Chapter 7

Listening Disabilities: The Plight of Many

Billie M. Thompson

Sound Listening and Learning Center
Phoenix, AZ

Listening is the most important and most basic of human communication and learning skills. Before we speak, read, or write, we learn to listen. In fact, listening provides the foundation for learning itself. The way the ear functions and integrates information from within the body (vestibular) and outside the body (sound) represents the context of this chapter for understanding how listening impacts our development and learning as humans and how listening disabilities must be understood from a functional and motivational context. A review of recent and significant educational, medical, and paramedical research and literature about learning disabilities, reading problems, attention deficit, speech/language problems, motor control, music, and foreign language problems points toward poor listening as a source of many of these problems, but only when one understands the perspective of the ear's functions and the distinction between listening and hearing. Some of the most interesting questions and insights into how to improve listening come from the work of noted French ear, nose, throat specialist Dr. Alfred Tomatis. If it is true that listening provides the foundation for all speech, language, social communication, music, learning, and literacy skills, the implications for most areas of our lives are huge. The question to answer is whether we will focus on listening disabilities, the plight of many, or listening abilities, the right of all.

LISTENING DISABILITIES: THE PLIGHT OF MANY

> The more I go into it, the more I'm convinced that those who know how to listen are the exceptions. Most people hear, they're equipped with ears, and think that they have reached the summit. No. That's a passive phenomenon—you let yourself be bathed in sound, but you don't Integrate any of it. But listening is integrating, and the will is an essential part of it, so that we go from a passive phenomenon to an active one. (Alfred Tomatis, in Michaud, 1989, p. 203).

If the 1990s and the early 2000s are to be, as some suggest, the Age of Integration, then it is indeed time to take a vigorous look at listening and listening disabilities. Understanding the ear and its myriad responsibilities will open new avenues to us in our fight against learning disabilities and other listening-related problems. Seeing the ear as integrator for the body and listening as integrator for all communication and learning endeavors is the key.

Dr. Alfred Tomatis (1979), French physician, psychologist, and educator, defines the major role of the ear as integrator. He says the ear is "a structuring organization which, neurologically speaking, coordinates the various levels of the nervous system" (p. 10). During a lifetime spent investigating the ear and its profound impact upon our connections to self, others, and the world, he has observed the relatedness of the following:

- the ear to the voice
- the ear to the entire body
- the ear to levels of personal energy
- audiovocal control to listening problems
- one's developmental history to one's desire to communicate
- listening to language acquisition and development
- posture, music, chant, and word repetition to listening improvement
- auditory processing patterns to listening and learning difficulties
- the mother's voice to communication motivation
- the prenatal development of the ear of the fetus to the phylogenetic development of the ear of the species

All these relationships undeniably connect listening to receptive and expressive language, learning, motor control, motivation, and one's developmental history. It is no wonder, then, that listening disabilities can cause such pervasive problems, both to individuals and to society.

Listening disabilities are significant and not uncommon. Sadly the plight of many, they often go unrecognized and untreated. Personally,

educationally, and professionally, such disabilities can have disastrous effects that we are only now beginning to understand and address. Specialists in areas such as education, psychology, performing arts, foreign language, and health care areas (such as medicine, speech pathology, audiology, occupational therapy, osteopathy, physical therapy, homeopathy) all must deal with the problems of listening disabilities. In fact, so must everyone who comes in contact with those who have them.

It is imperative that we begin to appreciate the ear and its relationships to our bodies and our abilities if we are to somehow understand and correct listening disabilities. Identifying the important questions and reviewing what has already been discovered will help us do so. What exactly is listening, and how does it develop? What are listening disabilities and their symptoms? How can we test for them? Who has them and what is their impact? Can they be eliminated, or must we learn to live with them?

WHAT IS LISTENING AND HOW DOES IT DEVELOP?

We have a host of definitions for listening, as Wolvin and Coakley (1991) demonstrate, and others for auditory perception (Myklebust, 1954) and hearing (Tomatis, 1963, 1974a,b, 1989a; Hudspeth, 1989). As Roberts (1988) concludes in a recent International Listening Association *Journal* article about listening tests, we have had difficulty evaluating listening because we have not yet decided what it is. We need before all else to define listening and listening disabilities so we might find ways to test listening, improve listening, and prevent listening disabilities whenever possible.

It is critical to use the context of the nature of matter to establish these definitions and to understand the role of the ear in human development and functioning. To begin, physicists in the past two decades have shown us that our solid world is not so solid. Remarkable photographs and videos by Jenny (1974) introduce us to cymatics and give us visible proof that movement, rhythm, and sound create the form of all matter. From this context, that humans are creatures of movement, rhythm, and sound, the ear becomes a key player as the organ for integrating, organizing, and analyzing these elements.

Tomatis understands the ear from this context. He developed a method to improve listening, and an insightful (some would say revolutionary) theory of hearing which can account for many phenomena traditional theories of hearing cannot explain, including that of listening. He defines listening as the desire to communicate as well as the ability to focus the

ear on the specific sounds to be analyzed. Having both a motivational and functional component to his definition is not unlike other definitions of listening proposed by leading researchers and theorists in the field (see Wolvin & Coakley, 1991). However, what is different is defining the ability to listen in specific neurophysiological terms. Tomatis proposes that the distinction between hearing and listening is one that begins at the periphery, the middle ear to be specific.

Tomatis offers valuable insight into the problems connected with poor listening. He stresses that we listen with our whole body, that one of the primary functions of the ear is to create cortical charge for the brain, and that we can only learn to think well if we can listen well. This approach differs from the cognitive listening training programs, which propose that one can listen better if one can think better.

Tomatis observes that we begin to listen prenatally and that the mother's voice plays a major role in inviting the fetus to communicate, develop language, and learn. He has discovered that the voice can produce only what the ear can hear, and he suggests that good listening is critical to our well-being, both to individuals and to society.

By reviewing some of the ear's anatomy and functions, we can better understand listening and the causes of listening disabilities. Without this review, we may continue to overlook the role of the ear in the entire learning process and the role of listening to tuning in to ourselves, others, and the cosmos.

Two Views of the Ear: Orthodox and Tomatis

Orthodox View. Pickles (1988) provides a comprehensive description of the orthodox view of the physiology and functioning of the ear. Weeks (1989, 1991) presents a summary of the orthodox view of the ear and the view of Tomatis as originally described in *Vers* l'ecoute humaine (1974ab). Assisted by the U.S. National Fund for Medical Education, Weeks reviewed and summarized much about the ear's functions in light of Tomatis's research.

In general, the orthodox view of the ear is that it is composed of three parts: the outer, middle, and inner ears. Bone vibrations of the skull create sound waves in the outer ear to excite the tympanic membrane. Sound is transmitted via the ossicles from the tympanic membrane to the oval window. From there the endolrnyph fluid takes the kinetic energy to the cells of Corti. The tectorial membrane anchors the Corti cells to facilitate the shearing force needed to set up an active potential, which will propagate along the 8th cranial nerve to the brain where the information is decoded and given meaning. The cochlea contains fluid and its kinetic

force so as to preserve sound fidelity. The round window dampens kinetic energy.

Listening, when it is considered to be distinct from hearing, is usually defined conceptually as a cognitive process mediated by the brain; little is noted about neurological, neurophysiological, or neuropsychological aspects of listening. Listening can be improved through better or more efficient cognitive skills and is highly dependent on one's motivation or desire. Many listening training approaches achieve success, but not without addressing and mobilizing the individual's motivation. Tomatis says that while motivation is important, the functional ability to listen a equally important, beginning with the middle ear.

Tomatis's *View*. Tomatis (1974a,b, 1989a) proposed a different view of the ear than Von Bekesy (1960), who was awarded a Nobel prize for ha theory, because as his method of improving voice and listening evolved the orthodox view did not explain his results. He has from time to time changed his theory as he gained new insights and as he learned from the research of others. He is the first to say that, if someone can provide a theory which better explains why his method works, he will be the first to listen.

Here are Tomatis' findings. First, he proposes for the ossicles a role other than the conduction of sound. Too much distance separating the incus and stapes and the presence of collagen there prevent the occurrence of sound with a human fidelity capability. The ossicles protect the inner ear from damage by dampening the tympanic membrane vibratory energy via a feedback loop from the endolymph. Second, the endolymph buffers the shearing potential of the vibrational force to protect the Corti cells. Third, bone conduction occurs even when the ossicles are removed, creating a resultant flaccid contact between the tympanic membrane and tympanic sulcus causing air conduction hearing loss. Fourth, bone is the ideal conductor for vibratory energy (the endochondral capsule is the only place in the human body where primitive bone which developed from fetal cartilage persists unchanged, without resorption, from before birth until after death). Bone conduction is the major route of sound conduction to the inner ear. Fifth, the cells of Corti are end organs rather than sensory cells. It is not the endolymph that vibrates the basilar membrane, but rather, the endolymph vibration results from the resonating membrane. The hair cells play a role in cochlear mechanics. Sixth, the stapedius controls the stapes and regulates high-intensity and high-frequency audition; it is the only muscle of the human body to never rest (Tomatis, 1974b). It is constantly involved in sound perception regulation, from before birth till death (Howell, 1984).

Tomatis understands the ear to be neurologically involved with the optic (2nd), oculomotor (3rd), trochlear (4th), abducens (6th), and spinal-accessory (11th) cranial nerves by coming under the control of the acoustic nerve via what should correctly be called the audio-opto-oculo-cephalo-gyro cross-over. This is the major mechanism of reception and integration of perception (Tomatis, 1974a). He also makes a case for the skin to be viewed as differentiated organs of Corti, based on similarities in cellular structure of these two types of cells.

