

OCCUPATIONAL THERAPY AND MONTESSORI— KINDRED SPIRITS: MOVING TOWARDS A SCIENTIFIC AND MEDICAL PEDAGOGY

by Barbara Luborsky

Barbara Luborsky explores the commonalities between occupational therapists and Montessori guides, such as their focus on the prepared environment, following the child, task analysis, and multi-sensory learning. She describes many types of sensory processing disorders including their symptoms, treatment, and the many resources and adaptations that are available to help children succeed. When an OT is familiar with the Montessori philosophy and practice they can positively collaborate with the teacher and parents to develop strategies for the child's independence.

This presentation focuses on ways that occupational therapists specifically, and medical professionals, more broadly, together with Montessori teachers can collaborate to better meet the needs of children. An explanation and definition of occupational therapy will be presented, along with an exploration of the commonalities that exist between occupational therapy and Montessori learning. In order to elucidate these connections, the use of Montessori materials as diagnostic and therapeutic tools will be discussed.

Sensory integration theory and sensory processing disorder will be defined and discussed in relation to their impact on readiness for learning. The concept of using sensory diets as a management tool as well as descriptions of how to create effective sensory diets will be presented. Finally, there will be a brief overview of ways to support fine motor skills development the classroom. Understand-

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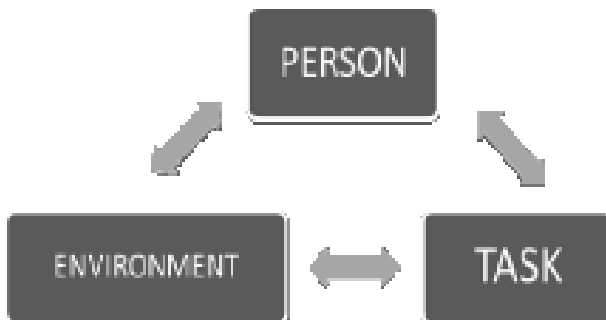
ing the basics of motor development will help teachers decide when to take a “wait and see” approach and when to refer a child to an occupational therapist for evaluation.

The concept of scientific and medical pedagogy will be considered. This is the idea that combining the knowledge from the medical sciences with the scientific pedagogy of Montessori through collaboration is the best way to serve children with special needs in the Montessori classroom. This concept will be further explored through descriptions of how this author has been working with children with special needs in Montessori settings over the past several years. The reality is that children with behavioral and learning differences that have not yet been identified are entering Montessori classrooms at seemingly increasing rates. The more information teachers have about how to identify and support these students the better chance they will have for success. This supports higher retention rates.

WHAT IS OCCUPATIONAL THERAPY?

Occupational therapy (OT) is an allied health science in which a person’s “occupation” is used as a tool for therapy. In this context the word *occupation* means how one enjoys spending time. In pediatric practice, the occupation of young children is considered to be play, or to what Montessorians would refer to as *work*. For older children, in addition to play, occupation would also include academic work, hobbies, sports, and social engagement. Pediatric OTs use structured play to help children build skills. The goals of occupational therapy treatment are to maximize independent function, enhance development, prevent long-term disability, and as appropriate, accommodate for an individual’s needs. OTs help patients acquire functional skills in many areas including activities of daily living (ADL), fine motor, gross motor, visual-motor integration, ocular-motor, sensory processing, cognitive, social skills, leisure skills, mobility, and communication.

For some children, home is where everything looks right, smells right, sounds right, and feels right. It is a place that promotes calm and organized behavior. When they get to school, the multi-sensory nature of that environment can be overwhelming and their behavior falls apart.



The Person, Environment, Task Triad

When treating clients, OTs look closely at the demands of tasks and situations to find ways to facilitate success. One way to look at this is by considering not only potential skill deficits on the part of the child, but also looking at the demands placed on the client by the environment and by the task itself. All three represent opportunities for adaptation and/or modification that can support success for the child. Looking at how a child is functioning in the classroom through this lens, there would be three avenues for improving the way a child functions: build skills the client is lacking, modify the environment to support success, and adapt the task to match the child's abilities. While the three aspects can be considered separately, they are, in practice, all interrelated.

The Montessori approach to education shares many fundamental tenants of practice with occupational therapy. A few of the commonalities are described on the following page.

MONTESSORI'S BEGINNINGS: FOCUSING ON THE CHILD WITH SPECIAL NEEDS

Maria Montessori began her educational work with severely impaired, institutionalized children (Orthophrenic School in Rome). Her approach was that of a scientific educator. She learned which materials were most effective by using a systematic trial and error approach in which she presented materials to children and observed their responses. She then made modifications and presented the materials again. Through careful application of this process, she developed her theories and materials in a systematic and scientific

Montessori	Occupational Therapy
Prepared environment: The classroom is set up to meet the needs of children and includes materials that support development.	Arrange tasks to offer choice: In a child-directed therapy setting, the child chooses among activities designed to build skills. The child engages in self-chosen tasks as he is developing needed skills.
Follow the child: The teacher connects the child to the environment and the materials through lessons. The child then teaches himself by following his own internal urges that lead him to take what he needs from the things and people around him.	Child-directed therapy: The child will show you what he needs/the child's "occupation" (how he chooses to play) provides the modality for treatment.
Task Analysis: The teacher breaks down a complex activity into its parts and shows one step at a time, executing each movement slowly and exactly. This provides a sequence of simple movements and the child has a greater chance of success when attempting it on her own.	Task Analysis: The OT analyzes task components so they can be taught separately or can be modified to support success for the child.
Incorporates multi-sensory learning: In addition to multi-sensory learning materials, Montessori developed materials for the perfection and refinement of each sensory system individually for First Plane children.	Incorporates multi-sensory learning: OT recognizes the value of multi-sensory learning and incorporate enhanced sensory inputs into activities to the greatest extent possible.
Recognizes the role of multi-step sequences in learning: This concept is woven into the curriculum throughout and is itself, provided in an elegant sequence.	Recognizes the role of multi-step sequences in learning: OT's incorporate opportunities for planning and sequencing multi-step activities throughout treatment sessions.
Play = "Work": Childhood is a time when children learn and experiment in a relatively pressure-free environment. Most social scientists refer to this as play. Montessori saw this as the "work" of childhood.	Play is the occupation of children: Through carefully chosen activities, pre-selected by the OT and then self-selected by the child, specific skills can be learned in all areas of development.
Coordination of Movement: The refinement of muscular coordination leads to increasingly independent functioning. Children are drawn to movement activities that are in pursuit of a developmental purpose. First Plane children are naturally attracted to activities which demand a certain level of exactitude and precision.	Motor experiences are the basis of abstract learning: Children learn by first "understanding" things concretely through experiences in their own bodies. Thus, for example, the child who can't walk on a line may later have trouble aligning written work properly.

manner. Due to complex historical and personal circumstances, she changed the focus of her work to typically developing children. Over the course of the past century, the educational approach that she developed was directed toward the education of typical children. The past forty years has seen a resurgence of interest in Montes-

sori's approach in the United States. According to the most recent data from the National Center for Montessori in the Public Sector, there are 439 public Montessori schools that serve 112,486 students (National Center for Montessori in the Public Sector).

