



iLS Practitioner Training Manual

Integrated Listening Systems

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PLEASE READ CONTENT OF THIS MANUAL BEFORE ATTENDING COURSE.

*NO iLs SYSTEM SHOULD BE USED UNLESS UNDER THE SUPERVISION
OF A TRAINED iLs ASSOCIATE.*

It is important to keep in mind that iLs systems are educational devices – not medical devices. As educational devices, no medical claim can be made, nor can insurance be billed for iLs as a medical procedure or service. In addition, clients can have a variety of issues that may be beyond the intended use of iLs systems. Therefore, it is important you stay within your qualified field or seek advice from an appropriate specialist.

SPECIAL THANKS:

TIM ENGELS, MA, FOR HIS INDEFATIGABLE ASSISTANCE IN WRITING AND ORGANIZING THIS MANUAL.

RON B. MINSON, MD, ILS CLINICAL DIRECTOR, FOR HIS ABILITY TO MAKE NEUROANATOMY AND FUNCTION UNDERSTANDABLE AND RELEVANT .

ANDREA POINTER, MS, CCC-SLP, FOR HER INVALUABLE CONTRIBUTIONS IN WRITING SO SUCCINCTLY ON THE COMPLEX AREAS OF AUDITORY AND LANGUAGE PROCESSING.

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Welcome

We would like to begin by telling you a short story. “John” was a kid that everyone loved and wanted to help. He was also the boy who frequently came home with notes of misbehavior at school and had an alphabet soup of diagnoses. He was failing several classes and tested low on reading and writing skills. Several years of therapy showed little progress. At 10, he still hadn’t mastered riding his bike, had few friends and spent his free time with his nose to his iPad. It was after he had a meltdown at school where he tore some artwork off the wall that his parents came to an iLs Associate for help.

Several weeks later, when he was half way through his iLs program, changes in John’s behavior became noticeable. He was riding his bike and talking more at the dinner table. He was turning in homework on time and actually asking his parents for help with it. After completing the iLs program, his reading and writing had climbed into the average category, along with significant improvements in working memory and processing speed. His teacher reported improved attention and behavior at school. His teacher also noted that he was interacting more with his classmates and playing with them at recess. His relationships at home also improved, and his parents were relieved to see how much happier he seemed with life in general.

How did these changes occur so quickly when he’d been in other therapies for the past two years with little apparent progress? John’s is a heart-warming story, one of many we’ve heard since founding iLs in 2007. The purpose of this training is to delve into the reasons behind John’s improvement and to explore the many ways iLs programs can be customized for your clients’ needs.

Please take time to review the information in this manual before your training date. There’s a lot we want to cover with you so you leave the training feeling well prepared to use iLs. Gaining comfort with the information presented here will make your training more rewarding and more enjoyable.

We strongly recommend you complete your own iLs program! Without exception, those practitioners who have done their own program have raved about the results! To a person, each has commented on the gains they experienced and cannot imagine using iLs with clients without having done their own program. Not only have they gained more energy, both mental and physical, but also increased mental clarity, improved organization, and greater ease at getting things done. Many have unexpectedly felt much calmer, freer and happier overall. As a minimum, each practitioner should complete 24 - 30 hours of an iLs Program at a frequency of three - four times a week. The time and energy spent will reward you in ways you haven’t imagined. Make sure to include Playbook activities in your sessions (you will see much better results!).

We look forward to supporting you as you integrate iLs into your practice!

1. THE ILS PROGRAM

iLs is an exercise program for improving brain and body function. The activities are fun and can easily be customized for all ages and skill levels.

The combined elements of iLs – music, movement and language – begin with building the foundational supports for body organization. As the body becomes organized, so does the brain. With increased organization the brain is able to process information from our environment, sustain attention and learn.

The beauty of addressing brain function at this foundational level is that we become mentally and emotionally resilient, effective at school or work and more socially adept. For example,

- Dynamic balance, proprioceptive abilities improve – a child finally learns to ride a bicycle
- With faster processing speed - student pays attention and catches on more quickly
- Eyes and ears are working together – third grader is now reading at grade level
- Gross and fine motor systems are integrated – handwriting improves
- Emotions are controlled– no detention, more friends at school
- Stronger working memory – better at math and reading comprehension
- Sustained attention – no longer distracting others and less impulsive

WHO BENEFITS?

Clients who demonstrate delays and/or difficulties in any of the following areas:

- Concentration/Attention/Memory
- Speech, Language
- Written Expression & Reading Comprehension
- Social Communication, Behavior
- Motor Skills
- Processing speed
- Sensory Processing

2. IMPLEMENTING ILS PROGRAMS

EXERCISE FOR THE BRAIN AND BODY

Starting an iLS program is very much like starting an exercise program. You don't just jump in and go all out. Based on your level of fitness, you begin slowly and increase moderately as strength and endurance build. Based on the fitness level within the brain, nervous system and body, iLS programs follow a neurodevelopmental sequence where the intensity of activities and music selections start very simply and become more challenging as fitness improves. Fitness in this sense includes increased attention to task, better control of behaviors and emotions, improved balance and motor control, thinking before acting, and improved language and cognitive skills to support success in school and at work.

Continuing the fitness analogy, one may think of the brain similar to a muscle that needs to be exercised since both grow and develop strength with stimulation. The iLS program structure follows well-established protocols for improved outcomes based on frequency, intensity and duration of stimulation to the nervous system. Frequency is the number of sessions per week. Intensity is the amount of total stimulation coming in to the nervous system from the combined input of music, movement and cognitive task. Duration is the overall length of the program.

As with a physical exercise program, it's important to create an individualized program that is both challenging and fun. The design of iLS programs will help you accomplish this.

Just as with physical activity, specific, simultaneous and repeated multisensory stimulation will gradually train our brains to process and respond to multisensory input more effectively.

ILS PROGRAM COMPONENTS

iLS programs are unique in providing input to multiple senses at the same time. Its success can be attributed to improved brain and body organization and function. This is accomplished through the interaction of simultaneous, multisensory input to the motor, visual, vestibular (balance and coordination), and auditory systems. Three distinct components are combined in iLS programs: Auditory, Movement and Language.

Auditory Component

The Auditory Component involves listening to treated music selections that are organized in a specific, sequenced design to achieve the overall goals of improved brain function and skill acquisition. The music is delivered through iLS' air and bone conduction headphones, which engage both the auditory and vestibular systems.



FIGURE 1: FOCUS SERIES SYSTEM

The essential parts of the Focus Series Systems, the delivery systems of the Auditory Component, include:

- iPod loaded with programs
- Focus Series amplifier
- Air/bone conduction headphones

FOCUS SERIES PROGRAMS

The development of Focus Series programs is based on over two decades of experience with thousands of children, teenagers and adults. Given this extensive clinical experience, five programs are recommended for clients:

1. Sensory & Motor Program (60 sessions)
2. Concentration & Attention Program (40 sessions)
3. Reading & Auditory Processing Program (40 sessions)
4. Optimal Performance I & II Programs (two versions, 24 sessions each)
5. Calming Program (with or w/o Chant) 10 sessions

There are several important features of these programs. First, each program contains the full spectrum of sound frequencies of human hearing (20-20,000 Hz.). iLS refers to the music containing all of these frequencies as full spectrum music (FSM). The number of sessions spent emphasizing each frequency range, shown below, gives each program its distinct design.

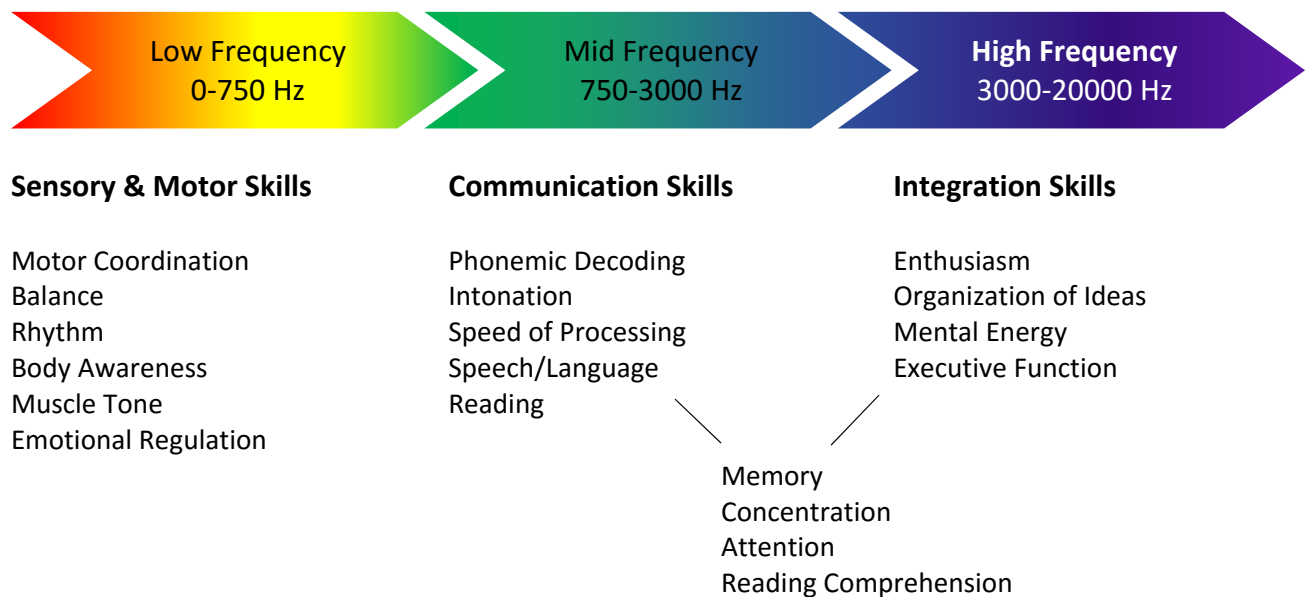


FIGURE 2: ILS PROGRAM FREQUENCY RANGES

Second, the Auditory Component delivers music through both air and bone conduction. Third, the programs are designed so the sequence of sessions follows a specific structure which gently and gradually transitions the listener from one phase to another.

FOUR PHASE STRUCTURE

Each program of the iLS Auditory Component follows four sequential phases: Organization, Transition, Activation and Integration. It is important to note that these phases happen over the course of an *entire* program, not within a single session.

The Organization Phase improves body organization, muscle tone, sense of balance, eye-hand and body coordination, integration of the body in space, sensory hypersensitivities, crossing the midline and spatial awareness, among other improvements.

Music in this phase is full frequency music with low frequency emphasis, providing substantial vestibular input (through bone conduction) for improving body organization. This phase is longest in the Sensory & Motor Program. It allows time for a client to improve body integration and spatial awareness, balance, posture and motor coordination, the foundation for higher learning.

The Transition Phase is a bridge between the Organization Phase where the music is either full spectrum or has an emphasis in low frequencies and the Activation Phase where the music emphasizes higher frequencies.

For those who have difficulty adjusting to changes or transitions in their environment, the Transition Phase may help them shift easily from one activity to another and to tolerate unexpected changes.

The music undergoes a gradual suppression of the lower frequencies during this phase. The level and rate of filtration will vary by program. As a bridge between the Organization and Activation Phases, the Transition Phase progresses more slowly in the Sensory & Motor Program to allow for gradual accommodation to changing levels of filtered music. It is designed for those who are more sensitive to change in their environment. The Transition Phases of Concentration & Attention, Reading & Auditory Processing and Optimal Performance Programs progress more rapidly for those who can easily adjust to change.

By the Activation Phase in a program, earlier phases have laid the groundwork to initiate body organization and some changes in cognitive functions. In addition, this phase fosters an increase in initiative and motivation to start and complete tasks. Treatment of the music in the Activation Phase includes higher filtration levels balanced with various types of full spectrum music.

In the Integration Phase the frequencies that were previously suppressed in the Transition and Activation Phases are gradually restored over a number of sessions. The Integration Phase challenges the listener's increased processing capacity by requiring him/her to process more information as previously suppressed frequencies are re-introduced.

In the following image, the lighter colors in the "mountain" section represent the low frequencies that are suppressed over the four phases of iLS programs. Notice how the lower frequencies are increasingly suppressed during the Transition Phase, plateau in the Activation Phase, and are then re-introduced during the Integration Phase.

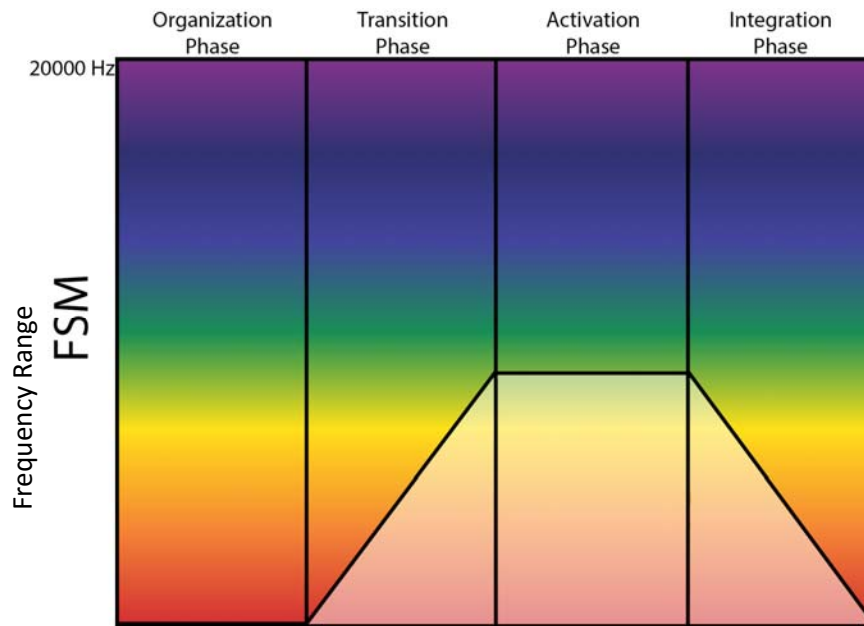


FIGURE 3: SAMPLE FREQUENCY CHANGES ACROSS PHASES

SENSORY & MOTOR PROGRAM (60 ONE-HOUR SESSIONS)

Effective functioning of the sensory motor system is critical to development of higher cognitive skills. This program is ideal for clients who have: poor balance and coordination, gravitational insecurity, motor planning difficulties, fine and gross motor concerns, low muscle tone, and/or poor spatial awareness. The program is used with virtually every client who has sensory processing difficulties and for those presumed to be on the autism spectrum. Individuals who are (or were) slower to reach neurodevelopmental and academic landmarks, and those who need more services (speech, occupational and/or physical therapy, reading interventions, etc.) benefit from this program.

The Sensory & Motor Program makes greater use of lower frequencies to emphasize input to the vestibular system and the body. The progression from one phase to another is gradual and gentle.

CONCENTRATION & ATTENTION PROGRAM (40 ONE-HOUR SESSIONS)

The Concentration & Attention Program emphasizes lower frequencies early in the program, which when coupled with bone conduction, improve vestibular function. The remainder of the program emphasizes higher frequencies to reinforce the ability to sustain focus and attention. This program enhances body integration, mental focus and attention.

When working with clients who have difficulty with attention, it is often unclear whether their difficulty has its origins in an auditory processing problem, an inability to sit still, ADHD, or even a combination. This program is designed to target all three areas.

READING & AUDITORY PROCESSING PROGRAM (40 ONE-HOUR SESSIONS)

The Reading & Auditory Processing Program is designed to improve brain function in two areas:

- Auditory processing for sound/symbol decoding, language and reading
- Mental focus, sustained attention and working memory for reading comprehension

It begins with full spectrum music and low frequencies to improve body organization from which everyone can benefit. The music then emphasizes the middle and high frequency ranges, enhancing communication, language and reading abilities through improved pitch perception, decoding skills and auditory sequencing ability. These frequencies also improve auditory memory and higher cognitive functions necessary for reading comprehension.

OPTIMAL PERFORMANCE PROGRAMS I & II (24 ONE-HOUR SESSIONS EACH)

The Optimal Performance Programs improve creativity, motivation, insight and inspiration, as well as information processing speed. The Programs also have a positive influence on alertness, awareness, and higher cognitive skills. These Programs assume the client's vestibular system is organized and functioning well and, therefore, the Programs have less low frequency input. The Transition Phase is quite rapid, requiring the listener to accommodate rapidly to changes in frequencies.

The Optimal Performance Programs consist of two complete programs that may be used alone or sequentially. Both versions are appropriate for teens and adults who are looking to optimize their overall executive function or for anyone age 10 and older who has completed either the Concentration & Attention Program or the Reading & Auditory Processing Program and is ready to proceed to this advanced level.