The vagus nerve connects with the tympanic membrane of the ear and then wanders to connect with and innervate the spino-accessory (11th cranial nerve) and the larynx area responsible for vocalization. The vagus subsequently connects the ear to every organ in the body and, through sound stimulation, can effect neurovegetative changes via this connection.

Tomatis and others (Hudspeth, 1989) acknowledge the importance of the ear due to the volume of the human nervous system devoted to the auditory and vestibular systems. In exploring the many functions of the human ear, Tomatis also describes what most view as two systems (cochlear and vestibular) as really being portions of one system. By understanding the functions, we can understand the ear's role in learning and define problems with listening which come from poor functioning.

Functions of the Ear

The human ear has at least the following functional capabilities, which can be altered at any age:

1. to transmit energy (cortical charge) to the brain
2. to integrate information from sound and motor movements to enable the development of verticality, laterality, and language
3. to establish a right lead ear for efficient audiovocal control
4. to establish balance/equilibrium and to stimulate neurovegetative balance
5. to perceive sound (hear)
6. to attend to and to discriminate between sounds we want to hear and to tune out those we do not want (listen)
7. to locate sounds spatially

Tomatis acknowledges all of these functions and developed techniques to restore to the ear its essential functional effectiveness when the cause is not sensorineural damage. Sometimes what appears to be an organic or sensorineural difficulty is at least partly due to poor functioning, delayed

development, and/or to one's emotions. When poor functioning occurs, poor self-esteem, low motivation, and even depression may follow. It is worthwhile to take a more indepth look at each function to better identify symptoms of poor listening.

Cortical Charge from High-Frequency Sounds. We have some approximately 32,000 Corti cells (hair cells) in each ear. Hudspeth (1989) reviewed the anatomy of the ear and described these hair cells of the two cochlea as responding more than 100,000 times a second to the minute motions presented. Each hair cell (Corti cell) is tuned to a particular frequency of stimulation. Hudspeth infers that the responsiveness of hair cells to high frequencies of stimulation implies that transduction channels are very rapidly gated. Whatever the exact count, researchers agree on the presence of more densely packed Corti cells in the area of the basilar membrane reserved for high-frequency stimulation. In comparison, the area for low-frequency stimulation is much less dense. This leads Tomatis to theorize that high-frequency sounds are very energizing and stimulate and charge the brain so it has a greater possibility to learn to think. The effect of this fight against gravity, which is needed to observe a good vertical posture so one can better hear the high-frequency range, is a great gain of energy. For Tomatis, the ear is primarily a system to effect a cortical charge and increase the electrical potential of the brain.

Sound is transformed into nervous influx by the cells of the Organ of Corti in the inner ear, sent on to the cortex of the brain, and from there to the entire body to tone up the whole system and impart greater dynamism. Not all sounds give this charging effect. Lower-frequency sounds not only supply insufficient energy to the cortex, but may even tire the person by inducing motor responses which absorb more energy than the ear can provide.

Tomatis observes that those who lose high-frequency reception often have an accompanying loss of energy and motivation, fatigue, bad posture, and problems with attention, concentration, and memory. People who tend to be tired or depressed often have dull, toneless voices with very little high-frequency content. Changes in all of these factors, but particularly inreased concentration and memory, can help the person considerably to improve communication and learning.

***The* Ear as Integrator.** Tomatis describes how the vestibular (balancing) and cochlear (decoding of sound) functions of the ear are joined in a single system. Phylogenetically, the vestibule analyzes larger movements, those within the body, and the cochlea evolved as an addition to analyze smaller acoustical type movements.

> The influence of the ear is vast. In fact, its involvement can be found at every level of the nervous system. . . Modern physiology is leaning towards a more unified view of the whole. . . the cochleo-vestibular apparatus, having reached a completely new dimension. . . is involved as an inductor, or organizer in the embryological sense of the word. I see it as the inductor which leads the nervous system to become what it is. (Tomatis, 1979, p. 5).

Anatomically, the vestibular nerve presents itself at every level of the medulla and is thereby directly connected with all the muscles of the body. Tomatis proposes the vestibular integrator role for the ear, noting that all muscles depend on the vestibule for their tone, equilibrium, and relative position with relation to the whole body (Tomatis, 1979).

Closely associated with this integrator is the optic or visual integrator. It is composed of the retina, optic nerve, thalamo-cortical tract, occipital area, and the tecto-spinal tract going down to the anterior roots of the medulla. The eye muscles are ordered by the vestibular integrator, as are all other muscles of the body.

Third and last is the cochlear or linguistic integrator, which gathers nerve tracts from the dorsal and ventral nuclei reaching the temporal area of the brain after passing through the pulvinar, back part of the thalamus. It then goes to the neocerebellum, where it connects with the vestibular analyzers through the surface network on the cerebellum, and then it returns to charge the brain through the frontal and parietal nerve tracts and some fronto-pontic and parieto-pontic fibers. This mass also connects with the vestibular tracts at the anterior roots after branching through the red nucleus. Tomatis thinks of the cochlear integrator as a linguistic dynamic that "step by step, guides the nervous system to its human fulfillment. . . [and] appears to be so much better adapted to language than what it was fashioned for" (Tomatis, 1979, p. 9). From this perspective, "learning appears as the result of a saturation, of a massive intake by the nervous system. . . [and] the whole body is involved in this process" (Tomatis, 1979, p. 9).

Tomatis (1971, 1978) observes that these integrators establish three humanizing characteristics, all of which are required for developing good audiovocal control: verticality, laterality, and language.

Vertical posture differentiates humans and animals and allows humans to construct a particular view of the world. Laterality provides a clear differentiation for controlling the body in its upright position. Use of language through voice emerges and, according to Tomatis (1978), "is harmonically related to this developing image of the body" (p. 137).

Laterality refers to the differentiation of function in the brain. A delay in lateralization probably means that the language function is not locked into one cerebral hemisphere. Laterality is a controversial issue, accord-

ing to Sutaria (1985), and is based on the notion that, "in order for learning to occur normally, the central nervous system must be developed completely and sequentially" (p. 77). Orton (1928) and Delacato (1963) propose this need and describe problems, such as lack of internal awareness of the right and left sides of the body and consequent difficulties in reading and writing.

Listening becomes the foundation skill for learning when we understand this "learning anatomy" involving the ear at every level—physical. mental, and emotional (or as others describe them, body, mind, and spirit).

Right Lead Ear. Closely associated with laterality is an emphasis on which ear should be the lead ear. Tomatis (1953a, 1959, 1962, 1963, 1970a, 1971, 1974a, 1976, 1979) and others (Eisenberg, 1976; Kimura, 1967; Dwyer, Blumstein, & Ryalls, 1982) find that most people need to be right ear dominant to have the most efficient pathway from the auditory input to the brain's processing center in the left hemisphere. Control for speech and voice from the right ear allows the best timbre, speech flow, and melody and rhythm control to develop.

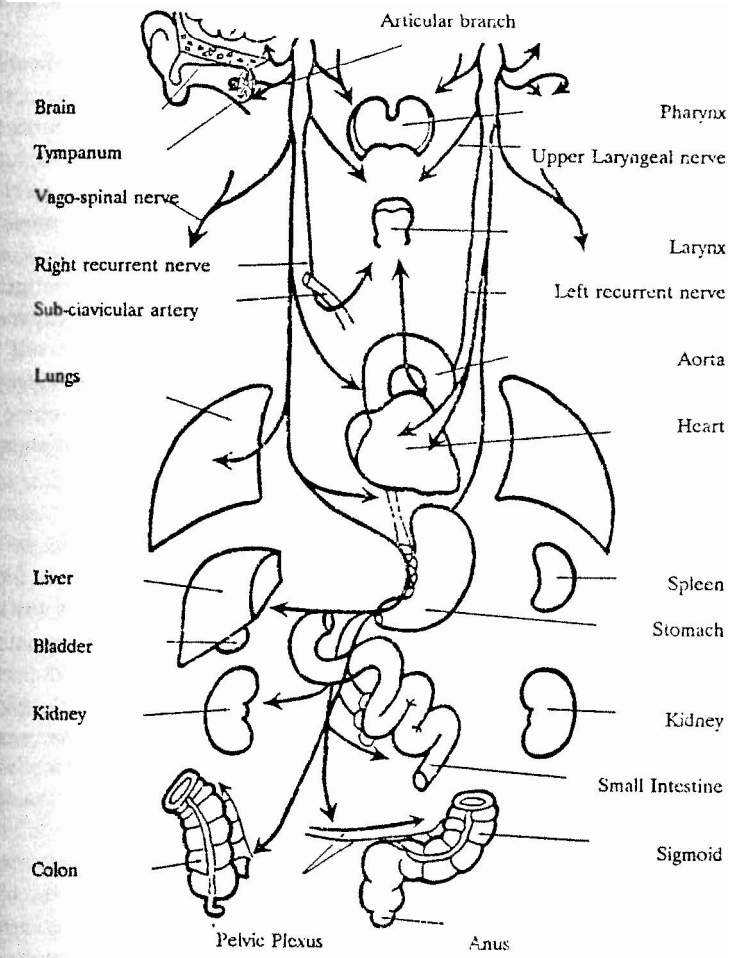
Balance. Most people know that the ear is involved in equilibrium or vertical balance. Another kind of balance can occur through sound stimulation, that of the sympathetic and parasympathetic nervous systems. Tomatis (1974b) describes how the vagus nerve, the sensory auricular branch of the pneumogastric nerve, regulates through its branches the larynx, the pharynx, and the organs of the body. The auricular branch connects to the outer surface of the eardrum, thus forming a link between our inner, neurovegetative life, and the outside world.

Figure 7.1 shows this connection of how listening affects the entire body.

