

The Listening Program®:

Auditory Series – Part 3

Our ears are always open. Whether busy with the activities that fill our lives in the light of day, or during a restful sleep under the shadow of night, the auditory sense is feeding our brain information about the environment.

Naturally, we recognize the significant part the auditory system plays in attention, listening, and learning. Its role in balance, posture, and spatial awareness is also implicit.

Many children and adults experience difficulties processing auditory information. Some of these far-ranging challenges include:

- auditory attention
- hypersensitivity to sounds
- filtering out background sounds
- temporal processing
- auditory memory
- understanding the meaning of what is being communicated

As the understanding of the neurobiological mechanisms of auditory function advances, so does our ability to develop and study the effects of auditory stimulation, both on brain organization and as an intervention strategy.

Researchers have made a link between the middle ear and social engagement that provides insight into why some children may demonstrate atypical behaviors and communication difficulties in certain situations and environments.

Middle Ear and Social Engagement

One clearly explicit model of a link between the middle ear and social engagement is provided by The Polyvagal Theory, formed by Dr. Stephen Porges at the University of Illinois at Chicago. He links the evolution of the neural regulation of the heart to affective experience, emotional expression, facial gestures, vocal communication, and social behavior that is responsive to the behavior of others. The theory proposes that the neural control of the heart is neuroanatomically linked to the neural control of the muscles of the face and head through mechanisms of the vagus, or tenth cranial nerve (Porges 2004).

The vagus nerve, a primary component of the autonomic nervous system, exits the brainstem and has two branches that regulate the

striated muscles of the head and face (e.g., facial muscles, eyelids, middle ear muscles, larynx, pharynx, muscles of mastication) and in several visceral organs, (e.g., heart and gut) (Porges 2001). Porges suggests that specific neural circuits can compromise social engagement in some psychiatric and behavioral disorders including autism. Social engagement is dependent, in part, on the control of the muscles of the face and neck, which enable us to express a wide range of emotions in ways that others around us can detect, enjoy, and respond to. A key to comfortable social engagement is the vagal nerve innervation of two tiny muscles in the middle ear.

The two muscles of the middle ear are the tensor tympani and the stapedius. Together, they regulate the stiffness of the tympanic membrane (eardrum) and the ossicular chain (consisting of three bones; malleus, incus, stapes) as a pathway of sound conduction to the inner ear. These muscles must function properly to protect the inner ear from loud sounds and to attenuate low frequencies so that the higher frequencies contained within the human voice can be discriminated. This is especially important with speech in the presence of back-

Auditory Stimulation for Improved Social Engagement

By G. Alexander Doman

ground noise. Poor speech discrimination in background noise is a common auditory processing problem. This is often coupled with auditory hypersensitivities.

If the middle ear muscles are not functioning properly, the nervous system can be bombarded with unwanted sound. We have no “ear lids,” and thus no protection from this assault. Children who experience auditory sensitivities may be unable to modulate sensations received in the middle ear and may experience the autonomic nervous system state of fight or flight. They may appear hyper-vigilant. When they can’t escape (flight) from seemingly threatening sensory experiences, they may act out defensively (fight). In extreme cases, a child may withdraw and completely shut down. Behaviors such as covering the ears, aggression, rocking, humming, and self-stimulation may be observed. The child may exhibit a lack of facial expression, make poor eye contact, show little interest in others, and have a flat, monotonal voice devoid of rhythm.

Ever attempted to carry on a conversation in a noisy, crowded restaurant? Then you will understand that socialization can be very difficult in a challenging sound environ-

ment. The noise creates a certain level of nervous tension. It becomes a challenge to modulate the middle ear muscles to listen and speak, to make eye contact, and to read and display positive facial expressions. This stressful experience may result in agitation and a desire to exit from the situation, causing you to become socially disconnected.

The social engagement system is intimately related to stress reactivity (Porges 2001). Sensitivity to the social engagement behavior of others also decreases.

Lower level needs including physiological and safety needs are prioritized before higher level needs such as love and belonging, esteem and self actualization can be met. If one is merely trying to survive, one cannot express or experience love, belonging, or intimacy, much less be confident, learn, problem solve, and show empathy and acceptance of others. Some of the very qualities that make us distinctively human are impaired.

