CONTINUING EDUCATION
for Occupational Therapists

FROM SENSORY PROCESSING TO EXECUTIVE FUNCTIONING

PDH Academy Course #OT-1702 | 3 CE HOURS

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Course Abstract

This course examines the intricate processes that precede the ability to obtain the occupational function of becoming a school student. It first reviews the developmental hierarchy and executive functioning skills, and then provides an overview of relevant assessment and intervention tools.

Target audience: Occupational Therapists, Occupational Therapy Assistants (no prerequisites).

NOTE: Links provided within the course material are for informational purposes only. No endorsement of processes or products is intended or implied.

Learning Objectives

By the end of this course, learners will be able to:

- ❏ Identify elements of the developmental hierarchy
- ❏ Recognize the different skills that make up executive functioning
- ❏ Recall assessments, interventions, and accommodative strategies relevant to the developmental hierarchy and executive functioning

Timed Topic Outline

I. The Developmental Hierarchy (45 minutes)
Regulation/Modulation/Inhibition; Motor Skill Development; Bilateral Integration/Laterality/Directionality

II. Executive Functioning Skills (60 minutes)
The Ability to Plan; The Ability to Use Attention; The Ability to Deal with Frustration

III. Assessment and Intervention (60 minutes)
Assessment; Intervention; Accommodative Strategies

IV. Conclusion, Additional Resources, References, and Exam (15 minutes)

Delivery & Instructional Method

Distance Learning – Independent. Correspondence/internet text-based self-study, including a provider-graded multiple choice final exam. *To earn continuing education credit for this course, you must achieve a passing score of 80% on the final exam.*

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Course Author Bio & Disclosure

Maude Le Roux, OTR/L, SIPT, RCTC, DIR® Certificate, Clinical Director at A Total Approach, is an accomplished occupational therapist with great affinity for learning and understanding the human brain.

She was born and raised in South Africa, and graduated from the University of Stellenbosch in Cape Town in 1984. Maude married Charl Le Roux in 1986 and moved to the USA in 1993. Together, they opened A Total Approach in September 2001. Maude is SIPT certified and specializes in Sensory Integration services as it applies to functional activities of daily living, including improving the ability of any child to partake in his/her learning environment. She also holds a certificate in DIR®/Floortime™, and is a certified Tomatis Consultant.

Maude has presented her Tomatis work in Dublin, Greece, France and Panama. Maude is an international trainer in Tomatis Sound Therapy,DIR/Floortime through ICDL, Interactive Metronome, Cellfield Reading Intervention, as well as for the courses she had developed herself. She has participated in multiple national and international speaking engagements with regards to the field of sensory integration, Autism and Attachment. Maude serves on the board for ATTACh. She has published two books, The Listening Journey for Children and Our Greatest Allies, available through www.amazon.com.

DISCLOSURES: Financial – Maude Le Roux received a stipend as the author of this course. Nonfinancial – No relevant nonfinancial relationship exists.

Overview

Children develop into becoming students; they do not simply gain the skill only through cognitive thinking.

There is a certain hierarchy of development that precedes the ability to obtain the occupational function of becoming a school student – but in today's world, where the primary child-centered focus is on "product," the development of "process" is undervalued, and the depth of this development is misunderstood. Of course we want to be able to intervene based on what we observe, but so much of what we see hinges upon the capabilities underneath what we can see. When a child appears to be unable to pay attention in a classroom, for example, we can certainly consider an attention deficit disorder. But what if the child does not have reflex integration, or postural control, or the ability to look at and listen to the teacher at the same time?

How can we understand the whole picture, in order to know where to intervene at the right time?

This course will take you on a journey of development, from utero through executive functioning (including its implications on reading, math, and acquiring skill in written expression).

First, we will visit the developmental hierarchy. Typically developing children have an innate drive to want to develop and learn hard wired in the brain, and will lead the way in gaining the necessary steps in a certain developmental trajectory. We do not have to tell a typically developing child to now start walking, to start talking, we simply exclaim in joy when they reach out for these "firsts" in their lives. But our atypically developing children's innate drive is strongly influenced by the over-activation of the Amygdala in the brain, sending them into "fight, flight or freeze" in search of protection. These children

shy away from the very learning experiences that will help them to achieve the necessary building blocks; they want to avoid the new and novel.

It is at this juncture that we become therapists: we have to facilitate the environment, relationship, and therapeutic activities in such a way that the child will find it safe to move forward again. We have to learn to dance with the child – carefully negotiating a love towards the world and nurturing development through scaffolding – to allow the child to gain the successes that encourage him or her to keep moving forward. (If the hierarchy of typical development is good enough for the typically developing child, it is going to be good enough for the atypically developing child.)

We will also look at each executive function capability, and consider the influence of play and emotional development, as they both are extraordinary compliments to the executive process. We need these executive functions to be able to be a school student, to be able to learn, and to be taught by the schoolteacher. But we are not taught executive skill; we develop it. It is based on finite neurology in the brain that is pruned through our early development through the process of registration of information, using processing speed, and being able to adapt to different stimuli. Thus, we will refer each executive function back to the developmental hierarchy, in order to gain understanding of the origin of the difficulty and so influence the targeted goal intervention plan.

To take a specific example, we cannot teach a child to become organized; at best, we can teach accommodation to an area of weakness. If we want to change the function, we have to intervene at the appropriate level at the right time to repair the missing building blocks as much as we can. We always frame it for our parents with a little humor: think of a child's foundation of development as Swiss cheese, with a number of holes, some bigger than others. We want to fill these gaps as much as we can in order to gain some sharp cheddar! In other words, we want the child to be able to access the intelligence he has available to him or her, not for it to be veiled under layers of avoidance behavior.

Finally, we will discuss assessment and intervention tools that help us negotiate this world of development. Consider that cognitive skill is different from developmental skill. We may know for certain that a child understands what behavior is expected of him or her, yet the child often behaves differently. It is easy to become confused: we see similar behaviors over and over and it feels like we have to apply the same learning again and again, yet we are faced with the fact that, in a quiet moment, with the right amount of language, this child is able to understand the expectation. Such children are frequently described as being manipulative, controlling, or rigid, but the truth is that the developmental brain is taking over, not allowing the cognitive brain to have access to the logic required. What we cannot see, when we look only at a child's behavior, is that the child is responding to a more primitive part of his brain that is "in the moment" and has no access to future or reflective thinking to negotiate the outcome of his behavior.

It is very important that we are able to discuss the needs of these children eloquently with the rest of the child's team and gain support for the therapeutic process. Thus, we will include assessment guidelines based on the developmental hierarchy in a developmental pathways model, and we will also provide intervention guidelines that would assist in the clinical thinking necessary to alleviate the developmental tension between skill, executive function, and emotional responses.

My sincere hope is that you will find this information helpful: that it will support your clinical practice so you can effectively touch the lives of children, assist them to embrace learning, and help them to not see the world as a tough place to negotiate.

The Developmental Hierarchy

Regulation / Modulation / Inhibition

The baby usually feels very secure in the womb of the mother during the pregnancy process. In this cocoon, the baby receives sufficient nourishment without asking and is encased in fluids that promote feelings of safety and being protected. During this time the baby is developing rapidly into a bundle of complex nerves that will serve to assist development outside of the womb. The baby already starts creating adaptive responses in the womb and is able to follow the cadence of the mother's voice through bone conduction by means of the spinal cord. This development of bone conduction becomes very primary in developing the vestibulo-cochlear system later for both audition and movement action. The baby also develops certain primary movement patterns, also referred to as reflexes, that set up an ability to negotiate some movement by use of a stimulus situation; they are available for the important birth process as well development for the first months outside of the womb. To understand these reflexes and their implications is important, though not the focus of this course.

PERTINENT RESEARCH: See Dr. Sally Goddard, Dr. Svetlana Masgutova and Dr. Sally Goddard, as well as the work of Bloomberg & Dempsey.

This very early development in utero and during the first months after birth is crucial for setting up sensory modulation as well as emotional regulation. It creates an environment that promotes the innate drive of the infant to continue the process of development at a rapid pace. In order to be able to modulate the

registration of sensory information, the baby has to develop a balance between the sympathetic nervous system for sufficient arousal and the parasympathetic system for inhibition or calming of the body (we talk about the "just right" place of alertness, a very important function of the reticular activating system in the brain). The baby goes through cycles of sleep, wake, and feeding routines, setting up the circadic rhythms that will support the development of the reticular activating system. The synchrony achieved in feeding between mother and baby, especially the development of the suck - swallow - breathe reflex, becomes a focal point for developing good sensory modulation.

PERTINENT RESEARCH: See Patricia Oetter's M.O.R.E program.

There are different patterns of difficulty that can be assessed in sensory modulation. Gravitational insecurity involves a fear of the feet leaving the ground or having the head go backwards while supine on a ball. Sensory defensiveness is another common pattern that can involve any system, but very commonly the tactile and auditory system: we talk about systems being over or under reactive to stimulation, which depends on when sensory thresholds – with regards to the "just right" place – are being met. If the threshold is met too early, the child is over reactive in a particular system; if the thresholds are met later, the child is under responsive to stimuli. Dr. Winnie Dunn (2007) describes 4 patterns of modulation categories: Sensation Avoiding, Sensation Seeking, Registration, and Sensitivity. Most children who struggle with sensory modulation have mixed reactivity patterns in different systems. Some systems may be over reactive, others under reactive. No matter the pattern, it causes maladaptive patterns to the environment that heightens feelings of sensory insecurity in a child, causing them to not expose themselves to the experiences they need to develop and grow.

But it is not only the sensory modulation that contributes to regulation, it is also the relationship unfolding between the mother and the baby, and closely following between the baby and the father. The bond between the primary caregivers and the newborn and their interaction together sets up a co-reciprocity in infant development that allows for the continuation of feeling safe, nurtured, welcomed and interesting. The "motherese" language forms a communication between baby and mother that lights up similar patterns in the brain of both mommy and baby and sets the stage for this important work of co-regulation.

During the first months the world is one very strange entity of multi sensory influences, and the baby must learn to adapt to it all. Feelings of safety and protection promote this development. Their absence can cause symptoms of withdrawal, failure to thrive, shutting down, and fear. For Dr. Jean Ayers (1979), it is all about the adaptive response, starting in utero and continuing strongly in the first months of life: the ability to inhibit a response (a very important executive function), and not to remain in impulsive mode, hinges on this balance in the central nervous system. For Dr. Russell Barkley (2011), the control of this skill has already emerged about 5 months after birth.

You can only speak what you can hear. As the baby focuses on hearing the sounds of the parents' voices, the ears begin to receive sounds more clearly through air conduction; likewise, the gurgling sounds made by the baby in the crib allow the baby to hear the effects of his/her own voice through both air and bone conduction. This sets the stage for developing the auditory system to receive sounds of words, which typically leads to the baby's first words by about 9 months of age. All the while that this is happening, the vestibular system (compatriot to the auditory system as they share the same cranial nerve with audition – CN8) is being activated, and baby learns to push up on arms, roll over, and otherwise try to gain access to the horizontal world he/she is observing during this time. The visual system also develops rapidly after birth, first in black and white (rods in the eyes), then in color (cones in the eyes). The baby starts to understand that the eyes can see beyond what is in front of them and gradually start tracking the mother's face and from there someone else's face, then starts to venture beyond the immediate 3 feet of space around their body. It is this very essence that starts to motivate the baby in the prone position to want to move towards a visually enticing object, hence the motivation to start crawling.