Hearing and Auditory Perception. Tomatis (1974a,b, 1989a) gives a good account of how hearing occurs, and Hudspeth (1989) describes hearing in the inner ear via the hair cells (Corti cells). Hearing occurs without effort or analysis, much like an open microphone that picks up sounds indiscriminantly. Hearing and listening are often confused, but according to Tomatis (1974b, 1987), they are not the same.

> Hearing is a passive action falling within the realm of sensation, whereas listening is an active process that falls within the realm of perception. The two are totally different. Hearing is essentially passive; listening requires voluntary adaptation. When hearing gives way to listening, one's awareness increases, the will is aroused, and all aspects of our being are involved at the same time. Concentration and memory, our tremendous memory, an testimony to our listening ability. (Tomatis, 1987, p. 23)

Figure 7.1. Pneumogastric nerve connects the ear to the entire body or the visceral organs



From *Vers l'ecoute humaine*, by Tomatis, 1974b, p. 68. Reprinted by permission.

Berry and Eisenson (1956) say that children with auditory perception problem can hear sounds but do not recognize their meaning. From Tomatis's view, they hear but do not listen. Myklebust (1954) defines *auditory* perception as the ability "to structure the auditory world and select those sounds which are immediately pertinent to adjustment" (p. 158). This definition of auditory perception is more similar to that of *listening*, because it adds selectivity. According to Lerner (1981), auditory perception has remained a relatively neglected research area.

Sutaria (1985) lists four types of auditory perception problems: (a) auditory discrimination of differences and similarities, (b) auditory foreground-background differentiation, (c) auditory blending, and (d) auditory sequencing.

If hearing and listening are different, then one can have good hearing and poor listening. On tests that do not differentiate between them, one can appear to have poor hearing when in fact poor listening accounts for part or all of the problem.

Increasing attention is being given to children who find it painful to listen to certain sounds they perceive to be overly loud. A number of autistic children are reported to have this difficulty. In fact, one, and only one, autistic girl was described as cured after receiving a treatment using sounds that allowed her oversensitivity to lessen, thus opening many more learning opportunities because she no longer had to protect herself by tuning out (Stehli, 1991). Stehli's book in particular has done much to focus public attention on the role of auditory processing and listening in many children with communication problems and to programs which may help.

Focusing on Sounds. Tomatis brings attention to a unique motor activity, that of the muscles in the middle ear that allow a person to focus on specific desired sounds and tune out those not wanted. Little is written about the two tiniest muscles of the body, even in medical literature. Tomatis wrote extensively about the role of the stapedius and tensor tympani muscles (1974ab). Simmons (1964), and more recently Borg and Counter (1989), examined this topic. Tomatis accords these two small muscles a fundamental role in the process of listening, which is a neurophysiological focusing process mediated by the muscles of the middle ear.

Listening is the active focusing of the middle ear to accommodate and enhance the sensory perception of those sounds of particular interest, those the individual wishes to analyze and interpret with maximum efficiency (Tomatis, 1954, 1963, 1971, 1974a,b, 1977; Tomatis & Moulonguet, 1960). It acts more like a directional microphone to highlight that part of the sound spectrum that needs analysis and diminishes the extraneous or background sound. This is accomplished by adjusting the tensions of the tympanum and the pressure of the endolymphatic fluid in the cochlea.

> One very important factor is the ability to analyze sound, to listen selectively, and to make subtle discriminations between sounds. When the selectivity is open, the ear is able to analyze sounds across the spectrum, which, you remember, goes from 16 Hz to 16,000 Hz. (Tomatis, 1987, p. 24)

In its fullest elaboration, listening is implicated, not only in aural comprehension, but also in voice, speech, body posture and body image, and the whole of our relational world.

Spatialization of Sound. Finding the spatial origin of a sound is a matter of timing. The two ears must work together well to locate the direction from which a sound comes. When this timing is off, difficulties nth reading and writing are also reported. While some may minimize attention to this problem, Tomatis believes it is of major importance, because it reveals the surprising degree of confusion some people experience in auditory processing (1971, 1978).

Problems in any of these functions can trigger or cause listening disabilities at any age. They can begin prenatally.

Prenatal Listening and Human Development

The area that is the most enticing for Tomatis in his work is that related to fetal audition. He says his own premature birth caused him to search for what he had missed (1977, 1991). He was among the first to postulate that the fetus hears (1963)—common knowledge now (Eisenberg, 1976; Verny, 1981; Chamberlain, 1983; Spence & DeCasper, 1986), but not 30 years *W*·

Listening actually begins in the womb. The ear and the neuronic tracks between the ears and the brain are already fully developed and operatonal in the fifth month of pregnancy (Tomatis, 1987). If human auditory development is similar to that of animals, then research by Abrams et al. (1987) with sheep lends support to Tomatis' contention that the ear plays a vital role in developing human potential. Abrams et al. found that, at least for fetal sheep, normal growth and maturation of the brain depends on an intact auditory system.

To what is the fetus listening anyway? Certainly to the sounds of the mother's body, and more importantly, to her voice. For decades preceding other researchers, Tomatis contended that the voice of the mother speaking and singing plays a key role in the child's language acquisition and development and in social communication skill development (Tomatis, 1963, 1981). His research showed that the fetus listens to the highly filtered mother's voice and that high-frequency sounds thereof are received and charge the brain of the fetus. Although his theory has changed over the years regarding the exact mechanism by which this is done, research by others now supports many of his contentions.

We know the following from research by DeCasper and Fifer (1980), Spence and DeCasper (1982, 1986), Eisenberg (1976), Querleu et al. (1988a, 1988b), and Querleu and Renard (1989):

1. The fetus hears by at least 4½ months in utero.
2. Newborns prefer the voice of their mother over other voices. More specifically, they prefer her intonation pattern.
3. Newborns prefer familiar stories and poems read by their mothers to nonfamiliar ones.
4. At 2 months, French babies (the only ones researched) distinguish between individual syllables.
5. One-day-old babies synchronize their movements to an adult's speech articulation.
6. New amplification techniques have indicated that the attenuation of both music and speech sounds above 2,000 Hz have been overestimated and that high speech frequencies would be transmitted,

Gilmor (1989c) provides a summary of the genesis of listening and the Tomatis Method. Tomatis contends that during pregnancy, especially the last half, the intonation, richness, and emotional coloring of the mother's voice are important determinants of the desire to deploy one's listening for communication with the external world. The rhythm and structure of the native language spoken by the mother will also be imprinted on the nervous system of the developing fetus. Everything except the semantic meaning of the prenatal listening experience will be registered and stored for future reference. But what is most important is the kindling of the desire to communicate.

The inability to hear the natural mother's voice (the one familiar connection between fetal and birth worlds) may have a traumatic emotional impact on infants, whether it is because the child functionally cannot hear her voice due to a physiological difficulty or developmental delay or because the mother is not there with the child, due to some extended physical separation such as adoption, illness requiring hospitalization of either child or mother, or death of the mother. The constitution of the child is certainly a factor, too, for while some will succumb to trauma, others will not. If the infant decides to tune out some sounds that are too loud or traumatic in self-defense, he or she may not be able to tune in at will later because of nonuse. Parents may be unaware this is occurring and even be listening disabled themselves!

Early emotional and functional auditory problems can greatly influence the developing child's learning potential. De Villiers and de Villiers (1979) comment on language acquisition and individual differences therein:

> There may well be several alternative routes to the mastery of the full adult language. . . .The documentation of these individual differences and the range of normal variation in the rate and pattern of language development is crucial for determining the nature and extent of many language disorders. But it is also important to our understanding of the process of first-language learning that we continue to seek the sources of these individual differences, be they in the child's intellectual or physical development, in his interaction with his parents, or in the particular language input that he gets. (p. 138).

A solution must access and turn on more of the child's inner natural ability and potential, so that he or she can learn and communicate more effectively in whatever situation is experienced. It may be that the biases and strategies for language acquisition arise from the parents' speech to the child, the parents' reaction to the child's speech, the parents' encouragement or lack thereof toward speech, and/or the child's memory and organization abilities. Listening is certainly involved in all of these. On top of the external influences and personal abilities, a critical period for learning a first language seems to exist and is described in relation to the wild children found in captivity who have difficulty picking up language if they do not get enough exposure to it during infancy (de Villiers & de Villiers, 1979, pp. 128–129). Regarding second-language learning, "the critical period applies more to the sounds of speech than to grammar or vocabulary" (p. 127). One of the leading researchers on language acquisition, Menyuk (1981), divides language development into three periods: infancy, age 2–11, and adolescent and postadolescent. The effect of any developmental difficulty will depend on both the nature of the difficulty (physiological, cognitive, or social) and the internal and external mechanisms employed to overcome the difficulty.

> Both neurological and cognitive factors have been suggested to account for the observed differences in second-language acquisition, pre- and postpuberty, and the effect of trauma. It may be that speech perception and production are set in the preadolescent period. This would account for the retention of the native language accent by adult second-language learners. (Menyuk, p. 156)

Hearing, Listening, and Learning

While hearing is a major function of the ear, problems with hearing must be distinguished from problems with listening. Berg (1987), in a study supported by the U.S. Department of Education ("Project Listening in Urban and Rural Noise (LURN)"), presents a summary of research relevant to listening and acoustics for normal and hard of hearing students.

According to Berg, hearing screening levels for identifying hard of hearing students under the All Handicapped Children's Law are now more

likely to be set at 15 dB, rather than 25 to 30 dB. A hearing loss of 15dB is enough to cause learning problems. Physicians say a loss of 25 or 30 dB represents a loss as medically defined. Hearing loss is often accompanied by listening problems.

The term listening disabilities frequently is confused with hearing disfunction. The two are not the same. Confusions occur when poor listening is tied first to hearing loss. In defining listening problems related to hearing loss, Berg (1987) defines listening as "detection, discrimination, recognition, or comprehension of speech through audition, vision, or both in combination" (p. 65). Interestingly, his definition focuses on the relationship of the ear for language and meaning through speech, just as Tomatis does.