The differences between Optimal Performance (OP) I and II are as follows: In OP I, the filtered music level goes up to 3000 Hz. On first glance, OP I may appear similar to the Reading & Auditory Processing Program, although shorter. As seen on the graph below, there is very little Organization Phase, as it is assumed that body organization is not an issue. In OP II, the filtered music level goes up to 4,000 Hz. (See Figure 4: Four Programs on Total Focus on page 8 for more detailed information.)

Note: Each of the previous full-length programs may be used alone, and, as such, each includes full spectrum music. It is the *emphasis* on different frequencies that makes each program unique. For example, the Sensory & Motor Program will emphasize low frequencies, while the Optimal Performance Program will emphasize high frequencies.

CALMING PROGRAM (10 ONE-HOUR SESSIONS)

This program is designed as a shorter supplement to longer programs. For those who have a high level of auditory or tactile sensitivity, it may be used as an introduction to acclimate to wearing headphones and/or listening to music. It may also be used by those feeling anxious and stressed prior to starting, or on any stressful day during another iLS program. The music is andante (slow) tempo and chosen for its calming effect.

CALMING PROGRAM WITHOUT CHANT (10 ONE-HOUR SESSIONS)

This version of the supplemental program is used in the same way as the above program. Occasionally, a client will have a preference for orchestral music over Gregorian Chant. Orchestral music has been substituted for the Chant (fourth track). Implementation is the same as described above.

UNIQUE PROGRAM DESIGN

The following graph of the Focus Series Programs provides a visual representation of the frequency ranges and four sequential phases of each program.

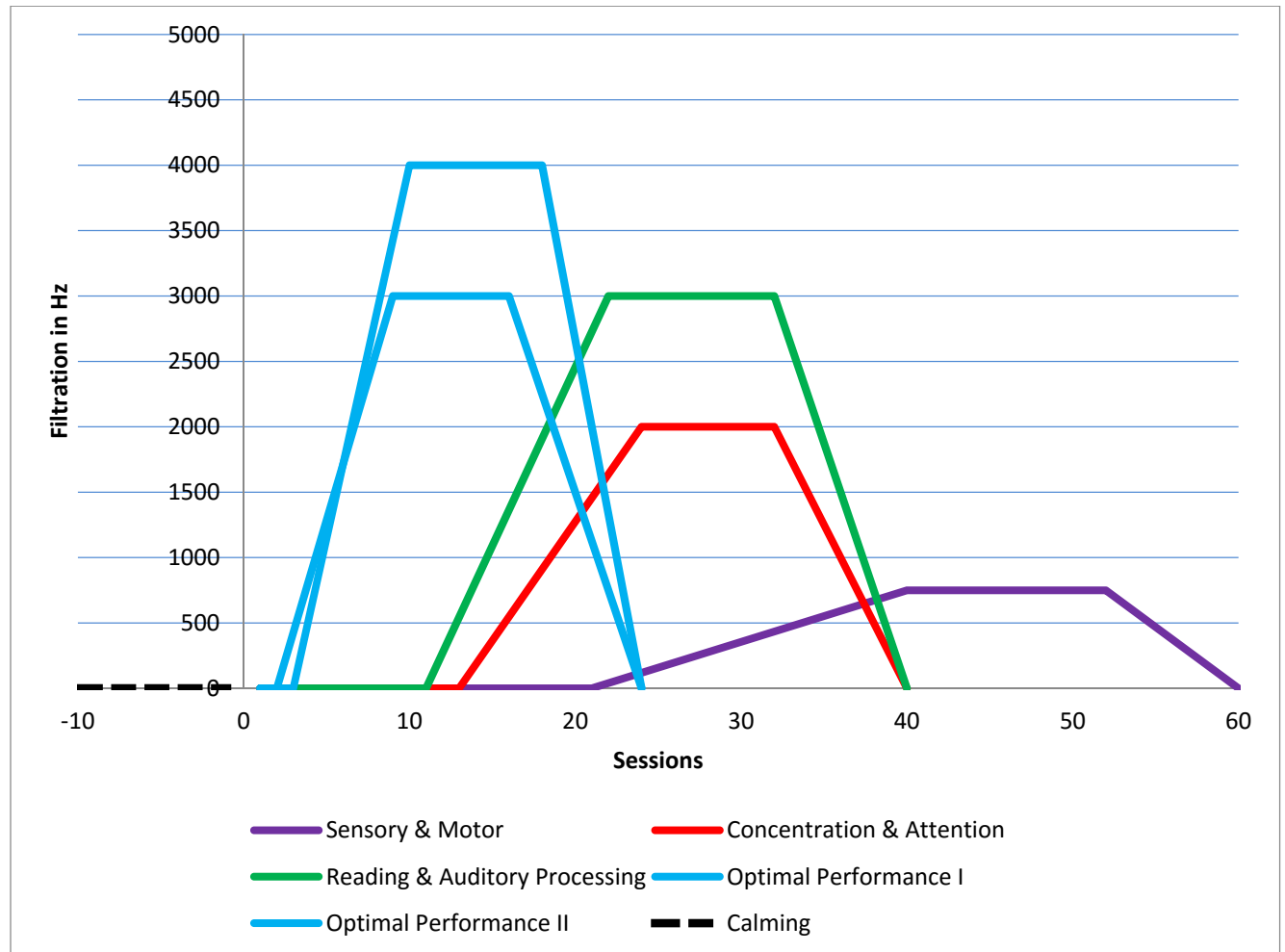


FIGURE 4: FOUR PROGRAMS ON TOTAL FOCUS

MOVEMENT COMPONENT

Movement activities target core strength, visual tracking, and awareness of where the body is in space. These activities heighten coordination, balance, motor planning and focus to establish a firm foundation for higher learning. Movement activities also “wake up” the brain through increased input to higher brain structures. The Movement and Auditory Components are done together.

The included accessories (Integration Kit) and guidebook (Playbook) provide tools for doing the movement activities.

The Integration Kit is made up of the following:

- Playbook
- Balance Board
- Bean Bags
- Tracking Ball
- Racquet Ball
- Headband



FIGURE 5: INTEGRATION KIT

Please read the Playbook before beginning iLS programs with your clients. The Playbook serves as a nice overview of iLS for your clients and answers many questions families frequently ask.

- The Introduction contains tips for implementing the movement activities successfully, and it explains the structure and usage of the Playbook.
- The Black and White Pages review important information, including background on how iLS works, an overview of the auditory programs, instructions for getting started and FAQs.
- The Activity Reference Pages explain the purpose of activities and suggestions to make activities easier or more challenging for both adults and children.
- The Program Sets contain photos and the name of each activity¹ in that set.
- The Early Developmental section is for those who are still developing their motor skills and might find the main program too difficult.
- The Playbook can be propped up 'easel style' on a table for viewing when doing the activities.

THE LANGUAGE COMPONENT

The Language Component is designed to improve specific auditory and language skills and to focus on progressing daily living skills (i.e. communication, social interactions, sequencing, multi-tasking) to higher levels of function. In one's daily activities, a need exists to be efficient with processing auditory information while performing other tasks, i.e. interacting with others in noisy environments, performing gross or fine motor tasks, taking notes in a class, playing on a playground, etc. The skills required to complete these tasks do not occur in isolation; therefore, true competency is only achieved when an individual is efficient and effective with completing the activity when other demands/challenges are present. A therapeutic example of this is when an individual is writing down words or phrases being spoken to him/her. This activity not only requires effective auditory processing to correctly identify the information spoken, but it also requires the individual to have efficient fine motor skills for writing as well as



FIGURE 6: THE VOICEPRO SYSTEM

functional visual skills to place the information correctly on the lines of the paper.

¹ A short video demonstrating each exercise can be found on the Focus Series iPod.

The Language Component is delivered using the VoicePro™ and Interactive Language Activities. It builds on the gains from the Auditory and Movement Components. The VoicePro and Interactive Language Activities focus directly on speech, voicing, expressive and receptive language skills, cognitive activities, auditory processing skills, memory activities, and overall integration of the neurological systems required for academic and social success. The application will vary depending upon the professional's discipline and an individual's needs. This program puts *listening into action*. It integrates and "fine tunes" extensive neural pathways that were developed and enhanced by the Auditory Component.

The client repeats the pre-recorded activities while wearing the specialized air/bone conduction headset which provides direct auditory feedback. The activities progress in complexity and allow for variability with application and use in order to replicate skills required in day-to-day living. The VoicePro also allows the therapist to use a CD player, tablet or other device for variety of input. Many use specific applications that are designed to facilitate language, such as flashcard apps in order to customize the program to meet an individual's academic, vocational or social needs.



FIGURE 7: VOICEPRO

NOTE: The User's Manual for the VoicePro provides detailed instructions for use of equipment and pre-recorded activities. A webinar training on using the VoicePro is included with purchase of the VoicePro System.

THE DREAMPAD™

For years, iLs' clients have benefited from the regulating and calming effect of bone conducted music. iLs developed the Dreampad to bring the remarkable effects of bone conducted music to children whose sensory sensitivity prevented them from wearing headphones. The Dreampad quickly proved helpful with reducing anxiety and improving sleep, in addition to reducing auditory sensitivities.



FIGURE 8: DREAMPAD LINE

In time, parents began contacting iLs to say they have been borrowing their child's Dreampad at night and discovered it helped *them* sleep. These parent comments led to the development of adult and junior-sized versions of the product. The Dreampad is currently being used by a broad range of ages – from infants to seniors – and for a variety of reasons, including general relaxation, reducing stress, anxiety and, importantly, improving sleep.

The Dreampad combines the benefits of bone conducted sound with processed music designed specifically for delivery through bone conduction. Sleep research has shown that attention attaches to a melody, and even if the music is pleasant and relaxing, we may find ourselves more engaged in listening than sleeping. For this reason Dreampad music options are mostly slow tempo ambient music. Ambient music is calming, repetitive and absent the melody line that might engage our interest.

Just as important is the Dreampad's method of delivery. Most of us are unaware of it, but we are all intimately familiar with bone conducted sound: every time we speak, the vibration caused by our voice box is carried by bone to the area surrounding the middle and inner ear (cochlea/vestibular apparatus). This area plays a key role in our hearing, balance, coordination and ability to filter out unwanted noise. It

is also an area that feeds the Parasympathetic Nervous System (PSNS) through the Vagus Nerve. Clinical experience suggests that the Vagus Nerve is being stimulated by the bone conducted music, causing the relaxation response. We see this in both iLs headphone and Dreampad users. (See the preliminary study measuring parasympathetic engagement through heart rate variability in the research section of the iLs website.)

Through feedback from Dreampad users, we know that the Dreampad is an integral part of an iLs Program when sleep disturbance is an issue, and when there is tactile sensitivity resulting in resistance to wearing headphones. The Dreampad gently exposes the user to the soothing sound and vibration in preparation for wearing headphones in a therapeutic setting. Consequently, we recommend using the Dreampad for two weeks before starting a program with a client who has sleep disturbance, significant sensory processing difficulties or a diagnosis of autism.

SELECTING THE AUDITORY PROGRAM

SENSORY & MOTOR PROGRAM (60 ONE-HOUR SESSIONS)

This program helps with body organization, motor planning, hypersensitivity to the environment, communication, and behavior – difficulties that are common in children with severe sensitivity, with developmental delays or who have been diagnosed on the spectrum. Years of experience, coupled with research, show that emphasizing the lower frequencies engaging the sensory and motor systems with the mid-range frequencies of communication and higher-range frequencies of mental attentiveness are essential for addressing these difficulties.

Consequently, the Sensory & Motor program has the full range of frequencies with a strong emphasis on the lower frequencies that help with body organization. To obtain the greatest benefit, the program may be repeated as often as needed.

CONCENTRATION & ATTENTION PROGRAM (40 ONE-HOUR SESSIONS)

Select this program to enhance body integration, mental focus and attention. The Concentration & Attention Program has a strong emphasis on lower frequencies in the beginning, which when coupled with bone conduction, is good for improving vestibular function. Higher frequencies are emphasized in the remainder of the program to reinforce the ability to sustain focus and attention.

There are many contributing factors to inattention. Therefore, this program's design improves the ability to sit still and attend, helps with auditory processing difficulties, the inattention of ADHD, or even a combination. If more sensory motor input is needed, begin with either all or part of the Sensory & Motor Program.

READING & AUDITORY PROCESSING PROGRAM (40 ONE-HOUR SESSIONS)

This program is recommended for those with academic challenges, including learning new information, memory, reading comprehension, writing, and oral expression, as well as mental focus and attention. It improves auditory and language processing. The frequencies stimulate the speech and language centers of the brain and improve the processing and interpretation of different sounds. This is especially relevant for decoding, phonics, sequencing of sounds/words/instructions, and speed of processing.

OPTIMAL PERFORMANCE I AND II PROGRAMS (24 ONE-HOUR SESSIONS EACH)

Select the Optimal Performance I Program when the goals are to improve cognitive function, mental energy, alertness, speed of processing and other higher cognitive skills. In addition, this program often results in improved alertness, creativity, motivation and inspiration. It is assumed the client's vestibular system is organized and functioning well, and, therefore, the Organization Phase is just long enough to adapt to wearing the headphones while doing movement. The Transition Phase is quite short, requiring the listener to accommodate rapidly to changes in frequencies.

The two versions of the Optimal Performance Program may be used sequentially. Often, Optimal Performance I is used as a short refresher after having completed previous programs. Optimal Performance II is used as a refresher to Optimal Performance I. Both versions are appropriate for teens and adults who will benefit from a program designed to help with mental energy and all aspects of cognitive function and for whom motor and balance issues are not of concern.

CALMING PROGRAM (10 ONE-HOUR SESSIONS)

This supplemental program is comprised mostly of music selections ideal for calming and relaxing. If uncertain how well a very sensitive client will tolerate bone conduction input, the Calming Program is a good place to begin. In fact, the Calming Program can be used as preparation for any individual who might benefit from a gentle introduction to listening before going into a full-length program. This Program can also be used as an extension to the Organization Phase of any other program.

If a client is anxious and/or stressed, any number of sessions from the Calming Program may be utilized before beginning one of the full-length programs. Additionally, if a client has a particularly difficult day at work or school, simply substitute one Calming session for the regularly scheduled daily session. Continue the next session on the normal schedule.

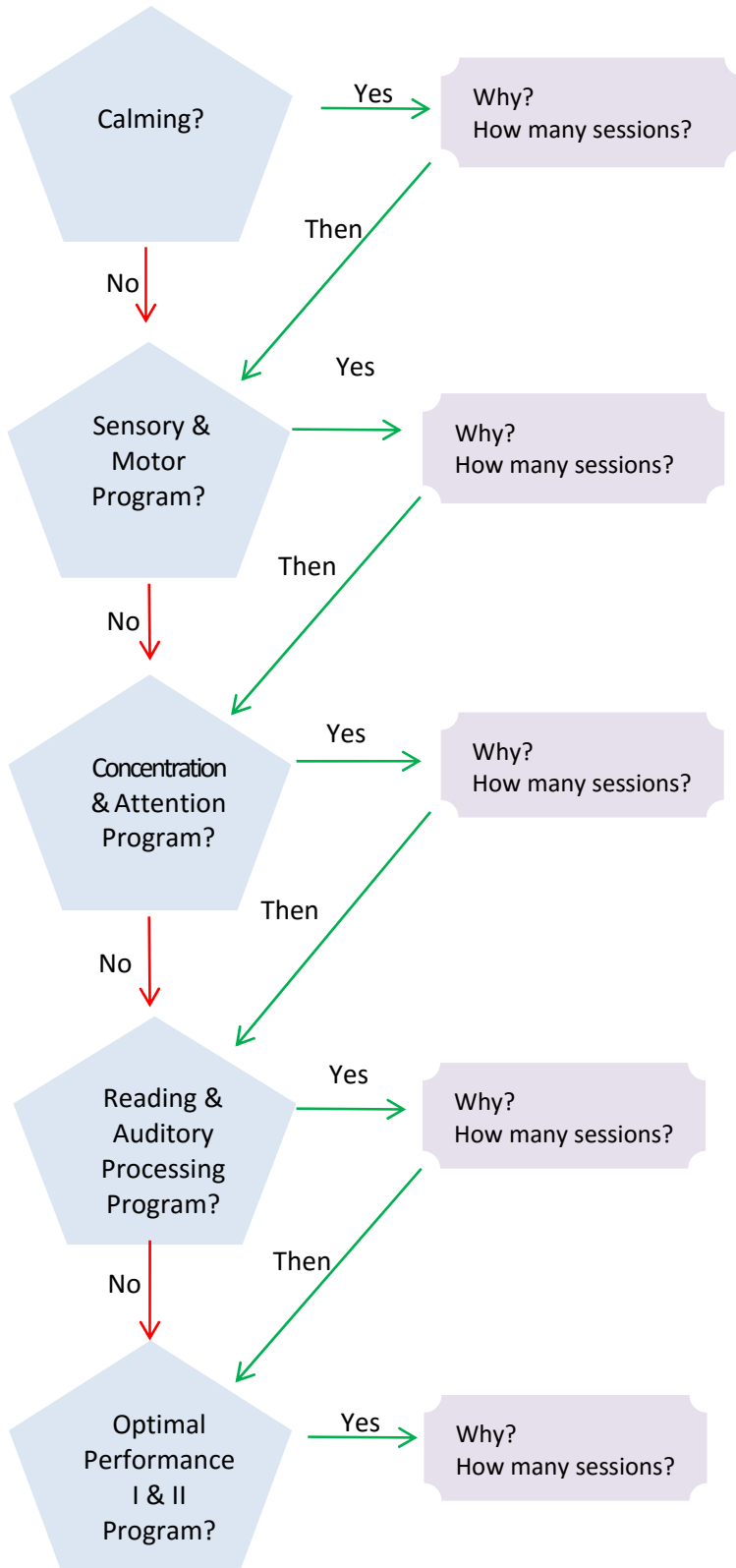
CALMING PROGRAM WITHOUT CHANT (10 ONE-HOUR SESSIONS)

This program has all instrumental music and does not contain chant. Select this program as an alternative to chant when the client does not like the change to vocal music or if the chant is inappropriate for religious reasons.