The brain is complex and development is complex. These early exploration patterns set up the ability of the body to register information at a rapid pace, so the cranial nerves can take it to the rapidly developing cortex for analysis. The baby learns that certain stimuli cause specific responses in the nervous system. These responses to what the body is experiencing lay down strong memory engrams in the brain that are mostly stored in limbic memory as associations are being formed. These implicit memory patterns start to build the foundation by which the child is going to be judging future events.

Let's take a picky eater for example. It is a frequent occurrence that the team cannot figure out exactly what prolongs the situation even when texture, taste and feedback have been successfully addressed. It's important to consider that the implicit emotional memory engrams of early stimuli and responses may continue to cause involuntary responses to certain foods, and hold a tight emotional rein on the experience of new or unfamiliar foods. We have to remember that all of us today are the sum of our past experiences, and our own limbic memories frequently drive irrational behavior as they trigger somewhere in our far distant past. The developing child is no different. If the regulatory system initially experiences

the world as a frightening place to avoid, this becomes the learnt pattern of response, eventually leading to a child who experiences frequent meltdown or frustration behavior. Not only did the central nervous system not learn to regulate efficiently into a "just right" balance, but it also is a victim of the memories of past experiences.

This ability to modulate and emotionally regulate our central nervous system also sets up our body awareness: the ability to know where our body parts are so that we can use them efficiently as we keep adapting to new patterns of movement. A student learning to write needs the ability to see the fingers of his/her hand as separate entities that are part of a whole, starting from the trunk, then following through the shoulder girdle. It is only when he/she registers that innate sense of individualization of the body, and understand how the parts fits to the "whole," that he/she is able to start applying the writing utensil efficiently to the task.

The student who dysregulates at school in the face of a performance demand is not capable of reaching a "just right" response to the demand, even when he/she is able to understand the demand cognitively. Teacher feedback may suggest attention issues, but we need to dig deeper: is it truly attention, or an inability to register information in a way that is conducive to learning while being asked to work through a maladaptive response to an environmental trigger? Further, the emotional system will always be elicited: this is yet another situation that requires the limbic memory engrams to assess if, and conclude that, this is an activity to avoid in the future. This creates a future anticipation response, in that even as the activity is approached, the disorganization starts simply due to anticipating it. We have to intervene at this level, and steadily replace the memory engrams with successful ones, in order to break the patterns of the past.

Motor Skill Development

Primary movement patterns make way for homolateral, cross lateral and more complex movements that are under the babies' voluntary control as they start to crawl, creep, and eventually walk.

A very important building block to consider is postural control, and, more essentially, trunk control. We have two muscle systems in our bodies, a flexor and extensor system. If both develop well, we are stated to have good co-contraction, which enables us to access each system fluidly with even strength, as we need it. One example would be the ability to sustain upright seating in a chair in the classroom. In order to maintain the ideal 90-degree position in the larger joints, we need the coordination of these muscle systems to sustain the position effectively. If one of these systems is weaker than the other, it causes the stronger system to need to compensate for the weaker one and this causes early fatigue, awkward posturing, and also fidgeting in this seated position.

Postural control is assessed in sustained antigravity positions where the possibility of momentum is eliminated. While the child is moving, momentum can compensate for what we do not have in sustained anti-gravity positions. This is one of the reasons why it is so important to exercise the developmental milestone of crawling. Crawling is a marvelous demonstration of the ability for the prolonged exercise of holding the trunk in the co-contracted sustained antigravity position, and strongly supports the development of trunk control; it is also great for developing homolateral patterns of movement as the left side of the body reciprocates with the right side of the body.

Another crucial building block is praxis. Praxis is a very complex skill in the body with multiple layers. Essentially it is the ability of the brain to tell the body what to do, and the order to do it in, while also being timely about it.

Praxis develops because we play. It is during free play that we explore our environments, that we try out different ideas, that we contemplate new body positions in movement and space. We do this freely and unencumbered by someone else's performance demand. We problem solve, we strategize and we explore. So frequently today, play is viewed as "not as important" in comparison with gaining the pre-skills necessary for academics. But when we focus too high on the developmental continuum, we then lose the very academics we are looking for, as we do not spend sufficient time developing these building blocks in play.

The initial component is ideation, which involves having a motor idea (not to be confused with a creative cognitive idea). Think about watching a kid at play – engaged in a specific activity – who only switches to a new motor idea when he/she physically sees something else demonstrated. Such kids cannot sustain themes in their play. Observers call the behavior "distracted," but it actually is quite purposeful. These kids want to keep going, and they feel the need for a new idea, but they need support in eliciting one. Ideation is dependent upon the ability of the child to picture what is not visible and is linked to the early exploration of visual space. Being bodily aware grows into a body image that is more abstract in nature, which enables you to visualize your body in the different positions required to achieve a motor goal. Think about an athlete doing a high jump over a pole. Without having an idea of how to lift his body in the correct trajectory of movement to clear the pole, he will not be able to actually do so.

PERTINENT RESEARCH: Dr. Teresa May-Benson researched ideation in her doctoral thesis and developed a protocol for testing this important facet of praxis.

Once the child can use ideation, the focus shifts to planning the movement to be completed. This also involves the ability to have an abstract image of the body in mind, but includes the ability to understand the step sequence that is going to be necessary to complete this goal. In order to pick up the glass (motor idea), I have to assess the distance between my body and the glass (visual space), then imagine my arm going through space in just the right trajectory, then physically follow through the action in the sequential steps that is necessary. In addition to this, I have to be able to complete this movement with the right amount of grading, because if I pick the glass up too fast or too hard I might spill what is inside – my movement has to be "modulated" or "graded" to achieve the right amount of intensity for the job being done.

When the toddler takes his first step, wobbles and falls down, the body of a typically developing child has already stored some feedback with regards to what the movement felt like. This feedback system is crucial in terms of repeating the same movement and laying down an engram in the mind so that this movement can become automatic and not need to be "thought out" any longer. Returning to our registration patterns from earlier reading above: if the child is unable to register information appropriately, the feedback system is impacted, which means that, for the child's body, it feels like it is the first time an activity is taking place, even though the child is cognitively aware of having done it before. This is one of the reasons why children with praxis difficulties do not enjoy new and novel activities. They have to cognitively compensate and re-adjust their bodies, as the body is not able to automatically follow through.

That said, children with praxis difficulties can develop a "splinter skill:" they are so driven to do an activity that they work at it for a long time with much repetition, and then achieve it as a function. This is why, for example, a child with bilateral integration difficulties can achieve bicycle riding, yet still have difficulty with bilateral integration on the body. Splinter skills do not translate to other skills – they do not generalize – so that same skill cannot be used fluidly in other situations.

Let us look at when a child is expected to do handwriting. They have to isolate both sides of the hand so that the radial three fingers are positioned on the pencil, and the ulnar two fingers are supporting the hand position. The index finger is the "captain" on the top of the pencil, while the thumb is abducted in a nice C – webspace and the middle finger rests underside the pencil. A lot of intricate motor action is finely tuned to be coordinated together for good pencil skill. All of this is developed after we develop postural and trunk control and have achieved proximal joint stability in the shoulder girdle. Let us suppose that all of the musculature has developed well, and when we do fine motor testing, the student performs well.

Why then is the handwriting still so peculiar? One of the reasons is the ability to use praxis in the body. You can have the musculature, but not have an adequate pathway for the brain to tell the fingers in what step sequence to move in order to achieve all 26 letters of the alphabet in all their different shapes and forms. The students can learn to copy the letters adequately in the OT room, as long as they have the compensation of the visual model, and beautiful handwriting can be achieved. But the moment that they have to ideate from their own mind, and recall the step sequences from their own body, the handwriting falls apart.

It is necessary to understand that good cognitive skill does not translate to good praxis skill. Students with praxis difficulties can frequently be very creative in their cognitive ideation and frequently exhibit good verbal skill to describe their creative ideas, but they "lose" this same creativity once they have to put these same thoughts to paper. Then they write "to get it over with." It is almost painful to watch these very bright students handwrite. Working on fine motor skills will not support this development; we have to intervene at the praxis level of development.

Praxis difficulties influence the intrinsic motivation to explore different multimodal options and inhibit the student's intrinsic motivation to thrive and grow, often leaving a trail of emotional developmental delay in their wake. Children with praxis difficulties have great difficulty becoming independent and want to keep leaning on an anchor (parent or teacher) in order to function. This impacts their self-identity formation, as they cannot symbolically separate from their anchor in order to trust themselves to become autonomous.

Yet another aspect to consider, related (and crucial) to praxis, is timing. A child can learn to do a jumping jack, but can he do this at the same rate and speed with his peers in PE? Can he kick a ball, but not be in the right place at the right time in a soccer match to be ready to kick the ball? Praxis is a crucial building block, but timing the movement patterns "clinches the deal." This same timing in the body becomes very important in the executive skill of understanding the passage of time: for example, how much homework can I complete in the time I have available? Or think about delayed gratification: a child cognitively understands that Mom said "we'll go for a bike ride after dinner," but wants to do it it now, at lunchtime, because there is no concept of the time span between lunch and dinner.

Parents of children with praxis and timing difficulties have a hard time with discipline in their homes. They know their child cognitively understand the rules, so why does he/she insist on doing the same "wrong" action each time regardless of the negative reward afterwards? Children with praxis and timing difficulties are only thinking of the now when they are in the moment; the events from the previous week, for example, are past tense, not to be considered in the present.

Bilateral Integration / Laterality / Directionality

In the early stages of infant and toddler development, we talk about "crossing the midline" – this usually refers to the child reaching out from the one side of his body towards the other side of his body. An important first building block is the ability of the baby to roll over. In order to do this fluidly the baby has to separate the function of the lower body, pulling the legs over first, causing trunk rotation to occur, then the upper body follows. The opposite of this typical development would be a "log roll," when the baby exhibits no trunk rotation and simply tries to roll the whole body as a unit. (Of course the previously-discussed primary movement patterns come in to play here as well.)

We want to be able to use both sides of our body simultaneously, with either a same action or different actions, in harmony. For example, when students write, they use their dominant hand to grasp the utensil and the other hand to support or stabilize the paper. This bilateral integration is very important for manipulating your body through the different planes of the space you find yourself in – on the soccer field, for instance, it allows you to be ready for action whether you need to move backwards, forward, to the right or to the left. Finally, just like in our praxis discussion, it is necessary to consider timing again. It is not sufficient if the child is able to independently do a cross lateral pattern of movement, but cannot exercise this in the same timing as a peer.

A couple short notices on hand dominance: First, there is no substantial body of research linking a specific hand dominance to a learning or reading difficulty, and we certainly see children with learning difficulties no matter the hand dominance. Also, there is still an old belief out there that a child has until the age of 6 to establish hand dominance. To the contrary, if we see young ones struggle in a cluster of skills such as the ones we are discussing, we need to support the building blocks to gain functionality as early as possible – we are not going to wait for intervention to start after 6 years of age.

