; Anderson M., 1994) believe that music evolved by sexual selection. Others make explicit reference to music linked to its adaptive role for promoting coordination, cohesion and cooperation. Multifunctional nature of music might reflect the action of many selection pressures, and nowadays we have a spectrum of selectionist hypothesis and theories, some of

which will be seen during this lecture. In the last few years Universities, Research Institutes, Music Schools and Public Institutions, world education experimentation and refresher courses have been paying more attention to the potential therapeutic capacity of music on general medicine illnesses and diseases. Music and Music therapy can improve medical approaches to several traumas, physical and psychomotor disabilities, emotional and behaviour troubles, communication and relational problems, learning and reading inability as well. Nowadays - in accordance with last European Music Therapy Congress organized in Naples on April 2001 - music and therapy with the music are getting involved in some preventive activities aiming at promoting and stimulating growth, accelerating and improving learning and reading, making relaxation and stress reduction easier, caring some kind of aphasia disease or some brain lesions. The important role of music, during medical treatment, psychotherapy and speech therapy setting as well, is the study of the circular relationship man-sound-man in all of us, in our everyday life (Bertirotti A., 2003a). Several researchers have confirmed that this kind of relationship begins even before childbirth. A phoetus in its mother womb is really sensible to sound, rhythm and movement. It hears many kinds of sound: breathe, heartbeat, deambulation and acoustic frequency of mother's voice. We have learnt from anatomical and physiological studies that we explore world and unknown reality to give a form to our life and communication. From acoustic physics we know that movement causes sound. Therefore we can say that different bodies can cause different kinds of sound. On this point of view, we can say that several kinds of phonic articulations cause different and significant intonations. Returning to phoetus, its cell physiological growth is achieved throughout micro-movements obviously producing rhythmic sound micro-events. We may say that human body is like a complex sound apparatus, so we have sound codes of specific organs and sounds of their functions. It is probably that this kind of communication is like a monitor of their physiological conditions. During therapeutic settings we know that music experience may have an important relationship influence. We know that music experience stimulates a greater therapeutic benefit. Therapy with music is not a new experience. We know that since human beings first presence on earth, music has always been measured as a little *magic* or *mystic*, and nowadays music therapy is considered an important aid together with psychiatric, psychological, speech therapy, pharmacological therapies, etc. In the last few years neuroscience has enabled us to understand that music and its grammar and syntax can be used in a correct scientific way. Music may contribute, not only to the treatment of several diseases, but to the development of man's intellectual abilities and his cognitive growth as well. Many researches report that the areas of music in human brain have been found out. For example, some cerebral areas such as the right upper cortex are remarkably developed in musicians. Other studies have demonstrated that soon after listening to a complex music piece, the ability of human brain to do abstract operations develops. "Learning process is based on an imitational capability forcing the fruiters to a listening and observing practice. Moreover it is possible to motivate the listening with an active sharing intervention. Through performances among groups, team games, etc the listening level attention gets better. It's all about learning how to manage one's own time, pauses and waiting: one learns how to "actively wait for" one's own moment and so how to listen and listen to oneself" (Napoli Marcello, Bertirotti A., et al., op. cit.). Actually we know that there is a connection between music stimuli and the production of endorphins; between sound and cardiac rhythm; between music and muscle tonicity and the recovery of physical stress. When some people listen to music with an obsessive rhythm, like Hard Music, techno or Metal Music, we have some increasing of the cardiac rhythm. On the contrary, when listening to soft or classic music pieces, like Bach's or Claude Debussy's, we can notice a reduction not only of cardiac rhythm but also of our respiration acts. Some musical pieces activate man's cerebral neurotransmitters, and these ones activate the production of endorphins in their turn. This way, bioelectric stimulation is followed by a remarkable production of endorphins, having a sedative function in our body. When we listen to