Many studies (Wrightstone, Aronow, & Moskowitz, 1962; Lennenberg, 1967; Quigley, 1969; Gentile, 1972) show hearing-impaired students perform less well academically than non-hearing-impaired students,

The impact of hearing loss is tied to language deficit as researched by Quigley and Thomure (1968) and Blair, Peterson, and Viehweg (1985). Using the Stanford Achievement Test in the former and the Iowa Test of Basic Concepts in the latter, these researchers found that as hearing deficits increased, academic deficits increased. Although differences in achievement are noted, differences in intellectual potential do not show up between these two groups (Moores, 1982).

If, on the other hand, hearing is normal and listening is poor, Tomatis explains why differences in IQ subscores, such as on the Weschler Intelligence Test, show up. In those subtest scores showing a high performance quotient but a low verbal quotient, lack of integration of incoming information causes the difference. The child may be very intelligent and have to struggle greatly because of verbal difficulties. Here is additional substantiation that good listening allows intelligence potential to develop, and research reported by Gilmor (1982) tends to support this.

Other data about hard-of-hearing students reviewed by Berg (1987) from Gengel (1971) show that those with bilateral loss have the worst time with listening, those with unilateral loss the next worst, and "even students with normal hearing cannot listen optimally in a typically noisy school classroom, even when the room has considerable acoustical treatment" (Berg, 1987, p. 98).

Noise and reverberation both affect listening scores. Bess and Tharpe (1988) concur that even students with unilateral hearing loss are 10 times more likely to experience academic failure than the normal population. And those with a loss in the right ear do worse than those with loss in the left ear (Oyler, Oyler, & Matkin, 1987).

The following from Berg (1987) are other important concepts that connect hearing loss, listening difficulties, and learning, as well as distinguish hearing loss from listening disabilities:

> The degree of hearing loss need only be minimal to cause deficit. (p. 1)
>
> The most frequent and most basic secondary consequence of hearing loss is listening deficit. (p. 1)
>
> In addition to the hard of hearing, many other children have listening problems. (p. 3)
>
> Listening is particularly important to children during their early language learning years. Often the hearing loss or auditory processing problem is not discovered until age five, and the child begins kindergarten with a language problem that makes listening even more difficult (p. 3).

Hearing, Listening, and Speaking

Literally from the beginning stages of fetal development, the voice and ear are connected. Tomatis reminds us that the muscles of the ear and the muscles of the jaw and the face have the same fetal development origin, the first and second branchial arches. A person's language and voice will be good if his or her listening function is good. Tomatis implicates the vestibular system, including breath and posture, when problems are observed in a person's speech and voice development (Tomatis, 1978, 1987).

Berg (1987) describes one speech need for those suffering from hearing loss: "Students must be able to detect speech sounds before they can learn to recognize them" (p. 75). This finding is identical to Tomatis's finding for all people (Tomatis, 1956) and was subsequently replicated at the Sorbonne in 1957. That "the voice can only produce what the ear can hear" is known as the Tomatis Effect (le Gall, 1961). Both the quality of voice and speech fluency are largely affected by the quality of the ear's listening.

Tomatis discovered this ear-voice link during his early work with professional singers (1974c, 1977, 1991). He applied engineering principles to train or retrain their listening in order to improve their speech and singing voices by focusing on the missing sounds (Tomatis, 1953a,b, 1956; Tomatis & Moulonguet, 1960). The ear-voice link became an ear-voice-learning link when those using the method discovered changes beyond those related to their voices.

While Berg's focus is on testing for hearing ability, he observes that audiologists work almost exclusively with identifying children with hearing loss, while speech language pathologists work primarily with students

without hearing loss. To improve listening for those with hearing loss. Berg recommends identifying hearing loss, speech deficits, and listening problems. He also recommends changing classroom acoustics and student proximity to the teacher as well as managing hearing aids and amplification equipment. Tomatis suggests that even with a hearing loss, some speech problems may be due to poor listening.

WHAT EXACTLY ARE LISTENING DISABILITIES?

Learning Disabilities and Listening Disabilities

Are learning disabilities and listening disabilities the same? Are poor readers learning and/or listening disabled? Despite several decades of research, programs, legislation, and funding, we still have varying, and sometimes conflicting, definitions of learning disabilities, little research about auditory perception problems, and a multitude of different projects and programs to improve some aspect of learning.

Gerber and Bryen (1981) give an overview of the historical trends in the field of learning disabilities. They have been defined as the result of organic sources such as cerebral dysfunctions, perceptual motor dysfunctions, and neurological development maturation delays associated with cerebral dominance developmental delay.

In 1963, when the term learning disabilities was coined by Samuel Kirk, differing categories were created; these categories roughly fall into two groups: those with an organic origin in the brain (dysfunction damage, injury, disease), and those whose symptoms were behaviorally displayed (dyslexia, disability, handicap, syndrome). They were also called brain dysfunction syndrome and minimal brain dysfunction syndrome. Either the part has a problem, the integration of the part with other parts has a problem, or the programming itself has a problem Sensory problems with hearing, vision, motor control and balance were acknowledged, but no notice was given to the ear as integrator.

The Illinois Test of Psycholinguistic Abilities (ITPA), developed by Kirk, McCarthy, and Kirk (1968), significantly changed the context in which learning disabilities were held, from being visual processing dysfunctions to having auditory and language processing deficiencies. Lerner (1976) showed this trend in special education.

Johnson and Myklebust (1967) and Ayers (1974) connected certain types of learning disability to dysfunctions in the brain's integrative functions. Birch (1973) showed neurologically impaired children were significantly delayed in their ability to integrate information from the visual and auditory channels.

According to Kephart (1960), Barsch (1968, 1976), Frostig, Lefever, and Whittlesey (1964) and Ayers (1974), many learning disabilities can be attributed to deficits in perceptual and motor development.

Tallal (1975, 1976, 1978; Tallal & Piercy, 1973, 1974) concluded that delays in language acquisition are somehow related to deficits in the ability to process rapidly presented auditory information. Increasing the length of the acoustic stimulus helped improve sound discrimination. Rosenthal (1974) hypothesized that, underlying delayed or disordered language, is a generalized (not specific auditory) processing disorder in all perceptual modalities.

Much has been done in the field of reading, too. Lerner (in Kirk & McCarthy, 1975) shows a discrepancy in how reading specialists focus on developing skills for the dyslexic child (typically defined as one who has difficulty with reading or writing but with no observable cause) and how learning disabilities specialists focus on underlying deficits or disorders with broader ranging remediation. Early on, the underlying cause was thought to be visual perceptual problems. Jansky and de Hirsch (1973) show an important predictive relationship between oral language ability and reading achievement. They conclude that both receptive and expressive spoken language abilities are essential foundation skills for reading and that good reading training takes this into account.

Rudel and Denckla (1976) found that, regardless of sensory modality, reading age only correlates with temporal-spatial matching. Gibson and Levin (1975) conclude that some process similar to that required for initial reading success probably "involves extraction of structure of patterned information, the relations between subordinate units, both over time and space and within and across modalities. Both analyzing a pattern and perceiving the structure of a pattern are necessary for reading" (p. 250). Spatial and relationship analyses require good auditory functioning and integration. Listening disabilities are at the heart of many reading problems.

The ear's role in learning disabilities began to emerge from these earlier investigations, but it only becomes clear once the ear's role of integrator is acknowledged. Where, then, do we place listening disabilities in the realm of learning disabilities?

Perhaps it will help to keep this role of integrator in mind as we consider the confusion about the definition of learning disabilities from the law which attempts to deal with such disabilities. Public Law 94-142 gives the following operational definition of a learning disability:

> The child does not achieve commensurate with his or her age and ability levels in one or more of seven specific areas when provided with learning experiences appropriate for the child's age and ability levels. (Lerner, 1981, p. 13)

The U. S. Office of Education's definition of learning disability, as it appeared in the 1977 Federal Register, is presented by Donahue, Pearl, and Bryan (1982):

> Children with learning disabilities are defined as those with normal intelligence, intact sensory and emotional functioning, but who still exhibit a disorder in one or more of the basic psychological processes involved in understanding or using language, spoken or written. (p. 399)

In 1981, the National Joint Committee on Learning Disabilities (Hammill, Leigh, McNutt, & Larsen, 1981) defined learning disabilities such that other disfunctions (such as hearing loss) could occur simultaneously with them.

The inclusion of normal intelligence implies the person's potential is probably normal, but average school-based achievement is usually not attained. Instead, the result in actual circumstances is for schools to document greatly the disabilities, ignore the potential, and make both parent and child focus on past performance rather than on developing potential. It is a frequent lament in my consultations with parents and children.

Uncertainty reigns when there is lack of agreement over even the basic definition of a learning disability. This situation creates confusion among those professionals working with learning disabled persons. Still another review, by Wallach and Butler (1984), regarding historical trends identified two general categories of processing models that originally attempted to identify mental processes that cause learning disabilities: one related to auditory processing deficits, and the other to general cognitive processing deficits. Their perspective adds to our understanding of poor listening as an underlying disability.

The auditory/linguistic processing model arose primarily to extend the medical model and attempted to explain causes primarily within the category of developmental language dysphasia. It suggested that language disorders result from deficits specific to auditory/linguistic processing, including sequencing, memory, and discrimination processes. Deficiencies in these skills were thought to cause the language disorder, and the solution was to work on them directly in order to improve general language development.

But Wallach and Butler believed that the skills being called processing skills were actually just one particular use of language. Some attention was given to possible subtle neurological damage, but a way to identify such damage did not exist. They concluded that efforts turned away from attempting to specify anatomical or physiological deficits characteristic of medical model interpretations of language learning disabilities.