Dr. Edouard Séguin and the Link between Movement and Learning

Dr. Séguin was a physician who worked with severely handicapped individuals and pioneered use of physical activities as therapy. In her book, *Edouard Séguin: A Study of an Educational Approach to the Treatment of Mentally Defective Children*, Mabel E. Talbot writes, "From Séguin's concrete examples of techniques and equipment, it is apparent that he used physical therapy techniques as educational 'incitations to activity and intelligence' " (Talbot 70).

Montessori was intrigued by the work of Séguin and she integrated many of his concepts and materials into her own work. She recognized the link between the body and mind and she believed that mental development is connected with and dependent on movements. She integrated manipulation of materials as an essential aspect of Montessori learning. Current neuroscience research supports the movement-learning link.

The locus of this connection in the brain is the cerebellum. It is noted that the neuroscience of how motor development and learning are connected is extremely complex. The information in this presentation is provided as a brief illustration of one of the ways this link plays out in terms neurophysiology.

THE ROLE OF THE CEREBELLUM

The cerebellum is a small structure, located at the back and beneath the cortex; it is a structure that is packed with neurons. Once thought to be responsible only for control and timing of movement, balance and posture, it is now recognized that the cerebellum plays a broader role. The cerebellum is part of a circuit with neural projections to and from areas controlling both movement and cognition. It is active in motor learning, especially for learning of new tasks. The cerebellum is also involved in information processing, mental tasks and imagery, and sensory perception and function. The cerebellum also plays a role in nonmotor functions such as motivation, emo-

tion, and memory storage of memories that are learned. In terms of motor learning, the cerebellum is involved with the learning of skills that need to become automatic, such as writing. It provides a level of baseline arousal, prior to learning, preparing the brain to process all information as it processes a continuous flow of input from the joints and muscles, through the proprioceptive system. Without proprioceptive input stimulating the cerebellum, we would simply not be alert enough to learn (Berkey 27).

Why Intervene?

Normal development unfolds naturally in predictable sequences, at specific periods of time (“sensitive periods”) and neuro-typical children move through developmental sequences without external prompting. However, children whose development is not unfolding as it should, benefit greatly from external prompting such as that provided by occupational therapists and other therapy providers. It is not quite clear in some cases why a child is failing to move automatically through the expected sequence of motor skills, but it is clear that physically based techniques will, in many cases, prompt the child to acquire the next skills and continue along the developmental path.

SCHOOL-BASED VERSUS PRIVATE SERVICES

Occupational therapy in the public schools is federally mandated through the Individuals with Disabilities Act (IDEA). In relation to ancillary services, such as OT, physical therapy, and speech therapy, the act mandates that students be given services to assist them with challenges that prevent them from accessing their educational program. This means that services are focused on providing accommodations and modifications aimed at helping students access their educational programs, rather than focusing on treatment of the underlying causes for a student’s challenges. Students must qualify for special education services by meeting eligibility criteria that are established by each jurisdiction. OT is not a stand-alone service, meaning that a child with no other qualifying disability other than OT is not eligible to get just OT services.

Accommodations are changes to the way a task is presented or the way the environment is structured and do not fundamentally

modify task demands or reduce learning or performance expectations for students. An example would be moving a child's work to promote better function or allowing a child to respond verbally instead of in writing due to challenges with writing. Modifications change the target skill expectations. An example would be removing five blocks from the pink tower to make it possible for a child with low muscle endurance to successfully complete the task before becoming fatigued.

Private services focus on treating the underlying problems as well as supporting and promoting optimal function across environments through development of accommodations and modifications. In many cases, children can benefit from both school-based services and those provided in the private sector.

Private Schools: A Unique Opportunity

With a commitment from administrators, private schools can make available classroom accommodations and modifications and treatment of underlying issues by making direct services available to their students. This can be offered as a stand-alone add-on to educational programming. Teachers with a good understanding of development and familiarity with the red flags that indicate significant challenges are the vital link; they identify which children need help and refer parents to appropriate resources.

The Montessori Classroom and Montessori Materials as Diagnostic Tools

The Montessori classroom is rich with activities that provide the observer with a wealth of information. Observing what work a child picks or avoids gives a great deal of information about a child's strengths and challenges. Watching how the child engages with teachers, peers, objects, and tasks provides information about abilities such as social skills, executive function, and ability to self-regulate.

In addition, watching the child engage in Montessori work can provide opportunities for clinical observation of specific skills. As an example, some of the skills supported by early work with the Pink Tower are:

- Executive functioning: such as self-regulation, attention, planning, organization, sequencing, working memory, ability to follow multi-step directions
- Postural strength and control: the ability to squat or bend down to retrieve cubes from shelf and then stand to walk and carry them to the mat and then kneel to place them on the floor
- Motor skills: prehension (ability to use the thumb against the fingers functionally), bimanual coordination (ability to use the two hands together in functional manner), midrange control (ability to control a movement throughout the full excursion)
- Eye-hand coordination-ability to pick up and place cubes with accuracy
- Perceptual skills: recognition of size, weight, and volume differences
- Cognition: understanding of relative size, weight, volume, and concrete experience of a continuum

DIFFERENTIAL DIAGNOSIS: THE STARTING POINT

Once observations have been made, the therapist must use clinical reasoning skills to try to determine what the underlying causes of a child's behaviors might be. For example, upon observing a child who avoids crossing her body mid-line, the therapist would consider whether the foundational problem could be poor postural control or poor bilateral coordination (the ability to use the two sides of the body in coordinated fashion). If the child has been avoiding specific tasks, the therapist would consider the challenges inherent in those tasks to determine whether underlying challenges with fine motor skills, perceptual skills, endurance, stamina, postural control, or sensory issues might be the underlying cause. If the child has specific sensory sensitivities, she may avoid certain works that are rich in that type of sensory input.