All iLs Systems are available with non-chant versions of programs.

PROGRAM DECISION MAKING

Would this client benefit from . . .



In deciding which program is most appropriate for a client, consider this decision tree. The decision-making process is covered in detail in the training, through continuing education webinars and case studies.

SELECTING THE MOVEMENT ACTIVITY SET

PLAYBOOK ACTIVITIES

The Playbook is designed as a guide to the movement activities that accompany the auditory part of iLs Programs. The Movement Component includes a combination of balance, visual, core strengthening and self-regulating activities. As one progresses through the Playbook, the combination of these multisensory activities becomes more difficult. Cognitive activities are also integrated to create a more complex processing challenge.

Begin with Set 1, advancing to the next Set when activities can be done easily. If an activity remains challenging, simply include it in the next set of activities.

Fun is an important element of each activity. Activities should challenge the client to stretch their skills *while having fun*. Consider the Playbook a guide. Please feel free to use other movement activities of your choosing. iLs suggests a combination of activities to improve eye-hand coordination, crossing the midline, balance, core strength and visual tracking.

EARLY DEVELOPMENTAL ACTIVITIES

The Early Developmental Program is for those who are still developing the motor skills required for more challenging activities. The focus of these activities is on building stronger muscles, core strength, postural control and stability, motor coordination, as well as basic visual tracking. The program includes floor-based activities, sitting on the balance board or standing on the balance board with support and simple visual tracking tasks. They may be modified to make them more complex, for example, by moving from 'Dog Walk' to 'Smart Dog.'

DESIGNING SESSIONS

Each Focus Series program is comprised of sessions, each session comprised of tracks. A single session consists of four tracks of iLs music combined with movement and quiet activities. Sessions may be abbreviated to 15 minutes or less for clients who are not able to complete a full 60 minutes. When possible, incorporate the Playbook's movement activities into the first part of each session. Once movement activities are complete, the client may participate in quiet activities (suggestions can be found in the Playbook Introduction). Session tracks are pre-set in Focus Series and Kick Start programs. For example, one session will consist of the following:

- 1) Music Track 1 (~15 minutes)
- 2) Music Track 2 (~15 minutes)
- 3) Music Track 3 (~15 minutes)
- 4) Music Track 4 (~15 minutes)

In the four primary Focus Series programs the sessions are designed to follow the iLs four phase structure: Organization, Transition, Activation, and Integration phases. The phases occur over the course of the program, not within one session. Each session is approximately 60 minutes long in Focus Series programs.

The programs will maintain their sequential integrity when shorter listening times are used but tracks should be followed in sequence. For example, if 15-minute sessions are used at the outset with someone who has tactile and auditory sensitivity, it will take four times to complete the first session. Likewise, if

30-minute sessions are implemented, it will take two times to complete the first session. (See Session Frequency, below.)

Tracks

Every session in a Focus System program (e.g., Sensory & Motor Program) is pre-set with four tracks of music. For example, Sensory & Motor Program Session #1 would be listed on the iPod as “SM 01.” To find the four tracks in the iPod, navigate through the menus as follows:

iPod location: Music> Playlists > Focus Programs > A. Sensory & Motor > SM 01 (4 songs) >

- 1) Music Track 1: 02L01
- 2) Music Track 2: 13O01
- 3) Music Track 3: 07O01
- 4) Music Track 4: 50T03

CUSTOMIZING FOCUS PROGRAMS

Specific customizing instructions are provided at the Practitioner Training Course and through Associate Webinars. However, programs and sessions can generally be varied as follows:

Session Frequency

Repetition of input strengthens neural connections in the brain and nervous system. Thus, iLS recommends a target of three or more sessions of listening per week for optimal results. The total number of sessions and/or the length of individual sessions can be adjusted as needed to meet clients’ needs. While it is not always possible to meet this suggested frequency, positive changes will still be obtained; they will just take longer to achieve. Using a system at home, under an Associate’s supervision, will help clients increase the frequency per week.

Length of Session

Based on the client’s needs, sessions can be shortened to as little as 3 minutes (consult your Pediatrician for clients under 18 months) or go as long as 60 minutes (e.g., grade school through adult).

The following list offers some suggested maximum listening times as tolerated per individual sensitivities:

Under 18 months of age	Dreampad may be used
18 – 24 months	3 – 15 minutes
2 – 3 years	15 – 30 minutes
Over 3 years	30+ minutes

Program Summary Sheet

The *iLS Focus Series Summary Sheets* are available in the iLS Store. The document provides an overview of each program, suggestions for combining programs and Refresher Programs, all of which aid in customizing a program for an individual.

HEADPHONE SETTINGS

Air Conduction (AC)

Air conduction refers to the volume of sound coming from the ear cups and is always set at a comfort level for the individual. This means, however, that there is no predetermined volume level for air conduction output. The volume should be set so that, while listening to the music, one may comfortably understand someone speaking at a regular conversational level. When switching the system from one client to the next, the best practice is to turn down the AC volume and reposition the setting for the next client.

When the system is used in an environment such as a multi-purpose room, it should be quite easy for the student to hear the instructor over the music. For example, in a quiet tutorial environment the volume may be turned down so that the student can easily hear the music and the instructor for directions.

In certain settings such as an office-based speech therapy practice, listening may occur simultaneously with speech therapy. In such cases, reduce the AC volume so that the client can hear and respond appropriately to the therapist.

In the case of auditory sensitivity, the volume can initially be set at a very low level to avoid discomfort. It may be possible to very gradually increase the volume over several sessions as the client's auditory sensitivity improves. When setting the volume for someone who has a distinct difference between hearing thresholds in each ear, always set the volume level for the "good ear".

It is important to remember that in general, young children have more sensitive hearing than adults. A common starting setting is slightly above .5 on the air conduction (AC) knob. Check the volume level before giving the headphones to the client. Make a notation of the level on the Program Tracking Schedule form.

Bone Conduction (BC)

The natural conductivity of bone lends itself to the added input from bone conduction (BC) headphones (see Figure 9) to the organ that informs us where our body is in space, called the vestibular organ. The bone conductor, a small device that converts sound to vibration, is located at the top of the headband, making contact with the skull. The vibration is carried along the skull to the bony housing of the ear. This process provides gentle vibration to the vestibular organ, which is very sensitive, and will respond to the input of the bone conductor. This input is the basis for the organizing effect on the body.

As with air conduction, the bone conduction volume will vary from client to client. The amount of vibration from the BC will be greatest with low frequency music and least with high frequency music.

Because some clients may have known or unknown vestibular or sensory regulation sensitivities, iLs suggests setting bone conduction, if well tolerated, as per the following schedule:

Use the Dreampad for very sensitive clients before starting them on an iLs Focus Series Program.



FIGURE 9: BONE CONDUCTOR AND AIR/BONE CONDUCTION HEADPHONES

Calming

Sessions 1 – 4	BC at .25
Sessions 5 – 8	BC at .50
Sessions 9, 10	BC at .75

Sensory & Motor

Sessions 1 – 4	BC at .25
Sessions 5 – 8	BC at .50
Sessions 9 – 12	BC at .75
Sessions 13+	BC at 1.0

Concentration & Attention, Reading & Auditory Processing

Sessions 1 – 2	BC at .25
Sessions 3 – 4	BC at .50
Sessions 5 – 6	BC at .75
Sessions 7+	BC at 1.0

Optimal Performance I & II

Sessions 1	BC at .50
Sessions 2	BC at .75
Sessions 3+	BC at 1.0

The vestibular system may be very sensitive in those with the following history, in which case an initial bone conduction setting of '0' with *very gradual* volume increases every three - four sessions, is recommended:

- Vestibular sensitivities (poor balance, coordination, carsickness, dizziness)
- Sensory processing difficulties, particularly the over-responsive type
- Emotional regulation issues
- History of premature birth
- Mild traumatic brain injury or recent concussion
- Recent stroke

If there is any concern about the initial tolerance to bone conduction, start with the Calming Program with bone conduction at '0' for the first session or two and gradually increase every few sessions.

Headphone Adjustments

iLS uses headphones that are easily adjustable for varying head sizes. While headphones are manufactured to fit children and adults, special accommodation can be made to help keep headphones on younger children. First, try the headband that comes with the system. If the headphones slip or do not stay in position, a knitted cap or baseball cap – even a costume hat – over the headphones may help. Pediatric headphones are available for very young children.

USING THE PLAYBOOK – GENERAL GUIDELINES

iLS recommends doing 15 minutes or more of Playbook or Playbook-like activities in a typical session. As a general rule, do the activities during the beginning of the session *while* the client is listening to music

from the Auditory Component. Once the Playbook portion of a session is completed, iLS recommends quiet activities and interactions for the remainder of the session.

Customizing a Movement Session

The Playbook includes guidelines on modifying the timing of activities during the session to meet clients' needs. Specific recommendations on adjusting activities (e.g., easier or more challenging) are also outlined in the Playbook. General information is provided below.

Timing of Activities

Playbook activities are typically done during the first 15-20 minutes of a session *while* the client is listening to the program music. If needed, the timing can be adjusted to meet a client's abilities and tolerances. For example, the activities can be done as an isolated activity with the goal of being combined simultaneously with listening.

Pace of Activities

Activities should be paced so that the client is challenged to stretch their skills *while having fun*. Generally, those with motor challenges progress more slowly through the activities. Someone with very good visual-motor-balance skills can move through activities more quickly.

When a client stops having fun or is no longer engaged, activities need to be modified. If frustration starts to take over, skip an activity or switch to an easier activity.

When a person achieves a degree of mastery, proceed to the next level of activities.

When a client can do 6 or 7 of the activities very well but struggles on the remaining one or two, simply advance them to the next program level and carry those individual activities forward until mastered.

Competency with Activities

It's important for the client to do the movement activities mindfully with precision, intention and attention to detail, rather than simply going through the motions. Mindful movement accelerates brain development, building competence and precision while one is engaged and having fun.

Selecting Movement Activities

Remember, the element of fun guides decisions about activity selection. Some people (especially children) prefer to begin with familiar activities or games that are not part of the Playbook recommendations. In such cases one may get better compliance by "going with the flow" and using the familiar activities or games alone, or in combination with standard Playbook activities.

Once the formal Playbook activities are completed, quiet activities or interactions are recommended for the remainder of the session. Good options for the remaining session time include:

- Legos, K'NEX, cars, dolls, building blocks
- Quiet table-top activities (cards, simple games, puzzles, drawing, painting)
- Knitting, taking a walk, stretching, yoga or just resting quietly

AVOID activities that require significant chewing, auditory or cognitive stimulation while actually listening because these activities may interfere with the program effectiveness. For example:

- Chewing gum, eating, talking loudly
- Engaging in highly focused reading or homework
- Electronic activities or watching any small screen (TV, PC, video game, mobile, X-Box, Nintendo)

The Playbook is intended as a guide, offering suggested sets of core strength, crossing midline, eye-hand coordination and visual tracking activities. At any time, the activities may be varied according to the preference of the supervising therapist, or other activities may be substituted to make a more engaging experience for the user. In fact, the movement activities may be done outdoors in a typical play session, for example, while playing catch.

It is suggested that activities performed while simultaneously listening to a Focus Series program be low to moderate in intensity. It is ideal to use the auditory component when the brain is well oxygenated, rather than when the demand for oxygen is sent to the body to sustain the activity level.

3. MONITOR CLIENT RESPONSES

It is important to monitor client responses for behavioral changes, whether the changes are difficulties or improvements. For example, a client may grow tired in the session or start feeling frustrated with the Playbook activities. On the other hand, a client may begin to experience boredom or ask for more of a challenge.

Both the Auditory Component and the Movement Component affect the intensity of a session. There are several types of modifications a practitioner can make to increase or decrease the intensity of the program for the client.

COMMON ADJUSTMENTS

Reduce/Increase Air Conduction Volume

When auditory input is perceived as “too much” or “not enough,” reduce or increase the air conduction volume until a comfort level is achieved. If the initial volume is low, the volume may be gradually increased every few days. For those with auditory sensitivity, start with lower air conduction volume.

Reduce/Increase Bone Conduction Output

When sensory input of any kind is too activating, the practitioner may reduce the bone conduction setting all the way down to 0, if needed. The practitioner may also increase the bone conduction setting up to 1.0 if more input is desired.

Add/Separate/Reduce Playbook Activities

Another option for changing the amount of sensory input at one time is to add or remove Playbook activities during the session. To reduce sensory input, the Playbook activities can be shortened or done as a separate activity. If needed, they can be eliminated for a number of sessions and re-introduced at a later time.

Change the Length of Sessions

iLs programs are structured in four 15-minute tracks. This design allows the practitioner to adjust a program based on the client’s tolerance. For example, sessions can be shortened to 15 minutes or less, if desired. Also, when scheduling allows, the client may complete several short sessions in one day. It is not generally recommended to do more than one hour of listening per day.

Adjust the Number of Sessions per Week

The more consistent the listening, the better. The total number of sessions and/or the length of individual sessions can be adjusted as needed to meet clients’ needs.

It is fine if a client wants to listen 5-6 days a week. If a client is doing a program four or more days a week and begins to feel overwhelmed or irritable during the program, simply reduce the length of the sessions or reduce the number of sessions to three times per week. In contrast, if a client is easily adjusting to sessions and wants more challenge, increase the number of sessions per week.

Add Breaks

iLs programs may be completed – from beginning to end – without interruption. This is often desirable because the client may have a limited time frame in which to complete a program.

Further, some children prefer continuity from one day to the next. In this case, it is best to have a regular schedule for implementing the program. If the program is implemented four or more times a week with a child who is very sensitive, it is advisable to limit the length of the sessions to avoid overstimulation. Doing a program in 30-minute segments, for example, may have better results in the long term.

Optional planned breaks are built into the structure of all programs². If there is a break in the program due to vacation, illness or other situation, use the following guidelines for continuing with the program upon return:

- If just one– three days are missed, *continue* the program as usual
- If four – six days are missed, *repeat the last session*
- If a week or more is missed, *repeat the last two sessions*

Breaks between Programs

A break between programs may be warranted when ‘program fatigue’ becomes evident. This may show in a child’s reluctance to participate in the program, fussiness the first few minutes of the session, or lack of enjoyment of something that had previously been fun. These may be indications that the body and brain need time for assimilation. It may be advisable to take a one – two week break before starting another program.

Additionally, it is sometimes evident that the supervising family member needs a break from the responsibility of overseeing the program. Again, having a break of one – two weeks may be advisable.

Length of Session with Young Children (18 months – 3 years)

One basic fact we have learned over the years is that, in general, the longer and more consistent the program, the better the results. The exception to this is for toddlers. With toddlers, use iLs for short periods of time, such as 3 – 15 minutes. Time may be increased as the child develops and matures.

HEADPHONE TOLERANCE

Some children are extremely sensitive to anything on their heads, which makes getting used to wearing headphones a challenge. Practitioners may find that a few children tolerate headphones for mere seconds in the beginning, gradually increasing with exposure. Some suggestions to facilitate the process of reducing the sensitivity include:

- Begin iLs programs with the Dreampad to acclimate the child prior to starting therapy that involves headphones.
- With bone conduction turned on, begin by draping the headphones over the ankle of the child (this is the furthest part of the body from the sensitive ears and head). Gradually, move the headphones to the knee, hip, then on to the wrist, elbow, shoulders around the neck, and, finally, on the head.

² Upon certification you may request a copy of the iLs Summary Sheets, which details break options.