music inside the hypothalamus, hypophysis and suprarenal glands axis, a strong biochemical electric conduction takes place as a result of the excitement occurring in the hypothalamus. For instance, it has been observed that in drug addicts music listening has brought about the production of beta-endorphins, and it stimulates all the neurological areas utilizing serotonin neurotransmitter. During present day rave parties some people take ecstasies that, associated to music listening, stimulate new altered state of consciousness (Bertirotti A., Bandiani G., 2004, in print). Moreover, using EEG instrument (it measures the electric activity of nervous cells), during a music experience, it has been observed that music stimulates a balanced hemispheric activity and increases the amplitude in the frequency ranges, both of the theta (4 - 7 Hz.) and of the delta (5 - 4 Hz.) cerebral waves. For these reasons we think that "the music issue, conceived in an educational perspective, is strictly related to a more general methodological issue. In other words, the surviving strength of a communicational typology is directly proportional to its prestige, as a recent research appeared on magazine Nature has demonstrated (August/21/2003, Abrams D. & Strogatz S.). For these reasons music exists and will exist, independently on a real cognitive comprehension of its constitutional procedures" (Napoli Marcello, Bertirotti A., et al., op. cit.). This context we believe that music play an important role during speech therapy setting. Inside spoken language we find a subliminal kind of communication: the prosody. Inside prosody we have a first important feature, with reference to both animal song systems and human speech: it is rhythm, especially its use in isometric way. About our human ability, keeping time, we should distinguish between us and other animals. Everyone can keep time and move his/her hands in a metric and alternating fashion. However, we have a further specialization about this ecological ability: we can keep time going into time of external timekeeper. We can imitate other rhythm, but we can also modify external rhythms going into rhythms of external people. This is not only imitation, but a creative activity of our mind, and this is not for other animals. This is an important cognitive ability for humans and it is on the basis of music and dance. This way we can influence our movements and others ones. Brain meets other rhythms during a conversation, and it can individuate, change, transform and modify, for example, the rhythm of spoken language of a partner conversation. This way we understand and decode emotions of other persons talking with us and can communicate a semantic plus value. Our brain always decodes, even on a neo cortical level, throughout a synergetic action with the limbic area. Summing up, there is no one only rational message. Any message - always - is also an emotional one. In case of therapy, might be useful to talk without meanings, but with the prosody of verbal phrase only. Sometimes, many significant codes can disturb who is talking, because the anxiety level can improve. Anonymity during a conversation evolves from semantic absence, as it happens with music. Music has a semantic role inside personal experience only, because many kinds of music can indicate different events for every one (Langer S., 1975). This context, the rhythm plays an important cognitive game. Evolutionary accounts of music in humans could give a great help to explain the emergency of this ability: to synchronize movements with other conspecifics and other external timekeepers, without meaning. "Neurological studies reveal that this ability is dissociable from the capacity to produce and perceive the tonal feature of music" (Wallin N.L., 2000). Second feature that is present in prosody is the ability to recognize the pitch of sound, without other sound references. This is described as "the ability to attach lo labels to isolated auditory stimuli on the basis of pitch alone" (Ward and Burns, 1992, in Deutch D. 1982) It is wired that this capacity regards music only. About colour stimulus or on speech sounds we cannot need this ability. We can recognize every colour and speech sounds without any reference to others of them. Absolute pitch is a musical capacity and it is important for classical training courses in the Western Music. Speaking, hearing and talking do not need absolute pitch. There are two interpretations about absolute pitch: a. Absolute pitch is an acquisition depending obligatorily on musical training and exposure during a critical period of our life, somewhere between the ages of 3 and 6; b. Absolute pitch, because so

few people have it, is a genetic trait. Many pedigrees analysis of families containing members having absolute pitch presents this ability as an autosomal dominant trait (Profita and Bidder, 1988). If this is true we have to search the pitch gene. We think that absolute pitch should be identified before a speech therapy setting, because it might be of a precious help during care. When a therapist sees that a patient can recognize a single sound from another, he can work in that direction to strengthen other kinds of word sounds recognizing and meaning that a patient can develop. Referring to an absolute pitch, we believe it is as genetic evolved at the same time as music evolved, especially if we meet a continuous exposure to music and its training. In our opinion, all human brain skills have been developed throughout many years of environmental activities, to adapt our life and soma to it. For example we think that it is possible, through a specific games use, to strengthen a multilateral attention capability. Multisensorial stimuli cover an important role on it. Because of Multisensorial theory we think it is very important for children to be educated to music with a training, during primary school. In that period of age, children have a good relationship with their imagination, and it happens - cognitively - something in their brain when they think throughout events imagination, reality observation and actions realization (mirror neurons). "Unidirectional attentive games allow an evaluation of the level of sound identity present in a child and an adult, related to familiar sounds (keys, telephone melodies, a buddy voice, etc.). Later, other sensorial stimuli (multi lateral attention) are added, active and/or passive. For example: right hand recognizes and separates pencils from rubbers, while the left one moves objects from one desk to a close one. In a second stage, sight and hearing stimuli are added" (Napoli Marcello, Bertirotti A., et. al., op. cit.). Multisensorial matter is very important especially to the research method, because we can individuate brain areas involved for coding and decoding hearing ad sighting imput as well. For these researches we utilize the Brain Imaging. We can provide insight into localisation and lateralization of these functions, as well as touch issues as phylogenetic and ontogenetic development, the effects of musical training on brain structure and neural correlations of skills such as absolute pitch, etc (Chiarelli B., 2003). We hope that this brief lecture on Music's and Prosody's roles inside speech therapy can set a stage for the many essays that will follow. Evolutionary interpretation on music and prosody is a great help for many questions of interest to contemporary scholars.

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