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# Occupational Therapy Sensory Integration Protocol for Early Intervention: Birth to Three Years

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Occupational Therapy Sensory Integration Protocol  
For Early Intervention: Birth to Three Years

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Scholarly Project

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## CHAPTER ONE

### INTRODUCTION

Information from the environment comes to us by way of our senses (Henry, 1997). The way in which we interpret the sensory information received is key to the way in which we function. The ability for us to take in information from our senses, combine it with other information stored in the brain, and produce a meaningful response is sensory integration (Stephens, 1997). Sensory integration begins before birth and continues throughout the lifespan as people mature and interact with the environment (Johnson, 2003). Imagine now, if you were unable to interpret these sensations appropriately. “People have different thresholds for noticing, responding to, and becoming irritated with sensations; these thresholds, in turn, affect their daily choices and are reflected in their moods, temperament, and in ways of organizing their lives” (Dunn, 2001, p.609).

The inability to take in, integrate and have a meaningful response to sensory stimulation is sensory integration disorder or dysfunction (SID) (Kapes, 1995). It is estimated that 12 to 17 percent of children today have some degree of sensory integration dysfunction (Kranowitz, 1999). “Approximately 10% of the pediatric population in the United States have severe over or under responsiveness to sensory stimuli that interferes with daily life activities” (p.442). Ayers (1979) describes the four main categories of sensory integration dysfunctions as: disorders involving the vestibular system, developmental dyspraxia: a motor planning problem, tactile defensiveness, and visual

perception and auditory language disorders. In order to overcome these dysfunctions proper intervention may be required.

Sensory integration treatment with children is usually done on a 1:1 basis in a room with suspended equipment to facilitate different types of movement and sensory experiences. The goal of therapy is to follow the child's lead, and select and modify activities according to the child's response, not to teach new skills. According to McCarthy (2001a) "If you suspect your child may have sensory issues, the earlier you have an expert evaluate your child, the better off he or she will be, and the sooner you and the therapist can start to reverse any damage that may already exist" (p.3).

McCarthy states (2001b), "If caught in time, evaluated properly, and given appropriate occupational therapy, vast improvements in your child's developmental progress can be accomplished" (p.5). Although sensory integration therapy has been around for more than 20 years, it is still controversial and more research needs to be done to determine its long-term effects. Currently, occupational therapists are able to define sensory integration and sensory integration dysfunction, identify deficits through assessment and provide an intervention plan to alleviate future problems.

The goal of the project is to review what the current literature includes regarding sensory integration dysfunction and intervention and to develop a protocol for use by occupational therapists. The protocol includes various intervention strategies and guidelines that may be useful in treating children with sensory integration dysfunction. The main focus of the protocol is on intervention with children ages birth to three years, but may be helpful for children of all ages. The protocol is not designed to be a specific outline for treatment as every child is different and has different sensory needs; however,

it is designed to give an occupational therapist ideas and strategies to be used, but it is up to the therapist to determine the child's sensory profile and needs.

## CHAPTER TWO

### LITERATURE REVIEW

#### Introduction

Some problems, like measles or broken bones or poor eyesight, are obvious. Others, such as the problems underlying slow learning and poor behavior, are not so obvious. Slow learning and poor behavior in children are often caused by inadequate sensory integration within the child's brain. These sensory integration problems are not obvious, yet they are widespread among children throughout the world. They cause some bright children to have trouble learning in school, and they cause poor behavior in some children who have fine parents and a good social environment (Ayers, 1979, p.3).

Since this is such a wide spread problem around the world pediatric occupational therapists are dealing with sensory integration issues on a regular basis. The review of the literature addresses the definition of sensory integration, the definition of sensory integration dysfunction, the assessment process, intervention strategies, and early intervention for sensory integration.

#### Sensory Integration

Information from the environment comes to us by way of our senses (Henry, 1997). The way in which we interpret the sensory information that we receive is key to the way in which we function. The ability for us to take in information from our senses,

combine it with other information stored in the brain, and produce a meaningful response is sensory integration (Stephens, 1997). Jean Ayres, an Occupational Therapist with training in neuroscience and psychology, developed the Sensory Integration (SI) theory more than twenty years ago (DiMatties, 2003). Ayers (1979) defined SI as:

The organization of sensation for use. The brain must organize all of these sensations if a person is to move and learn and behave normally. The brain locates, sorts, and orders sensations. When sensations flow in a well-organized or integrated manner, the brain can use those sensations to form perceptions, behaviors and learning (p.8).