- The parent uses (inexpensive) headphones connected with a player at home for listening to a favorite book, songs or video. In this way, the child has a positive experience wearing headphones.
- The parent brings a portable DVD player and favorite movie to the clinic. Start the first day with the volume fairly normal for video viewing and the air conduction volume on the iLs system barely audible. Each day, slightly increase the volume of the iLs headphones while slightly diminishing the volume of the movie. Many children can make a significant shift in headphone tolerance within two weeks using this approach.

Using Headphones with Young Children

Young children have sensitive hearing. Set the air conduction lower than you would for an older child or adult. In children whose fontanel (soft spot at the top of the skull) has not closed place the headphones so that the bone conductor is slightly in front of, or behind, the fontanel. Pediatric headphones are available for smaller head sizes.

Sleeping with Headphones

If the child falls asleep while wearing headphones or is unable to tolerate headphones, listening may be done while sleeping provided an adult is in *constant attendance* with the child during the entire time of listening. This is to make certain the cable attached to the headphones is safely positioned for the sleeping child. In general we recommend using the iLs Dreampad in this situation.

SHORTENING A SESSION

Within one session playlist (4 tracks), the tracks are programmed to automatically continue playing from one track to another. In order to know when you should stop the music, you can set a timer for 15 or 30 minutes, as needed. The client can stop listening to the music when the timer goes off, even if the track is not finished.

Less than 15 Minutes

When a client cannot listen to a full 15 minutes, simply advance the first track a few minutes for subsequent sessions. Do not be concerned if all or part of the music is repeated. Continue increasing the time as tolerated, until accommodation to wearing headphones for at least 15 minutes is accomplished.

15 Minutes

When implementing 15-minute sessions, progress each session track by track; that is, it will take four times to get through Session #1, four times for Session #2, etc. Additional 15-minute sessions may be introduced throughout the day, in clinic, school, or at home, until accommodation for longer time is achieved.

Thirty minutes or Less

Listen to the first two tracks of a session; during the following session, listen to the next two tracks. Continue with all tracks in a designated session before moving to the next session in sequence (e.g., SM 01, SM 02, etc.). For example:

Monday, Session #1	SM 01: Track 1 (15 minutes) & Track 2 (15 minutes)
Wednesday, Session #2	SM 01: Track 3 (15 minutes) & Track 4 (15 minutes)
Friday, Session #3	SM 02: Track 1 (15 minutes) & Track 2 (15 minutes)

Six 30-minute sessions per week will reach the suggested minimum goal of three hours per week of listening. If in a school environment, five 30-minute sessions is close to that goal and schools have shown excellent results with similar schedules. If at home, two 30-minute sessions may be completed in one day.

45+ minutes

When it is not possible to complete the entire 60-minute session, there are a few options to optimize listening time. Choose one of the following variations that most suit the client's needs. If the facility or clinic schedules in one-hour sessions, allowing 50 – 55-minute therapy sessions, iLs recommends advancing to the next session at the next visit once the 45 – 50-minute mark has been reached.

45-Minute Variations

In general, iLs recommends using the tracks in sequence (e.g., first 3 tracks together or the last 3 together).

In the Focus Series, when Chant is included in a session it is in the *last* track position, so select the tracks accordingly.

- Select tracks 2 thru 4 if you wish the session to end with Chant to provide more calming input at the end of the session.
- Select tracks 1 thru 3 if you wish the session to end with an instrumental track to provide more energizing input at the end of the session.
- Another option is to advance the first track to about halfway and begin. This will provide all of tracks 2 & 3 and about half of tracks 1 & 4 so that some of each track will be included in the session.

SHORTENING A PROGRAM WITH FEWER SESSIONS

Even though better results generally occur with longer and more consistent programs, the Focus Series programs may need to be shortened for clinic or school use.

The simplest way to shorten a program while retaining the design flow and objectives is to skip every other session, i.e., using only odd or even numbered sessions. For example, a 40-session Concentration & Attention Program would become a 20-session program. However, this markedly reduces the amount of therapeutic input and is not always ideal for helping reach therapeutic goals. Note: this method is NOT generally recommended with the Sensory & Motor Program. See below for details.

Sensory & Motor Program

In situations where a shortened Sensory & Motor Program is needed, we recommend completing the first 20 sessions and then doing every other (or even every third) session.

Keep in mind that the first 20 sessions of the Sensory & Motor Program are rich in full spectrum music and low frequency bandwidths. These frequencies are particularly beneficial for individuals with neuro-developmental or sensory motor delays. Many children who have significant developmental delays — including Autism Spectrum Disorders — actually repeat the Sensory & Motor Program three or four times over the course of a year for maximal benefit. Therefore, reducing the first 20 sessions (especially if a client has sensory motor issues) is *not* recommended. In fact, at times it may be optimal to repeat the first 20 sessions a second time before continuing into the Transition Phase of gradually filtered music. Likewise,

if there are a limited number of sessions available and a longer Organization Phase is preferred, simply complete the first 20 sessions and repeat as many of the first 20 sessions as time allows.

LENGTHENING A PROGRAM BY ADDING SESSIONS

For Some Additional Foundation Building

For clients who will benefit from extra sessions in the Organizational phase to improve physical coordination and reduce sensitivities, begin with the Calming Program before starting the Sensory & Motor Program.

For clients who will benefit from some additional time to integrate body organization, yet don't require the entire Sensory & Motor Program, begin with the first 10 sessions of the Sensory & Motor Program before starting the Concentration & Attention or Reading & Auditory Processing Program.

Two Complete Regular Programs

If planning to do more than one program, we recommend beginning with the program lower on the developmental hierarchy. The rationale here is easily explained using the house building metaphor – build a strong foundation before working on the upper levels of the structure. For example:

Start with Sensory & Motor, take a 1 to 2 week break, and then begin Concentration & Attention or Reading & Auditory Processing.

Start with Concentration & Attention, take a 1 to 2 week break, and then begin Optimal Performance.

REFRESHER PROGRAMS

Refresher Programs refer to short programs that are done periodically to reinforce gains previously made.

Children

Children are stressed in ways we sometimes don't think about. They go through growth spurts that change their body organization. They are confronted with new situations frequently – day care center, pre-school, full day schooling in large classrooms, the introduction of being graded, family moves, etc. Short Refresher programs can help children transition through these times of difficulty and change more peacefully. Refresher programs are available in the iLs Associate Resource Center through the iLs store.

Teens and Adults

Teens and adults are often stressed and fatigued due to heavy workloads, long hours and school demands/office environment. These conditions, becoming more and more common, may result in harm to overall health, emotional well-being and productivity. Completing a short Refresher Program once or twice a year has proven effective in reducing stress while increasing mental energy and resilience.

As an example, someone who completed the Concentration & Attention Program in the summer may do a refresher during winter break or the following summer. Short Refresher Programs have been written for each Focus program. Each program is eight or twelve sessions in length. Please log in to the iLs Store and go through the Resources section to the Summary Sheets for information on the Refresher Programs.

EXAMPLES OF PLAYBOOK MODIFICATIONS

Ideas on how to make the activities easier and more challenging are outlined in the Playbook.

Ball Toss

- To make a tossing activity easier, use a larger, softer ball; use smaller balls to make them more challenging.
- If tossing through the air is too difficult, roll the ball across the floor.
- If too easy, toss higher or faster or toss and catch with the non-dominant hand.



FIGURE 10: MODIFIED BALL TOSS

Balance Board

- The balance board is easier to use if it is placed on a softer surface, such as a thick carpet square or a towel folded a few times. Hold onto the back of a chair or touch the wall if needed.
- Sitting on the balance board is easier (the person will still receive vestibular stimulation).
- If a person becomes dizzy on the balance board, suspend balance board activities for a week or so and try again. Be sure that someone is 'spotting' the client if balance is unsteady.
- To increase difficulty on the balance board, combine auditory listening with balance activities. Separate the two to make balancing tasks easier.
- Increase balance competence by using the board only in short stints of about 30-60 seconds at a time to start, and gradually add seconds as competence increases.
- Do NOT use the balance board when the user is very unstable and the required motor skills are not in place, especially if there are known vestibular deficiencies or history of head injury.
- Modified activities are recommended for seniors.

Add New Activities

- Our brains like novelty. Feel free to create your own variations to the basic activities, making them easier, new and different or more challenging.
- No matter how you modify activities, make sure clients are having fun! (It's the best way to insure compliance and completion of the program.)
- If you add activities, try to incorporate the key types of activities:
 - Balancing
 - Crossing the midline (with the eyes and hands)
 - Eye tracking
 - Combining activities
 - Performing thinking tasks while doing physical activities
 - Any activity that combines visual and balance with listening *all at the same time*

ACTIVITIES BETWEEN SESSIONS

Through the entire program, clients will benefit most if they can experience a balance between physical and mental activities. As part of this philosophy, minimize *extended* hours of TV/video use to maximize the benefits of the iLS Program. Encourage clients to spend time outdoors in physical play.

4. THE SCIENCE BEHIND ILS

In thinking about how to improve brain function, it is helpful to recall how the brain developed in the first place. The brain grows and develops in response to sensory input from the environment. Even before birth the developing brain is being stimulated by sound, movement and touch. After birth, all the senses - hearing, tasting, smelling, seeing, touching and the senses of movement from muscles and joints (proprioceptors) along with the sense of balance (vestibular) combine to insure that the brain continues on the trajectory of normal growth and development. We live and play in a multisensory environment.

When normal growth and development is derailed for whatever reason, it makes sense to use a multisensory approach to put brain development back on track. The sensory input from our environment does not arrive one at a time, but all at once. Thus, any effective intervention to improve brain function needs to be built upon the architecture of how the brain normally grows and develops. This is the rationale underlying the development of iLs. It is structured and modeled on the simultaneous, multisensory way the brain develops.

And, since the brain relies upon accurate information from the body and the environment to plan and execute appropriate responses, iLs includes motor and cognitive activities to build the networks needed for successful engagement with the world.

Just as our bodies are malleable, so are our brains and nervous systems. The brain can change its structure and function in response to sensory input and experience. This is called “neuroplasticity”.

NEUROPLASTICITY

Repeated stimulation of nerve cells strengthens their connections while new information creates new synapses. This is called neuroplasticity, and the brain holds on to this capacity to change and grow throughout life. iLs programs succeed because the brain changes and grows as it receives information from the environment including its own thoughts, ideas and emotions. iLs increases the brain’s capacity to efficiently process, organize and make sense of incoming information.

THE NEED FOR A MULTISENSORY APPROACH

Research indicates that the more input the brain cells receive, the better their organization and functioning; therefore, they can process more information faster. Specific, simultaneous and repeated sensory stimulation gradually trains the brain to process and respond to multisensory input from the environment more effectively. This emphasizes the *processing* of information - touch, auditory, visual, and so on - before it gets to the brain.

Increasing the amount of multisensory information getting to the cortex from subcortical systems activates the cognitive centers for attending, organizing, planning, and inhibiting impulses. For children with immature nervous systems some adjustments may be needed in:

- Frequency of the session (how many times per week)

- Duration of the session (the length of sessions)
- Intensity of the session (adjustments in air/bone conduction volume and movement activities)

The iLs Program is unique in providing input to multiple senses at the same time, which is the best known way to promote brain growth.

THE BRAIN AND BODY COOPERATE WITH EACH OTHER

“iLs has a global effect on the brain and nervous system.” What does this actually mean? Let’s delve into some of the functional anatomy behind this statement. First, the brain is part of the overall nervous system. The brain and spinal cord compose the central nervous system (CNS). Their job is to 1) receive sensory input from the internal and external environment, 2) integrate the input, and 3) respond to motor, cardio-respiratory and digestive systems demands.

CORTEX

Most of you have seen pictures of the brain. The wrinkled surface, called the cortex, or the gray matter, is the outermost layer of the brain. It is composed of brain cells called neurons. The cortex plays a key role in higher cognitive functions: memory, attention, perceptual awareness, language, thinking and reasoning.

An important function of the prefrontal cortex, the front part of the brain just behind the forehead, is to inhibit unwanted responses. As the prefrontal cortex grows and matures, we see increased ability to inhibit impulses, postpone gratification and control emotions and behaviors. Difficulties in managing these functions may be signs of immaturity of the brain and nervous system. iLs programs help the brain mature.

What is the cortex of the brain?

The cerebral cortex is the outermost layer of gray matter that covers the surface of the brain. It is involved in memory, processing sensory input, initiating motor activity, and interacts with other cortical areas.

The cortex is crucial for attention, thinking, language, reasoning, memory and inhibition of impulses.

SUBCORTEX/SUBCORTICAL SYSTEM

Beneath the surface of the brain is the subcortical system composed of information highways that carry sensory input from our environment to the brain and motor output from the brain to muscles. Sensory input from hearing, seeing, touch and balance is processed by the subcortical system before arriving at its destination in the cortex. This transfer of sensory information is called subcortical processing. This is important because higher cognitive functions – thinking, reasoning, memory, planning – are dependent upon the quality of the information delivered by the subcortical system. Through its multisensory stimulation to the nervous system, iLs improves the integrity, efficiency and accuracy of subcortical processing.

CEREBELLUM

For decades, it was believed that the function of a part of the brain called the cerebellum was to make motor performance smooth and automatic. We now know much more. Recent discoveries from neuroscience reveal that the cerebellum is also intimately involved in higher order brain function. Memory, reasoning, planning, organization and even language and emotional regulation are under the influence of the cerebellum. Delayed development of the cerebellum is now implicated in many learning and behavioral disorders such as dyslexia, ADHD and autism.

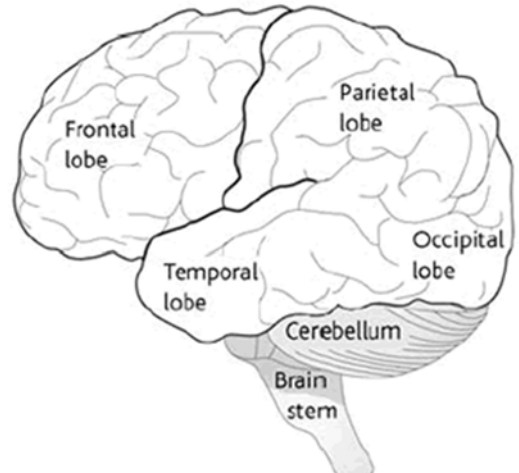


FIGURE 11: THE PARTS OF THE BRAIN

Both the cortex and cerebellum are highly active when learning a new skill. Once acquired through practice and repetition, the skill becomes automated and activity of the cortex and cerebellum diminish. When the cerebellum is not functioning properly, one's ability to acquire new skills is impaired. The absence of automaticity requires having to start over again and again; learning becomes long and tedious.

The iLS multisensory approach improves cerebellar function and by extension improves higher order brain functions and body organization.

RETICULAR ACTIVATING SYSTEM

The Reticular Activating System (RAS) is a network of neurons and neural fibers running deep within the brain stem. Sensory signals from all parts of the body feed into the RAS on their way to the cortex. When the RAS is stimulated by these signals, it awakens the cortex, alerting it that sensory information is on its way, and it has work to do. The RAS awakens the cortex so it can attend and think.

There must be an optimal level of arousal and alertness for any cognitive, emotional or physical learning to take place. All iLS programs provide input into the RAS, which along with the cerebellum has a major responsibility in creating the level of arousal needed for attention, learning and memory.

PERIPHERAL NERVOUS SYSTEM

The Peripheral Nervous System (PNS) refers to the nerves and pathways lying outside of the Central Nervous System (CNS) – the brain and spinal cord. The Peripheral Nervous System (PNS) has two divisions, each with two subdivisions of their own. The subdivisions work synergistically and cooperatively with one another.

- The Somatosensory System
 - Sensory Division
 - Motor Division
- The Autonomic Nervous System
 - Sympathetic Nervous System
 - Parasympathetic Nervous System

The Somatosensory System

Sensory receptors, and their pathways to the brain, are the windows through which we perceive the world, and through which the world communicates to us, whether through colors, sounds, smells, taste or bodily sensations. Through our balance and joint sensors, we are informed about our relationship to gravity and where our body is in space.

The sensory division of the PNS allows us to perceive the exquisite beauty of a rainbow, or relish the fragrance of a flower, savor the taste of chocolate or experience the soothing feeling of sliding into a pool on a hot summer's day.

This sensory division includes the sensory receptors, neurons, ganglia and nerve fibers that lie outside of the CNS. The PNS gathers information from the environment and transmits it to the brain for interpretation and decision making; it puts us in contact with the outer world. As new or novel information arrives, it is then stored in memory.

If an action is required, that information is sent out from the CNS through the *motor, or somatic, division of the PNS*.