One important reason not to delay is that bilateral integration in the body and dominance development feeds the next building block of laterality. This is when we really grasp an understanding of left and right in our bodies, and are also enabled to use our visual space as in a more dynamic and rhythmic way. For example, we are now able to follow a mirrored pattern of movement, such as when a dance instructor demonstrates a series of steps while facing the students. People with laterality issues really prefer for instructors to model body movements with their backs facing the student, so they can follow the step instructions in the same direction.

Laterality is closely followed by directionality: while laterality understands left and right within the body, directionality understands left and right in space using the body as a reference point. Directionality allows us to organize our visual space from our minds as we follow directional instructions – think about how hard you work to retain your sense of direction when travelling somewhere new for the first time. This skill also impacts the transition from using the body in space to being able to handwrite on paper. The directionality of writing (reversals), the use of space on a line, the ability to start writing from the left to the right, maintaining form constancy in letter formation, all depend on having these foundational skills.

All these functions combined provide developmental support for developing inter-hemispheric organization. Though there is great overlap in our brain, the right hemisphere appears to be more in tune with creativity, emotionality, visual spatial skill, keeping the "whole" idea in mind, and being "picture" thinkers. The left hemisphere appears to be more involved in logic, rules, structure, linear thinking, organizationally intact, paying attention to the detail of the "whole" idea, and being more of a "word" thinker. Ideally we would like to cross over fluidly from one hemisphere to the other as we need it and be a "whole brain thinker," but if the building blocks described are not laid down firmly, we frequently see the strengths in a particular profile over played and tired under the pressure of the weaker skills. Think of a student trying to write an essay. He needs the creativity to write and the ability to keep the whole idea in mind with the right brain, but if he is unable to organize left brain this creativity give attention to detail with the left brain, the student often learns to "hate" writing. We will discuss the complexity of writing again later in this reading.

One last important area to consider is that laterality does not only happen in the body itself, but also in vision, as well as auditory skills. We need both eyes to be looking at the same point in space or on a page, working together, so that the cortex can receive images from each eye at the same time and fuse these images into one integrated whole. We need to pay closer attention to ocular skills, alongside of visual perceptual skills, to be sure that both hemispheres are receiving the same information from each eye. When imbalances go unchecked, and the brain has to handle confusing imagery that is not timed together, one of the coping strategies is to suppress the information from one eye in order to favor the stronger image, which also affects depth perception.

Our auditory system is interesting in this regard as well. Of course all information from the left side of the body crosses over to the right hemisphere and information from the right side of the body crosses over to the left hemisphere. Being that the left hemisphere is more equipped to deal with lexicon, speech, and reading, it becomes really important to have a stronger tendency towards right ear dominance. It is true for all of us that our right ear is geared more towards the teaching instruction, while our left ear is

continuously surveying the environment. When we test our auditory sensitive students they frequently show a left ear preference for dominance due to the consistent vigilance to the environment. This upsets the attentional patterns in the student's behavior, as the competing background information is insistent on drowning out the teacher instruction the student is supposed to adhere to. Audiologists refer to "Speech in Noise" deficits.

Thus, as can be seen, the developing brain is quite complex and the impact of one or more missing building blocks is not to be underestimated. We simply cannot require a student to function at a higher level while they have to overwork their system to cope with our performance demands. As therapists, we are not teachers and we do not "teach" skill – we leave that to the education professionals. Instead, we have to facilitate and mobilize development: we have to intervene at the student's "just right" level in order to provide more successful experiences that will foster increased intrinsic motivation for learning and an "I can" attitude. In the last section of this reading I will attempt to bring this together for you.

Executive Functioning Skills

"Why does he not remember to bring things home from school? Why does she not retain the information from our session the week before? Why is it so difficult for him to wait for the next step to take place? Why is homework such a long drawn out process, and why is staying on task on her own so hard? Why does he procrastinate? always hand things in late? not seem to know how much can get done in a certain time?"

All these questions are related to the different skills of executive functioning.

To complicate the issue, these students have the intelligence to understand – they grasp concepts, but they simply do not execute at the same level as their understanding. Teachers, parents, and therapists alike look at this outcome, may decide the student is willful or negligent, and then attempt to intervene at the level of behavior. The difficulty is that what the student understands is related to his/her intelligence. What the student does is related to his/her development. So if the development is not in place, the intelligence cannot compensate for skill that should not have to require cognitive thought to begin with. How do you teach a student to understand the passage of time if they do not have a good concept of what timing feels like in the body? You can accommodate with cognitive / visual strategies such as an auditory or visual timer, but how would this translate to the automaticity required to be efficient? We do not want to spend available energy and cortical arousal on skills that should already be in the subconscious, but rather keep all the energy focused on learning in the present moment. It is important to understand that "if a student could, he would." Nobody wants feel unsuccessful for prolonged periods of time. As therapists we have to match the needs of the students, not place demands on students to force them to meet our agenda.

Executive functioning skills are skills that we expect every Kindergartner to have as they enter school. We do not have a curriculum for them; rather we expect every student to access these skills based on their development as described above.

Eric Peterson and Marilyn C. Welsh (2013) described the concept of "Hot" and "Cool" executive functions. The "Cool" functions are goal-directed and oriented to the future: examples include planning, inhibition, flexibility, working memory, and monitoring. They are mostly manifested under relatively de-contextualized, non-emotional, and analytical testing conditions, and are also very oriented towards left hemispheric organization in the brain. The "Hot" functions include contexts that engender emotion, motivation, and the tension that exists between immediate gratification and long-term rewards. Of course these skills would be more connected to the right hemisphere of the brain.

PERTINENT RESEARCH: See Dr. Russell A. Barkley, a great resource with regards to his assessment tools, as well as his model for developing executive skills, which coincides with the developmental hierarchy – already familiar to many occupational therapists – described above.

Executive functioning deficits are often described in the form of the child's behavior, and much of the time a "top-down" approach to intervention is used. We attempt to "teach" a student how to be more organized. We become creative with accommodative aids to assist the student with strategies to achieve a desired end result – and these can be quite successful! But the difference between a student with executive functioning skills and one without is a subconscious priming based on the developmental hierarchy to achieve this end result. Ideally we would like these skills to be automatic and accessed without additional effort, which takes energy and attention away from the learning environment.

We will address tools for effective evaluation, as well as intervention guidelines, later in the course. First, let's look at some key executive functions to consider.

The Ability to Plan

Whereas motor planning and motor ideation relates to the body as described above, the ability to plan activity in a step sequence requires both the motor and cognitive functions. While the mind sweeps forward to set a step-by-step action in place, the body keeps up with the know-how of what a step sequence would feel like.

Task Initiation:

Let's start with considering the ability to initiate a task. We frequently observe children being slow to "get going" on projects, and have to repeat an instruction, or provide encouragement, or otherwise nudge them forward. One conclusion is that the child may have an attention difficulty causing him/her to be distracted from starting a task. But task initiation requires the ability to begin a task without undue procrastination, in a timely fashion – which implies that the child already has an innate sense of timing in place to respond adequately.

Each new task brings the challenge of the "new and novel," which would be difficult for a child with motor planning deficits to undertake – they have to reorganize all their systems to accommodate this new learning. And if they struggle with developmental delay, these students also learn to anticipate when tasks will be too hard, just by looking at the proposed activity, and will want to avoid them based on memory alone. These issues will indeed contribute to being late in getting started with an activity. Another factor to consider is the ability to see beyond the project, to see the end game and what you are working towards. Students with difficulty understanding sequence in their body frequently cannot look beyond the first step of a task to become motivated by the thought of its completion.

Planning:

The act of planning provides the student with ability to create a roadmap to reach a goal or to complete a task, and involves the ability to manage current or future tasks by setting goals and developing appropriate steps ahead of time. Again, being able to understand a step sequence and time lapsing are crucial skills for delivering this skill: without them, the "next step" in planning is a big black hole where all the ideas are floating away, not gaining solid ground to enter into the functional process.

Planning also involves being able to make decisions about what is important to focus on and what is not important. This requires the brain to rely on inter-hemispheric organization, because the student cannot become so immersed in the details of each step that she forgets the "whole" of the idea she was planning towards. The brain of a typically developing student is quite incredible in the process of taking in all kinds of information and discarding what is not important without much thought energy.

Organization of Materials:

The process of organizing the materials needed for a task can influence the planning potential. This requires the ability to establish and maintain a system for arranging or keeping track of important items. Systems are tough for students with executive difficulties. Once they are in the moment putting a structure together, they can perhaps follow their own strategies, but a week later the system appears to be non-existent as it never related to the level of integration required to make it permanent. Structure is important for these students, but they frequently require consistent supervision in order to maintain the structure. Once a routine is established and has been repeated several times, the students can learn to rely and cope with the structure in place, but the skill is not generalized over into new and novel areas each student encounters in everyday life, requiring someone to impose another structure to organize by. The ability to design and maintain these systems independently is lacking: when left to their own devices these students are not able to keep track of information or materials.

Understanding Time:

Several times during our reading we have referred to the concept of time. This skill, rooted in a baby's growing understanding of the different cycles of sleep and wake, as well as night and day, is elusive for many students struggling with executive functioning skills. Students who struggle with impulsivity, for example, frequently have difficulty applying past experience to the present – they remain in the moment, instead of fully employing past, present, and future, another building block in the understanding of time.

Our own internal sense of timing lies within these concepts, as well as in our own body's ability to anticipate timing (as described above under motor coordination). After we develop body timing, the intricate process of integrative timing starts to build: the ability to look at the teacher while listening to her at the same time: the ability to hear kids in the background playing, yet still to continue focusing on a task.

Reading decoding is another layer to consider. Rayner and Duffy's research (1986) stated that a good reader would scan lexicon on paper for about 11 to 18 character letters at a time in one saccadic eye movement before fixation takes place. During this visual fixation, phonics kicks in within 5 to 20 milliseconds, and this enables us to decode unfamiliar words in a fairly even way. The timing between the visual and auditory system is important for decoding to become rapid and automatic. Frequently programs focus on one or the other skill, but it is timing them together that makes the difference to reading fluency.

Think again about the student wanting to write an essay: he/she has to think a thought, plan the sequence of events as well as sentence construction with language pragmatic skill, while also negotiating penmanship. He/she has to keep the main idea in mind, while paying attention to all the details that support it. Written expression is likely the most intricate of all in timing different systems to work together in an efficient manner. Therapy that targets integration as a goal is not complete until this process has also been included and addressed.

Students with timing difficulties frequently ask the same questions over and over – especially "when" – because the common responses we use such as "in a moment" or "in 5 minutes" or "after dinner" do not make sense to them. For them, it is as if they have been abandoned in mid-air: all of those answers in the space of time could be "now," and the insecurity leaves them feeling vulnerable and exposed, unable to affect closure – anxiety reigns. We rely on an understanding of time so much, we take it for granted in ourselves. We should not take it for granted in a student with special needs.

In another consideration, timing and rhythm work together in assisting the student to keep pace with his peers. It is that innate sense that transpires into a timely production of task in the time allotted for it. The student develops his/her own sense of pace by the understanding his/her body has reached in terms of working with a certain rhythm, while keeping track of time. It simply does not help students with this difficulty to ask them to work at a faster pace, because even though they understand your words, they do not have the ability in their bodies to create an adaptive response to the command. It leaves them feeling frustrated: their mind is willing, but their nervous system cannot comply.