Cognitive processing models developed out of influences from information-processing theory, linguistics, and cognitive psychology (especially symbolic function). Treatment of learning disabilities by professionals using this model varies according to which of the following two views is held: (a) the processes underlie the use of language; or (b) the processes are one type of language use. If the first is held, then one would believe that remedial work on the processes would affect the social-interactive use of language in context. If the second is held, then work on metalinguistic skills would enhance only the metalinguistic uses of language. The models alert us to the possibility of multiple deficits and to the possibility that while some individuals may need to work on symbolic function, others may need to work on hierarchic organization.

Listening and Listening Disabilities: Definitions

The ear provides many functions, and listening does, in fact, involve the whole body. Our definition of listening and listening disabilities keeps this in mind. The definition of listening proposed here is that of Tomatis, that listening is the active, motivated whole-body tuning in to sounds one wants to hear and tuning out those one does not. Listening disabilities are the dysfunctions physically, emotionally, and mentally caused by the inability of the ear to focus on sounds (movements of the air) it wants to hear, to tune out those it does not want, and to naturally integrate and analyze those sounds and the internal movements of the body (motor) for our use. This definition acknowledges the singularity of the cochlear-vestibular system, desire as an important component of listening, and the ear's role of integrator.

From this context, a listening disability exists when we have (a) poor functioning of either cochlear or vestibular portions, or (b) poor control of and lack of harmony between both systems, and/or (c) we are emotionally not willing to tune in. Symptoms of listening disabilities are observable in many areas.

Symptoms of Listening Disabilities

The Listening Checklist shown in Figure 7.2 is for some people their first encounter with connecting problems of expressive and receptive language, motor control, attitude/behavior, and developmental difficulties to a single source, that of poor listening.

People of any age can show these symptoms. This checklist is a good screening device for parents, teachers, and other professionals interested

Figure 7.2. listening Checklist.

The trouble with listening, you'd think, is that it's an invisible act. You can't see if a child's ears are shut, even though the consequences of not listening, in terms of self-esteem, happiness and achievement may be devastating.

To help parents and teachers identify children with a listening problem, we've devised the foliowing checklist. There is no "score" on this checklist; it is only a guide to identification.

Receptive Listening/Language

This is the listening which focuses outside, on what another is saying, cr what is going on in the home or school environment.

- ☐ has short attention span
- O is easily distractible, especially by peripheral noises
- ☐ is oversensitive to certain sounds
- O misinterprets questions or requests
- ☐ has difficulty with auditory discrimination (confuses similar sounding words or consonants). often asks for repetition
- ☐ is able to follow only one or at most two instructions in sequence

Expressive/Listening/Language

The listening which focuses inside, which monitors and reproduces correctly what one hears, especially one's own voice.

- ☐ voice quality (flat, monotonous)
- ☐ speech lacks fluency, rhythm, is hesitant
- ☐ vocabulary is weak
- ☐ sentence structure is poor or stereotyped
- ☐ singing is out of tune
- ☐ confuses or reverses letters
- ☐ has difficulty with reading (dyslexia), especially out loud
- ☐ poor spelling

Motor Skills

"Listening to the body." These skills are intimately related to the vestibular system of the ear, which controls balance, coordi- nation and b.dy image.

- ☐ poor posture: slouching and slumping
- ☐ uncoordinated body movement, fidgeting. clumsiness
- ☐ poor sense of rhythm
- ☐ messy handwriting
- ☐ a hard time with organization. structure
- ☐ confusion of left and right, mixed dominance

Behavioral and Social Adjustment

A listening problem is often accompanied by the following:

- ☐ low tolerance of frustration
- ☐ poor self-image, self confidence
- ☐ difficulty in making friends, relating with peers
- ☐ withdrawal/avoidance
- ☐ irritability
- ☐ hyperactive tendencies
- ☐ is inordinately tired at the end of the school day
- ☐ low motivation, loss of interest in work
- ☐ immaturity (indicates lack of desire to grow)

Developmental History

Listening difficulties usually develop well before school age. If you've noted any of the signs above, you can trace the problem further by checking into the following:

- ☐ a stressful pregnancy
- ☐ difficult birth
- ☐ adoption
- ☐ early separation from the mother
- ☐ delay in motor development
- ☐ delay in language development
- ☐ recurring ear infections

From *Listen, Newsletter of the Listening Centre,* Gilmor & Madaule, 1988, p. 3. Reprinted by permission.

in identifying listening disabilities. It draws the attention of professional and nonprofessional alike, for it brings together symptoms of problems in different areas of research, all of which could lead us to the ear—if we know to follow. A description of some behaviors of children who have these symptoms is given by Thompson, Madaule, and Gilmor (1988–1989) and a found throughout the anthology by Gilmor, Madaule, and Thompson (1989). A review of research connects problems in several areas to listening if we keep in mind the definitions and list of symptoms given here.

Specific Areas of Disability

Speech/Language. Listening and speaking are intimately tied together in their anatomical development (Tomatis 1953b, 1954, 1956, 1963, 1967, 1972a, 1974b, 1979, 1987; Tomatis & Moulonguet, 1960). Might a listening disability cause a speech disability just because of this functional connection? Might we change speaking just by changing listening, as the Tomatis Effect implies?

Tomatis's clinical research, and that in schools and centers using his method (including ours in Phoenix), show that, when a child's listening improves, parents report many and varied changes: sentences become longer and more complex, participation in conversations increases, speech becomes clearer and possesses more modulation, relationships with friends and siblings improve, and the child begins to hum and sing more frequently. The coordination extends to the children's bodies as well, and they notice more, pay attention to more, and therefore have more to say. They can find language to describe feelings and desires. They begin to fit in. to know how they are related to others. Drawings take on dimension and colors change; names and other language are written on them with no prompting.

Belk (1989) describes use of the Tomatis Method from a speech pathology/audiology perspective and tells why improving listening first (so one can hear the sounds to be made) sometimes succeeds or accelerates improvement when traditional speech methods do not. Her training in both areas and in Special Education allows her to see connections others without this integrated background might miss. Used to establish good audio-vocal control and/or to prepare the client for additional traditional speech-language therapy, she concludes that the Tomatis Method is an appropriate treatment modality. It works even when major psychological or physiological causes have stopped communication.

Dyslexia. Serendipitously, Tomatis's work with professional singers led to the discovery that learning disabilities, especially reading and

writing difficulties (dyslexia), are tied to listening. Some of the singers Tomatis helped reported additional beneficial changes in their reading and writing abilities, memory, concentration, sleeping and eating patterns, and energy levels. Later some of the singers brought him their children to see if the Method would help them overcome problems in school in these same areas (Tomatis, 1978, 1991).

Tomatis comments on dyslexia at length in his book *Education* and Dyslexia (in French, 1971; in English, 1978). "The dyslexic's real problem is an inability to interpret the world of human beings. Because he is unable to apprehend this world, he is also unable to see himself as an integral part of it" (Tomatis, 1978, pp. 133–134). Here is a description of what it is like to be dyslexic from psychologist Paul Madaule (1989), who has experienced dyslexia and the Tomatis Method first hand.

> The dyslexic, because of a dysfunctional auditory receiver, is a stranger to his own language. Any educational method used with dyslexic children must deal with the fact that the sound information they perceive, regardless of its original quality, is always distorted. (p. 55)

> The dyslexic is absorbed to such an extent in his problems that he often cuts himself off from the best parts of his own nature. His own image is reflected back to him in a deformed fashion, as if he were seeing himself through a trick mirror that makes everything look ugly. The therapist's role is to focus the patient's attention and interest on the healthy side of his being, to offset his distorted, dyslexified perception and to awaken him to the genuinely positive dimension within. (p. 59)

It appears to Tomatis, and others such as Levinson (1984), that reading and writing problems are just one symptom of dyslexia, not the definition of dyslexia itself. Tomatis says these problems affect one-third of French children (1971, 1978, 1988), and recommends a program, such as the Tomatis Method, to help them construct a normal perspective of the surrounding world.

Connecting the ability to listen with the ability to read becomes easy when we acknowledge that reading is a language-based skill, not a visual-based skill per se; that is, deficits in language more than in visual perception explain the problems. Orton (1925) explained the basis for developmental dyslexia in neurological terms as a lack of a well-established hemispheric dominance. Vellutino, Steger, and Kandel (1972; Vellutino, Smith, & Steger, 1975) showed that verbal labeling problems, rather than visual perceptual confusion, were the basis for reading reversal and orientation errors. Wallach and Butler (1984) concur that, though visual problems can cause reading problems, "in most cases alternative explanations, relating to linguistic rather than visual-processing deficits, appear to have more salience" (p. 272).

Liberman et al. (1980) also tie audition to reading:

> the consonant segments of the phonemic message are typically folded, at the acoustic level, into the vowel. The result is that there is no acoustic criterion by which the phonemic segments are dependably marked. However, every syllable that is formed in this way contains a vocalic nucleus and, therefore, a peak of acoustic energy. These energy peaks provide audible cues that correspond to the syllable centers (Fletcher, 1929). Though such auditory cues could not in themselves help a listener to define exact syllable boundaries, they should make it easy for him to discover how many syllables there are and, in that sense, to do explicit syllabic segmentation. (p. 196)

Most recently, using REM brain scans to monitor reading, Montgomery (1989) made some surprising findings contrary to common theory. It has been commonly believed that, to neurologically understand a word that *we* read or repeat aloud, the brain must first translate the written symbol into an auditory form by sounding out the words in our head. But to the surprise of Marcus Raichle, head of the brain study group at St. his, REM images show that this translation is not necessary: "Somehow the visual form of a common word like screen can be directly shot forward to the motor areas controlling the mouth, or the semantic areas within the forehead, without being internally sounded out in the auditory cortex" (p. 60). But something different occurs on the images when a person reads verse and has to consider the way words sound. "Then we see an area near the auditory cortex become active. . . .This word sounding region in the auditory cortex appears to come into play, even though the sounds are only heard in our head'" (p. 60). Furthermore, what is true for adults reading simple, commonly used words may not be true of children learning to read. '"As I remember,' says Raichle, 'when learning to read in first grade, I had to learn to sound out the words on the page.' During this kerning experience, he speculates, these phonological coding areas are active. But when one becomes a proficient reader they're no longer necessary," unless, he hypothesizes, a foreign or more complicated word appears, requiring components of this phonological system to come back *into* the process (p. 65).