From Observation and Clinical Analysis to Action

Occupational therapists use a scientific approach that includes first observing the child and then meeting with the teacher to gain her insights to add to information obtained during formal evaluation procedures. The OT uses clinical reasoning skills to analyze the information gathered and develop a plan for treatment. Ideally, in a school setting, the whole team, meaning teacher, parents, and all special service providers, would meet to discuss goals of treatment, so everyone is informed about the child's strengths, needs, and goals.

The OT incorporates input from parents, teachers, evaluation data, and observations to develop long-term goals and short-term objectives for skill development. These are shared with parents and the classroom team. This plays out differently in different schools. The public schools are mandated to use the Individual Education Plan (IEP), which is a legal document delineating the students current level of function, exact number of minutes and type of interventions that a child will receive, goals of treatment, and benchmarks for progress. In the private setting, there is no specific requirement or specifications for an IEP document. However, it is best practice to gather information in the evaluation and intervention planning process and then make sure that all team members are aware of the child's level of function and goals and objectives so they can be a part of the ongoing process of monitoring the child's progress. In some settings, the OT is quite separate from the classroom team and parents, while in others, there is good ongoing collaboration with the team. Much depends on the school administration's perspective about the role of the OT and the value of a team approach. Without a commitment from administration to support collaborative teams, the therapists will remain on the outside. In many instances, administration may understand the value of the collaborative approach, but it still may not be feasible financially to implement their use. It is costly to provide classroom coverage so teachers can attend meetings or to have teachers attend meetings during afterschool and evening hours when it is convenient for parents to meet.

The OT must consider the various environments in which the child spends time. This means, school, home, afterschool program,

classes or sports teams, and church, for example. Each of these settings presents different challenges. It is not uncommon for a child to function very well in one environment and struggle in another. Often, parents report that they do not see the kinds of dysfunctional behaviors the child is demonstrating at school or vice versa. For some children, home is where everything looks right, smells right, sounds right, and feels right. It is a place that promotes calm and organized behavior. When they get to school, the multi-sensory nature of that environment can be overwhelming and their behavior falls apart. Alternatively, some children work extremely hard to meet the behavioral expectations of being at school and are able to do so to a large degree. These children often fall apart completely when they arrive home each day. This is why parent and teacher reports of how a child is behaving can vary so widely.

For the school setting, the OT would recommend accommodations and if necessary, modify task demands to facilitate success in order to increase the child's willingness to engage in activities he has been avoiding. These modifications would be faded gradually as the child's skill level increases and he has less need of help in order to function independently. In addition, the OT would develop and implement a sensory diet if it is indicated. The OT would also determine the frequency and duration of direct services needed as well as collaborating with the teacher to determine a schedule for providing support and consultation to the classroom staff.

In terms of planning for the home environment, the OT would work together with the parents to educate them about the child's needs and to collaborate with them to develop appropriate ways to integrate activities into the home routine in order to support therapy goals at home. The OT assists the family with implementing and maintaining a sensory diet. While it is important that parents not try to be the child's therapist, through increased understanding of the goals and of the kinds of activities that promote development of skills for their child, they can greatly enhance the therapeutic process by understanding how to structure play for the child in the home and community.

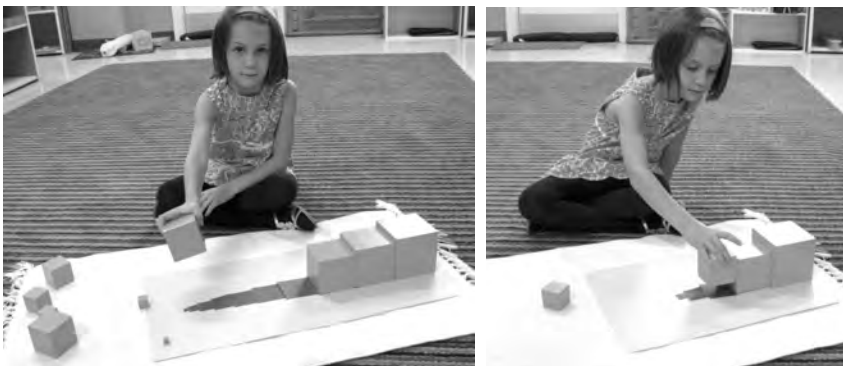
In the clinic, the OT provides direct treatment. This is treatment that is directed toward development of foundational skills such as

postural control, balance, and bilateral coordination that allow the child to develop higher level skills. Specific skill development is also addressed in a comprehensive manner. Once treatment is initiated, the OT is also responsible for continually reassessing the child's progress and adjusting the objectives and activities accordingly.

The Montessori classroom provides a multitude of opportunities for development of specific skills for students. The works can be used to support the goals of OT. For example, the Pink Tower could be a tool to help a student build perceptual skills, endurance and stamina, postural control, and eye-hand coordination.

To support development of perceptual skills, one could use a mat to give the student visual cues to support correct placement of each cube in horizontal orientation on the floor. The task could also be modified to accentuate the differences in size and volume of the cubes by removing every other cube.

For the child who needs to build stamina and may have been avoiding this work altogether because of its physical demands, using five cubes instead of ten might allow the child to complete the task independently. Once he begins engaging, doing the work will help him build stamina. If the child is very weak, you may want to encourage him to set up his mat within a few feet of the shelf where it is kept. Once the child can easily do the work, he can be encouraged to add more cubes and move a little farther from the shelf to maintain an appropriate level of challenge. This means be-



Using a mat to guide placement of cubes. Removing every other cube accentuates volume differences.

ing challenging enough to be of interest but not so hard that it is overwhelming to the child.

Some children may have postural or balance challenges that are so severe, that working on mat activities on the floor presents too much of a challenge for them. These children may do better working at a table. They can sit on a regular chair, use an appropriate seat cushion, or use an adapted orthopedic chair.

A child can work on building postural control while working on the Pink Tower, through use of various body positions. For example, the child could work in prone, or in prone over a bolster for support if needed.