When running after a fly ball, sliding into the pool or walking on the edge of a curb, the movement of the muscles and joints is through the motor division of the PNS, which also controls the balance and coordinated movement of these activities.

Ideally, these two divisions work together harmoniously and synergistically; the motor division moves the body in response to the signals received from the sensory division. Dancing is a good example of this relationship: the body moves smoothly and rhythmically (motor) in response to the sound, melody and beat of the music (sensory).

The PNS is, for the most part, *conscious*. A person is consciously aware of sights, sounds, smells and touch and, therefore, has voluntary control over their response. Spinal reflexes, (for example, the knee jerk reflex), are the sole exceptions, as they are not under voluntary control.

The Autonomic Nervous System

The Autonomic Nervous System (ANS), by contrast, functions mostly *unconsciously*; we are unaware of the mechanisms that control our body temperature, electrolyte and hormonal balance, breathing and heart rate. Whereas the Somatosensory division regulates our responses to the external environment, the ANS responds to and regulates our internal environment - internal organ function, glands, hormones and immune function.

There also two division of this system, the sympathetic and the parasympathetic. The Sympathetic Nervous System prepares the body for action by increasing heart rate, breathing and metabolic rate. It consumes energy.

The Parasympathetic Nervous System has a calming influence on the body. It conserves energy by inhibiting the Sympathetic Nervous System, slowing breathing and heart rate, lowering blood pressure and regulating elimination and digestion functions. It also supports healthy immune function.

The Vagus Nerve

An important branch of the Parasympathetic Nervous System is the Vagus Nerve; it emerges from the brain as the 10th cranial nerve and carries 75% of all parasympathetic activity. The Vagus Nerve is involved in producing the calming effect of iLs.

This is important for iLs practitioners: the calming, relaxing effect and the decreased stress responses of the Sympathetic Nervous System are mediated by stimulation of a small branch of this nerve as it emerges onto the anterior surface of the ear drum and ear canal. Virtually all children who have a learning, attention or behavioral problem are under considerable stress. In turn, they often lack resiliency and have little ability to calm themselves.

When stressed, the flood of chemicals streaming throughout the body inhibits one's ability to take in, assimilate and learn new information. For children in school, this has a compounding effect, as they fall further and further behind, creating even more stress. As they begin iLs, the parasympathetic system puts the brakes on the overactive sympathetic response, resulting in what can be a profound calming effect. The individual becomes happier, alert, attentive and available for therapeutic intervention and learning.

THE EAR

The ear has three major parts, the outer ear, middle ear and inner ear.

The outer ear is the part we can see (the skin-covered cartilage appendage on the side of the head) and the auditory canal that sends sound to the middle ear. Along the edge of the auditory canal runs a sensory branch of the Vagus Nerve that has a prominent role in homeostasis, regulating emotions, stress and digestive and cardio-pulmonary response. You may have heard of this being called the relaxation response. Sound is one of the ways of activating the relaxation response.

In the middle ear are the three smallest bones and two smallest muscles in the human body. Their function is to protect the inner ear from excessively loud sounds. Chronic middle ear infections can weaken these muscles resulting in poor transmission of sound and increased sensitivity to loud sounds. Chronic middle ear infections can also harm one's auditory processing resulting in delayed speech and language development that underlie many reading, spelling and learning problems in school.

Enhancements of iLs music activate the muscles of the middle ear while increasing alertness and attention.

The inner ear contains both the Cochlea, the organ of hearing, and the vestibular organ through which we detect balance and movement. Let's take a closer look at each of them.

The Cochlea is a snail-shaped organ filled with fluid that causes hair cells in the Organ of Corti to move in response to sound waves, changing sound waves into electrical signals that are transmitted to the brain by the Vestibular-Cochlear Nerve. Our ability to correctly interpret sounds as meaningful language is dependent on the accurate functioning of the Cochlea and the accurate transmission of the electrical signals through several relay stations between the ear and brain.

The Vestibular Organ contains three fluid-filled semicircular canals, positioned at right angles to each other so that movement in any direction can be detected. It also includes the utricle and saccule that contain the sensory receptors for detecting linear movement, gravity and head position. The movement of the fluid over hair cells turns the movement into electrical signals transmitted to the vestibular nuclei in the brainstem by the Vestibular-Cochlear Nerve. Together these make up the vestibular system. Please

note the many important connections between the vestibular system and other parts of the nervous system. It connects with the:

- Cerebellum to provide balance and equilibrium
- Proprioceptors to provide awareness of the position of our limbs and body in space
- Muscle receptors to provide gross and fine motor control
- Spinal cord to provide the input for core strength, muscle tone, and posture
- Eye muscles to control teaming, tracking and smooth pursuit needed for eye-hand coordination, reading and much more
- Auditory system for reflex turning of the eyes and head toward the source of a sound
- Cortex of the brain for motor planning

BODY ORGANIZATION: THE FOUNDATION FOR LEARNING AND HIGHER COGNITIVE FUNCTION

For a moment, think back to what you went through learning to ride a bicycle. Remember how your entire attention was focused on staying upright as you struggled to ride in a straight line? Remember how, as you gained more control over your straight-line balance, you learned how to turn, stop and start? And then you were off to the races! Bicycling became an automatic activity freeing you to look around, enjoy the scenery, think of other things, and talk with friends.

This is how your brain and cerebellum, when working together, learn and integrate new skills. When you learned to ride a bike, your brain and cerebellum were busy making new connections. The repeated attempts at riding your bike strengthened these connections. Your persistence made the transmission of information from your balance and coordination systems stronger, faster and ultimately seamless until riding your bike became automatic. At that point you didn't have to think about it anymore.

When one participates in an iLs program, the combination of listening to treated music, the use of bone conduction and the movement activities promote higher brain function through improved brain and body organization. iLs trains the brain, including the cortex, subcortical system and cerebellum, to efficiently and effectively manage all the information coming in from the environment.

Remember John in the welcome statement? The most significant piece of information to explain John's improved cognitive and emotional gains is that John is now able to ride his bike. We know that higher brain function depends upon body and brain organization. Previously, his brain was preoccupied trying to coordinate his balance with motor planning and seeing where he was going. Little was left over for learning and emotional control. Once body integration was established through iLs, his brain was freed up to learn and participate socially.

HOW DOES THIS IMPACT LEARNING?

Attention and concentration require energy. Brain scans of those with ADHD demonstrate low energy levels in those brain areas critical to attention. What's less commonly recognized is that these areas for attention are activated and energized by lower brain structures of the subcortex. The iLs Auditory and Movement Components stimulate these brain structures responsible for sustained attention, building and strengthening their neural connections over time.

Reading requires an integration of visual, auditory and cognitive skills. For example, to read fluidly, the visual and auditory systems need to work together. The eyes must track the letters in sequence along the lines of print. Simultaneously, letters must be decoded into sound to have meaning. As the eyes move from letter to letter or from word to word, the auditory interpretation center translates these symbols into meaning. Sound brings the words to life!

For reading comprehension, two other skills are needed : rapid processing speed and a good short-term memory.

Processing Speed

If word recognition is slow, the reader struggles to process the words, uses up valuable cognitive resources and comprehension suffers. Good reading comprehension requires rapid visual and auditory processing of the text.

Short-term Auditory Memory

Words must be combined into a phrase and then held in short-term memory long enough to build a whole picture or to have a complete thought. A reader must be able to hold at least five discreet items in short-term memory long enough for good reading comprehension. Example: *The-black-horse-was-grazing*. Only after the fifth word is there a complete action and picture, yet each word must be held in short-term memory to understand and comprehend the entire phrase.

Slow processing speed and poor short-term memory are often under-recognized as frequent contributors to weak reading comprehension. These two cognitive skills are markedly improved by iLs. In addition, other foundational skills such as ocular-motor function for smooth eye tracking and auditory discrimination to support decoding skills are strengthened.

Executive functioning includes memory, reasoning, judgment, organization, planning, inhibition of impulses and emotional regulation. These functions are primarily under the control of the pre-frontal cortex. Research confirms that many neurodevelopmental delays, learning difficulties and problems in regulation of emotions and behaviors are due to immaturity of the brain in general and of the pre-frontal cortex in particular. The multisensory stimulation of iLs fosters development and maturation of these brain areas critical to learning.

NUTRITION FOR THE BRAIN

The following provides information on how iLs influences healthy development, organization and functioning of the body/brain system.

Sound

Just as the brain needs the nutrients of oxygen and glucose to provide energy for its metabolic function, it also requires stimulation in the form of sensory input. Even with adequate glucose and oxygen, but without stimulation, the brain cells would atrophy and many would die off. The cochlear and vestibular

organs, the organs of hearing and balance, are part of one system in the inner ear that converts sound and movement into electrical signals. In this way sound and movement are major sources of rich sensory input - nutrients for the brain.

The iLS air/bone conduction headphones provide this sound nutrient to the brain in two forms: through both air and bone conduction. Air conduction has a greater effect on the cochlear system while bone conduction has a predominant effect on the vestibular system. The movement of the hair cells in the inner ear, in the cochlea and vestibular organ, convert the vibrations of sound, one form of energy, into electrical signals, another form of energy. Bone conduction, through its gentle vibration to the vestibular organ, also provides input. This combined effect makes the ear a major source of stimulation and energy to the brain and nervous system for the accomplishment of its many functions.

Movement

Have you ever noticed when you are having a hard time attending, that as you get up and move around, the movement wakes up your brain? As with sound, movement also energizes the brain.

An increasing body of evidence shows that movement is crucial to brain function, including memory, emotion, language, and learning. In fact, higher brain functions have evolved from movement. Not only does movement require energy, but it also energizes the brain through input from the muscles and joints and from the somato-receptors along the spine in response to gravity.

Thus, the inner ear is a “battery to the brain,” charging the cortex with energy. The filtered high frequencies of iLS are selected to be mentally alerting and energizing as are the movement activities.

HEARING VS. LISTENING

Hearing and listening are not the same. Hearing is passive. It is simply the physiological ability of the ear to hear at a normal threshold. And we hear in two ways, through air conduction and bone conduction.

AIR CONDUCTION

Air conduction refers to sounds carried through the medium of air. Sound waves enter the outer ear, vibrate the eardrum and, through the mechanics of the middle ear, vibrations are transmitted to the inner ear. One’s voice is transmitted via air and bone (see below).

BONE CONDUCTION

The inner ear is encased in a bony structure of the skull. Bone conduction refers to sound that is conducted as subtle vibration along the bones to the inner ear housing the organs of hearing and balance. The sound

HEARING VS. LISTENING

Hearing and listening are not the same. Hearing is passive. It is simply the physiological ability of the ear to hear at a normal threshold. We hear in two ways, through air conduction and bone conduction.

Listening is active, requiring not only the ability, but also motivation, desire and intention.

vibration actually activates both the sense of hearing and the organ of balance. The vibration, in fact, is carried through the entire skeletal structure.

Listening is active. It requires ability, motivation, desire and the intention to be engaged in taking in, processing and responding to the information being heard. When hearing is normal, listening depends on both psychological and cognitive processes that involve:

- Filtering out irrelevant sounds and distractions
- Focusing attention on what is relevant in the stream of incoming auditory information
- Holding information in working memory long enough to understand and extract the meaning of what is being heard
- Forming an appropriate behavioral response

A good “listening ear” is one that both dampens and suppresses the lower frequencies of background sounds while simultaneously enhancing the ability to attend to high frequency sounds. Many sounds in our language are very high frequency, particularly sibilants (producing a hissing sound such as in “sip, zip, ship or chip”). The sound of consonants such as ‘f’, ‘h’, ‘r’, ‘s’, ‘w’, ‘y’ and soft ‘c’ are as high as 4,000-6,000 Hz. These sounds when expressed are very soft; it requires a good listening ear to detect them in conversation.

Children with a history of ear infections often have difficulty hearing and processing the frequencies of language. They may misunderstand what they hear, have difficulty speaking clearly, and struggle learning to read, write and spell. iLs helps in all of these areas, improving a client’s ability to listen and speak clearly.

Bone conduction is an important tool to increase activation to the vestibular system. This enhanced activation results in improved body awareness, balance, coordination and increased muscle tone.

Bone is a good conductor of sound. The sound of operatic singers’ voices, for example, are carried through their entire body by the bones of their skeletal structures. Every time you speak, the sound of your voice vibrates throughout your whole body.

iLs makes use of this natural process by inserting a bone conductor into the top of the headphones.

Through the unique qualities of the bone conductor one can both hear and feel the music. Therefore, placed against the ear, the bone conducted sound is audible. Held between the fingers, the vibration is palpable.

The low frequencies of music have more acoustical power and generate more vibration than high frequencies. Therefore, lower frequencies will have a greater effect on body organization and the sense of being grounded.



FIGURE 12: ILS AC/BC HEADPHONES

iLS MUSIC

As sound is a nutrient, iLS believes the quality of the sound is also important. Music choices are based on criteria established by iLS and tested through years of application. iLS uses classical music that is universally appealing and is played on acoustic instruments. It has a predictable structure that includes the elements of harmony, melody and rhythm. The music is selected with attention to the frequency distribution of treble and bass tones and the dynamic range of louder and quieter sections.

iLS selects music that includes a variety of instruments. Stringed instruments are rich in overtones and harmonics that reach into the highest frequencies of human perception. Tympani, brass and woodwinds provide depth, add richness to the compositions and complement the frequencies of the string instruments. Symphonic pieces using a wide range of instruments provide this rich musical content.

Did you know that both music
and language share the same
neural pathways?
This helps to explain the power
of music to improve language,
reading and speech.

5. CASE STUDIES

The following are representative of some common presenting cases with program suggestions.

- I. 5-year-old girl with a number of symptoms raising the question of autism, though no diagnosis has been made: minimal language skills, some self-stimulating behavior, eye contact poor for anyone outside the immediate family, needs routine, starting preschool half day.
 - A. Considerations
 1. Her age
 2. She is in a new sensory environment
 - B. Recommendations³
 1. Begin with Dreampad at bedtime, for calming and acclimation to the sound and music
 2. Select a program rich in low frequencies to help with body organization and, subsequently, the feeling of being safe to make transitions easier
 3. Sensory & Motor Program
 - a. ½ hour per day, if tolerated; may need to build up from 15 minutes per day⁴, 3 – 7 times /wk. The routine of daily listening will likely prove valuable
 - b. Begin with .25 BC, increase as per iLs recommendations⁵
 4. Introduce Early Developmental Program Playbook activities, as abilities allow
 5. Program Options
 - a. Complete SM sessions 1 – 20; return to session 1 and complete sessions 1 – 60
 - b. Or, complete the SM Program several times over the course of a year
 6. Introduce VoicePro and Interactive Language Activities when child begins showing interest in vocalizing or using language, for example, naming objects, singing nursery rhymes, counting songs and any language apps⁶, as suitable
 7. Evaluate how well she has integrated the changes and if her improvements are consistent in all areas of her life. Determine whether to repeat the program or to offer shorter, periodic refresher programs for continued integration and stabilization by using iLs at home
- II. 7-year-old boy in the 2nd grade with mild sensory processing problems and behind peers in reading; sounds out letters with great difficulty and very slowly, leaving him with almost no comprehension.
 - A. Considerations
 1. Mild sensory difficulties
 2. Phonemic decoding difficulties (the ability to break down, manipulate, blend and make meaning of the individual sounds of language)

³ *Note:* These program options would also be suitable for a child with Down Syndrome, cerebral palsy or when neuro-developmental delays are present.

⁴ Additional information on length of sessions on page 15

⁵ With significant sensitivity, follow the BC setting guidelines on page 16

⁶ Playback devices, such as CD players, MP3 players, as well as iPads and tablets may be used as the source material for the voice feedback loop in the VoicePro

B. Recommendations

1. Five sessions of Sensory & Motor Program, Reading & Auditory Processing Program (1 - 40)⁷
 - a. 60 minutes, 3 – 5 times/wk
 - b. Begin at .25 and increase as per iLs recommendations
2. Introduce Playbook or similar activities with first session
3. Introduce VoicePro and Interactive Language Activities toward end of the Transition Phase of the Reading & Auditory Processing Program, with emphasis on Sibilants, Filtered Words, Auditory Memory

III. 8-year-old boy with a diagnosis of high-functioning autism. He has trouble paying attention, is fidgety and restless in class, plus he is always tapping his fingers on the desk. He is not at peer level with language, with poor phonemic decoding. Working memory appears low, though it varies. He does not participate in any activity that requires good motor skills.