This clearly supports the use of oral repetition of sounds and oral reading for poor and beginning readers. This active work is a necessary part of retraining the ear and simulating the most complex stages of language development in order to improve one's reading ability and develop one's learning potential.

The role of auditory processing in reading difficulties is gaining more attention from professionals and researchers such as Bryant and Bradley (1985). They conducted a comprehensive 10-year literature search in many countries and for many ages and grade levels with the following conclusion:

The most obvious and the most consistent of the difficulties which backward readers encounter is with sounds in words. They find it hard to isolate these sounds, to use them to build words, and to see that different words have sounds in common. This means that they are slow to learn about the relationship between letters and sounds, and between groups of letters ('chunks') and sounds. The result is dire. Any child who cannot grasp these relationships is bound to fall behind in learning to read, and even further behind in learning to spell. (Bryant & Bradley, 1985, p. 152)

Laterality/Modality. A modality is a channel through which a person interacts with his or her environment. Audition is considered to be a modality, as are vision, motor movement, and speech. Much has been written about laterality and modality separately, yet they may be more related than we at first thought, if only we see the ear as the link they share. If a person is to perceive and make sense of information from his or her environment, he or she must be internally organized first. Perceptual difficulties result in the person seeing, hearing, and experiencing the world differently from those who perceive well. Typical programs to improve modality integration use motor control and perceptual-motor activities. Research by Ayers (1978), Quiros (1976), and Quiros and Shrager (1975) link motor and posture functions to language and learning problems.

Any trauma, illness, or accident that interrupts the child's explorations and interactions adversely affects the development of the organized self. Over confinement to a playpen, restrictions to free movement, some even slight injury to the central nervous system, and an early separation from the natural mother may impede the development of the internal structure. And it is this internal structure upon which school learning depends for success.

When integration of two or more modalities is required, some people do poorly. In a well-functioning child, all the modalities operate well and in a balanced way. Research by Early (1973) shows a sharp difference between normal and learning-disabled children, the former being markedly superior in cross-modal function. In particular, the act of oral reading is a highly integrated skill. Motor and voice functions may organize and promote visual and auditory integration. Listening is the feedback loop for this integration to occur.

To help screen for integration difficulties, Heiniger (1990) offers a 20-minute test a classroom teacher can give to students. Tomatis' Listening Test battery includes a laterality test that does the same (Tomatis, 1953b, 1963, 1971, 1978).

Motor control also impacts the body's skeleton (Upledger & Vredevoogd, 1983). One Doctor of Osteopathy works with some clients from our center and explains to them how the skeleton of the body can be misaligned in specific areas, including craniosacral areas, causing difficulties with speech and language. He adjusts the physiology of the nervous system, musculature, and skeleton to enhance each of their functions. The result ranges from no improvement to improved capacity to use the neuromusculoskeletal system, improved response to other forms of therapy (physical, occupational, speech, and listening), and improved behavior.

Attention Deficit. Bloom and Lahey (1978) believe that auditory language processing problems may result from either an attentional deficit or the inability to integrate information from different sensory modalities. Attending and integrating both involve the ear. Being unable to attach meaning to sound may cause a child to "tune out" either complex input or particular types of input.

Medication, especially methylphenidate (commercially, Ritalin), has been used with hyperactivity (another descriptor often associated with attention deficit), and a review of studies describing its benefits for over 40 years has been made (Millichap, 1977). Its impact is to improve attention, visual perception, conceptualization, and eye-hand coordination, and to decrease hyperactivity. Auditory perception has not been observed to benefit as much as visual perception (Gerber & Bryen, 1981).

Children with attention disorder are theorized to be troubled by too many stimuli that are not task specific. Such children cannot tune out distractions. Studies by Swanson and Kinsbourne (1976) show no academic gains for children on drugs for hyperactivity. One conclusion is that they need to acquire motivation for learning in addition to improved processing. Farnham-Diggory (1978) recommends using special methods to teach complex learning tasks and to focus the attention of hyperactive children, rather than using drugs which have risky side-effects.

Richardson (1975) and Kinsbourne and Caplan (1979) support this view that neuropathology is not the cause of learning disabilities except for a small percentage of cases. Gerber and Bryen (1981) summarized this trend, showing a movement away from medical/etiological emphasis and toward either broadening the spectrum of possible causation or questioning the value or validity of organic diagnosis (p. 19).

Psychology. Whether a listening disability begins with a functional difficulty or an emotional need to tune out, many psychological implications exist for listening disabled youngsters and adults. In fact, it would be a disservice to motivate and enable someone to listen again if you leave him or her in the same disruptive or traumatic environment that caused the problem, either in fact or from his or her perspective. They would just have to "tune out" again for self-protection! Therefore, the use of

counseling to assist both the listening disabled and those who interact with them is needed. Psychologist Tim Gilmor (1989a) summarizes psychological factors involved in poor listening that begin very early in life:

> A number of encounters in a person's life can detrimentally affect the desire to listen, and thus to communicate. A difficult prenatal life, traumatic birth, early separation from the mother, health problems in infancy and early childhood, all of these can be critical. Often the child's only possible response is to 'tune out' his environment by selectively dampening critical frequencies in the sounds around him. This is an unconscious process, which can quickly become a permanent filter through which the child's world is perceived darkly. (Gilmor, 1989a, pp. 9–10)

According to Tomatis (1963, 1967, 1970a, 1971, 1972a,b, 1977, 1978, 1991), a listening problem that is not the result of organic lesion generally has a psychological origin. In thousands of case studies he observed that many clients experienced or described times in their early lives when there were refusals or reluctance to accept certain stimuli from the environment, specifically those of spoken language. It manifests itself at the physiological level by a relaxation of the muscles of the middle ear, which considerably impedes the passage of sound. If the muscles of the middle ear are inactive for too long, they lose their tonicity. Sounds an imprecisely perceived, and as a result incorrectly analyzed.

Frostig (1976) attributes learning disabilities to the interplay among organic and environmental causes. Gerber and Bryen (1981) conclude explanations and assessment and treatment for learning disabilities "must include cognitive, psychosocial, and linguistic components" (p. 20). Tomatis (1963, 1967, 1971, 1977, 1978, 1991) developed the science of audio-psycho-phonology to acknowledge the relationship of ear, voice, and psyche.

Programs such as psychologist Lee Gibson's PEAKE Experience provide intensive process-oriented workshops that educate older teens and adults about ways to begin to perceive what they have been tuning out for years for self-defense. They learn techniques to improve relationships, to acknowledge others by listening, to become responsible for their communications and behavior, and to feel emotionally empowered and able to more fully develop their potential. They learn to listen to themselva a d others—to the degree they have the functional ability to do so. Some of our clients have participated in both his workshop and the Tomatis Method, some starting with one, and some with the other. PEAKE is an acronym for the personal change process (Perceive, Experience, Acknowledge, Know, and Expand). The combination of methods as powerful as both of these is encouraging. The changes are lasting, as clients attest, and empower the participant to know that he or she is responsible for these changes, not the therapist facilitating the process. Tomatis concurs, the process of improvement must leave the client responsible for the change, not transfer responsibility to the facilitator.

Another therapist who concurs about nontransfer and brings a different dimension to the definition of listening is Ilana Rubenfeld. She developed Rubenfeld Synergy Method™, integrating Feldenkrais body movement, Alexander technique, Ericksonian hypnotherapy, and Gestalt therapy (Rubenfeld, 1988). Rubenfeld says she "listens with her hands." When a person who has been isolated by and from a previous emotionally and/or physically painful experience lies on a table, Rubenfeld invites and facilitates his or her listening to his or her own body, words, and feelings and then putting language to them. Meanwhile, she gently uses her hands to encourage the person's body to release old holding patterns affecting posture and movement.

Some of these traumas might be prevented by learning how to speak so others will listen and listen so others will speak, as suggested by Faber and Mazlish (1980) and Hamlin (1988). Taylor (1986) in Positive Illusions and Ornstein and Sobel (1989) in Healthy Pleasures recommend having optimistic perspectives over pessimistic ones for maintaining health and positive self listening.

Are we to be considered listening disabled if we have not the experience of listening these ways to ourselves—so that we can let go of the physical, emotional, and mental barriers that keep us from relating to self, others, and environment? From Tomatis' insights, the ear and listening ability are integral components of this lifelong process.

Music. Others besides Tomatis know of the importance of listening to and producing various tones. The famous violin teacher Suzuki (1983) observes that tone deafness often occurs in young children when they are trained by a tone deaf parent and learn to perfectly represent an imperfect tone.

Suzuki and Tomatis hold some ideas in common: the important function of listening *in* utero, listening as the basis for music ability, the need to focus on the child's potential, a love for Mozart's music, and the need to have the family support the child's listening development.

Musician, composer, writer, and teacher Don Campbell has done much to educate people about listening disabilities and the role of music. In *Rhythms of Learning* (1991), Brewer and Campbell place much emphasis, and rightly so, on rhythm's role in learning. At the heart of rhythm and movement is the ear, and once more, we are drawn to listening ability as the key for integration.