One more aspect to cover with regards to time is the difficulty posed by interruptions. Parents frequently struggle with transitioning their children from one activity to another, especially if the first activity was the preferred activity. If the parent tells the child that the interruption will be quick and he/she will be right back to his video game, two major areas are going to come into play. Number one, since the child has limited concept of time, taking him/her from his preferred activity would be "forever!" and the word "quick" was not attended to. Number two, the child may be in the middle of a plot that he/she is focusing on, and know from past experience that no matter how small amount of time the interruption takes up, he/she will have renegotiate much of what he/she has already gone through to pick up the thread where he/she has left. Even though timing is not the only aspect involved in this (others are described under Goal Persistence), it certainly is part of the equation: it speaks to the ability to be busy with a task that you have allotted a certain amount of time for, being interrupted by the teacher or another student, and being able to make a quick calculation in your mind with regards to how and when you will be able to make up the time lost.

Goal Persistence:

Having a goal in mind is complex in itself, but being persistent about your ability to see it through no matter the distractions in your way is an added piece of executive skill. To see a task through to completion relies on an ability to visualize the end goal, plan the steps to reach it and lay out the amount of time you are going to need to achieve it. Dealing with interruptions along the way and maintaining the course is quite a high-level skill and relies on so much of the developmental hierarchy described above.

When we play with cars on the floor with our students, and all they want to do is the same repetitive motion over and over – for example, lining up the cars – we might try to intervene by taking one of the cars and quickly driving it under a bridge to park. We easily saw an end goal, and purposefully set out to achieve it, as a model for the students. But for them it is not so simple. The car has certain affordances which are categorized by the cognitive brain, hence the lining up of all kinds of cars, but having to build a plan from those affordances that would allow for steps to be taken while visualizing the end goal is another complication altogether. The best we could hope for is that the students imitate us and copy our plan for the cars, but we cannot allow them to go through life thinking that in each situation someone is going to be there to create the plan for them and allow them the luxury of only imitating. The idea has to come from within the students, created and formulated to be able to plan the adaptive response to the idea. We are dealing with complexities that need to be torn apart so we can intervene to put them back together again.

The Ability to Use Attention

The lack of the ability to pay attention in the classroom is among the most common complaint from teachers, and concerns parents the most. "Johnny is very distractible in class." "Suzie is very fidgety and wants to move all the time." "Eric daydreams most of the day and I have to call on him twice to pay attention." These are common statements that frequently have everyone considering if the student may have an attention deficit disorder. Yes, it could be, but before we jump to this conclusion, we need to consider the developmental hierarchy.

When students engage in all kinds of different posturing while seated at a desk, such as lying on one arm while writing with the other, or wrapping their legs around the chair legs so they can freely move their upper bodies, these could likely be examples of a therapist needing to check out primitive reflex patterns that may be interfering with maintaining sufficient posture in the 90 degree angles we need in all our major joints for seated work. A further complication to consider is postural control. The extensor and flexor systems of the body are supposed to support each other to maintain efficiency in sustaining our postures against gravity. If the one system is weaker than the other, the stronger has to start compensating for the weaker system: fatigue sets in and we see slumping, distractedness and shifting in the seat occurring. Either scenario could look like an attention difficulty to the casual observer, as the student focuses much needed attention on the bodily comfort rather than on the

learning material, but medication will not be helpful in these cases. Instead, the focus of intervention would be on efficient trunk / postural control.

We also have to look at the integration between different senses when considering attentive ability. Our visual and auditory senses are closely connected with taking in material to be taught. We look at what the teacher is showing us and hear what the teacher is saying at the same time. For some students, looking and listening at the same time is not a possibility, and they have to look away to listen more efficiently: in essence they have to choose the more available system and sacrifice the information the other system is not gaining. The teacher thinks the student is not focusing and commands "Look at me." The student understands the command, and obliges, but now loses all auditory connection with the learning. Students will not tell the teacher or therapist "If I look at you, I cannot hear you," because they simply do not know that their nervous system's adaptive response is any different from their peers. They do not have another body to compare it to. It is here that we have to intervene at the level of integration between different senses.

The Influence of Working Memory:

Long-term memory is what I can recall of past events in my life like my first trip to Disney etc. Short-term memory is remembering what I had for lunch an hour ago. Working memory is the memory I am using in the moment when I am actively contemplating learning. I am able to hold some detail in my mind, recall old information from long term memory that is already learnt, then add the new and novel information to this process. Once the new information is grasped, usually through some repetition, it becomes a subconscious automatic function that we can rely on without thinking.

Think about when you were learning to drive a car. There were so many things to remember to pay attention to at a given time, and all your energy was focused on getting your body to respond to all these demands. You had to employ working memory to make this work. Then you repeated the action a number of times and when you drove in to work yesterday, you could think of all the great things you were going to do on your vacation coming up, while you are driving. Automatic subconscious functioning frees up your working memory to attack additional new learning as it presents itself.

Dr. Allen Baddeley (1974, 1980, 1986, 2000) is a strong researcher in this field of brain development. He describes the pre-frontal cortex as having a "central executive" where information from different senses will gather to obtain the best probability for executive functions. He specifically researched the verbal and visual-spatial working memory stream and its influence on efficiency in this region. It is the confluence of these two specific streams of information reaching the brain at exactly the same time that creates the most efficient working memory span for us to use for new learning. When students have weaker auditory systems (verbal working memory) or weaker visual systems (visual-spatial working memory), the timing of information reaching the central executive is different or one system might be entirely suppressed, which in effect limits the available working memory span and the student becomes overloaded with new information far quicker than his peer. The student loses track of the teaching and the observation is that the student may be struggling with an attention difficulty. No amount of medication is going to intervene at the level of working memory. We have to get a good handle on the efficiency of these information streams and how they are timed together in order to intervene where it matters.

Sustaining Attention:

Being ready to start paying attention when the teacher starts speaking is one thing, and relies much on our inner sense of timing between different sensory systems. The ability to sustain this attention over the span of a lecture of 30 minutes or 1 hour (and even longer as we get older) is quite another feat. Although this skill really relies on everything we've discussed so far, I want to highlight a few crucial aspects.

One such building block is the ability to sequence. As stated above, sequence starts on the body level, translates to the language level, but then culminates in the ability to comprehend learning material, whether you are reading text or listening to a lecturer. Without a strong ability to sequence, the order of information becomes jumbled and we lose our focus on the main idea.

Students also have to exhibit a consistent behavioral response to the information, for which they need an internal regulatory capacity. We know when to drink coffee to remain alert or to chew on something at a conference after the lunch meal to prevent the afternoon slump. These are all aids to our regulatory system to assist in the process of sustaining attention.

A further consideration is distractions during this period of needing to sustain attention. As we become more tired, distractions may upset our internal regulation, and the ability to remain goal persistent despite the distractions requires the steadfast integration of all our senses. Let's say a student is having difficulty filtering background information through his/her auditory sense: he/she will be distracted if someone keeps talking nearby, or when a pencil keeps scratching over the paper of an adjacent peer. The inability of the auditory system to negotiate background and foreground noise simultaneously in his/her brain will eventually cause him/her to lose attention.

A final thought to ponder is the ability to remain focused even when the material is really boring. This is frequently tested as a hallmark for diagnosis such as ADHD or ADD, as families frequently comment that their child is not losing attention; he/she is bored. The truth lies in the above: that if all of the developmental hierarchy is intact, if working memory is intact, if all the sensory systems are timed together appropriately, we would find the objectivity and goal persistence to achieve the goal of sustaining attention regardless of the interest level. Is it possible that there could be an "attitude" difficulty? Yes, but we do not assume behavior if we did not check out development first.

Shifting Attention:

This skill concerns the ability to move focused attention consciously and deliberately from one task to another. For example, a student is busy completing a math assignment and the teacher calls for attention to shift to Social Studies. The student, who may have difficulty with working memory, knows that if he/she does not complete the current task now, he/she will not be able to recapture his/her train of thought later on, and will have go over all the information again. Another student, who may have difficulty with motor planning, has trouble bringing one activity to a successful end while efficiently negotiating the initiation of the next task. Students with sensory integration difficulties frequently find it hard to transition from a familiar activity to an unfamiliar activity: the central nervous system has completed its adaptive response to the familiar activity, and changing requires that the entire nervous system "re-work" itself to settle into the new activity. Students faced with these or similar challenges tend to be labeled as having difficulty with "transitions," and are frequently described as being rigid and/or inflexible. The descriptions are good observations, but to not understand the inner need of the student to achieve a comfort zone in an activity would take our intervention away from the core of the problem. It would be inefficient to target the behavior before considering the developmental hierarchy. The student may not be particularly willful, but may be in need of "saving" from having to work so hard in order to do what others seem to do so seamlessly.

When you are busy with a task and your colleague interrupts you with a question, you should have the ability to relatively easily go back to what you were doing. Students with this difficulty struggle to do just this. When they go back to the original task, they have to read from the beginning to get back on track or renegotiate all their writing to gain back the gist of what they were trying to say. Sometimes this shifting of attention is so hard to do that the previous task is left incomplete and they start procrastinating in getting it done, which leads to a whole different set of executive troubles. When we intervene at the origin of the difficulty, we have the best possible option of gaining the automaticity necessary to be an efficient and attentive learner.

The Ability to Deal with Frustration

Emotional Control:

The emotional development of students is a gray area in many school systems today, and caregivers frequently displace attention, discussing or disciplining behaviors without considering emotional development as well. Just as the central nervous system has to develop in a hierarchy, the emotional development coincides or follows right on its heels.

Each experience we have is buried in associative limbic (emotional) memory and is able to be recalled to assist in future decision-making processes. Implicit memory is laid down in the first two years of life and we are not able to recollect it consciously, though it remains stored in the subconscious. Explicit memory can be recalled from about age two.

As a baby our reticular activating system gears our sensory systems to be modulated as well as aids our emotional systems to achieve some regulation that would lead to self-soothing. This innate ability forms the foundation for us later in life to be able to continue a task while feeling out of sorts and frustrated. While the baby is developing this ability, it is relying on the caregiver to co-regulate, as the caregiver forms the position of emotional anchor in the baby's life. When students experience developmental delay, they are not always weaned from having their parent as an anchor and co-regulator, and the parent's presence at homework is frequently needed to co-regulate their emotions. This can cause much frustration at home, and also carry over to the school setting. In many cases the school settings are not aware of putting the parent through school as much as the student! The student holds it together at school, as he/she knows the parent will be helping do the work for hours that night. Even when a student achieves a task, it does not automatically carry over to feeling successful and "owning" the new level of attainment.

Students who cannot regulate their own emotional responses to task challenges find it difficult to become independent learners, but regulation is not all that matters. There is also an overlap between not being distracted by outside interferences, as we discussed above, and the ability to inhibit the need to respond to it. Likewise, students can also be prompted by internal interference to lose control over a situation – this is quite prominent in students with low self-esteem, who might engage in negative self-talk during a task. Children who develop negative self-esteem can do so for multiple reasons, including their home circumstances, but it could also be due to their developmental delay combined with their school and social experiences. Self esteem is not formed from

hearing a generic "good job" or a blanket statement that a child is "so smart." We only feel smart when we have felt the sense of accomplishment in our own body, our own experience of the situation. If students are engaged in classroom activity each day for 6 hours on end, and constantly comparing themselves with apparently more successful peers, self-esteem is whittled away constantly.