Intervention

To improve spontaneous social behavior, Dr. Porges has proposed that an intervention must stimulate the neural circuits that regulate the muscles of the face and head.

Theoretically, once the regulation of these structures is activated, social engagement and communication will spontaneously occur as natural emergent properties of the biological system (Porges 2004).

The Listening Program® (TLP) method uses music-based auditory stimulation to modulate the regulation of the middle ear muscles. The theory is that the middle ear muscles need to be regulated during listening, and the nerves that regulate the muscles are linked to the nerves that regulate the other muscles of the face and head involved in social engagement (Porges 2004). TLP is engineered to do this, and included in the method are processes that stimulate and exercise the neural pathways involved in listening and simultaneously stimulate the function of other aspects of the social engagement system.

Technical Details of The Listening Program

Since The Listening Program® (TLP) was introduced in 1999, parents and providers have recurrently reported a reduction in hypersensitivity to sounds with improved communication and

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social engagement. When the regulation of the middle ear muscles improves, so does comfort and safety in the environment. When a listener no longer has to devote his internal resources to comfort and safety, he becomes available to listen, learn, communicate, and engage in prosocial behaviors.

TLP is a patent-pending, music-based auditory stimulation method that is intended to improve auditory, vestibular, and other brain functions.

It involves, in part, listening to acoustically modified music through headphones. Listening schedules are five days per week, 15-30 minutes each listening session. The program length is typically five months and is individualized to meet the needs and goals of each listener. Listening can be done for shorter and longer time periods. In addition, certain programs can be delivered through speakers when a person cannot tolerate headphones. The method is normally integrated within academic and therapeutic programs in home, school, and clinic.

The Listening Program incorporates the most advanced psycho-acoustic processes, including the highest quality music available, recorded specifically for the method at 24-bit 192 kHz HD using ABT's Spatial Surround® process delivered with Dolby Headphone® technology.

The music consists of Classical pieces performed by the award-winning Arcangelos Chamber Ensemble. The compositions are principally Mozart with Haydn, Vivaldi, Corelli, and Danzi, offering a rich tapestry of sound with instrumentation of strings and woodwinds.

TLP includes four training categories: full spectrum, sensory integration, speech and language, and high spectrum. This progressive structure allows for refined stimulation and training at any point in the program. To accommodate individual listener preferences, there are options to follow a program with or without sounds of nature. While many prefer to enjoy and focus on the exquisite music, others, especially children, benefit from the novelty of combining music with beautiful sounds from nature.

The program is available on CD and iListen™. The CD version includes ten 60-minute albums, an easy-to-use guidebook, a portable CD wallet, listening schedules, and free access to online listener resources.

iListen is an iPod with preloaded music (uncompressed), with the ten 60-minute albums and a library of music from the Sound Health® collection (music for relaxation, thinking, etc.), as well as the guidebook, carry case, listening schedules, and free access to online resources.

A recent technological development was the introduction of ABT Bone Conduction Technology™. It combines the experience of listening through specialized headphones adding subtle vibration to the skin and skeletal system, engaging the whole body and brain in the listening process. This multi-sensory approach accelerates and expands the benefits of The Listening Program. It can be particularly targeted to listeners with social engagement problems, making them more available to benefit from the program. This portable equipment is

compatible with iListen and portable CD players.

TLP is available exclusively through an international network of professionals who receive extensive training, certification and continuing education through Advanced Brain Technologies (ABT). The providers offer information, assessment, individualized program development, and support to their clients. Parents and professionals may contact Advanced Brain Technologies for a free consultation or referral to a TLP Provider by phoning +1.801.622.5676 or visiting www.thelisteningprogram.com.

ABC Modular Design

The Listening Program's patent-pending ABC Modular Design™ provides appropriate training for social engagement by effectively exercising the auditory system. The training has three phases: "accommodation/warm-up," "training/workout," and "integration/cool-down" – akin to a "sensory diet" for the ears.