Besides the Tomatis Method, several other learning methods (such as Accelerated Learning and Orff-Schulwerk) use music and listening to

enable the learner to accelerate the learning process. The music therapists use many forms of music to improve mental health, decrease pain, improve coronary care, assist childbirth and premature infant care, and reduce migraine headaches. A problem occurs when listening is poor from the beginning and cognitive approaches do not succeed in overcoming them. Campbell (1983, 1989, 1991) recommends chant activities to improve listening and open up one's awareness and classroom activities to integrate right and left brain functioning.

Through his original work with singers, Tomatis discovered that the ideal listening ear is a good musical ear and that Caruso had the perfect musical ear.

Are we listening disabled if we lack this kind of precision or call ourselves tone deaf? Is it important that matter is made up of rhythmic energy and that we relate to everything through our ear? Listening disabilities tie into an inability to experience or respond to music, the rhythmic sounds of voice and instruments that many take for granted.

Foreign Language. Learning a foreign language is considered to be a necessity in some countries, though not usually in the U.S. OptimaLearning (1988) recently published cassette tapes to teach very young children who are native English speakers how to speak French and Spanish and describes Tomatis's insistence that we must be able to hear the sounds of a language before we can learn it. "Before your children can speak a language, they must be able to hear the particular sounds and auditory frequencies of that language, according to Dr. Alfred Tomatis.. ..When children learn a second and third language, they are actually increasing their cognitive flexibility, a key to problem solving and creativity" (p. 1).

If early exposure is not possible, an older child or adult may use the Tomatis Method to develop an ear for a language, meaning he or she listens to sounds of a native speaker through the Electronic Ear's adjustments to that language in order to learn its intonation and frequency patterns. Tomatis discovered that every language has a particular frequency range within which most of the sounds therein are intensified, which he calls the envelope curve or *ethnogram* (Tomatis, 1960, 1963, 1970b, 1977, 1991; Tomatis & Moulonguet, 1960).

Are we listening disabled, in a sense, if we can hear only the sounds of our own language? For those who want to learn a foreign language, it is certainly a valid consideration.

Education. We can hardly pick up an educational journal or book without hearing about students at risk, learning disabilities, special education, drop-outs, illiteracy, poor teaching, and low funding. It is not uncommon to change standardized tests, textbooks, educational goals, curriculum, report cards, and teacher certification requirements, but maybe it is also time to change how we look at learning disabilities and perhaps see that something more basic than "the 3 Rs" is where we must start.

It is necessary to get to the problem source of many learning problems—listening disabilities—rather than to continue to merely address the symptoms (Thompson, 1989, 1990). Recommendations include perceiving the problem source to be poor listening, providing for early screening for listening problems, providing programs to improve both the functional and emotional aspects of poor listening, educating students (parents, too) about how to take care of their ears, preparing teachers to use techniques which develop and reward good listening, and addressing the need to prevent listening problems. Instead of just looking at the short-term costs of providing these measures, we must also count the long-term cost to the person and the entire society when we don't.

There is every indication that we need programs to improve listening a d that some people need more than just cognitive-based methods. According to Friedlander (1973), 25% of kindergarten children from advantaged milieus fall into the category "learning disabled" because of poor listening. He connected poor listening with learning difficulties and saw the connection as the cause of poor scores on standardized tests; the students couldn't comprehend language well enough to complete questions correctly. According to de Hirsch (1981), "A child who does not comprehend fairly complex language in first grade will retreat into daydreaming, and the more he dreams the less he will listen. There are many youngsters who have learned not to listen before they are seven" (p. 64).

Can we keep our emphasis on standardized testing and continue to ignore the impact of poor listening on the scores? Content validity may give way to process validity, in a way of describing what must additionally be addressed.

Listening training programs are needed as early as possible in the child's life, yet we are often told, "Don't worry, he'll outgrow the problem." For many children, one year makes a difference in maturity and academic abilities, yet one should not sit back and do nothing for a year. "During transitional stages—and the age between 5 and 7 is such a stage—training stimulates maturation" (de Hirsch, 1981, p. 64). Exposure to information results in learning. A poor listener's perception alters the information so that it has to be unlearned and then relearned through an altered perception. (And also, a good listener learning distorted information has to unlearn the distortion before relearning the correction.) With the poorly functioning ear as integrator of information, what is the impact?

Learning disabled children do not see a relationship between what they

do and what happens to them. It is suggested that this view of self and the world may hinder these children from actively seeking appropriate learning strategies such as verbal rehearsal (Hallahan, Gajar, Cohen, & Tarver, 1978). In other words, these children are disconnected. When students are disconnected, they resort to tuning out and to using whatever learning strategies they find to allow them at least some response. What can be done?

Learning Strategy Change. Simon (1985) and Lasky (1985), among others, describe a number of strategies to improve listening and speech. Insight that teachers must teach to the student's strength area is common knowledge. Developing the weak areas so they have a greater learning resource base is the challenge.

Proponents of Neuro-Linguistic Programming™ view every strategy one has as useful for something. When a strategy is applied in the wrong way or in an inappropriate situation, then one has problems. NLP is a controversial yet rapidly expanding communication technology based on the initial work of John Grinder and Richard Bandler. Some people object to its misuse by people who lack integrity in its applications, while others point to efficient techniques to improve gaining rapport and making desired communication and learning changes. The integrity of the user of any method is always a key to the acceptance of the method. The specific application of NLP techniques to education is provided by Cleveland (1987), Jacobson (1983), and Van Nagel, Siudzinski, Reese, and Re— (1985). Often only one step in a process separates success from failure. For example, while poor spellers compare a visually constructed image of how they think the word is spelled to an auditory image of how that visual image would sound, good spellers compare two visual images — the word as they construct it and as they remember seeing it. NLP, a fairly new and still evolving technology, has many techniques and insights that can help people use auditory and other sensory skills appropriately.

Are we listening disabled if we use auditory processing when some other strategy is more appropriate or, vice versa, do not use it when we should? Might we not use one strategy because of a functional disability therein and will that affect our learning ability?

HOW DO WE TEST FOR LISTENING DISABILITIES?

Test Requirements and Research Concerns

Public Law 94-142 has many formal test administration requirements but does not preclude using systematic behavioral observation and other nonstandardized clinician-constructed evaluation tools. Critical determinations cannot be made on the basis of only one test, so emphasis on testing comes through legal requirements to protect a child's civil rights. Descriptions of several auditory and language-based tests are given by Gerber and Bryen (1981) and Wallach and Butler (1984). They include standardized tests and subtests of auditory reception, discrimination, and closure, and those of sound blending, word recognition, oral directions, selective attention, and other language development and comprehension tests requiring reading/speech/auditory feedback. One such set of tests was developed by Flowers (1983). "The Flowers Auditory Test of Selective Attention is one of the first assessment instruments suggested for use with young children suspected of auditory perceptual deficits" (Gerber & Bryen, 1981, p. 13).

As Carver (1974) and Schery (1981) point out, the stability and reliability of standardized tests make them effective measures of group differences but reduce their ability to pick up important changes in the individual. For this reason, criterion referenced tests (CRTs) are often better for identifying specific changes. For both standardized tests and CRTs, problems in testing occur when a test assumes competence of lower-level skills or does not acknowledge that this lower-skill competence underlies abilities being tested.

Beyond the evaluation of listening abilities of individuals, the evaluation of programs must be considered. In a summary of the effect of language intervention programs for learning-disabled children, Wallach and Butler (1984) noted that no really comprehensive program evaluation research in speech and language intervention could be found. Research of any type is not an easy mistress to master.

Tomatis Listening Test

If one looks for a way to test the seven functions of the ear listed earlier, one test, the Tomatis Listening Test, is seen to address all of them and to incorporate the components in the proposed definition of listening and listening disabilities. A trained consultant using this composite test battery gathers information using electronic equipment to perform several types of test to identify both listening problems and listening strengths (Tomatis, 1967, 1971,1978). A summary of the description given in *Education and Dyslexia* (Tomatis, 1978) follows for the test that is done in a sound quiet room and follows a specific protocol.

Threshold Evaluation. The person's ability to hear at a specific, predetermined intensity threshold the normal sound scale frequencies ranging from 125 to 8,000 Hz are tested for both air and bone conduction for both ears. A curve is derived for each of these. The good listener has

parallel curves, while the disabled listener has distortions of varying types. The curves are examined in three ranges—bass (125-800 Hz), middle (800-2,000 Hz), and treble (2,000-8,000 Hz)—and as a whole. When a French person's self-monitoring is perfect, the curve rises at the rate of 6 db per frequency tested from 125 to 3,000 Hz and descends slightly thereafter. Disturbances in the curves indicate different problem.

Selectivity Evaluation. The person's ability to recognize pitch differences between frequencies is determined for each ear. The test is usually given using a sound input of about 45 db. This discrimination ability should be present by the time a child is 8 to 10 years old. People who have difficulty with this test are unable to discriminate tonal values of sound.

Spatialization Evaluation. The person's temporal spatial orientation ability is tested. Not everyone is able to orient himself or herself spatially. Confusion here indicates a fundamental difficulty in *Wiring* oneself within one's environment.

Leading Ear Evaluation. The person is tested while speaking to determine his or her dominant ear. Sound is directed to each ear at the same intensity level at first and then changed to a different intensity toward the nondominant ear until there is a shift in facial expression, voice modulation, muscle tone around the mouth and jaw, general pasture, and breathing depth. An audiolaterometer developed by Tomatis is used to do this test.

Additional Tests. Additional tests include the tree test, family test, and human figure test. Optional tests may be done or requested from other professionals.

WHO HAS LISTENING DISABILITIES AND WHAT IS THEIR IMPACT?

Listening disabilities occur at any age as a result of illness, accident, a major lifestyle disruption, or stress. Those children with listening disabilities are impacted in any of several ways, as described by Tomatis (1963, 1967, 1971, 1976, 1978, 1989a, 1991), and can be identified from their behavior as shown in the list of symptoms of poor listening in Figure 7.2.