Working on hands and knees is another way to build trunk strength and shoulder stability. As the child reaches for materials, he must go from four points of weight bearing to three, which will cause a weight shift as the trunk adjusts to weight bearing on one shoulder and the opposite knee. Working in this posture strengthens the core muscles and the oblique abdominal muscles as well as the muscles of the shoulder girdle.

Another important foundational skill that can be addressed through work with many Montessori materials is crossing midline. The way a body is used impacts inter-hemispheric communication in the brain. Each side of the brain controls the muscles on the opposite side of the body. Therefore, moving in a way that causes one extremity to cross into the space on the opposite side of the body mid-line actually forces the two hemispheres of the brain to communicate. This happens through fibers in the corpus callosum, which is the structure that connects the right and left hemispheres of the brain. Each time this type of movement occurs and this inter-hemispheric communication happens, the pathways are strengthened and the speed and efficiency of communication is enhanced. Thus, movements that cross midline help to support the child's ability to use the two sides of the body together in a coordinated, lead-assist fashion.

Red Flags

Following is a list of some of the red flags that would give one an indication that a child might be in need of individual support from an OT. Be aware that if a child has one or two of these alone, it is not necessarily cause for alarm. It is important to look at the child's overall demeanor as well as other areas of development. Development often occurs serially for some children, meaning that the child would make progress in one area of development fairly quickly while seeming to stall in another area. For example, a two-year-old might make significant gains in speech and language over a period of several weeks during which no progress at all is seen terms of motor development. With this in mind, it is important to watch a child over time (one to two months) to confirm that there really is a concern.

If there is a concern, it is best to intervene as early as possible. The early intervention window is open until approximately age seven. This is a time when the central nervous system is primed to develop and change. The nervous system is referred to as being *plastic*. This means that it will change in response to what is referred to as stress. Stress, in this context, means challenging the system to work. So the idea of structuring activities to challenge a child to cross midline is an example of challenging the system with stress. As the system rises to the challenge, changes are taking place wherein the circuits are becoming more efficient. Nerve cells will actually branch to create more synapses (connections) in order to increase the efficiency of pathways that are being used consistently. This plasticity remains throughout life, although later in life, it is much harder to achieve the same kinds of gains than are possible during the (first plane) early intervention window.

Here are some of red flags to look for:

- W-sitting
- Difficulty with transitions, changes in routine, unexpected events, rigid behaviors
- Excessive touching of peers or objects, overreaction to being touched or bumped

- Prolonged or severe outbursts, difficulty with regulating emotions
- Difficulty forming and maintaining peer relationships, relates best with adults
- Inconsistent performance or behavior; the child may be fine with an activity one day and hate it the next day.
- Avoids use of pencil, markers, crayon
- Avoids puzzles
- Dislikes messy play, avoids sand, or water table
- Mouths, licks, or puts non-food items into mouth
- Refuses to climb on playground equipment
- Moves around the room excessively, does not move, or seems to move as little as possible
- Hands over ears, hands over eyes
- Seeks out small spaces, crawls under the table

W-sitting is a way of sitting that allows the child to avoid crossing her legs. Sitting on a W position also provides a wider base of sup-



port. Because it can cause problems with the hips and knees later in life, it is important to discourage children from sitting this way.

Some alternative ways to encourage children to sit instead:



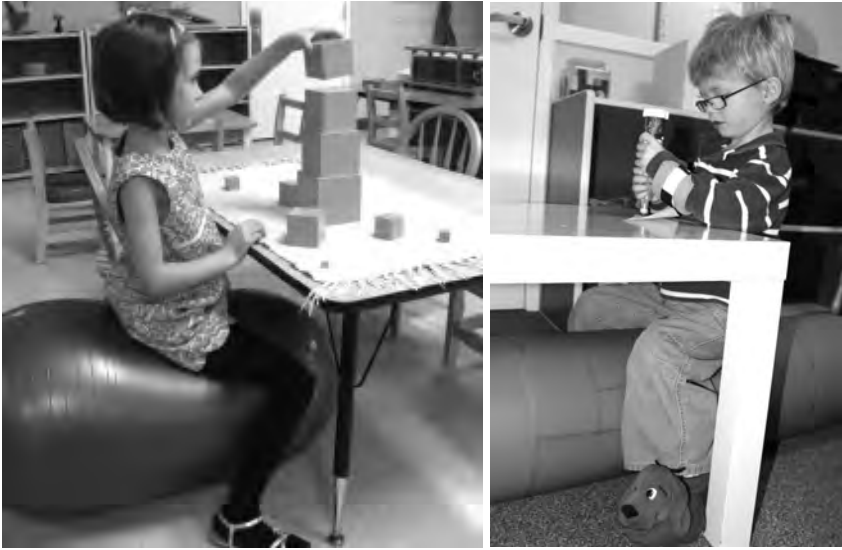
Side sitting



Long sit



Cross legged



If a child continues to W-sit despite being asked to sit a different way, it may be necessary to discontinue floor sitting and put the child on a chair or in a cube chair. Sitting on a peanut ball or bolster discourages internal rotation of the upper leg bone, which is encouraged by W-sitting.

SENSORY PROCESSING DISORDER: HOW IT AFFECTS READINESS FOR LEARNING AND HOW TO MANAGE IT

Sensory integration (SI) theory is a construct developed by Dr. A. Jean Ayres in the mid 1970s. She continued researching, developing, and expanding her work until her death in the late 1980s. SI theory deals with the five senses with which we are all familiar, touch, taste, smell, hearing, and vision, plus the internal senses: the proprioceptive (joint and muscle sense) and the vestibular (sense of movement and balance). SI theory postulates that the brain constantly takes in sensory information from all of the senses and then must prioritize and sort it in order to respond adaptively.

The adaptive response means being able to respond appropriately across environments, which may require different types of responses. It also includes being able to tolerate situations that present sensory challenges such as birthday parties or transitions from one activity or situation to another without incident. Adap-

tive response also includes being able to successfully learn skills that require complex motor sequences that require the integration of the two sides of the body in order to accomplish tasks such as buttoning or tying shoes and having the ability to plan long-term projects or organize belongings effectively.

Sensory integration is a process that is ongoing for all of us. There is a broad continuum of typical function with variability among individuals, including more or less efficiency with different sensory systems for each individual. Sensory challenges become a sensory processing disorder (SPD) when the difficulties and inefficiencies cause a person to behave in ways that are so far off the continuum of typical behavior that daily function is impaired. Diagnosis is a challenge and research is ongoing to find better ways to identify and treat people with SPD and differentiate them from individuals with other diagnoses that cause similar sensory symptoms. Problems with efficient sensory processing will affect a child's readiness for learning.