Each 60-minute TLP album contains four 15-minute modules. Each module provides three phases of stimulation. The first phase, "A," relaxes the listener, making her nervous system available to benefit from the more intensive stimulation of the "B" phase. This is the phase in which a technology called *audio bursting* stimulates and exercises the neural pathways involved in listening and simultaneously stimulates the function of other aspects of the social engagement system. The listener is then guided to a relaxed state during the final "C" phase.

These modules integrate progressive entrainment processes of

tempo, music complexity, and various psychoacoustic processes that regulate arousal levels providing the greatest opportunity to benefit from the program. As Dr. Porges suggests, interventions to improve spontaneous social engagement should ensure that the context elicits in participants a neuroception of safety that allows the social engagement system to function (2004 Porges). *Neuroception* is a term coined by Porges to describe how neurocircuits distinguish whether situations or people are safe, dangerous, or life threatening.

A safe, comfortable listening setting with a context of positive association, incorporating the ABC Modular Design within The Listening Program, helps to provide a neuroception of safety for the listener.

Michael

At age five Michael was hypersensitive to sound, touch, and multi-sensory input, unable to modulate this type of sensory information effectively. During the course of the day, he would quickly reach his sensory limit, either responding with negative behaviors, withdrawing, or shutting down. At that time, he was attending a private preschool three mornings a week and was receiving limited services including occupational therapy and speech therapy. Michael was also on a waiting list for a school specializing in autism spectrum disorders. His diagnosis was ADHD, PDD-NOS, and a Sensory Processing Disorder.

Michael was involved in a pilot research study on The Listening Program® at Primary Children's Medical Center (PCMC) in Utah. The investigator was his Occupa-

tional Therapist, Bryan Gee, OTD, MS, OTR/L. The Listening Program was initially introduced in his occupational therapy sessions and was then followed through by his parents at home.

Intake, pre- and post-testing included a client history, Listening Checklist, Sensory Profile, Peabody Developmental Motor Scales 2nd Edition, and video tape. According to the testing Michael responded to The Listening Program with moderate improvement, which was the criterion required by PCMC to expand the use of TLP to be offered to the local community.

Michael's mother video-taped him as he participated in two school musical programs. In the pre-program video, he demonstrated a rapid decline in social engagement as the school program progressed through several holiday songs. Michael's facial affect flattened, he covered his ears and eyes, rocked himself, and progressively shut down as he became increasingly overloaded by all the activity and bombardment of sound.

Observing Michael in the post-program video, you see a very different child. He is paying attention, smiling, dancing, has excellent motor timing and coordination, initiates and maintains eye contact, and actively sings throughout a nine song program, completely engaged with the other students. To the lay observer, it is difficult to differentiate him from his peers.

In the course of his initial TLP program, Michael greatly improved his ability to modulate sensory input, began to engage in imaginary play, had reduced hyperactivity, and expressed appropriate emotions

with adults and his peers. According to his speech therapist, his receptive and expressive language skills improved, as did his social skills. Michael now follows multi-step directions, maintains good eye contact, has increased facial expression and reduced sensitivity to sound and touch, and has improved emotional regulation.

Consequently, The Listening Program continues to be an integral part of Michael's everyday routine. He was discharged from therapy and is no longer on the waiting list for the specialized school, as he is currently attending and thriving in a regular education first grade class. ♦

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G. Alexander Doman is the Founder, President and CEO of Advanced Brain Technologies (ABT), a neurotechnology company that develops and distributes interactive software and music programs for the improvement of memory, attention, listening, academic skills, sensory processing, brain health, peak performance and more. Prior to founding ABT he served as Executive Director of the National Academy for Child Development. For the last 15 years his career has been focused on research, product development, and education primarily in the areas of psychoacoustic music technologies and brain fitness software.
Email: alexd@advancedbrain.com

Questions about Michael may be directed to:
Bryan Gee, OTD, M.S., OTR/L
Idaho State University
Department of Physical and Occupational Therapy
Clinical Assistant Professor of Occupational Therapy
Academic Fieldwork Coordinator
Email: geebrya@isu.edu



As appeared in the Spring 2008 issue.
www.SIfocus.com



5748 South Adams Avenue Parkway | Ogden, UT 84405
US Toll-Free 1.888.228.1798 | Outside US +1.801.622.5676
www.thelisteningprogram.com

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