A. Considerations

1. The body must be organized for more efficient higher learning
2. Parents/teachers may be more concerned about reading than body organization

B. Recommendations

1. Start with Dreampad - better sleep may help his daytime restlessness
2. Sensory & Motor Program
 - a. 60 minutes, 3 - 6 times/wk. A daily routine of listening can be very helpful
 - b. Begin at .25 BC and increase as per iLs recommendations
3. Introduce Playbook or similar activities with first session
4. When body organization is stabilized and he has demonstrated ability to adapt to changing filtration levels, the next program would be the Reading & Auditory Processing Program. If changes are not stable, repeat the Sensory & Motor Program, sessions 1 – 20, then every other session to the end of the program
5. Introduce VoicePro and Interactive Language Activities when he seems ready to add an additional task. Begin with interview style skills involving social engagement. Subsequently, use the recorded activities, such as Sibilants, Filtered Words, Auditory Memory
6. Consider iLs at home for enhance ongoing gains

IV. 9-year-old girl in the 4th grade with mild attention difficulties: difficulty sitting still in classroom and easily distracted by activity in classroom. She is the last one picked for playground activities, as she isn't particularly athletic. She is one year behind in reading and math.

A. Considerations

1. Are difficulties with attention due to disconnectedness from body (inattention in the body) or distractibility due to auditory processing issues?
2. True ADHD? Or a combination?
3. Is inattention the reason for lag in academics?

B. Recommendations

⁷ Note: The specific combination of Sensory & Motor Program followed by the Reading & Auditory Processing Program can be very helpful with his two major areas of difficulty. With a positive response to the Sensory & Motor sessions, the remaining concerns are likely to be addressed by Reading & Auditory Processing Program.

1. Choose a program to address 'grounding' first for body organization, the foundation for language and learning
 2. Concentration & Attention Program (optional, add Sensory Motor 1 – 10 at beginning)
 - a. 60 minutes, 3 -5 times/wk
 - b. Begin at .25 BC and increase as per iLs recommendations
 3. Introduce Playbook or similar activities with first session
 4. Introduce VoicePro and Interactive Language Activities toward the end of the Transition Phase of the Concentration & Attention Program, using Filtered Words, Tongue Twisters, Auditory Memory, and Auditory Filter Ground
- V. 13-year-old male, good athlete, poor handwriting, not able to attend in school, unable to complete homework, misses assignment deadlines.
- A. Considerations
1. Poor fine motor skills are often under-reported by parents when asked about motor skills, as the focus may be on athleticism and gross motor skills
 2. Poor handwriting (fine motor), when not related to postural or core strength issues, may indicate weakness with cortical rather than subcortical processing
- B. Recommendations
1. Concentration & Attention Program (optional, add Sensory Motor 1 – 10 at beginning)
 - a. 60 minutes, 3 -7 times/wk
 - b. Begin at .25 BC and increase as per iLs recommendations
 2. Introduce Playbook or similar activities with first session
 3. Introduce VoicePro and Interactive Language Activities when midway through the Concentration & Attention Program, with emphasis on Auditory Memory, Auditory Figure Ground, and Dichotic Words
- VI. Graduating Senior, preparing for college, good student and athlete, slow reader, reads several times for comprehension. He is concerned about keeping up with required reading assignments in college.
- A. Considerations
1. Well-rounded student overall
 2. Short time frame to complete program
- B. Recommendations
1. Emphasis on mid-to-high range frequencies for reading and reading comprehension, higher cognitive function
 2. Optimal Performance I
 - a. 60 minutes, 4 – 5 times/wk
 - b. Begin at .5 BC and increase as per iLs recommendations
 3. Introduce Playbook or similar activities with first session, combining with balance board; bring in cognitive challenges early
 4. Introduce VoicePro and Interactive Language Activities early in the Optimal Performance Program with emphasis on Sibilants (levels 3-7), Filtered Words (levels 4-8), Auditory Memory, Auditory Figure Ground, Dichotic Words (suggest lengthening overall session by 10 – 15 minutes to do the Interactive Language Activities)
 5. Optimal Performance II as a follow-up program during winter or summer break if needed

- VII. Adult low energy, low motivation, lack of creativity; no significant history from childhood or current contributing conditions exist as of recent annual physical.
- A. Considerations
 1. Lack of relevant medical history
 2. Given the low energy and mood, emphasis on higher frequencies will be beneficial
 - B. Recommendations
 1. Emphasis on higher frequencies for energy and creativity
 2. Optimal Performance I
 - a. 60 minutes, 3 – 7 times/wk
 - b. Begin at .5 BC and increase as per iLs recommendations
 3. Introduce Playbook activities with first session; bring in cognitive challenges early
 4. Introduce VoicePro and Interactive Language Activities early in the Optimal Performance I Program with emphasis on Sibilants (levels 3-7), Filtered Words (levels 3-6), Auditory Memory, Auditory Figure Ground, Dichotic Words (suggest lengthening overall session by 10 – 15 minutes to do the Interactive Language Activities)
 5. Suggest Optimal Performance II in 2-3 months
- VIII. Adult with attention difficulties (distractibility), sleep problems and fatigue. Struggles with finishing projects and has developed many compensatory skills.
- A. Considerations
 1. He has great trouble falling asleep, with sleep often disrupted, and feels sluggish on awakening
 2. Fatigue seems associated with poor sleep, coupled with the energy expenditure require using his compensatory skills
 3. Sleep issues appear to be compounding inattention issues
 4. Changes may not be immediate, as this client has developed coping skills and strategies
 - B. Recommendations
 1. Dreampad for sleep problems
 2. Emphasis on higher frequencies to help energize the brain
 3. Calming Program sessions 1 – 5, followed by Concentration & Attention⁸
 - a. 60 minutes, 3 – 5 times/wk
 - b. Begin at .5 BC⁹ and increase as per iLs recommendations
 4. Introduce Playbook activities with first session; bring in cognitive challenges early
 5. Introduce VoicePro and Interactive Language Activities early in the Optimal Performance Program with emphasis on Sibilants (levels 3-7), Filtered Words (levels 3-6), Auditory Memory, Auditory Figure Ground, Dichotic Words
 6. Optimal Performance II in 2 months

⁸ Note: The Reading & Auditory Processing Program could be used in place of the Concentration & Attention Program.

⁹ Use the BC Guidelines for the Optimal Performance Program in this case, even though starting with the Calming Program

- IX. 36-year-old male with head injury following automobile whiplash injury, with poor memory and concentration, poor depth perception, poor organization, inattention, fatigue, sound sensitivity.
- A. Considerations
1. Do not overdo low range frequencies, despite the depth perception issues. Once body organization improves, client will benefit from the energizing effect of the higher frequencies
 2. Depending upon the severity of injury, clients who had skills before may respond more quickly than someone who did not suffer from fatigue, organization, inattention and so on, prior to the injury
 3. Sleep is often disrupted post head injury
 4. Vestibular issues are often reported post head injury
 5. Playbook modifications
- B. Recommendations
1. Begin Dreampad with 5 – 10 min sessions, increasing by 5 min each session (to avoid auditory/vestibular overstimulation)
 2. Sensory & Motor Program sessions 1 – 5 (more, if needed), followed by Concentration & Attention sessions 1 – 30, followed by Reading & Auditory Processing sessions 22 – 40
 - a. 60 minutes, 3 + times/week. Client may fatigue initially, and may do some of the program while resting with straight spine¹⁰ (not slouching)
 - b. Begin at .25 BC ('0' BC if significant vestibular problems) and increase as per iLs recommendations
 3. Introduce Playbook activities with first session (NO balance board). Introduce balance board as vestibular system stabilizes, using the back of a chair or other stable fixture for support.
 4. Introduce VoicePro and Interactive Language Activities with Transition Phase of the Reading & Auditory Processing Program.
 - a. Begin with humming and toning as gentle form of self-generated energy for the brain
 - b. Follow with Repeating Words, Repeating Phrases, Sibilants, Filtered Words, Auditory Memory, Auditory Figure Ground
 5. Use periodic short programs of 4 – 6 sessions to reinforce gains
- X. 59-yr-old female with history of left-sided stroke three months ago. She has balance problems, poor gait, significant memory problems and is easily fatigued. However, biggest concern is dramatic impact on speech due to Apraxia. Client is receiving physical therapy and speech therapy.
- A. Considerations
1. Speech/language problems are the biggest concern
 2. Playbook modifications for balance problems
- B. Recommendations
1. Consider Dreampad to see if it will help with more restorative sleep and with naps that are frequently required throughout the day. Begin Dreampad with 5 – 10 min sessions, increasing by 5 min each session (to avoid auditory/vestibular overstimulation)
 2. Client can benefit from low, mid and high frequencies; add some Sensory & Motor Program sessions to support improvement in balance, coordination, depth perception
 3. Sensory & Motor Program sessions 1 – 10 (or 1 – 20, if balance and coordination issues are still present), followed by Reading & Auditory Processing Program
 - a. 60 minutes, 3+ times/wk - client may fatigue initially, and may do some of the program while sitting with straight spine (not slouching)

¹⁰ A straight spine allows for bone conduction through entire skeletal system, thereby, helping the body feel more energy.

- b. Begin at .25 BC and increase per iLs recommendations
- 4. Introduce Playbook activities with first session (NO balance board). Add balance board as vestibular system stabilizes, using the wall, the back of a chair or other stable fixture for support
- 5. Add speech therapy and VoicePro during Reading & Auditory Processing Program
 - a. Introduce speech tools (mirror, mouth placement and sound cue cards, photo cards/objects) as appropriate and needed
 - b. Begin with humming and toning as a gentle form of self-generated energy for the brain
 - c. Follow with Repeating Words, Repeating Phrases, Sibilants, Filtered Words, Auditory Memory, Auditory Figure Ground for improved memory, word finding, speech production and prosody
- 6. Reading & Auditory Processing Program may be repeated, if indicated
- 7. Periodic refreshers are suggested

6. BEFORE USING ILS IN YOUR PRACTICE

Read ALL manuals and try the activities personally prior to using them with clients (even family). Consider the following history or current conditions when designing a program.

Developmental Delays

Signs that the nervous system may not be well developed and the motor system is not integrated include delayed developmental milestones (e.g. ages children crawled, walked, spoke); absence of any milestones (e.g., did not crawl), as well as problems of balance and coordination. It is frequently helpful to lengthen programs by repeating each session one or more times and repeating programs one or more times to accommodate to the pace at which these children are able to develop.

Additionally, when children are born under the stress of premature birth, and/or with medical conditions or other significant history, iLs recommends considering repeating sessions to lengthen programs as well as repeating programs. Once the rehabilitative work is complete, periodic short Refresher programs help these children maintain the gains they've made.

Refresher programs also address ongoing neurological challenges that may occur when there is a lot of sensory input, illness, stressors (such as difficulty in classrooms) or big growth spurts. In these situations, a short Refresher program can help children through a difficult time.

Refresher programs are available in the Associate Resource Center through the iLs store.

Infections, Illnesses and Allergies

If a cold, sinus infection or allergy is present, simply stop the program for a few days until the infection has run its course. The presence of ear tubes is not a contraindication to auditory stimulation. Take note of a history of chronic ear infections, sinusitis, asthma or tonsillitis, as these illnesses may influence decisions around program selection.

Medications

In general there are no contraindications to doing iLs programs while on medications, but check with the prescribing physician. Some clients may prefer NOT to take stimulant medications on weekends or on days they come in to listen. From an iLs perspective, this is acceptable as long as the client's behavior is not a problem during the session. Final medication decisions should be made between the client and their physician.

Mental Health History

iLs strongly recommends a mental health history be obtained on each client, including whether there is a family history of bipolar (manic/depressive) illness on either side of the family. If a history of bipolar is present, fill out a Supervision Request Form for guidance.

Head Injury

Careful attention should always be paid to a history of head injuries, particularly where there was a loss of consciousness. The injury may contribute to difficulty with auditory processing, sequencing, word finding, reading and/or memory problems, or other cognitive problems. Even a mild whiplash injury can

cause sound sensitivity, problems with depth perception and feeling easily overwhelmed. If a history of severe head injury is present, fill out a Supervision Request Form for guidance.

Hearing Aids

iLS advises that clients with hearing aids remove the hearing aids while listening. It is important to consult with the client's audiologist, and/or obtain a copy of the audiogram for unaided frequency perception. Air conduction volume will likely need to be adjusted (increased) when the iLS music is filtered to frequencies where the audiogram indicates more hearing loss. While age related hearing loss is typically in the higher frequencies, congenital and medical syndrome hearing loss may be anywhere on the auditory spectrum.

BAHA Devices

BAHA devices should be removed while wearing headphones. Please see iLS' general reference guide for using iLS with Cochlear Implants and other hearing devices.

Cochlear Devices

iLS recommends those with cochlear implants wear the headphones over the ear, rather than plug into the device, though the ear cup is placed slightly further back than usual so the ear cup is centered over the receiver of the cochlear implant. Bone conduction is set using the same criteria as for a client with normal hearing. Clients with cochlear implants should be watched carefully for overstimulation with both air and bone conduction. (Signs of overstimulation are the same as hearing typical clients.) Their auditory spectrum is "mapped" artificially for language (not music) via their cochlear implant, so we cannot be entirely certain of the intensity and range of stimulation we deliver with iLS programs. Please see iLS' general reference guide for using iLS with Cochlear Implants and other hearing devices.

Tinnitus

Tinnitus is by nature both variable and complex. Tinnitus of long standing and characterized by persistent high-pitched ringing does not generally respond to iLS. (Some clients with recent onset of less than two years' duration, where the ringing is intermittent and characterized by variable pitch and volume, have found some improvement.)

Bipolar Disorder

iLS is **not** helpful for the symptoms of Bipolar Disorder. However, many learning, attention and behavioral problems co-exist with a diagnosis of Bipolar Disorder. In these cases, only the Calming Program and/or Sensory & Motor Program should be used, as *it is contra-indicated to use high-frequency filtration with this condition*. iLS recommends reviewing the archived webinar¹¹ on using iLS with this condition. For further guidance, complete a Supervision Request Form to be reviewed by iLS' Clinical Director.

Seizure Disorder¹²

iLS is **not** a treatment for Seizure Disorders. As above, many learning, attention and behavioral problems co-exist with a diagnosis of seizures. There are also many different kinds of seizure disorders. Please review the archived webinar¹³ on using iLS with this condition. For further guidance, complete a Supervision Request Form to be reviewed by iLS' Clinical Director after the following conditions are met

¹¹ Webinars may be downloaded at no charge via the iLS Store. <https://store.integratedlistening.com>

¹² It is very important to make certain that the headphones are functioning properly to verify that input to both ears is equal.

1) the client is currently seizure free, 2) the client has been seizure free for one – two years on medication, and 3) the overseeing neurologist has given approval for iLs.

Co-existing Medical Conditions

Experience with certain co-existing medical conditions has shown that iLs programs will NOT help with symptoms of Alzheimer's, dementia, Tourette's Syndrome, OCD, Schizophrenia or nerve-related hearing loss. You may be able to help with the learning and attention difficulties that frequently accompany these diagnoses.

iLs is an Educational Tool

Make sure to communicate that iLs is an educational tool. It is important to let your clients know that while the vast majority of users benefit from iLs programs, iLs makes no claims of cures or guarantees of any kind. iLs systems are not medical aids or devices.

Appendix I. Headphones & System Storage

Store your systems neatly with the headphone cables coiled, but not twisted.



FIGURE 13: TANGLED SYSTEMS



FIGURE 14: NICELY STORED SYSTEMS

AIR/BONE CONDUCTION HEADPHONES

A bone conductor is a transducer that converts one form of energy to another. In this case, the properties of sound energy are converted to vibration. (Link to Bone Conduction Settings on page 16.) The bone conductor is inserted inside the top of the headband and is powered by the iLs amplifier.

TESTING HEADPHONE FUNCTIONALITY

It is very important to check headphone functionality *before each client session*. iLs has two short tests to make checking headphone function quick and simple.

The first, called the AC Test, is used to check air conduction functionality. On the iPod, select Playlists > Headphone Test > AC Test. There are two tracks, Left and Right Ear Tests, that send music to one ear only enabling you to check each side independently. Turn the amplifier on, the bone conduction volume to '0' and the air conduction volume to a comfortable level. Music should be heard in only one ear at a time.

The second, called the BC Test, is used to check bone conduction functionality. On the iPod, select Playlists > Headphone Test > BC Test. With the amplifier on, and the air conduction volume as low as possible, turn the bone conduction volume up to 1.0. Placing the bone conductor next to the ear, the sound should be audible. Next, try holding the bone conductor between thumb and forefinger, squeezing gently. Some people are able to feel the vibration.

Check cable connections if there is a problem. Otherwise, refer to the User Guide. For further assistance, contact the iLs Service Department at 303-399-4183.

Appendix II. Understanding Auditory Processing

This section describe some key skills related to auditory processing, their importance and what can go wrong.

The iLs Auditory Component helps develop the efficiency of the pathways that process and decode sound and language, as well as the ability to modulate the amount of incoming information. The Language Component allows for free-form interaction and includes specific exercises to allow the client to develop or improve the language skills described below.