There are several layers of emotional development that a student has to go through in the early years to prepare for school, and they learn them in play: the ability to understand authority, winning and losing, self identity in different layers, and to understand the good and bad in yourself are a few of these developmental aspects. Each warrants a course of its own, as they are not the scope of this course, but need to be investigated and considered in each case where the student is being evaluated for a behavior plan.

Response Inhibition:

The ability to inhibit our impulses and plan the correct response to a situation is a loaded topic as so many students are labeled as being impulsive. To curb impulsive behavior, the student has to have the ability to stop, think, plan, and then respond or act. The ability to stop requires regulation and timing in the body. The ability to think and plan requires sequencing and working memory, and then to respond requires the physical ability to communicate and / or do. Impulsivity is not simply a behavior as each of these aspects has been dealt with separately above and requires a developmental continuum to become efficient.

This ability also includes delaying a response that may affect others, which implies that this student does have a theory of mind and a social perspective that understands that someone else may have a different point of view in a given time. The student would have to be able to read the social cues of another to know that now is not exactly the right time to, for example, ask a parent for a favor. To keep from going forward the student would need to be able to wait to respond until he/she has been able to "break down" the information received to better analyze it – but for those with difficulty with timing regulation, waiting is not so easy. While "waiting," the student may need to be able to soothe him/herself without external support / reward, which again relies on regulation. He/she also would need to be able to separate facts from feelings during the wait in order to plan a response appropriately, which implies an ability to employ working memory in the moment. Impulsivity is a developmentally "loaded" ability and not to be dealt with simply as a symptom to a diagnostic. It requires a developmental consideration of its own.

Flexibility:

Another common occurrence in written reports is single statements that refer to the student being "rigid." To be flexible students must have the ability to revise plans in the face of obstacles or setbacks: they may have had one plan for a certain situation, but their peers have another plan. Our student would need all of the skills we've discussed in order to consider the needs of his/her peers and deal with the pressure of change: if the developmental delay is being challenged from different directions such as motor planning, timing, language, and immediate gratification, it simply might be too difficult to negotiate. The rigidity of holding steadfast to the original plan serves the purpose of "saving" him/herself all the trouble of changing the plan – it simply is easier to just stick to the current one. In peer relationships, we observe these students to be "bossy," to want to direct the play or task, not because they operate from a sense of heightened self esteem, but based on fear that someone will come and upset THE plan. Such students struggle with high levels of anxiety – the more they are challenged in this direction, the more they will fight for control over the situation – which stems from not feeling internally in control, hence trying to achieve external control.

The agent we are dealing with here is an ability to adapt to changing conditions: for example, to be able to deal with not going to the amusement park on this day because of the weather or to be able to deal with a different teacher today because the regular teacher is sick. Change requires adaptation from the central nervous system as well as from our emotional regulatory system. Dealing with disappointment and frustration on top of the change could be a multi faceted ordeal for some students and staying with their plan is simply easier than tackling all this renegotiation of their adaptive systems.

Self Monitoring:

In order to become an independent thinker and learner, students have to culminate all their resources in their ability to self-monitor their own work. They have to know when a project is due and how to pace themselves through a time period so the project can be completed in a timely manner. They need to understand and own the pace at which they work and obey a sense of time in their bodies to plan efficiently for the outcome.

Students with executive difficulties usually do not have intelligence difficulties and therefore it is difficult for adults to understand why they are working on the task the night before the project is due when they knew about the timeline three weeks ago. Now frustration fills the air as time steadily runs out on the project, and the students encounter further challenges of changing conditions that were not planned for. But if you do not know how to pace your progress, and how to check in with yourself on examining this progress in the light of

a due date, you are simply unable to apply this planful behavior.

This ability does not lie in the realm of intelligence or logical understanding, but in the realm of subconscious developmental processes. The students have to have the ability to see their own behavior and learn to respond to situations appropriately. There has to be a self-perspective that requires the building block of "sense of self," also contributing to self-identity. In other words, the students have to know themselves and their abilities, and plan accordingly. They have to regulate their behavior in the pace required for fulfillment of the end goal.

A further aspect to consider is the ability to strike a balance between indifference and obsessing over the work. In order to compensate for these difficulties, the students may become perfectionist in their approach to their work and spend hours in making everything just right, which is counterproductive to creating a balanced lifestyle, and feeds them on anxiety rather than on productivity. These students are frequently revered by school systems as they are able to achieve straight A's, but there is little realization of what it costs them to maintain these grades. The parent observes the hours spend on homework, observes the anxiety and sees the toll it takes on personal and social relationships.

The flip side of this coin is those students who appear indifferent to their work and are labeled "lazy" or "unmotivated" due to not showing a sense of remorse over their inadequate productivity. These students are frequently encumbered by a sense of feeling overwhelmed with the prospect of planning their work. Due to developmental challenges they are not able to gauge time or progress and simply become "frozen," unless they find support. Again anxiety takes its toll, and parents wonder at their child's ability to sleep endlessly or play video games ad infinitum, not realizing that all of it is an attempt to escape from the great anxiety inside. Other students may show a mask of indifference as they are "caught" time upon time not being able to complete assignments on time due to their lack of planning and self monitoring, and the mask of indifference is a protective mechanism to preserve ego integrity in the face of shame and guilt for not being able to make happen what needs to be done. It is true that in some cases it certainly could be an attitude that needs re-adjustment, but in most cases students would prefer to perform well, to believe in themselves as being capable and not to be the one singled out as the "behavior" problem. They simply do not have the ability to change the situation.

Self-monitoring includes the ability to stand back and take a bird's-eye view of oneself in a given situation. It requires much maturity in the brain and everything we have discussed above influences this area of function to gain its fullest expertise. Without this ability even the most intelligent of students will have difficulty in college. With supports in place they can make it through high school and show grades that would gain acceptance in colleges, but without the necessary self monitoring to pace themselves through the rigors of college and its great amounts of self study, it would be difficult for such students to achieve their goals and feelings of potential failure will pursue them as they make decisions for future endeavors.

The student's ability to feel successful as a student plays a strong role in preparing for life after high school. Students with executive difficulties frequently choose a path based on their profile, and not on their actual abilities, such as their intelligence and aptitudes. This leads to a life long impact on their behavior and decision-making. Students with executive difficulties frequently observe themselves to not be "smart," simply due to their own comparison with their peers. They are also at risk for substance abuse in higher school grades or belonging to circles of friends that might not be as favorable, simply because they do not feel they "fit in." School systems frequently support students with accommodations to the curriculum, but for many students to feel better about their abilities, we have to intervene at different levels of development from which they can feel and own a sense of accomplishment that will afford them the self-esteem to take on higher ground.

Assessment and Intervention

Assessment

To really achieve a holistic view on each student, the assessment will have to be thorough. There is a strong push today in the direction of shorter assessments, which I believe is not helpful with regards to using our clinical judgment and not as expedient as we want to believe.

At my center we use a developmental pathways approach to assessment that I believe will prove helpful to you. We start with an initial intake call, during which we complete a form while discussing the student with the parent to gain an idea with regards to the profile. We do ask for other reports to be brought in on the day of the evaluation, but we do not want to read other reports until we have gleaned our own view of the student. The actual battery of tests is conducted within two hours, scoring of tests another hour and three hours for writing up the report in a template we have designed: we start our report with a background history consisting of other reports as well as information from our Sensori-motor History. We end the background summary with a list of strengths and concerns noted by the family and or teacher. The tests I mention in this writing happen to be favorites of ours, but by no means prohibitive of any other tests. Consider them suggestions only. Also note that

a good evaluation report is going to need findings corroborated at least twice to make sure you are looking in the right direction to plan intervention.

The process of the evaluation occurs in three phases, described below.

Phase 1: Foundation

The first phase considers the development of the baby from utero until about two years of life. Because development is quite gray and individual to each person, we cannot make the timeline a very strict one, but we are able to approximate. You will want to consider the autonomic functions of the student, which would include sensory modulation as well as emotional regulation. You have two strong options here. The Sensory Profile of Dr. Winnie Dunn is a favorite of ours, but the SPM (Sensory Processing Measure) is another good tool to use.

For Sensory Registration of information we tend to use only parts of the SIPT (Sensory Integration and Praxis Test), as it is too time consuming to use in its entirety and will not provide you the full executive picture. We like to use the gross motor section of the BOT-2 (Bruininks Oseretsky Test of Motor Proficiency), which has a great balance section. For Visual Perceptual testing, there are multiple choices and we favor the TVPS3 (Test of Visual-Perceptual Skills (non-motor), Third Edition), especially since now there are separate scores for each subtest that we can include in clinical judgment. For auditory, we may use the SCAN test, though would add a disclaimer to the report that we are only considering this for purposes of total sensory integration and not to diagnose auditory processing disorders.

We have a number of clinical observations for this phase, though most of the attention goes to specific reflex assessment that will assist in understanding primary movement patterns. You will want to know what the quality of movement in all planes of movement are, and assess for the presence of gravitational insecurity or postural insecurity. The standard clinical observations for postural control would be the antigravitational flexion and extension postures, as well as cocontraction ability. Observations on strength and endurance, as well as equilibrium reactions are essential as well. For pre-school age students, the DeGangi-Berk TSI (Test of Sensory Integration) is still a gold standard to use.

Phase 2: Organization

Once the student is able to register information through the different senses, he would have to use it adaptively in any environment he should find himself in. Praxis (as noted above) becomes very important to assess at this level. The SIPT has good praxis tests, though there are also a number of clinical observations (Schilder's Arm Extention test, Disdiakokinesis, Sequential Finger Touching, Finger-to-nose) that can assist you in this process. The BOT-2 can give you a score for bilateral integration. In order to be a fully functional student, he/she has to understand sequencing, order and timing in her body. At this stage, we are moving from more central processes in phase 1 to more peripheral functions with finite development. Other clinical observations may include jumping jacks, scissor jumping, hopping, skipping, or walking toe to heel on a straight line.

An important building block to consider in this phase is vision. Our ocular motor skills develop after our postural and trunk control and can play a strong part in developing organizational and bilateral skill. The DEM (Developmental Eye Movement Test) provides functional information on saccadic eye movement and may be helpful. The Vestibulo-Ocular Reflex (VOR) comes to mind as it assists with integrating peripheral movements in visual span with stable vision in the central dimension of vision. Another great clinical observational tool would be to do the Infinity Walk and gauge the ability of the student to negotiate visual space.

But it is not enough to be able to do a skill; the student also has to be able to use the skill in the same timing as a peer. There are virtually no really good timing tests available, so we have invested in the Interactive Metronome Program, that has a great test that covers all planes of movement, cross and homolateral, as well as bilateral. There is a measurement for sustaining timing amidst of background information as well as an Attention Over Time test that is very helpful to compare with the average score. Finally it also provides a measure of being hyper-anticipatory vs. late in response to a steady beat, which gives us an idea about timing regulation in the body. Sensory Integration is not complete until the different sensory systems can cooperate with each other in a timely manner.

