The Dilemma of the Mother's Voice

Background:

Dr. Tomatis' interest in intrauterine listening was aroused by the work of Konrad Lorenz who had studied singing and non-singing birds. When Konrad Lorenz had nested non-singing birds with the singing birds after hatching they were able to sing. He also did the reverse in which he nested singing birds with non-singing birds that after hatching did not sing unless they were reunited with the singing birds during a critical period after hatching. If this period was allowed to go on too long, they lost the ability to acquire singing.

This curious story was further amplified by Konrad Lorenz speaking and singing to ducks as they were developing embryologically in the eggs. After hatching the ducks responded to Konrad Lorenz's voice as he spoke or sang to them. They would follow him around the yard like the Pied Piper. Thus, it was obvious that the birds were able to not only hear sounds from the environment while in utero but also were encoding and imprinting these sounds neurologically.

Obviously, in order for the developing embryos to hear while in gestation it would be necessary for the ears to be functioning. Tomatis pointed out that the ear is fully formed and operational at 20 weeks of gestation. Elliott and Elliott (1964) confirmed physiologically that the human cochlea has normal adult functioning after the 20th week of gestation. Johansson and others (1964) were among the first to report testing fetal hearing using high frequency tones presented by means of a microphone placed on the mother's abdomen. Fetal heart rate increased in response to tones and was recorded after the 20th week gestation.

Later, in 1983, Birnholz and Berncerraf observed the auropalpebral reflexes in 236 human fetuses during a study screening for gross deafness. Stimuli were presented via vibroacoustic stimuli applied to the maternal abdominal wall, directly over the fetal ear, and eye clenching was observed with ultrasonic imaging. Their results, confirmed by Kuczwara and others in 1984, indicated that auropalpebral reflexes consistently occur at approximately 24 to 25 weeks gestational age in normal fetuses.

Tomatis' Discovery:

So Tomatis set out to investigate the nature and frequencies of sounds that the fetus was hearing. In addition to the normal physiological sounds from the body, Tomatis was most interested in the sounds of the mother's voice. Using a Pimhoff filter, Tomatis' results revealed that the low tones were removed and the mother's voice is heard at approximately 8000 hertz. This led to the well-known practice of using filtered mother's voice at 8000 hertz during the traditional Tomatis Method. This also became the practice taught to DLS practitioners. He went on, erroneously, to believe that the low frequencies were then being captured by the ear as the fluid is flowing out of the middle ear through

the Eustachian for the first 10 to 12 days after birth. He, therefore, added back in the previously removed low frequencies during what has become known as "*the sonic birth.*"

The problem:

From physics we know that skin, bone and fluid are low pass filters; that is, that they removed the high frequencies and allow the lower frequencies to pass through. Therefore the sounds heard by the unborn infant are of low frequency. The problem was that the filter Tomatis used was faulty; it did not record the low frequencies but did reveal that there were in fact high frequencies in the voice that otherwise would not have been discovered. This led to his erroneous conclusion of the unborn infant hearing high frequency sounds in the womb.

The interesting thing here is that it has been confirmed that the infant is able to discriminate his or her mother's voice, and even to show preference for the mother's voice over the voice of another female. These capacities were demonstrated by DeCasper and Fifer (1980) utilizing the classic sucking paradigm with infants shortly after delivery. This technique used the sucking reflex and response of the infant to hearing his or her mother's voice compared to the same sucking response in hearing another mother's voice. This elegant design was set up in such a way that the infant could, through its sucking response, not only show recognition but also a preference for eliciting the mother's voice over a different female voice.

So, knowing that the unborn infant is physiologically prepared to hear external environmental sounds and the sounds of the mother and in fact is able to recognize the mother's voice in contrast to other women's voices, the question becomes what frequencies does the unborn infant hear?

Bench (1968) has shown that for a 72 decibels signal there is the least attenuation of sound going into the uterus at 200 hertz. There is slightly more attenuation at 500 hertz and even more at 1000 hertz. The most attenuation occurs between 2000 to 4000Hz. Thus the frequencies of 1000 hertz and below are the frequencies of the maternal voice that may be heard, if faintly, from the fifth month of gestation when it has been shown that the fetal ear is capable of analyzing sounds.