In a lecture, occupational therapist Winnie Dunn described how sensory experiences and interpretations are individual. Ask one person to describe a pear, and you will get a description of something sweet, juicy and delicious, with a marvelous smell. Ask someone else, and they will describe something with an unbearable grainy texture, an offensive odor, sticky juice, and a fragrance that stays on the hands long after they are done eating. The pear is the same but the interpretation of its properties by different individuals is different (Dunn).

Clearing a Path

Theoretically, children with SPD are dealing with a "software" problem. Something has gotten in the way of their forming neural pathways for efficient sensory processing. Imagining the impediments as trees, providing sensory supports is a way of clearing a path for the child through the trees. The clearing them allows the child to find a pathway for the connections that need to be made in the brain. Removing the trees makes room for the pathway and traveling the path strengthens it. Once the pathway is established,

the supports will not be needed for as long or as often. Eventually, they may not be needed at all.

Some children have organic issues with their brains that could be thought of more as “hardware” issues that are the underlying cause of their difficulties. These children may present similarly to those whose issues are caused by “software” problems, but they will not necessarily respond as readily to a sensory-based treatment approach. For these students, sensory strategies are effective as tools to promote self-regulation and manage difficult behaviors. Many kinds of behaviors and issues can result from challenges with sensory processing. Here are some of the kinds of symptoms that may occur.

Tactile

- Withdraws from touch or overreacts to being bumped or scraped accidentally or does not react to falls, scrapes, or bumps
- Strikes out at other children when they come near
- Dislikes standing in line, being held or cuddled, or wants to be held all the time
- Bothered by labels in back of shirt, seams in underwear, or seams in socks
- Touches everything, walks touching the wall
- Constantly puts things in mouth
- Dislikes messy play (mud, finger paint, glue on fingers, sand table)
- Pinches or bites self or others
- Poor concentration
- Hates haircuts, having face washed, nails clipped

Proprioceptive

- Walks on toes
- Stamps feet, plays too roughly, deliberately falls, bumps, or crashes
- Throws ball too hard, holds pencil too hard/writes too hard (or too softly)
- Trouble with buttons or with dressing self
- Wiggles constantly during seated activities
- Poor jumping skills, poor posture, tires easily, clumsy, seems unaware of body
- Handles toys roughly, lots of banging and breaking
- Confused about motions when eyes are closed

Vestibular

- Craves spinning, swinging, head inversion, constantly in motion, rocks while sitting or standing
- Is fearful of movement, often carsick
- Very still, makes few postural adjustments
- Avoids slides and swings, will not climb, disoriented and fearful when moved out of vertical posture
- Very clingy, no “terrible twos,” can learn to become intellectual and/or manipulative to avoid motion
- Difficulty walking downstairs, fears escalators, elevators, and airplanes
- Afraid to sit on toilet
- Messy eater, frequent spills
- Seems to have poor balance, difficulty learning to ride a bike

Visual

- Does not focus on objects
- Poor eye contact
- Unable to locate things with eyes, does not localize eyes to sounds
- Does not follow movement with eyes, difficulty catching a ball
- Visually distractable. looking at bulletin boards and shelves

Smell

- Overly aware of smells in the environment, smells everything, or ignores unpleasant odors
- Complains that food smells bad, uncomfortable and wiggly at lunch
- Notices how people smell

The goal of OT for children is always on developing automatic and appropriate responses to sensation so that daily occupations can be competently performed and social participation fostered. As these competencies increase with effective treatment, social participation, self-esteem, self-regulation, and sensorimotor abilities also increase, and other family goals and priorities are achieved. (The Sensory Processing Disorder Foundation)

Hierarchy of the Nervous System: Top-Down versus Bottom Up

This refers to the direction of information flow through the nervous system. Telling a child to “calm down” or “sit still” is a top-down approach and involves higher centers of the brain trying to control the arousal level by sheer force of will. Using a bottom-up approach involves having the child engage in activities that send stimulation up the spinal column to the brain to be processed through cerebellum, via information from the spinal column, which helps regulate the child’s arousal level from the body upwards to the brain (Williams & Shellenberger 1-10).

The SPD Foundation has developed a taxonomy of terminology for discussing SPD. This is an attempt to arrive at unified language to be used to diagnose SPD. The taxonomy includes three subdisorders: sensory modulation disorder, sensory discrimination disorder, and sensory-based motor disorder.

Sensory modulation disorder(SMD) will produce social and emotional deficits and challenges with regulation. Individuals with this disorder may tend to over react or under react to sensory inputs or may be sensory seekers. Symptoms can include protracted tantrums, difficulty with transitions, inability to tolerate loud noises, tendency to over-react to unexpected touch, and may respond by screaming, fleeing, or striking out. There are many ways that SMD can present. Here are a few examples based on the different sensory systems:

- Tactile: withdraws from touch, strikes out unexpectedly, leans on people or objects
- Vestibular: gets carsick often, avoids playground swings, fearful of heights, seeks quantities of movement
- Proprioceptive: hits when he means to touch, slams doors, stamps feet every step he takes
- Auditory: overreacts to loud or unexpected sounds, seems to hear sounds that others don't hear
- Visual: averts gaze, seeks visual input by flicking fingers in front of face
- Smell: does not seem to notice smells that are very apparent, refuses to eat foods that don't smell right
- Taste: only eats bland foods, seeks extremely spicy foods, has aversion to some textures, likes only smooth or rough texture

Difficulty regulating arousal levels (self-regulation) is common in children with SPD. Providing opportunities to engage in activities that provide proprioception is a good place to start helping these children learn to better regulate their responses. Proprioceptive

receptors are located in joints and muscles and they are activated by using muscles against resistance. The Montessori work cycle has a great deal of proprioception built in. This would include preparing the work area by getting a rug, rolling it out and getting materials from the shelf. Many of the materials such as the Pink Tower and Broad Stair have materials that provide proprioception when moved and others such as metal insets provide proprioceptive input through their execution. This also holds true for water activities that require the child to carry containers of water whose weight will vary depending on their size and how full they are.

One of the most important concepts for the Montessori teacher to understand is that children with special needs often will not automatically “lead.” In fact, at times, the child with special needs may “lead” in a direction that does not move them forward along the developmental path.