Phase 3: Achievement

Executive functions and academic readiness is the hallmark of this phase of the assessment process. Ideally you would like to consider a higher level of timing that concerns interhemispheric organization and achieving a balance between using the left and right brain within the parameters of their different functions. The important task of writing an essay is going to lean on getting this phase of development in the right order.

The BRIEF (Behavioral Rating Inventory of Executive Functioning) is a parent and / or teacher questionnaire that can really give you good information with regards to different executive functions and has good test / retest reliability for a questionnaire.

The BOT-2 is good to use for fine and visual motor skills, as well as Design Copying on the SIPT. We also enjoy using the THS (Test of Handwriting Skills) if we want to go deeper into handwriting. The Jordan Left/

Right Reversal test is another standardized tool that provides good information for the automaticity of letter form / discrimination for the process of reading and writing.

A more expensive assessment tool would be the IVA (Integrated Visual and Auditory Attention Test), which is a continuous performance test which psychologists may use to diagnose ADD or ADHD. We do not want to diagnose, but rather use the score for attention and sustained attention between the visual and auditory system to determine their compatibility of working together for the purposes of concentration and taking in information. You can see quite clearly if the visual and auditory system is initiating together and timing together or not.

Another test that is helpful for working memory is the AWMA (Automated Working Memory Assessment), which is a computerized test purchased from the UK that requires a renewal license fee annually. It has a screener version, short form, and then a longer form version, which you have to consider to ensure getting all tests completed within two hours.

Our clinical observations also include a full fine motor screening (Dr. Mary Benbow), so as to provide background on hand development with regards to handwriting.

Social-Emotional

All the scores are typed into the templates under each phase. After each phase a summary of the phase is provided with explanation linking it to the main concerns of the family / teacher. After all three phases we consider a fourth section for the social-emotional piece. Information from the Sensori-motor History as well as the Sensory Profile and our clinical observations are added to this section. We frequently use the Beck Inventory for Children as a self-questionnaire for our older students and families complete the Pediatric Symptom Checklist for the younger students. We gain sufficient information from these tools.

Another very helpful tool that require additional training is the FEAS (Functional Emotional Assessment Scale) of Dr. Stanley Greenspan that provides more depth to the developmental, communicative, as well as symbolic developmental delay.

Once information is added to the template, a summary of the social-emotional section will consider contributing factors of the entire evaluation to aspects such as anxiety, depression, social inability and / or performance anxiety. The reasons for meltdown behavior are considered and the possible triggers that resulted from the previous phases of assessment.

A short final conclusion will then lead to the clinical recommendations. We delineate between clinical and educational recommendations to assist the family in their planning for their child. We may include specially designed instructions for the IEP process (Individualized Educational Plan).

ADDITIONAL RESOURCES: The above was a quick overview of the assessment process – a complete discussion is not the scope of this course. The interested reader is referred to the A Total Approach website to learn more.

A final note as you plan your assessment battery: always include standardized tests, but also confirm the outcomes of these tests with your clinical observations. Anyone can learn to give a test, but your interpretation of the test the backbone of being a therapist. Each evaluation that carries your name is considered a communicative effort to any reader as to the level of your expertise in your field. It is not good enough to simply report scores and then strengths and weaknesses and hope that others can make the links you did not provide. It is important to be thorough so that you can plan the best possible plan of action that will make sense to the family / teacher.

Intervention

As in the assessment process, intervention ideas will be discussed via the three phases of the Developmental Pathways Model. Families or teachers will come to you with the executive concerns relevant to phase 3, and will want to see them addressed. Using this model will assist you in the ability to communicate more effectively why it is necessary to start at the foundation of development.

Phase 1: Foundation

OT services are combined with sound therapy to gain a stronger response with regards to, especially, modulation and emotional regulation. There are many sound therapy products on the market today, and it is not in the scope of this course to go over each therapy. I am trained in most of them and prefer to use the original Tomatis Method from TDSA in Luxembourg. The program runs in intensives of varied lengths of 10-12-or 15 days each with 4 to 8 week breaks in-between during which the client continues weekly OT. If your system does not allow for intensive work, it would be good to plan for at least 6 months of weekly OT services, while also completing some sound therapy of your choice.

Dr. Svetlana Masgutova provides a two day workshop on tactile integration, which is a practical hands-on massage method that follows developmental movement patterns across the body. We frequently add this massage during our sound intensives, and also train the parents to use this as a sensory diet at home. It is really good for somatosensory registration, sensory regulation and – due to the touch-limbic aspect – for bonding between mother and child. Parents are asked to complete this massage once in the morning and once in the evening. We have found our students to gain more regular sleep patterns due to the improved

regulation and parasympathetic activation of the nervous system: students who struggle with anxiety in their dreams at night, holding them back from feeling rested, have benefitted from this massage technique.

During this phase we work extensively on primitive movement patterns and reflex integration. It is important to integrate an efficient crawling pattern that will set the base for both homolateral and cross lateral movement in different planes. Suspended equipment is used regularly, but we are also careful to frequently work on the floor and gain the movement pattern sustained against gravity as much as possible. Postural or trunk control is gained by this foundational work, and depending on the individual profile, there is an active push towards gaining balance between the extensor and flexor control system.

Emphasis is placed on registering information in the body through visual, auditory, somatosensory and vestibular systems. We are not focusing on how they are organizing together as yet, though this will emerge later as you solidify the foundation. Care is taken with regards to positioning. The intervention is child centered and the student has to assume all positions independently in the most balanced way with correct positioning. We try to stay away from physically assisting, but use affect cueing and gestural communication to draw attention to the body positioning. If the body is able to register information in the correct positioning, you are setting up a great building block for motor planning later, for which you need an efficient feedback system with new and novel movement. Feedback is going to rely on the body registering information correctly.

If a student has a picky eating or problem feeding profile, we usually do not intervene at this foundational level. Eating behavior is frequently emotionally laden, as parents do not feel like "good parents" if they cannot get their child to eat well and anxiety in both parent and child runs high. The student uses food as a mechanism of external control and will not let go of this pattern of eating behavior unless he/she starts feeling more in control inside. What we usually see is a gradual loosening of control with the student leading the way in attempting more variety once he/she feels ready.

Gaining ground in sensory modulation, though anxiety triggers may continue to be strong, supports emotional regulation. Even though the student is feeling more capable, there still will be a tendency to anticipate a challenge before it has even presented itself. In some cases, it is needed to add a program such as DIR/Floortime intervention to resolve these older anxious associative memories through play. These sessions provide a place where the student can work out their fears, worries, and anxieties in the safety of the therapeutic relationship. For older students we use SandPlay therapy, which is a projective technique that assists all ages of people to bring subconscious situations to the fore. It is also helpful to use such sessions as a progress report to us to gauge how the students are adapting emotionally to the changes in their bodies.

Phase 2: Organization

The larger emphasis in this level of intervention is to gain ground on using more than one sensory system together and the ability to use the body employing praxis. We also focus on more "peripheral" skills such as ocular and oral motor as this development is more secure once the student has achieved postural control.

The infinity walk pattern is used quite frequently during this intervention period. As the student becomes more proficient in using the pattern, we start "loading" it with additional tasks involving other sensory systems. While working on timing the systems together, it also is a useful tool for integrating stable and dynamic vision or central and peripheral vision. It is a great home program for both younger and older students and is a mainstay of our phase 2 intervention.

To target ocular motor skills, while also using dynamic balance, we enjoy using the Balametrics program. These are great exercises worked out in thorough precision that really support the visual accommodation piece. Another program, called Bal-A-Viz-X, also targets this area of functioning, but we don't have much personal experience with it.

In cases of speech articulation, or other oral motor difficulties, the TalkTools protocol of Sarah Rosenfeld Johnson is used. With oral motor skills it is important to get in more frequency with shorter durations of time. The home program would consist of 5 minutes of exercises, preferably before a mealtime for a better adaptive response, 3 times daily.

For intensive work we invested in the Interactive Metronome Program to assist us with timing, body coordination, bilateral integration and praxis. This program is supported by multiple research studies and is used in many larger hospitals across the US today. It contains hardware and software with a computer station: hand and foot triggers are attached to the student, and the computer scores, with millisecond precision, the ability of the student's body to anticipate the beat. The student works in hour-long sessions for intensives of 10, 12, or 15 days. The days could be consecutive or at a minimum 3 sessions per week. At first the goal would be to get the score as low as possible across all domains of movement, then the fun begins. The student has to be able to maintain this timing with the body while reading, spelling or doing another cognitive task, in essence supporting the building of active working memory.

If your situation makes the purchase of such equipment difficult, you can download an app for free on your Ipad that gives you the steady beat of a metronome. Ideally you want to match up to 54

beats per minute, but you could slow it down initially depending on the pace of your student. For sport students we also make this faster than 54bpm. You continue your regular OT activities with obstacle courses, multi-tasking activities, yet now the student has to match up to the beat from your metronome. You can use this in your weekly sessions and also add it to your infinity walk home program as an additional load.

Another program that we may use toward the end of phase 2 is The Astronaut Program, designed by Mary Kawar and Sheila Frick. This is a specific protocol that gradually enables the system to adapt to using the auditory, visual and vestibular system together. We start with the pre-exercises very early in phase 2 and once these pre-exercises are completed fluidly and easily, we consider the student ready for the full protocol.

Phase 3: Achievement

As the work progresses through phases 1 and 2, you'll begin to receive reports that some executive functions are already improving. With some students, all they needed was foundation. Phase 3 is reserved for the developmental needs that are essentially "left over," and in some cases this phase of intervention may not be needed at all.

Cellfield is a visual training program for reading decoding and comprehension and quite frequently used at our center. The first 10 days are computerized and require the wearing of red tinted lenses individualized by profile. If a student has no reading difficulty, it still remains an excellent tool for fine tuning the ocular motor system, central and peripheral vision balance, and every visual perceptual skill we usually target (visual discrimination, foreground/background, visual closure, to name a few). It also has good exercises that assist in the formation of working memory, and the timing between the visual and auditory system is planned according to Dr. Keith Raynor's research quoted above. 10 weeks of regular OT follows on this computerized version and we may target speed of reading with decreased errors, spelling, written expression or handwriting.

Another program that is really good for working memory is Cogmed. Multiple studies have been completed, and we like the results we have been seeing in this program. It is more strongly designed for the visual-spatial difficulties in working memory, through there are some verbal components as well. It consists of an at home computerized program over a period of 5 weeks. The program is monitored daily by the Cogmed coach via the internet, for progress and activity completion, and weekly telephone discussions follow up on rate of progress through the program.

Sometimes we will refer to speech language therapy or work in tandem with a speech language pathologist, specifically with goals in mind such as articulation, and tonal quality of voice, as well as reading. It is helpful to work with a microphone and recorder, so students are able to hear themselves clearly.

Intervention that could either be targeted weekly or in an intensive format is a combination of more Interactive Metronome, or regular metronome, for the first hour followed by a second hour working on handwriting, forming letters in clay (Davis Clay Method), and handwriting with paper en pencil.