The auditory system is extremely complex. We can only mention some of the highlights in this section. We strongly suggest you invest time researching professional literature¹⁴ and/or participate in continuing education coursework that focuses on auditory processing disorders (APD) and establish a professional relationship with an audiologist who specializes in this diagnosis if your expertise does not include prior knowledge or experience in working with APD.

A. Auditory Processing Problems

1. Discrimination (recognizing and distinguishing subtle, yet distinct, differences in sounds and words when listening to auditory information)
 - a. Auditory discrimination refers to the brain’s ability to recognize sounds as being distinctly different from one another. Once these differences are recognized, they become neurologically “grouped” according to salient features. Without the ability to recognize differences in sounds, individuals would have difficulty developing, understanding and using language.
 - b. Auditory discrimination is an essential skill for distinguishing between phonemes (letter sounds) that differ by subtle features. For example, the discriminatory feature between /p/ and /b/ is the voicing (i.e. both sounds are made in the same place/manner but the voice is “turned on” for the /b/ and not for the /p/). If a person were only lip-reading, the context of the sentence would be essential for identifying the sound/word in the absence of functional auditory discrimination skills. Therefore, auditory discrimination plays a key role in processing sounds and language.
 - c. When individuals struggle with differentiating sounds such as /p/ and /b/, /t/ and /d/, /s/ and /z/, or (sh) and (ch), these individuals are at a disadvantage in reading, spelling, and writing as well as with overall functional communication.
2. Phonemic Decoding (describes one’s ability to break down words into phonemes/sounds and requires an individual to be able to manipulate sounds in words without a visual cue when addressed as an auditory processing skill)
 - a. Decoding builds on subtle differences in phonemes while listening.

¹⁴ Minson, RB; Pointer, AW – “Integrated Listening Systems: A Multisensory Approach to Auditory Processing Disorders”, Multimodal Interventions for CAPD, Chapter 29, Auditory Processing Disorders, Geffner & Swain, 2013

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- b. This auditory processing skill requires one to hold a word in his/her memory while assigning the linguistic element of meaning. It is then the process of breaking down the word into its phonemic parts and then blending the phonemes/sounds together again to form the whole. (For example: bat [presented auditorily] is broken down into each individual sound within one's working memory as b – a – t).
- 3. Prosody (refers to rate, rhythm, and intonations of speech)
 - a. Prosody may reflect the emotional state of the speaker, may clarify the type of utterance being spoken (i.e. question, statement, command/directive, or exclamation), or may be used to show sarcasm or emphasis on key points.
 - b. An individual must be able to detect the difference in vocal inflections and pitch changes in order to auditorily process the prosodic features of speech.
 - c. In addition to the semantics of a message, the ability to differentiate the prosodic changes in speech is critical to the meaning of what is being spoken.
 - d. Poor pitch perception (difficulty distinguishing changes or variations in tone that can negatively impact musicality, social interactions, and understanding of speech/communication) and auditory processing of the prosodic features may result in misunderstandings of communication intent (i.e. whether someone is angry or joking).
- 4. Sequencing (requires one to combine phonemes to form words, words to form phrases and sentences, and sentences to form paragraphs or stories).
 - a. Auditory sequencing is often known as auditory blending when this task is performed at the word level. For example: b – a – t when presented one sound at a time can then be blended, or sequenced, to form the word *bat*.
 - b. If an individual has difficulty with this task, the child or adult will often process the word in error. For example, *desk* might become *deks* if an individual is having difficulty with this auditory processing skill. These types of errors often change the entire semantic meaning of the sentence.
 - c. Letter reversals are often due to an auditory processing problem in this area as opposed to a visual one.
- 5. Memory (involves various types of auditory memory including one's immediate recall and exact recall of information, delayed recall of information with or without distractors, and working memory which requires an individual to manipulate the information to achieve a task)
 - a. Often children and adults are working so hard at decoding, sequencing, or even discriminating auditory information that auditory memory is impaired; and the individual cannot remember the groupings of numbers, words, or other information with enough success to complete a task.
 - b. Reading comprehension relies heavily on good auditory memory when one suffers from poor decoding skills.
 - c. Often when auditory comprehension weaknesses are present, too few words are held in an individual's short-term memory to be successful with completing the comprehension task.
 - d. If chunks of information are "lost," retrieval of information is then also compromised.

6. Dichotic Listening (refers to the ability to process/understand different information being presented in both ears simultaneously).
 - a. When the ears can coordinate their function and information presented, auditory processing skills are enhanced and become more functional.
 - b. An example of this skill from a functional standpoint is when two conversations are occurring at the same time and an individual is able to process information from both conversations. This skill is essential when one is in a group setting.
 - c. Effective dichotic listening also measures how well the two hemispheres share information and how well integrated they are.
7. Speed (refers to the ability to process information in a timely manner and then utilize that information efficiently and effectively to complete tasks).
 - a. The speed of processing auditory information is critical to successful listening, reading, and auditory comprehension.
 - b. If the speed of processing is slow, the individual has difficulty keeping up with the rate at which auditory information is being received.
8. Competing Acoustic Signals, also known as Auditory Figure Ground (refers to one's ability to process information in the presence of background noise)
 - a. Functional examples of auditory figure ground tasks include "restaurant talk" or "cafeteria talk." When an individual is successful with auditory figure ground activities, he or she can process information spoken in a noisy restaurant or cafeteria.
 - b. The most difficult times are when the noise level is significantly greater than the speaker's loudness level.
 - c. Adults often experience difficulty in noisy environments where the sound is reflected off hard surfaces and is amplified such that the volume level is overwhelming. Children with auditory processing weaknesses experience similar difficulties in cafeterias, in hallways when classes are changing and classroom doors are open, or on the playground.
9. Degraded Acoustic Signals, also known as Filtered Words (is often perceived as "muffled speech")
 - a. A functional example of this occurs when a teacher or speaker turns away from the class or audience to write on a white/black board. The perceived quality of sound is "muffled" or at a softer intensity although the speaker's intensity of speech is actually the same. The changes occur as the sound signal is reflected off the object (i.e. chalkboard) and then back to the audience which results in the need to "fill in" missing gaps of acoustical information.
 - b. Language differences or hearing loss are other common reasons for degraded acoustic signals.

Appendix III. Practitioner Support

SUPERVISION

For questions related to a specific client, submit a *fully completed* Supervision Request Form. This process ensures that all the necessary information is available for review by the support staff.

For unique, complicated cases where a higher level of clinical/medical supervision is required, iLs' Clinical Director, Ron Minson, MD, is available to provide assistance. Please complete a Supervision Request Form (available in the Associate Resources through the iLs store) and schedule an appointment through the office 303-741-4544.

TECHNICAL SUPPORT

Technical Support is 'in house' and available 8:00 am to 4:30 pm Mountain Time, Mon – Fri by phone: 303-399-4183 or email: service@integratedlistening.com.

Call our Technical Support Department with any questions about connecting the system, system performance or repair. Please take special note of newsletters and postings on our Associate website for available updates.

A Return Merchandise Authorization number (RMA#) must be issued to you *in advance* by Technical Support for all returns to iLs for repairs and updates. This insures proper tracking of your system and the purpose for which it has been sent to us.

ASSOCIATE RESOURCES

Online Resources

Archived webinars are available to provide iLs Associates with additional knowledge and understanding of how to use iLs with certain conditions and with variable situations.

iLs Portal to Measure of Foundational Abilities (MFA) and Tracking

iLs has created an online clinically-based performance measure, the Measure of Foundational Abilities (MFA), identifying functioning in six key areas: coordination, sensory, social, attention/organization, language and sleep. Pre/post program results are graphed for each sub-category as well as in aggregate, for easy integration with other documentation and assessments. Program implementation may be tracked using the iLs portal, allowing all iLs Program information to be centrally located.

Continuing Education

iLs provides ongoing continuing education. This includes webinars, short courses, additional training courses and Associate Conferences. Advanced courses are available for those who have become familiar with use of the Total Focus and desire a richer understanding of the principles behind iLs and the ability to customize programs. The iLs Associate Conference is a three-day event, held every few years in

Colorado, with featured presenters, presentations on relevant topics and case studies for group discussion.

iLs in Your Community: Explaining iLs to Parents, Schools, Organizations

iLs makes available a power point presentation that may be customized for presentations to parents, schools and organizations. iLs also provides access to videos for both general informational purposes and user testimonials.

iLs in Schools

iLs offers a School Program that has programs in 30-minute sessions tailored specifically for most school schedules. Many schools have implemented iLs successfully within the school day. While before or after the regular school day is an option, it is ideal for most educators to include iLs within usual school hours. Since most schools have students five days a week, the schedule allows flexibility incorporating iLs three to five times a week.

Among the options for combining iLs within the school schedule are occupational therapy, speech therapy, special education/resource, library time, study time, art class, and writing class.

iLs in the Home

iLs highly encourages use of its systems in the home under direction of an iLs Associate. Use in the home allows the client to meet the suggested frequency and intensity to support changes in brain function and acquisition of skills.

Appendix IV. What Sets iLs Apart?

YOU, THE PRACTITIONERS

You, the practitioners using iLs in your work with care, compassion and expertise, set iLs apart. We can be successful only by providing products and training that help *you* generate great outcomes for your clients.

ILS' MULTIDISCIPLINARY TEAM OF EXPERTS

A multidisciplinary team of experts designed both the iLs programs and delivery systems. The team continually updates and refines iLs programs based on the newest science and the latest technology. Contained within iLs are decades of collective expertise in the fields of neuroscience, human development, psychology, sound and movement therapy.

ILS' MULTISENSORY TRAINING

We live, work and play in a multisensory world. Our environment demands that we, as children and adults, receive, process, and respond effectively and efficiently to all the different inputs from our environment. What may not be so obvious is that to train the nervous system for handling life's challenges, specific, simultaneous, repeated multisensory stimulation is needed. iLs combines precise movement, visual, auditory and vestibular exercises with cognitive activities. This methodology is truly multisensory training. All of the programs follow a natural developmental sequence based on the principles of neuroscience.

THE AUDITORY COMPONENT

The Auditory Component provides input to the inner ear encompassing both the auditory (hearing) system and the vestibular organ responsible for balance, coordination and orientation of the body in space. This sound input through iLs headphones replicates the natural way we hear ourselves speak through both air and bone conduction.

The input from iLs' treated music is carried through the subcortical system to the cortex. At this point the cortex may do one of several things: 1) it may store the information in memory; 2) it may share the information with other cortical areas known as association areas (connecting visual, motor and auditory processing areas for reading aloud); 3) the cortex may plan and execute an action demanded by the input.

By putting an emphasis on the organization/integration of communication of the subcortical structures of the brain, we are helping to establish a stronger foundation for higher learning. Our subcortical structures need to be in place in order for the cortical functions to work to their full potential.

THE MOVEMENT COMPONENT

The Movement Component follows a developmental framework. It applies a specific, properly sequenced combination of balance, core strengthening, visual tracking and self-regulating exercises that train the brain and nervous system to process and manage multisensory input. Many people are unable to process sensory information in an efficient manner. Like the Auditory Component, the Movement Component exercises the subcortical structures of the brain, the foundation for cognitive activity, while also activating the higher brain centers of the cortex.

THE LANGUAGE COMPONENT

The Language Component is unique to iLs. Originally designed to help clients with speech, receptive language, auditory processing, and memory for optimal communication, it has expanded beyond iLs' earlier vision for its use. A number of practitioners use iLs for the additional purpose of social engagement. Using the microphone system in a back-and-forth interview style has been very effective in engaging clients with low verbal skills to become more talkative.

Once basic language skills are established, the Language Component improves higher level language skills, such as sequencing of sounds, phonemic decoding, auditory memory, even improving voice quality and musicality.

The Language Component can be coupled with external devices, such as a CD player or tablet so that the practitioner may take advantage of existing tools used in expanding language skills.

NUTRITION FOR THE BRAIN

Our brains require oxygen, glucose and stimulation to thrive. Breathing and eating take care of the first two. iLs' combined components help with the third, nurturing the entire brain system. The combination of Auditory and Movement Components together create an elegant blend of multisensory stimulation that improves overall brain function greater than either alone.

iLs programs prepare us for the challenges of real life, training us to handle real life situations more effectively. For example, imagine the auditory filtering and attention skills that a student in a classroom needs when faced with fellow students misbehaving behind him, windows facing the playground, A/C thrumming in the background and the teacher speaking while facing the board and writing at the same time.

Imagine the challenges faced when walking down the street with a friend, attempting to converse while traffic speeds by, other pedestrians hurry by, and a curb and crosswalk loom ahead.

Daily life, particularly successful performance in a learning environment such as school, requires a lot from us: sensory processing, cognitive processing, receptive and expressive language, and the emotional balance to assess a situation and respond appropriately. iLs trains all these functional skills.

ILS MUSIC

iLs music is based on criteria established by iLs and tested through years of application. The music is carefully selected based on the three fundamental elements: melody, harmony and rhythm. Each piece of music is further selected for its dynamic range, the quality of technical recording production, as well as musicianship and the presence of sufficient frequency range to accomplish listening goals.

iLs selects music that includes a variety of instruments. String instruments are rich in overtones and harmonics that reach into the highest frequencies of human perception. Tympani, brass and woodwinds provide depth, add richness to the compositions and complement the frequencies of the string instruments. Symphonic pieces, with their diversity of musical instruments, provide abundant musical content to stimulate and challenge one's brain.

The result is musical content, rich in dynamic range as well as breadth of frequencies, that enables iLs to provide unique programs that support the therapeutic and cognitive goals of the user.

ILS COMPLEMENTS OTHER PROGRAMS

The iLs Program is designed to complement other interventions and academic/reading programs, improving the results that would otherwise be obtained. The Auditory Component is constructed so that it may be used for just a few minutes (infant/child with tactile sensitivity) or for a full hour by a client to optimize performance outcomes. Further, the Movement Component is easily adapted to accommodate all levels of coordination and motor function.

QUALITY EQUIPMENT

Great care and attention is paid to each piece of iLs equipment we manufacture. Our backgrounds in clinical settings informed us of the need for reliable equipment that is not only portable, but also very durable, holding up to rugged use. The current equipment has been refined over many years and is designed for ease of use in clinic, school and home.

ILS TRAINERS

iLs is fortunate to have a cadre of trainers very experienced in using iLs in their own practices and school rooms. They are a skillful group of professionals whose enthusiasm and desire to teach is born out of the positive and remarkable improvements they have seen personally with their own students and clients.

SUPPORT

iLs clinical and equipment support is available by phone or email Monday through Friday during business hours. Our staff is trained to address questions from clinicians, educators and parents. iLs Clinical Director, Ron Minson, MD is available by appointment for advanced cases requiring medical expertise. iLs production is in Colorado, so equipment repair and replacement are typically completed within a few business days.

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Appendix V. iLs Research & Supporting Data

The following list is comprised of iLs-specific studies conducted by third party researchers, clinicians and educators. Please visit www.integratedlistening.com/research to read and download the complete studies.

An Investigation to Evaluate the Benefits of the Integrated Listening Systems in Primary/Early Elementary Classrooms (Kindergarten-Third Grade): The Case of Valley View Academy in Northern California, Jeannie Dubitsky, Ed. D., University of California, Davis, 2014

Abstract: Ten students were chosen for the case study to compare pre and post test scores, survey results and interview data. Results showed similarities and differences among the students regarding physical, academic, social and emotional development after the intervention. Students showed improvement in all areas evaluated after experiencing the iLs program.

University-based Controlled Study Regarding Literacy: J. Anne Calhoun, Ph. D. Educational Psychology, College of Education, University of New Mexico

Abstract: A controlled study involving 64 K-2 at risk students was conducted by U of New Mexico researcher Anne Calhoun, Ph.D. Students participated in the Alpha Program,* a program combining iLs with art therapy (see following page for details). The average improvement in reading over the 3-month intervention was 2 years. *“Taken as a whole, this analysis indicates that the students in the experimental group have improved in all categories associated with reading. This improved achievement is significantly greater (more meaningful) than the improvements of the control group peers. Overall the picture presented of the students in ALPHA is one that shows immense growth in cognitive, academic, and psychological areas.”* J. Anne Calhoun, Ph. D.