Sensory discrimination disorder leads to deficits in the ability to produce skilled motor output. For example, the child who cannot discriminate what type of surface she is walking on (poor proprioceptive discrimination) will fail to respond appropriately to a shift from pavement to grass, resulting in a propensity to fall.

Sensory-based motor disorders (SBMD) include postural issues such as low tone or high tone and challenges with dyspraxia. This means lack of efficient praxis that is dependent on the ability to conceptualize (ideation), organize (sequencing), and execute (execution) motor tasks. There are many types of praxis that involve various aspects of movement, including fine motor skills (affecting activities of daily living, practical life, writing, etc.), gross motor-coordination (affecting locomotor skills), oral motor skills (affecting speech and eating), and constructional skills (affecting ability to conceptualize space in three dimensions.)

The Montessori curriculum supports development of good praxis in students because of a multitude of opportunities for practicing sequencing and other executive skills such as initiative, motivation, memory, organizational skills, and time management. Montessori curriculum is very helpful for children with dyspraxia.

Some Questions when Considering Sensory Processing Disorders

Is it behavior or is it sensory? Teachers and parents often ask this question, wanting to know if it makes sense to use a sensory approach. The answer is Yes! In other words, in any case of behavior that is far from norm, both sensory and behavioral anomalies are involved. For that reason, it is often helpful to use both sensory strategies and a cognitive-behavioral approach.

What is sensory defensiveness? This refers to a situation in which the nervous system interprets nonnoxious stimuli as if they are noxious. This leads to avoidance behaviors that could be in relation to any sensory system (Biel & Peske 116). This can escalate to a situation in which the child has a fight or flight response upon encountering input from the offending sensory system. For individuals whose systems consistently misinterpret input in this way, the system becomes so accustomed to being in the fight or flight mode when the body is awash in stress hormones, that fight or flight becomes the body's default setting. As soon as the individual encounters input from the sensory system to which he is defensive, he immediately goes into a fight or flight response and essentially stays there for the rest of the day.

What is the role of "heavy work" (proprioception or muscles working against resistance)? When a child is experiencing sensory defensiveness, proprioception is always a good place to start to find a way to calm the child down. Proprioceptive input, or as it is called, *heavy work*, will bring the child into a calm alert state. The receptors are located in the joints and muscles and can be activated by using the muscles against resistance. This can apply to the oral muscles as well, which can be activated by providing crunchy foods, chewy foods (think about snack table offerings), a heavy water bottle, a water bottle that requires strong suction to activate, or by drinking thick liquids such as milkshakes or applesauce through a straw. Proprioception can be in the form of compression (weight bearing, pushing something heavy) or traction (hanging, pulling).

Creating Opportunities for Proprioceptive Input throughout the Day

Creating works that have extra proprioception such as activities using a weighted ball is a great way to offer students opportunities to get heavy work. Some ideas would include walking the line carrying a heavy tray or holding a weighted ball, rolling the weighted ball on the line, or passing the weighted ball around the circle before starting lesson. Attention to placement of materials can also be a means to increase the amount of proprioception embedded in an activity. For example, by increasing the distance between the shelf and the table or mat area or between sink and water area, the child must carry the heavy materials for a longer distance and the demand for heavy work is increased.

With consultation and oversight from the OT, another option is to use weighted products, such as a weighted vest, waist weight, cuff weights, weighted lap pad, or weights on the chair. Some children benefit from having a stretchy band tied across the front legs of a



Weighted vest made from an L.L. Bean fishing vest (left); pressure vest (right)



Sensory basket in the classroom providing access to weighted ball, weighted lap pad and seat cushion (left); using cuff weights during a water activity(right).

chair so they can pull on it with their feet as a way of getting proprioceptive input while seated. Make sure to have children help with tasks that involve proprioception, such as moving chairs or taking books back to the library. A sensory corner can be set up to provide easy access to weighted items for any child who may want them.

Garments that provide compression can also be helpful. Many children enjoy wearing Under Armor® garments under their clothing to get deep pressure throughout the day. There are also pressure vests commercially available. Bike shorts are another option for giving a child some compression input.

THE SENSORY DIET

Planning ways for children to get sensory inputs at regular intervals is referred to as the *sensory diet*. The idea is to provide organizing sensory input throughout the day to promote and maintain an optimal level of alertness and arousal for function and learning. The goal is to maximize adaptive responses and minimize seeking and avoiding behaviors in order to increase the child's ability to focus and attend. The sensory diet is initially developed by the OT and, once in place, is continually refined through active collaboration between the OT, the child's parents, and the classroom staff. It is constantly in flux because the child's responses will change due to the inputs as well as in relation to the varying demands of different classroom tasks.

It is very important to take a scientific approach to using a sensory diet. Make sure to observe the child carefully. Assess the child's behaviors in terms of their being a means of communication; think about what the child might be trying to communicate. Make a hypothesis based on observations. If the child is constantly in motion, you probably want to provide opportunities for movement with proprioception. If the child is engaging in excessive touching or invading the space of others, having access to tactile fidgets and squeeze toys may provide an intriguing alternative to touching peers. Think about what kinds of input any given activity offers the child and then choose a specific activity that offers a specific input based on your best guess about what the child needs. It is essential to observe and document the child's response. Modify the options offered to the child based on how the child is responding, implement the new strategies, and again observe the child's response. Below are some considerations to be used when observing the child:

- What is the child's behavior communicating?
- Is the child seeking or avoiding specific sensations?
- Given the use of a specific strategy, is the child better able to regulate her responses?
- If not, what if the input were given for a longer duration, with higher intensity, or with more frequency?
- Would it be more effective if it were combined with other kinds of input?

It may be helpful to provide the child with a menu of choices. This means making a visual aid to assist the child in understanding the options and participating in the process of making a choice about what activity will help him get organized. One way to do this is to use a file folder and peel-and-stick Velcro tabs. Each activity that is being offered is printed onto a small card and can be laminated for durability. For young children, a picture of the item or of the child engaged in the task is more appropriate than written words. Each should have a Velcro tab on the back so it can be placed on the

menu. The sample below was made for a child who was struggling with anxiety. The activity choices were written on index cards and Velcro was used so that the child could be given a choice of two or up to eight, depending on the situation. In some cases, if the child is extremely disorganized or out of sorts, it may be best to put only one activity on the menu and simply tell the child, "It looks like you need to ____." Once the child begins to recognize the connection between doing certain activities and feeling more alert and organized afterward, it will be more appropriate to offer choices.