Other times a struggle with emotional developmental delay may be observed: students who have gained much ground physically sometimes feel afraid to take the step of owning their independence. This is especially true for clients who have had their parent as an anchor for homework over many years. The long history of relying on someone other than themselves causes a trigger for performance anxiety, and the students need time to "catch up" emotionally with their physical prowess. We may use sound therapy again in an intensive format, simply to "calm" the anxiety, while doing DIR/Floortime or SandPlay during the OT sessions (bear in mind that our use of SandPlay is different from the use in trauma work, more focused on developmental delay rather than trauma). We do this program in both an intensive format or in a weekly format.

The emphasis of the intervention is not really on how much you do, but on when you do what. Each learning profile will to provide you with indications of progress along the way so you can more easily determine the next step forward. We have family consultation between each intensive that keeps the parent abreast of the progress we are seeing, and the parent provides feedback of what is functionally changing at home. It is a team process and families are guided to stay in the "here and now" with their son or daughter so as to curb the influence of anxiety over the future, and celebrate what is changing in the "now." Some families like to get the entire program completed in succession; others take longer breaks between intensives or phases – this would entirely be their decision. The feedback we mostly get is that this frame of assessment and intervention, The Developmental Pathways Model, provides them a plan with an end goal. We do not promise the final outcome ahead of time as we simply do not know what it will be, but we can reasonable lay out what is possible with each step of the way as we are on the journey. There is no talk of a "cure" or "perfecting function." Our goal is to gain as much comfort as possible in the students' bodies and environmental adaptation, so as to allow them to be all that they can be, with less holding them back from accomplishing their goals, while accessing the necessary self-esteem and attitude that they "can!"

Accommodative Strategies

The above intervention plan is considered "bottom up" intervention, depending on the developmental hierarchy to lead the way towards subconscious automatic performance that does not require cognitive energy. Accommodative strategies are considered "top down," as we have to appeal to the cognitive brain, using cognitive energy, to apply function to the brain and body. In essence, we have to spend some of our energy on strategy, leaving less energy available for the new learning processes.

While the student is undergoing components of the intervention plan, he/she still needs support for weaker skills in the classroom and at home. As skills are strengthened, accommodations can be weaned until no longer needed.

As the student's executive weaknesses are identified, each executive skill needs to be considered in its entire scope; rather than deciding that once the student knows what the weakness is, he/she will be able to figure out a way to deal with it, the student requires support in finding effective strategies that works for his/her individual needs. Another factor to consider is planning strategies that are commensurate to the student's developmental level, and not his/her chronological age: some students can be highly verbal and highly intelligent, and there might be a tendency to rely too much on their understanding of the matter. This common mistake leads to behavioral failures that can be perceived as "willful."

In addition, we have to remember that every individual wants to be autonomous and independent: when students do not feel successful, their sense of self-identity is violated. It is important to recognize the students' inner drive for control, and to work with them on breaking down and analyzing executive difficulties. A plan is not necessarily going to be successful because it works for the caregiver – the student also has to "own" the plan and add their own input to the mix of strategies. Per our earlier discussion of intrinsic motivation, when students are fully involved in their plans, and gain feedback from within in regards to feeling successful, the inner drive to please themselves will reduce the need to use an extrinsic reward.

Start your strategy plan at the foundational level of success and carefully scaffold a next layer upon the first layer as the student becomes more autonomous in the planned strategies. Be careful to keep matching the student's level of effort to gain success as frequently as possible. Once a student has been successful once, it is not the time to remove supports: any new learning takes multiple repetitions of successful behavior before support can be weaned. Weaning refers to supports being faded away gradually and not abruptly and not more than one support at a time.

The Ability to Plan:

Task Initiation is nicely supported when the caregiver and student work out a visual cue between them that will be a reminder to get going on something. This cueing system works even better if the caregiver and student decide on the method of cueing together. This also inhibits the habit of calling the student's name in front of his/her peers multiple times per day, saving some self-esteem.

Breaking overwhelming tasks into smaller, more manageable pieces is another strategy that works quite well for students with this difficulty. And a similar idea addresses planning and organizational ability. Creating any plans with these students assists them to understand what the task entails. Involve the students in other plans of daily life as well, such as planning a daytrip for the family or planning the order of activities needed for an hour-long therapy session. Teachers have found it helpful to do a quick check in at the end of the school day and run through the day's schedule, cueing the students to make sure all the homework and books are in their bags. Initially it could be helpful to start the process with a question of what should we be doing first, then next, etc.

To organize projects or the space wherein to do them, it is important that all tools necessary are nearby. A forgetful student may find it valuable to have two sets of everything, keeping one set for home and another for school. Equally important is having a specific place to organize the homework, as the principle of "sameness" is important for students with executive challenges and decreases the tension surrounding homework.

Managing time is sometimes aided with the support of an auditory or visual timer. Predictability of the daily routine would be another strategy, although it is always good to keep one part of the day flexible, so the student has to negotiate the uncertainty at least once per day and does not become "stuck" with predictability. Calendars are useful tools for helping with the passage of time and planning to get a project completed over a span of days. It is also helpful to plan activities together with the sequential steps needed and monitor the time as the activity progresses. Technology can also be helpful to create reminders on projects due.

It is important to start with goal orientation early in life, but no matter the age, start with goals that are intrinsically motivating to the student. A reward could be planned initially to give the student something to look forward to that is associated with success and task completion. Rewards should not be something that the student has free access to at other times. Again, it is better to work with the reward of relational praise, so that the student is learning to take the effort to please others and in this way also please him/herself through his success. Gradually build up the time that is needed to reach the goals and remind the student from time to time what he/she is working towards.

The Ability to Use Attention:

Supporting working memory is not easy, but it is essential. You have to make sure you have the student's attention. For the visual learner it makes sense to make sure you have eye contact while you are going over an instruction; the auditory learner might do better with a tactile cue to listen up. Wherever possible, external distractions have to be decreased. Some students can focus better with noise cancelling headphones; other students need music playing so as to drown out outside interference. Classical music, such as Mozart, has an energizing and organizing effect on the brain, but be careful not to impose your choice of music on the student. Experiment together and work out what is best.

The caregiver could also request that the student repeat back what was said. This may work better in younger grades, as older students will not find this easy on their self-esteem when done in front of their peers. Written reminders may work. Some of our students also find it helpful if they are "pre-taught" the information of the next day in certain subjects during their homework the night before. Hearing information the second time is not as new and novel as hearing it the first time and is less taxing on working memory.

Students who struggle with sustained attention frequently require constant supervision to stay on task. Increasing the time spent alone on task could be assisted with a timer and also through a gradual process. Making the task more interesting will hold attention for longer periods of time. If the student is a tactile kinesthetic learner it might be more interesting to build the concept to be learnt first before committing it to paper. Offer praise not only for the completed task, but also for the amount of time the student was able to focus.

Students who have difficulty transitioning or shifting from one locus of attention to another can be helped by a pre-warning system. For some a verbal warning of a shift that is going to take place in 5 minutes may be enough (take into consideration if the student has understanding of the concept of time); others might benefit from a written note on the desk. Younger students also benefit from an item placed on their desk that they can take with them to the next station of engagement. Just before a transition is taking place, the caregiver could provide a verbal prompt to the student to write down the last thing he has done to make it easier to continue when he returns to the work.

The Ability to Deal with Frustration:

It is really important to consider the student's level of emotional development when figuring out strategies to support emotional experiences. The executive pathways in the brain are not fully mature until age 24 according to most research studies, and the younger the student, the less control we can expect. Also, as we've repeatedly stressed, it behooves the caregiver to consider that intellectual understanding does not necessarily equal emotional acceptance of the situation. You have to meet the student at the level of emotional understanding to prevent situations where too much is expected from the student who already is overwhelmed.

Help impulsive students to learn to delay gratification by using formal waiting periods for things they want to do or have, and require students to earn what they want. Previewing learning material is also a good tool to use with regards to impulsivity. Sometimes cueing students before they enter a situation that calls for a specific behavior you are targeting may help. Reward them for self-control after the fact.

To gain emotional control, it is important to regulate the environment, and consider the student's sensory profile and preferences. Preparing the student for upcoming tough situations is another helpful strategy: working out in role-plays different ways of dealing with different sets of frustration can be quite supportive. Younger students may benefit from stories being read to them in which characters exhibit the behaviors the student needs to learn.

Students who struggle with flexibility find it helpful to keep to schedules that enhance predictability. It also helps to reduce new and novel information by not introducing all the changes at once. Providing advance warning for what is coming next is another helpful tool as is providing the student with a script of how to deal with an upcoming change. Giving the student choices assists with structure and framing the gray area of change. Do not assume that the student's bossy and controlling behavior is due to "willfulness" and a "manipulative" attitude. For most students it is more that "if they could, they would!"

Finally, to support a student to employ self-monitoring skills, the caregiver could work with the student on recognizing how tone of voice changes the meaning of what is being said, and ask the student to identify how his/her actions might make someone feel. While providing specific praise for key elements of performance is important, it is also important to teach the student to self evaluate their own performance on a task: we need to help the student to identify what "finished" looks like so as to decrease the gray areas of the unknown.

Conclusion

When students cannot learn effectively, the effect on their lives are devastating. The behaviors we observe are a direct result of trying to protect a struggling self-identity. We need to move beyond the surface and to analyze these behaviors in the light of what we know of development. Too many students face multiple behavior plans in their lives that band-aid their difficulties rather than changing their origin or core.

The discussion above provides a hierarchy that you could follow, assessment tools to consider, as well as guidelines for intervention. Thank you so much for taking this journey with me as we traverse the complexities of this topic. Thank you so much for taking this journey with me as we traverse this complex topic. My hope is that you have not only gained ideas, but also insights that will improve and / or support your clinical judgment so as to plan the best possible scenario for assessment and intervention.

Each student presents to us a puzzle that needs to be clearly looked at from different vantage points in order for us to plan intervention with more specificity and clarity. Each student has the potential to gain learning, to feel success and to embrace future goals to become all that they can be!

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Additional Resources

A Total Approach: www.atotalapproach.com

This website contains more information on the programs mentioned throughout this course, as well as references to pertinent research articles. Information on live courses as well as webinars may be of interest to the reader.

The following listings present the tests and programs mentioned throughout the course in more detail; many also contain their own body of research.