Measuring the Effect of the iLs Dreampad with Ten Veterans Diagnosed with Post-Traumatic Stress Disorder (PTSD) , Jan C. Nelson, OTR, MA

Abstract: Study conducted with 10 veterans suffering from PTSD. Each participant recorded their sleep habits and pain symptoms for two weeks prior to using the Dreampad and two weeks while using the Dreampad. Their journals included usage, sleep habits and other comments. Study participants were interviewed after initial Dreampad use and again three months later. All participants saw significant sleep changes after use of the Dreampad.

iLs Home Program Autism Study, Theresa May Benson, PhD, OTR/L

Abstract: Study on the effect of the iLs home program on 18 children diagnosed with autism. The purpose of this multi-site intervention study was to examine the effectiveness of the iLs Focus home program with children 4 to 8 years of age with Autism Spectrum Disorder (ASD). This mixed-methods study (single-case series with pre/post-testing) of 18 children with ASD supported outcome findings of a previous iLs practitioner survey on the perceived effectiveness of the iLs program.

Results found significant gains across multiple subjective and objective outcome measures in areas of:

- social skills and emotional regulation
- quantity and quality of atypical and problem behaviors including behavior during treatment
- number and severity of autistic behaviors; and overall functional adaptive behavior skills

- visual, fine and gross motor skills including body functions and motor planning
- auditory listening skills

Overall, results demonstrated that the effects of the iLs program were significant, of generally large magnitude, easily observable, and sustained throughout the post-intervention baseline. The iLs home program was thus supported as an effective intervention for improving multiple areas of functioning in children with autism spectrum disorder.

Sensory Processing Disorder Foundation (SPDF) Arousal Study, Lucy Jane Miller, PhD, OTR/L and Sarah Schoen, PhD, OTR/L, currently pending publication

Summary: The primary aim of this study was to examine the effects of the iLs Focus program on arousal, auditory processing, adaptive behavior and functional skills in children with Sensory Processing Disorder. The study investigates the immediate and short term gains achieved with the iLs program. We hypothesized that children with auditory over-responsivity and auditory under-responsivity would show *in situ* and laboratory changes in physiological arousal (as measured by electrodermal activity) following the iLs program. Additionally we expected to see improvements in an individualized family goal, the efficiency of auditory processing, adaptive behavior and functioning. A multiple baseline repeated measures single-case study design was employed.

Survey of iLs Professionals Using iLs with Autism, Spiral Foundation, Boston, MA

Summary: Survey reviewing therapists' experience using iLs with over 1300 children on the autism spectrum; results are in 24 outcome categories

Auditory Processing Disorder, Julia Harper, PhD, OTR/L and Aimee Levine Weiner, Aud; published in Advance OT Magazine

Abstract: Therapeeds, a private clinic in Ft. Lauderdale, Florida, reports the results of 29 children diagnosed with APD who completed the Therapeeds' H.O.P.E. Sensory & Motor Program combined with iLs' receptive and expressive programs. The iLs equipment used was a combination of the iLs Pro, Focus and Expressive Language Program. Among the pre- and post-program tests are the following:

Vestibular: Pre-testing indicated 0 of the 29 children had intact vestibular processing skills measured by the PrN and functional skills. Post-testing showed all 29 in normal range.

Ocular Motor: Pre-testing showed that 28 of the 29 demonstrated ocular-motor deficits in the areas of visual pursuits, saccades and convergence/divergence skills. Post-intervention, 25 of the 29 demonstrated intact ocular motor skills.

All Auditory Processing Skills: Post-intervention, 22 of the 29 children had auditory processing skills that were completely within normal limits *in every area*.

Medications: Seven of 29 children began this therapy on medication for attention-related concerns. By the end of the program, the medications for all 7 had all been discontinued.

ABR Binaural Summation: Pre-intervention ABR tests showed all 29 children had little difference between listening with one ear and listening with both ears (binaural summation). Post-intervention, all 29 tested in the normal range.

A Sleep Intervention for Children with Autism: A Pilot Study, Sarah Schoen, PhD, OTR, Assistant Research Director, SPD Foundation

Abstract: This study examined the immediate, short-term effects of Integrated Listening Systems' (iLS) Dreampad on the sleep behaviors of children with Autism Spectrum Disorder (ASD). In addition, this study examined the effects of changes in sleep patterns on parent and family measures of stress and quality of life.

iLS Dreampad Heart Rate Variability (HRV) Study, Kelly L. Olson, Ph.D., Director, Clinical Research and Development, SleepImage

Abstract: This study measures the effect of the Dreampad on the parasympathetic nervous system.

School Pilot Study, Denver Area School Pilot Study, 2009

Abstract: A variety of normed, standardized tests were used to assess 20 children with learning difficulties before and after iLS programs. The report includes each child's pre- and post-program test scores as well as teacher and parent comments. Teachers involved in the program reported "significant improvement" in 19 of the 20 children. The criteria of "significant improvement" includes at least one of the following: being transitioned from special education to regular education, having an IEP removed or overcoming a substantial emotional/behavioral challenge to successful classroom performance.

HISTORICAL RESEARCH ON MUSIC, MOVEMENT & LEARNING

The following research studies do not specifically measure iLS as an intervention; rather, they are supportive of the general iLS methodology integrating music, movement and language to improve brain function. Studies are listed per the categories of Music and Motor (including cerebellum, vestibular and movement/exercise research)-related.

The Neurochemistry of Music, Mona Lisa Chanda, Daniel J. Levitin, Trends in Cognitive Sciences, Volume 17, Issue 4, 179-193, 1 April 2013

Abstract: Music is used to regulate mood and arousal in everyday life and to promote physical and psychological health and well-being in clinical settings. This meta-analysis evaluates the evidence that music improves health and well-being through the engagement of neurochemical systems for (i) reward, motivation, and pleasure; (ii) stress and arousal; (iii) immunity; and (iv) social affiliation.

Music and Pleasure Motivation, V. Menon and D.J. Levitin, 2005

Importance: shows fMRI images of subjects listening to classical music demonstrate that music evokes responses in areas of the brain involved in positive reward, motivation, sleep, mood, attention and learning.

Measuring Musical Timing Skills. Overy, K., Nicolson, R.I., Fawcett, A.J., Clarke, E.F., 2003. Dyslexia 9, 18-36

Importance: Study connecting dyslexia with timing challenges

From Timing Deficits to Musical Intervention Overy, K., 2003. Ann. Ny Acad. Sci. 999, 497-505

Importance: Study finds that classroom music lessons had a positive effect on both phonologic and spelling skills, but not reading skills, among dyslexic children

Music & Fatigue, Jing L, Xudong W.; J Sports Med Phys Fitness. 2008 Mar; 48(1):102-6

Importance: Study on 30 college students in which music significantly reduce exercise-induced fatigue.

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“Conclusion: The results suggest that relaxing music has significantly positive effects on the rehabilitation of cardiovascular, central, musculoskeletal and psychological fatigue and the promotion of the regulatory capability of the kidneys.”

Music & Visual Recognition, Pavlygina RA, Frolov MV, Davydov VI, Milovanova GB, Sulimov AV.; Neurosci Behav Physiol. 1999 Neuroscience of Behavior and Physiology, Mar-Apr;29(2):197-204

Recognition of visual images in a rich sensory environment: musical accompaniment. Importance: According to a report in the journal Neuroscience of Behavior and Physiology, a person's ability to recognize visual images, including letters and numbers, is faster when either rock or classical music is playing in the background

Music & Insomni, Lai HL, Good M.; J Adv Nurs. 2005 Feb, 49(3):234-44

Importance: Randomized, controlled study on 60 adults aged 60-83 with difficulty sleeping. Listening to 45-minutes of music before bed resulted in significantly better sleep quality in the experimental group, as well as significantly better programs of sleep quality: better perceived sleep quality, longer sleep duration, greater sleep efficiency, shorter sleep latency, less sleep disturbance and less daytime dysfunction. Sleep improved weekly, indicating a cumulative dose effect.

Music & Reduced Stres, Labbé E, Schmidt N, Babin J, Pharr M.; Appl Psychophysiol Biofeedback. 2007 Dec; 32(3-4):163-8. Coping with stress: the effectiveness of different types of music

Importance: Results indicate listening to self-select or classical music, after exposure to a stressor, significantly reduces negative emotional states and physiological arousal.

The influence of Mozart's music on brain activity in the process of learning, Jausovec N, Jausovec K, Gerlic I., Clin Neurophysiol. 2006 Dec; 117(12):2703-14

Importance: Controlled study involving 56 individuals concludes that Mozart's music, by activating task-relevant brain areas, enhances the learning of spatio-temporal rotation tasks.

Music & Spatial Temporal Reasoning, Sarnthein J, vonStein A, Rappelsberger P, Petsche H, Rauscher FH, Shaw GL, Neurol Res. 1997 Apr;19(2):107-16. Persistent patterns of brain activity: an EEG coherence study of the positive effect of music on spatial-temporal reasoning

Importance EEG showing the spatial-temporal area of the brain looking at reasoning while patients are listening to music.

Music Training & Mathematical Ability, Schmithorst VJ, Holland SK., Neurosci Lett. 2004 Jan 16;354(3):193-6. The effect of musical training on the neural correlates of math processing: a functional magnetic resonance imaging study in humans

Importance: fMRI imaging leads to hypothesis that the correlation between musical training and math proficiency may be associated with improved working memory performance and an increased abstract representation of numerical quantities.

Music & Spatial-Temporal Reasoning, Rauscher FH, Shaw GL, Levine LJ, Wright EL, Dennis WR, Newcomb RL, Neurol Res. 1997 Feb;19(1):2-8. Music training causes long-term enhancement of preschool children's spatial-temporal reasoning

Importance: Controlled study involving 78 schoolchildren; suggests that music training produces long-term modifications in underlying neural circuitry in regions not primarily concerned with music, such as mathematics and science, which draw heavily upon spatial-temporal reasoning.

Motor Development And Motor Resonance Difficulties, Autism Frontiers in Integrative Neuroscience, 24 April 2013, Joseph P. McCleery*, Natasha A. Elliott, Dimitrios S. Sampanis and Chrysi A. Stefanidou

Summary: Research suggests that a sub-set of children with autism experience notable difficulties and delays in motor skills development, and that a large percentage of children with autism experience deficits in motor resonance. These motor-related deficiencies, which evidence suggests are present from a very early age, are likely to negatively affect social-communicative and language development in this population. Here, we review evidence for delayed, impaired, and atypical motor development in infants and children with autism. New studies involving a focus on motor skills alongside speech and language intervention are showing promising preliminary results.

Brain Stem Dysfunction & Autism, Ornitz EM, Atwell CW, Kaplan AR, Westlake JR.; 1985, Arch Gen Psychiatry, Oct:42(10):1018-25; Brain-stem dysfunction in autism. Results of vestibular stimulation

Importance: brain stem dysfunction in autistic children shown using a vestibular test

Dyslexia & Automization of Skills, Nicolson RI, Fawcett AJ., 1990, Cognition, May; 35(2):159-82. Automaticity: a new framework for dyslexia research?

Importance: Authors Nicolson and Fawcett suggest dyslexics' deficits in both balance and reading tasks may be symptoms of a more general learning deficit – the failure to fully automatize skills.

Cerebellum & Attention, Akshoomoff, N.A., Courchesne, E., Journal Cog Neuroscience, Fall 1994, Vol. 6, No.4, pp 388-399; ERP Evidence for a Shifting Attention Deficit in Patients with Damage to the Cerebellum

Importance: study shows connection between cerebellum and ability to shift attention between visual and auditory stimuli.

Cerebellum, Attention & Autism, Courchesne, E., Townsend, J., Akshoomoff, N.A., Saitoh, O., et.al; 1994, Vol. 108 Behavioral Neuroscience; Impairment in Shifting Attention in Autistic and Cerebellar Patients

Importance: cerebellum is involved in rapid attention shifts; cerebellar maldevelopment in autistic children may account for inability to shift attention

Cerebellum & Cognition, Aakshamoof, N.A., Courchesne, E., Townsend, J., 1997, Int'l Review of Neurobio, Vol 41, pp 575-584a, 585-598

Importance: This study presents neurobehavioral, neurophysiological, and neuroimaging data to support the hypothesis that the cerebellum plays a role in attentional functions; discusses the idea that the cerebellum is a "master computational system that anticipates and adjusts responsiveness in a variety of brain systems (e.g., sensory, attention, memory, language, affect) to efficiently achieve goals determined by cerebral and other subcortical systems."

Cerebellum Coordinates Eye & Hand Tracking, R. C. Miall, R. C., Reckess, G. Z., Imamizu, H., 2001 Nature Publishing Group

Brief: These data provide the most direct evidence from fMRI imaging that the cerebellum supports motor coordination. Its activity is consistent with roles in coordinating and learning to coordinate eye and hand movement.

Motor Control & Dyslexia Ramus, F., Pidgeon, E., Frith, U. (2002); Inst. Of Cognitive Neuro; The relationship between motor control and phonology in dyslexic children

Importance: Scientists find correlation between coexistence of motor problems and dyslexia; however, they believe the relationship is do not necessarily causal.

Dyslexia & Cerebellum Size, Eckert, M.A., Leonard, C.M., Richards, T.L., Aylward E.H., Thomson, J. and Berninger, V.W. , 2003, Brain, Vol. 126, No. 2, 482-494; Anatomical correlates of dyslexia: frontal and cerebellar findings

Importance: Controlled study showing neuroanatomical differences among dyslexics. The dyslexics exhibited significantly smaller right anterior lobes of the cerebellum, pars triangularis bilaterally, and brain volume.

Cerebellum & Auditory Processing, Petacchi, A., Laird, A. R., Fox, P. T. and Bower, J. M. (2005), Human Brain Mapping, 25: 118–128. Cerebellum and auditory function: An ALE meta-analysis of functional neuroimaging studies

Brief: meta-analysis of 15 different auditory studies selected through PET and fMRI literature; results are consistent with the hypothesis that the cerebellum may play a role in sensory auditory processing

Appendix VI. Additional Resources

Bellis, PhD, Teri James, *When the Brain Can't Hear: Unraveling the Mystery of Auditory Processing Disorder*, 2002

Bluestone, Judith, *The Fabric of Autism: Weaving the Threads into a Cogent Theory*, 2005

Buckendorf, PhD. CCC-SLP, R., *Autism: A Guide for Educators, Clinicians, and Parents*, 2008

Buron, Kari Dunn & Wolfberg, PhD, Pamela, *Learners on the autism spectrum: Preparing highly qualified educators*, 2008

Doidge, MD, Norman, *The Brain That Changes Itself*, 2007

Doidge, MD, Norman, *The Brain's Way of Healing*, 2015

Geffner, D & Swain, D, *Auditory Processing Disorders*, 2013

Geffner, D & Swain, D, *Auditory Processing Disorders*, 2013, Minson, RB; Pointer, AW – “Integrated Listening Systems: A Multisensory Approach to Auditory Processing Disorders”, *Multimodal Interventions for CAPD*, Chapter 29

Goddard-Blythe, Sally, *Attention, Balance and Coordination: The A.B.C. of Learning Success*, 2009

Grandin, Temple, *The Way I See It: A Personal Look at Autism and Asperger's*, 2008

Hannaford, PhD, Carla, *Smart Moves: Why Learning Is Not All in Your Head*, rev 2007

LeDoux, Joseph, *The Synaptic Self: How Our Brains Become Who We Are*, 2002

Leeds, Joshua, *The Power of Sound: How to Be Healthy and Productive Using Music and Sound*, 2010 (newest edition)

Madaule, Paul, *When Listening Comes Alive: A Guide to Effective Learning and Communication*, 1994

Miller, PhD. Lucy Jane, Fuller, Doris, *Sensational Kids: Hope and Help for Kids with Sensory Processing Disorder*, 2007

Pert, Candace, *Molecules Of Emotion: The Science Behind Mind-Body Medicine*, 1999

Pica, R., *Experiences in Movement, Birth to Age 8*, 2004

Ratey, MD, John, *A User's Guide to the Human Brain*, 2002

Ratey, MD, John, *SPARK: The Revolutionary New Science of Exercise and the Brain*, 2008

Schwartz, MD, J., Begley, S, *The Mind & the Brain: Neuroplasticity & the Power of Mental Force*, 2002

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Summerford, Cathie, Action Packed Classrooms, Using Movement to Educate and Invigorate Learners, 2000

Tomatis, A.A., The Ear and Language, published 1963, (Trans English orig 1978), 1997

Tomatis, A.A., The Ear and The Voice, 1999

Miscellaneous:

Nash-Wortham, Mary, Hunt, Jean, Take Time, (Bean Bag activities, age 8+)

Smith, Nell, The Breathing Circle -Learning through the movement of the natural breath (great activities for early years)

McAllen, Audrey, The Listening Ear (great resource for speech and child development; may be helpful with the VoicePro)

Videos:

Lavoie, Richard, How Difficult Can This Be? The F.A.T. City Workshop: Understanding Learning Disabilities, DVD Format

Lavoie, Richard, Last One Picked . . . First One Picked On: Learning Disabilities and Social Skills, DVD Format

Lavoie, Richard, Beyond F.A.T. City: A Look Back, A Look Ahead, DVD Format