Pay attention to the way a child chooses work and assess the schedule she chooses for herself in terms of the types of input the work is giving her. For example, mat work and water activities provide a great deal of proprioceptive input. In some cases, suggesting mat activities for a child immediately can help to start the child's work cycle with proprioceptive input, which will set the child up for success. Other children may need to be encouraged to do only one table activity at a time, interspersing mat work to provide proprioceptive input throughout the work cycle.



If space permits, it may be helpful to set up a quiet cave area where students can go to be quiet and calm. This would be a small area, possibly a tent or similar structure with a roof, filled with pillows, bean bag chair, soft lighting, and books. This would be a place available to students as a break time spot where they could go whenever they felt the need. Certainly one would not want any one student to be in the quiet cave for long periods of time on a daily basis, but for students who are challenged by the multi-sensory stimulation of the classroom, providing a place for respite is very helpful.

ADDRESSING FINE MOTOR ISSUES IN THE CLASSROOM

Be sure the child gets plenty of time to build trunk strength and shoulder stability, which are the basis for good fine-motor control. Some easy ways to provide that would be playground time for climbing, running, ball play, etc. or free playtime on the floor for creeping on all fours (e.g., using a play tunnel or playing pretend with being animals). Providing chairs and tables that are properly sized for the children in the class is also very important. Here are some guidelines for proper sizing of chairs and tables.

- The child's feet should be flat on the floor with hips, ankles, and knees at ninety degrees.
- Table height should be 2" above elbow level when arm is at the child's side
- If using a seat cushion, remember to put it on a lower chair to maintain the correct relationship of heights of chair and table
- If table is too high and cannot be changed, size chair to get child high enough for proper arm placement and use stool to provide stable surface for child's feet.

Tips for Promoting Handwriting

Having children work on a vertical surface will help promote shoulder stability, wrist extension, and prehension. This could be at a blackboard, a whiteboard, or an easel. Setting up a painting or crayon project right on the floor also provides an opportunity



for working in all fours to facilitate wrist extension and shoulder stability. Doing activities in this position will also force the child to move repeatedly between four-point and three-point weight bearing, which promotes integration through the trunk. Another great strategy is to use small crayons or chalk pieces to force the child to use good tip to tip prehension with the fingers. Crayon rocks are great for this.

Scissor Skills

For children who are struggling to master use of scissors, try the following to help them along.

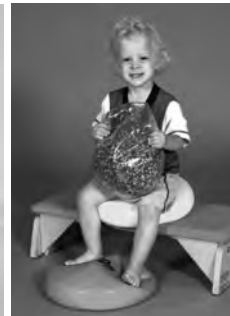
- Begin with paper tearing-this will give the student help with having the two hands do two different tasks simultaneously, as is required for scissor control.
- Use the right scissors. There are many kinds of adapted scissors, and the OT can help you decide which is the right one for any given student.

- Make sure the thumb is pointing to the ceiling
- Start with card stock such as index cards or old file folders.
- Start with snipping paper edge, then cut across paper before trying to get the child to control their strokes to cut on a line, a curved line, or cut out shapes
- Some options for adaptive scissors are Benbow scissors, scissors that open with a spring (Westcott spring safety scissors), Westcott training scissors, Fiskars total control scissors, and Koopy scissors by Maped.

Seating Options for Circle Time

Inattentive behavior during circle time that includes motor restlessness or lack of ability to maintain personal space can be very disruptive. Providing some cues about where the child's personal space should be can go a long way toward addressing these issues. Some ways to provide those cues would be:

- Use a carpet square or tape on the floor to delineate the space for each child
- Use seat cushions on the floor
- Use seat jack chairs or cube chairs
- Have all children sit in chairs



Cube Chair (left); Back Jack or seat jack (center); Core disc cushions (right)

PUTTING THE PIECES TOGETHER

It is clear that OTs and Montessorians have much in common. There are individuals all over the world working on small projects that foster collaboration between medical and Montessori professionals but they are isolated from one another. It only makes sense that everyone should be working together and sharing ideas to promote more and better collaboration between medical and Montessori professionals. We should not be working in isolation or reinventing the wheel.

Scientific and Medical Pedagogy

Scientific and medical pedagogy seems to be the best term to describe this collaboration. The goal of this effort is to promote collaboration between medical scientists and Montessorians (scientific pedagogues) to enhance therapeutic outcomes and inclusion for children with special needs in the Montessori setting. For an initiative such as this to succeed, both medical professionals and Montessorians must work toward comprehensive mutual understanding. This collaboration can only be successful when we understand and respect each other's perspectives and approaches.

What Montessorians Need Occupational Therapists to Understand

It is vital for medical professionals to be familiarized with the Montessori curriculum in order to understand how many skill-building opportunities are built into the curriculum. The Montessori approach to education encompasses a multitude of sequenced challenges aimed at skill development in the areas of sensory, motor (both gross and fine), executive and cognitive, social and language. The Montessori materials themselves build skills and can meet therapeutic goals within the educational framework. Thus, the medical professional spending time observing the child in the classroom is essential as the starting place for input from the medical professional to the teacher regarding ways to support therapeutic goals in the classroom. Further, the medical professional must understand the over-arching goals in the classroom, which are the culture of Montessori and includes maximizing the child's freedom of choice and independence within the classroom, and

remembering not to break the child's concentration or interrupt a child to give praise, just to name a few. The OT or other medical professional needs to:

- *Observe*: watch the child before doing anything
- *Communicate*: meet with teacher and parents
- *Observe*: watch the teacher give specific lessons
- *Collaborate and analyze*: work together with the teacher to modify work as needed
- *Treat*: provide direct OT treatment outside the classroom at school if space allows or at the clinic

The importance of collaboration between the teacher and the therapist cannot be overstated. The teacher must communicate with the therapist so the issues are clearly defined and then the therapist must make sure that the teacher understands the child's therapy goals. Then, together, the two can develop specific strategies for each goal. These strategies must represent the end product of discussions in which the OT/medical professional proposes possible ways to address the issues and the teacher then determines which approach meshes best with the culture of the classroom. Over time, these strategies must change in order to continually encourage increasing levels of independence for the child.