Another more recent study has verified this conclusion by using high pass and low pass filters. By using low pass filters of 1000 hertz and high pass filters 1000 hertz, measurements of the acoustic brainstem response (ABR) revealed that the auditory nervous system is responsive to the low frequency sounds and not the high frequency sounds. An older study by Querlieu et al. (1981) perform actual intrauterine measures on humans and demonstrated that the fetus could hear the mother's voice and other voices which were perfectly audible but lacking in tone because the high frequencies were absorbed.

Results of VM at 8000 hertz:

The fact that there have been both interesting and beneficial results in using the mother's voice filtered at 8000 hertz creates an interesting dilemma, especially since we know these frequencies are not dominant and may even be inaudible during the intrauterine life. Furthermore, the faulty filter that Tomatis used in eliminating the low frequencies revealed that there are in fact high frequencies present in the intrauterine world. Had it not been for this serendipitous discovery Tomatis never would have pursued his research into the effects of high frequency sound in the fields of auditory processing and brain stimulation.

On the positive side, the benefits seen in using the filtered mother's voice are that children are more affectionate, are more relational, happier and often show an increase desire to communicate. In addition language acquisition is also often enhanced by the use of the VM. This improved relationship with the mother is particularly noticeable when there has been a break in the mother/child bond due to illness or because of separations that may have been endured during infancy.

On the downside, some kids experience a negative reaction to the filtered mother's voice. They may become irritable, fussy or even have crying spells. Anxiety and nightmares have also been reported in some children when listening to the filtered VM.

Finally, the use of the sonic birth also makes no sense in light of the fact that the infant does not go from listening to high frequency sounds to low frequency sounds but in fact just the opposite. It is important to note here that when we do the test of *selectivity,* or the pitch discrimination test, we note that the ability to discriminate frequency opens from low to high frequencies. This improved ability to discriminate pitches in the higher frequency ranges with chronological age is an absolute contradiction to Tomatis's theory that we go from filtered sounds into full spectrum sounds at birth. *Thus, I would conclude that the use of the mother's voice in the sonic birth phase is contraindicated.*

Possible solutions:

Martha Mack, a Tomatis and DLS practitioner in Australia, has taken an innovative approach to the use of the mother's voice. She involves the mother quite early in the auditory training program with the child. From the second or third listening session the mother is involved in reading, singing or talking to the child through headphones. Her voice is initially unfiltered. Only occasionally does she filter the mother’s voice up to approximately 1000 hertz. As a psychologist she is very interested in promoting and improving the relationship between the child and mother so she engages the mother in the treatment program to promote a greater sense of security, self-confidence and self-esteem in the child.

Paul Madaule, one of the most experienced Tomatis practitioners in the world, only uses the mother's voice filtered at 8000 hertz when he is interested in improving the child's

ability to be more relational. In personal conversations Paul has told me that the children become more helpful, are more appreciative and polite with please and thank you, more easily redirected and happier in response to the VM at 8000. He also does not do a sonic birth using the mother's voice. Interestingly, in contrast to the training from Dr. Tomatis that I have had, Paul does in fact use the VM under special circumstances with adopted children. He has found this to be useful in helping the child connect on a deeper level with their adopted mother, improving the attachment and mother-child bond.

Conclusions and recommendations:

Given the foregoing information, practitioners who are already using the VM in accordance with the training you have had with me may obviously continue to use the mother's voice as you have in the past. In the current and future trainings, I will be recommending that the VM be used only at 8000 hertz and not be used in the sonic birth phase. Following Paul Madaule's lead, under special circumstances, when the relationship warrants, it may be appropriate to use the VM in adopted children.

I hope this review of the literature, the clarification of Dr. Tomatis's findings and exploration of the scope of intrauterine listening with a particular focus on the mother's voice is of value and will more accurately inform our clinical decisions.

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