Tests

AWMA (Automated Working Memory Assessment): http://www.pearsonclinical.co.uk/Psychology/ChildCognitionNeuropsychologyandLanguage/ChildMemory/AutomatedWorkingMemoryAssessment(AWMA)/AutomatedWorkingMemoryAssessment(AWMA).aspx

Beck Inventory for Children: http://www.pearsonclinical.co.uk/Psychology/ChildMentalHealth/ChildMentalHealth/BeckYouthInventories-SecondEditionForChildrenandAdolescents(BYI-II)/BeckYouthInventories-SecondEditionForChildrenandAdolescents(BYI-II).aspx

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BRIEF (Behavioral Rating Inventory of Executive Functioning): http://www4.parinc.com/Products/Product.aspx?ProductID=BRIEF

BOT-2 (Bruininks Oseretsky Test of Motor Proficiency): http://www.pearsonclinical.com/therapy/products/100000648/bruininks-oseretsky-test-of-motor-proficiency-second-edition-bot-2.html

DeGani-Berk Test of Sensory Integration™ (TSI™): http://www.wpspublish.com/store/p/3069/degangi-berk-test-of-sensory-integration-tsi

DEM (Development Eye Movement Test):

http://www.bernell.com/product/DEM/Eye-Movement-Saccadic-Tests

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FEAS (Functional Emotional Assessment Scale) of Dr. Stanley Greenspan: http://www.icdl.com/research/functional-emotional-assessment-scale

IVA (Integrated Visual and Auditory Attention Test): http://www.braintrain.com/iva2/

Jordan Left/Right Reversal Test:

https://www.wpspublish.com/store/p/2823/jordan-left-right-reversal-test-third-edition-jordan-3

Pediatric Symptom Checklist:

http://www.massgeneral.org/psychiatry/services/psc_home.aspx

SCAN Test: http://www.pearsonclinical.com/language/products/100000490/scana-test-for-auditory-processing-disorders-in-adolescents-and-adults-revised.html

Sensory Integration and Praxis Test (SIPT): http://www.pearsonclinical.co.uk/AlliedHealth/PaediatricAssessments/Sensory/sipt/sensory-integration-and-praxis-test.aspx

Sensory Processing Measure (SPM): http://www.pearsonclinical.co.uk/AlliedHealth/PaediatricAssessments/Sensory/SPM/sensory-processing-measure.aspx

Test of Visual-Perceptual Skills (TVPS3):

http://www.wpspublish.com/store/p/3072/test-of-visual-perceptual-skills-non-motor-third-edition-tvps-3

THS (Test of Handwriting Skills):

http://wpspublish.com/store/p/3042/test-of-handwriting-skills-revised-ths-r

Vestibulo-ocular reflex (VOR):

http://www.ncbi.nlm.nih.gov/pubmed/17314478

Programs

Bal-A-Viz-X: http://www.bal-a-vis-x.com

Balametrics: http://www.balametrics.com/index.htm

Cellfield: www.Cellfield.com

Cogmed: www.cogmed.com

Davis Clay Method: http://www.symbolmastery.com

DIR/Floortime intervention: http://www.icdl.com/DIR

Dr. Mary Kawar and Astronaut Training: http://astronautboards.com

Dr. Russel A. Barkley: http://www.russellbarkley.org

Dr. Sally Goddard: http://sallygoddardblythe.co.uk

Dr. Svetlana Masgutova and method: http://masgutovamethod.com

Dr. Teresa May-Benson: http://thespiralfoundation.org/whoweare.html

Infinity Walk: http://www.infinitywalk.org

Interactive Metronome: http://www.interactivemetronome.com

SandPlay therapy: http://atotalapproach.com/index.php/programs/10-programs/41-sand-play-therapy

Sarah Rosenfeld Johnson and TalkTools: http://www.talktools.com

Tomatis® Method: http://www.tomatis.com

From Sensory Processing to Executive Functioning
(3 CE Hours)

1. **In order to be able to modulate the registration of sensory information, the baby has to develop a balance between the sympathetic nervous system for sufficient arousal and the parasympathetic system for inhibition or calming of the body (we talk about the "_____" place of alertness, a very important function of the reticular activating system in the brain).**
   a. Central
   b. Just right
   c. Limited
   d. Up and down

2. **During the first months the world is one very strange entity of multi sensory influences, and the baby must learn to adapt to it all. Feelings of _____ promote this development.**
   a. Challenge and threat
   b. Discouragement and compensation
   c. Safety and protection
   d. Stress and feedback

3. **The baby learns that certain stimuli cause specific responses in the nervous system. These responses to what the body is experiencing lay down strong memory engrams in the brain that are mostly _____ as associations are being formed.**
   a. Erased
   b. Nonessential
   c. Overwritten
   d. Stored in limbic memory

4. **The ability to sustain upright seating in a chair in the classroom is an example of _____.**
   a. Extensor dominance
   b. Flexor dominance
   c. Good co-contraction
   d. All of the above

5. **_____ is a marvelous demonstration of the ability for the prolonged exercise of holding the trunk in the co-contracted sustained antigravity position, and strongly supports the development of trunk control.**
   a. Crawling
   b. Lying prone
   c. Rolling over
   d. Sleeping

6. **Which of the following is NOT correct?**
   a. Students with praxis difficulties can frequently be very creative in their cognitive ideation
   b. Students with praxis difficulties frequently "lose" their creativity once they have to put these same thoughts to paper
   c. Students with praxis difficulties have great difficulty becoming independent
   d. Students with praxis difficulties rarely exhibit good verbal skill to describe their creative ideas

7. **Eric Peterson and Marilyn C. Welsh (2013) described the concept of "Hot" and "Cool" executive functions. Which of the following is NOT true of "Cool" functions?**
   a. They are goal-directed and oriented to the future
   b. They are mostly manifested under relatively de-contextualized, non-emotional, and analytical testing conditions
   c. They are very oriented towards left hemispheric organization in the brain
   d. They include contexts that engender emotion and motivation

8. **Task initiation requires the ability to begin a task without undue procrastination, in a timely fashion – which implies that the child already has _____ to respond adequately.**
   a. An innate sense of timing in place
   b. An interest in the task
   c. Overcome attention difficulties
   d. Resisted distractions

9. **The process of organizing the materials needed for a task requires the ability to establish and maintain a system for arranging or keeping track of important items. Students with executive difficulties _____.**
   a. Can generalize a skill over into new and novel areas once a routine is established and has been repeated several times
   b. Cannot put a structure together in the moment, but are able to reach the level of integration required to make a system provided to them permanent
   c. Frequently require consistent supervision in order to maintain systems
   d. Will design and maintain these systems independently when left to their own devices

10. Students with timing difficulties frequently ask the same questions over and over – especially "when" – because _____.

a. The common responses we use do not make sense to them
b. Their attention difficulties prevent them from attending to the answer
c. Their cognitive function is such that they are unable to absorb information
d. They are indulging in attention-seeking behaviors

11. Working memory is _____.

a. A debunked concept
b. Remembering what I had for lunch an hour ago
c. The memory I am using in the moment when I am actively contemplating learning
d. What I can recall of past events in my life

12. Students who lack the ability to be flexible _____.

a. Give up the fight for control over a situation when challenged
b. Operate from a sense of heightened self esteem
c. Struggle with high levels of anxiety
d. Try to achieve external control because they feel a strong sense of internal contrrol

13. The influence of working memory, sustaining attention, and shifting attention are all components of which executive function?

a. The ability to deal with frustration
b. The ability to plan
c. The ability to use attention
d. None of the above

14. Among the tests recommended for use in the Foundation phase of assessment is the _____, which now includes separate scores for each subtest, for Visual Perceptual testing.

a. BOT-2 (Bruininks Oseretsky Test of Motor Proficiency)
b. DeGangi-Berk TSI (Test of Sensory Integration)
c. SPM (Sensory Processing Measure)
d. TVPS3 (Test of Visual-Perceptual Skills (non-motor), Third Edition)

15. The Achievement phase of assessment _____.

a. Considers executive functions and academic readiness
b. Considers reflexes
c. Diagnoses attention deficit disorders
d. Does not emphasize interhemispheric organization

16. During the Foundation phase of intervention, _____.

a. Emphasis is placed on registering information in the body through visual, auditory, somatosensory and vestibular systems
b. OT services are combined with light therapy to lessen response with regards to, especially, modulation and emotional regulation
c. We focus specifically on picky eating or problem feeding profiles
d. We work extensively on advanced movement patterns and reflex suppression

17. Among the activities recommended for use in the Organization phase of intervention is the _____, which targets ocular motor skills, while also using dynamic balance.

a. Astronaut Program
b. Balametrics program
c. TalkTools protocol
d. Tomatis Method

18. The Achievement phase of intervention _____.

a. Focuses specifically on picky eating or problem feeding profiles
b. Highlights extensive work on primitive movement patterns and reflex integration
c. Is reserved for the developmental needs that are essentially "left over," and in some cases may not be needed at all
d. Returns to fundamental skills like postural control

19. Accommodative strategies are considered _____ intervention, as we have to appeal to the cognitive brain, using cognitive energy, to apply function to the brain and body.

a. "Bottom up"
b. Permanent
c. "Top down"
d. Useless

20. Accommodative strategies supporting the ability to pay attention include: _____.

a. Decreasing external distractions wherever possible
b. Using a visual cue as a reminder to get going on something
c. Using formal waiting periods for things students want to do or have, and requiring students to earn what they want
d. Working with students on recognizing how tone of voice changes the meaning of what is being said

ANSWER SHEET

First Name: _____ Last Name: _____ Date: _____

Address: _____ City: _____

State: _____ ZIP: _____ Country _____

Phone: _____ Email: _____

NCBOT #: _____

Other: License/certification # and issuing state/organization _____

Clinical Fellow: Supervisor name and NCBOT account # _____

Graduate Student: University name and expected graduation date _____

** See instructions on the cover page to submit your exams and pay for your course.

By submitting this final exam for grading, I hereby certify that I have spent the required time to study this course material and that I have personally completed each module/session of instruction.

From Sensory Processing To Executive Functioning Final Exam

1. Ⓐ Ⓑ Ⓒ Ⓓ	5. Ⓐ Ⓑ Ⓒ Ⓓ	9. Ⓐ Ⓑ Ⓒ Ⓓ	13. Ⓐ Ⓑ Ⓒ Ⓓ	17. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ	6. Ⓐ Ⓑ Ⓒ Ⓓ	10. Ⓐ Ⓑ Ⓒ Ⓓ	14. Ⓐ Ⓑ Ⓒ Ⓓ	18. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ	7. Ⓐ Ⓑ Ⓒ Ⓓ	11. Ⓐ Ⓑ Ⓒ Ⓓ	15. Ⓐ Ⓑ Ⓒ Ⓓ	19. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ	8. Ⓐ Ⓑ Ⓒ Ⓓ	12. Ⓐ Ⓑ Ⓒ Ⓓ	16. Ⓐ Ⓑ Ⓒ Ⓓ	20. Ⓐ Ⓑ Ⓒ Ⓓ

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FROM SENSORY PROCESSING TO EXECUTIVE FUNCTIONING

(3 CE HOURS)

COURSE EVALUATION

Learner Name: _____ Completion Date: _____

❑ PT ❑ PTA ❑ OT ❑ OTA ❑ SLP ❑ SLPA Other: _____

	Disagree				Agree	
Orientation was thorough and clear	1	2	3	4	5	
Instructional personnel disclosures were readily available and clearly stated	1	2	3	4	5	
Learning objectives were clearly stated	1	2	3	4	5	
Completion requirements were clearly stated	1	2	3	4	5	
Content was well-organized	1	2	3	4	5	
Content was informative	1	2	3	4	5	
Content reflected stated learning objectives	1	2	3	4	5	
Exam assessed stated learning objectives	1	2	3	4	5	
Exam was graded promptly	1	2	3	4	5	
Satisfied with learning experience	1	2	3	4	5	
Satisfied with customer service (if applicable)	1	2	3	4	5	n/a

What suggestions do you have to improve this program, if any?

_____

_____

What educational needs do you currently have?

_____

_____

What other courses or topics are of interest to you?

_____

_____