What Occupational Therapists Need Montessorians to Understand

For each of the medical professions, there is some basic developmental and medical knowledge that the teacher must possess in order for this collaborative process to be a success. In the area of OT, that would include:

- a basic familiarity with the sequences of motor development and approximate timeframes for various motor milestones
- the basic sequence of developmental hand skills

- the basics of sensory integration theory, an understanding of sensory processing disorder, and use of a sensory diet
- the value of proper positioning
- awareness of the red flags and when to refer a child for evaluation by the OT

In addition, one of the most important concepts for the Montessori teacher to understand is that children with special needs often will not automatically “lead.” In fact, at times, the child with special needs may “lead” in a direction that does not move them forward along the developmental path. This may be particularly true for children who are working to avoid activities that are too hard for them or those that present a particular type of sensory input that is overwhelming to them. This presents a significant conundrum for the Montessori teacher whose guiding principle is to “follow the child.”

In many ways, therapists function like coaches. We are trying to get our patients to do things that are extremely challenging, and often they do best with ongoing vocal support and encouragement. This is a fundamental difference in approach that must be recognized and reconciled through mutual respect for successful collaboration. The teacher and the therapist collaborate with the child to help them find their own will. The typical child already has the will; the special child may not. The teacher shares her will with the child, initially, until the child develops it for herself. In this way, by providing supports, accommodations, modifications, and encouragement, the child with special needs can begin to move forward. This recognition that children with special needs require additional help to get started is the essential piece of understanding that teachers need in order to remove the barriers that children with special needs face. The next step is continued collaboration with medical specialists, in order to determine which supports are appropriate for any given child. Follow-through in the form of ongoing communication and collaboration with specialists is the final piece that will ensure a successful integration of the child with special needs into the Montessori classroom.

QUESTIONS EVERY TEACHER ASKS

How can I make adaptations to the Montessori environment? Isn't it essential to teach them exactly as I have been trained in order to preserve their inherent educational and developmental qualities?

As a scientific pedagogue or *scientific educator*, Montessori used the scientific process in relation to supporting the child's development. In welcoming children with special needs into the Montessori classroom, Montessori teachers must take this same scientific approach: Observe the child's preferences and avoidances, work with medical professionals to identify the barriers to success, make a collaborative hypothesis about how to break down the barriers, and refine through ongoing collaboration with medical professionals. Be mindful that the reason for making these adaptations is to make it possible for the child to engage and succeed with the materials and the environment. Because children with special needs do not follow the same developmental trajectory as children who are neurotypical, they need more support, more modeling, and more coaxing in order to engage.

The exact types of supports and encouragement needed will be unique to each child and that is where the medical specialist assesses the child and determines what modifications will be most helpful in getting that child to successfully participate to the greatest extent possible. The goal is to fade (remove gradually) the supports and adaptations as the child gains skills and no longer needs them. So think of these modifications as temporary ways to help the child with special needs achieve success in the Montessori classroom. Think of it like putting training wheels on a bike.

How do I talk to parents about a child who is struggling?

While it can be anxiety producing to share information with parents, especially if it is regarding potential difficulties related to their child's development, parents should be informed of your observations without delay. Be as clear as possible about what you are seeing and describe, as objectively as possible, what you are observing that is causing your concern. Remind the parents that these challenges are the child's way of communicating. Be sure to ask parents if they have similar observations of their child at home.

Come prepared with proposed options for action, a referral, and suggestions of specific professionals they can call so there is a plan when you leave your meeting.

What do I tell the other children about special equipment or alternative ways of doing things recommended by the specialist for one particular child?

You will be surprised how accepting and adaptable your students can be. If you are calm and matter-of-fact about making adaptations to works, other students will follow your lead. You can say things like:

“This is the way Johnny is going to do it. You can keep doing it the way I showed you during our lesson.”

“Doing it this way is best for Johnny; doing it the way I showed you is best for you.”

Won't it be disruptive to have special equipment in the classroom?

It is helpful to give the class some introductory information about the equipment you will be bringing into the room. Show them what it is, describe how each item will be used, reassure them that they each will have a turn to try things out. Using simple, matter-of-fact explanations is best.

“Susie needs this slant board because it helps her see her work, just like your glasses help you see better.”

“This ball chair is not a toy. It is another kind of chair that you might like to sit in. You can try it and decide for yourself if it is something that helps you feel ready to work.”

There will be an initial investment of time to implement recommendations from the medical professional. If the teacher is able to focus on making careful observations, this will assist the medical professional in refining the classroom program more quickly. The child whose program is appropriately designed and implemented will be better regulated, have improved focus and attention, and will be better prepared to learn. The child in this state will be an active and engaged learner, ready to benefit from the Montessori curriculum.

**EQUIPMENT THAT EVERY
INCLUSIVE MONTESSORI CLASSROOM SHOULD HAVE**

Providing modifications shows the child the way to independent function. Remember, making these items available to students makes it possible for them to do things they otherwise would not do. It is not a crutch but is a catalyst for helping the child develop skills with the ultimate goal of independent participation to the greatest extent possible.



Standing work tables



Disc cushion (left); ball chair (center); lap pad (right)



Two views of homemade standing tables and a standing work area for a preschool classroom

There are many types of ball chairs available commercially. Here is an example of one type. They also are available with armrests.

There are many commercially available lap pads or they can easily be made using beans, rice, sand, or feed corn. They can be used with the child sitting on the floor or on a chair.

Make Your Own Standing Table

Standing tables, like the ones in the photos, are available commercially but they tend to be pricey. It is easy to make your own standing table using a music stand as the desk surface. They can adjust up and down and the angle of desktop can be set. It is important to provide a footstool to allow the child to put one foot up to ease strain on low back.

WEBSITE RESOURCES

www.abilitations.com

Therapy balls, lap pads, core disc cushion, ball chairs and more. Air filled cushions are also available from many sources. Ball chairs and lap pads are available in many kinds, sizes, and price points, look around on the web.

www.crayonrocks.net

www.funandfunction.com

Lap pads, vests, seat cushions, scissors, specialty papers, pencil grips, and more

www.sinetwork.org

A great resource about sensory integration theory, SPD, treatment and current research

www.southpawenterprises.com

Sensory integration equipment, toys, games, resource material, balls, etc.

www.therapro.com

Wide array of therapy items

www.therapyshoppe.com

Fidget toys, sensory toys, whistles/oral toys, fine motor and more

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