In the classroom or elsewhere, students with poor listening develop problems using and expressing cognitive potential at three levels. They

are (a) less focused, centered, and verbally articulate, (b) less curious and less interested in seeking information, and (c) less capable of solving communication-relational-social problems. According to Tomatis, when we can listen well, we have the possibility of thinking well.

Listening disabilities affecting adults account for problems with work, relationships, career achievement, and self-esteem loss. They are a huge problem. A 1988 2-year, joint project of the American Society for Training and Development and the United States Department of Labor, says that what businesses want most is workers who can listen, create, set goals, work in teams, and solve problems (Carnevale, Gainer, Meltzer, & Holland, 1988). Listening disabilities are as common in adults as in children. As an indicator, half the clients of Tomatis centers around the world are adults.

Both individual and cultural listening disabilities exist. The cultural ones, related to noise, negative and abusive verbal communication, too loud music, and abuse of television by cutting off dialogue, demand some mention because they provide an environment in which the individual disabilities exist (Jaret, 1990).

CAN LISTENING DISABILITIES BE ELIMINATED, OR MUST WE LEARN TO LIVE WITH THEM?

To overcome listening disabilities means preventing them whenever possible, using cognitive approaches when appropriate, and using program that improve functioning when needed. The appropriateness of programs varies according to individual needs and the goals to be achieved for that person.

Traditional Approaches

Descriptions and summaries about listening disabilities programs that work are offered by Simon (1985), Sutaria (1985), Wallach and Butler (1984), and Gerber and Bryen (1981). In general, one-on-one instruction or therapy that has school-system support are effective. Beyond institutional support, support and belief in correction by the professional in charge, the person with the disability, and others in his or her support system are absolutely essential.

Studies in education, beginning with *Pygmalion* in the *Classroom* (Rosenthal, 1968), show that a teacher's expectations are responsible for some degree of a student's success. When expectations about a student's abilities do not change, it is almost impossible for the student to do well

even though capabilities are improved. When teachers, and pa—s as well, lose sight of potential and stop directing attention down that path. the possibility of success is less.

Harmon (1988) suggests a fundamental change is happening in Western society to acknowledge that mind gives rise to matter. Ferguson's *(1980)* Aquarian Conspiracy guided many during the past decade to transform beliefs of inadequacy from the past and to choose some that are more empowering: "Our past is not our potential" (p. 417). Taylor (19861 Williams (1989), Pennybaker (1990), and Burns (1990) describe bow to cognitively change listening and thinking to feel good and to be physically healthy. Beliefs tell us what to listen to, how to filter incoming information. They can work for or against our health.

A new program, the Reading Recovery Program (Pinnell, Fried, & Estice, 1990), requires one teacher to tutor a poor reader for 1/2 hour daily over several months as he or she reads aloud and writes about what was read. We should expect it to be successful, as is claimed, because the focus is on audiovocal control (self-listening), daily reading aloud, focus *on* the student's potential and competence (instead of problems), and development of a strategy to integrate information in the complex reading and writing process. And as Pinnell et al. (1990) raise the question for their program, others might relate their thoughts to their own program about the "real" costs of providing or not providing it. "Since we know we can provide this powerful instruction, are we obligated to provide it to those who need it despite the cost?" (p. 294).

Though some teachers help the poor listener compensate for listening weaknesses, their aim is not correction. Still, they should use all means possible to permit children to listen to themselves, to express themselves orally (sing, read, spell and study their homework aloud), and to sit at the front of the class with their right ear receiving the information from the teacher. For severe listening problems, placing the child in a small class and giving constant teacher support and positive reinforcement increases motivation and concentration.

Education is part of our very fabric. Language skills are the medium of instruction through which all other learning is fostered. The use *of* verbal instruction is a large part of teaching. So not only is listening the basis of learning, it is also a large basis for teaching. A listening disability could even be considered something a student has if the teacher is a poor speaker or user of language when teaching.

If we are to define what skills students must have in order to be effective learners, not disabled learners, we must begin with listening. It is more basic than the three R's.

The Tomatis Method

Tomatis's books are primarily in French, and his method has been difficult to barn about for those who speak English. Most research about it is based on clinical work in private centers, doctoral research, and special unpublished reports.

The Tomatis Method exists within our expanded definition of listening. It is a sound stimulation, counseling, and educational intervention to improve the ear's functioning, communication through language, desire for communication and learning, body image awareness, audiovocal control, and motor control. An initial assessment is given by a trained listening therapist and is interpreted during a consultation by a trained Tomatis consultant. It includes tests of listening and lateral dominance and figure drawings. Information from the test and consultation is supplemented by a detailed personal history.

In 1953, Tomatis developed an apparatus called the Electronic Ear, whose purpose is "to help the ear acquire its three functions: listening, monitoring of language, and laterality" (Tomatis, 1978, p. 141). The Electronic Ear uses four mechanisms: filters, electronic gate, balance control, and bone and air conduction reception.

The method simulates the five stages of listening development, depending on the program goal and the level attained by the person: (a) prenatal (filtered high frequency) listening, (b) sonic birth (integration of lower frequencies similar to what occurs when the fluid drains from the middle ear after birth), (c) prelanguage (humming), (d) language (repeating words and phrases), and (e) reading aloud. The length of each specific stage varies from person to person, depending on motivation and goals; breaks are interspersed to allow for integration of new listening patterns. Phases (a) and (b) are primarily passive, where the person simply listens for two hours each day, while he or she participates in some activity such as painting, playing games, doing puzzles, or even sleeping or talking with others. Phases (c), (d), and (e) include active work with one's own voice as well as continued passive listening. The Electronic Ear is used throughout the program phases. A typical program length is 30 days, broken into several intensive sessions.

During the auditory training the client listens to sounds of electronically filtered and unfiltered music (primarily Mozart and Gregorian chant) and voice to improve the focusing ability of the ear. If the client is a child, a tape of his or her mother's filtered voice is used. If the client is learning a foreign language, a tape of a native speaker of the language is used. By increasing the selective power of the ear, the person can perceive

sound with less distortion and analyze it more precisely over the whole frequency range, from fundamental frequencies to the highest harmonics. For a nontrained ear, the fundamental frequency of a sound too often masks its harmonic spectrum, and the person has difficulty in controlling voice timbre (the mix of higher harmonics). Consequently the voice stays flat, with no modulation. By improving listening, the speaker has the opportunity to improve voice quality, fluency, modulation, and articulation, for the benefit of one's self as one's own first listener and of those others who listen. Implications for education and workplace are vast. When one's voice conveys energy and interest to others, the invitation to listen is more readily accepted.

Research reviews by Stutt (1983) and Gilmor (1984, 1989b) indicate that the experimental evidence is "growing and positive." A recent study by Kershner, Cummings, Clarke, Hadfield, and Kershner (1990) did not find significant changes favoring a group of learning disabled students who received the Tomatis Method in its group format (called the Listening Training Program or LTP). A number of methodological shortcomings and overdrawn conclusions limit the extent to which the results obtained in the study can be generalized (Tim Gilmor, personal communication, June 5, 1991). All the children in this study were attending a private school with low teacher–pupil ratio and individual remedial programs. It is probable that the LTP could not add significantly to such an intensive private school program which was so strongly supported by staff and parents.

On the positive side, a study by du Plessis and van Jaarsveld (1988) using two treatment groups (one counseling and one Tomatis) and one control group confirmed "significant positive changes following both [treatment] programs, but no change in the control group. On a number of variables the APP [Tomatis] group achieved significantly better results than the alternative therapy group, especially with regard to hearing and listening. A follow-up study confirmed the long-term effect of the intervention" (p. 144). This study followed another review (van Jaarsveld & du Plessis, 1988) that described eight empirical studies conducted in South Africa on topics such as laterality, stuttering, anxiety, and the use of the Tomatis Method with severely mentally retarded persons) and that showed positive gains within methodological deficiencies that limited the degree to which the gains could be attributed to the Tomatis Method alone.

The Method is still evolving and is used in a 150 centers worldwide and a few public and private schools by professionals from such varied backgrounds as education, psychology, speech pathology, audiology, medicine, music, and physical and neurodevelopmental therapies.

CONCLUSION

Just as with many programs that have been evaluated by specific criteria and found wanting, then reevaluated by other criteria and found effective, so it is with listening training programs. Do we want to test merely for specific auditory skills and ignore desire for communication, motivation to learn, integration of information, and other not easily testable concepts? Or do we want to view listening in a broad sense, to see its relationship to learning and development of intelligence, and to attack listening related problems from as many fronts as possible? The answer may well be that it is a political question. Luis Machado, former first Minister of Intelligence for Venezuela, insists "intelligence is a teachable and learnable faculty,...This is now a fundamentally political problem. The teaching of intelligence is an affair of state" (1980, p. 27). We must want others to listen, then to think and to question. Only then, when we are willing to acknowledge the thoughts and perceptions of others, knowing acknowledgement is not the same as agreement, will we open up a truly safe place for all to speak. The power of one person over another is the power to speak but not listen. Individuals who are empowered use their voices, are no longer quiet victims; they question, listen, and search for answers everywhere.

What can we do? We can begin by acknowledging the existence of listening disabilities, having a goal to overcome them, and being excellent models of good listeners ourselves. We must seek out programs that work. We must make listening the focus of our foundation work in learning — for children and adults.

We're facing a new decade, and soon a new century, where listening on every level is required. We must listen to our own voice and body, the family and community voice, and the earth's voice. We can start by seeing the connection between listening and learning and by looking for solutions to related disabilities.

There is a price for success. Then again, there is a price for failure. Is it "Listening Disabilities, the Plight of Many" or "Listening Abilities, the Right of All"?

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