We are all equipped with five main senses and two that are less known. These seven senses include: touch/tactile, sound/auditory, sight/visual, taste/gustatory, smell/olfactory, movement and balance/vestibular, and joint or muscle sense/proprioception (DiMatties, 2003). Integrating this sensory information enables us to develop motor and speech skills, emotional stability, and the capacity for attention and appropriate behavior (Henry, 1997).

The term sensory integration is used to describe both a neurological process as well as a clinical framework or theory used by occupational therapy practitioners for evaluation and treatment of persons exhibiting difficulty with sensory processing (Brachtesende, 2003). The SI theory describes the relationship between the brain and behavior; it explains why people respond to sensory stimulation in certain ways and how that can, in turn, affect behavior (DiMatties, 2003). According to Neistadt & Blesedell Crepeau (1998) the SI theory has three basic premises:

1. The integration of sensory information, especially, vestibular, tactile, and proprioceptive input is fundamental to a person's ability to interact efficiently with the environment.
2. Sensory integration provides a foundation for learning and emotional regulation. Deficits in sensory processing and organization can lead to certain types of conceptual and motor learning.
3. Sensory experiences provided within the context of meaningful activities and resulting in adaptive responses will enhance sensory integration, and in turn, enhance learning. (p. 547)

Before therapists can identify a person as having sensory integration deficits, they must first understand the normal development and impact sensory integration on developmental milestones throughout the lifespan.

### Normal Sensory Integration Development

Sensory integration begins before birth and continues throughout the lifespan as people mature and interact with the environment (Johnson, 2003). The earliest responses to sensory stimuli occur approximately 5 ½ weeks after conception and by the time typically developing children are seven to eight years old they test at almost the same maturity as an adult on standardized sensory testing (Case-Smith, 2001). Ayers (1979) wrote that children learn to sense their body and the world around them in the first seven years of life. She also says that sensory integration develops in a natural order with all children following the same basic sequence, but some children may develop at a quicker rate than others of the same age (Ayers).

The same author described three basic principles of child development: “organization through adaptive responses, the inner drive, and building blocks”(p.14). A great deal of sensory-motor organization occurs during adaptive responses to sensory stimuli, which is the first principle of child development. “An adaptive response is a purposeful, goal-directed response to a sensory experience” (p.6). “This is a response in which the person deals with his body and the environment in a creative or useful way” (p.14). As an adaptive response is formed, a challenge is mastered and a new skill is learned. As adaptive responses occur, the brain develops the ability to organize itself. Kranowitz (1998) describes adaptive response as “the ability to respond actively and purposefully to new circumstances” (p.8). Adaptive responses may include such things as turning your head when you hear a sound or shifting your weight to regain your balance after someone bumps into you. Before we can have an adaptive response, our brains must first receive the stimuli and then organize the information in order to create the needed output or the adaptive response. Each new adaptive response serves to further develop an individual’s sensory integration skills (Ayers, 1979).

The second principle of child development is inner drive. All children have inner drive to develop SI, and for this reason it is often taken for granted. For normally developing children, nature automatically takes care of them to create sensory integration (Ayers, 1979).

The third principle described by Ayers (1979) is “building blocks”; this consists of taking the skills that are already in place and progressively building onto them with more complex skills. This is easily demonstrated by the skill of crawling and then walking, but it is not as easily seen when developing the senses.

Ayers (1979) wrote that the major developmental steps of sensory integration occur between birth and seven years. The following table describes the developmental milestones adapted from the works of Ayers.

<b>Age</b>	<b>Developmental Milestone</b>	<b>Sensory Experience</b>	<b>Benefits</b>
1 <sup>st</sup> Month	<ul style="list-style-type: none"> <li>❖ Primitive reflexes</li> <li>❖ Follow objects with eyes then head</li> <li>❖ Turn head in response to sound</li> <li>❖ Make small throaty sounds</li> <li>❖ Sucking reflex</li> </ul>	<ul style="list-style-type: none"> <li>❖ Tactile, gravity and movement</li> <li>❖ Eye and neck muscles</li> <li>❖ Sensations in speech area of brain</li> <li>❖ Sensations in the mouth and jaw</li> </ul>	<ul style="list-style-type: none"> <li>❖ Automatic response to gravity, movement and touch.</li> <li>❖ Strength and movement against gravity.</li> <li>❖ Developing vision</li> <li>❖ Developing and understanding speech</li> <li>❖ Developing sense of smell and taste</li> </ul>
2 <sup>nd</sup> & 3 <sup>rd</sup> Months	<ul style="list-style-type: none"> <li>❖ Visual Perception</li> <li>❖ Lifting chest off floor</li> <li>❖ Grasping</li> </ul>	<ul style="list-style-type: none"> <li>❖ Head and eye stability, inner ear sensations</li> <li>❖ Using muscles in arms and back</li> <li>❖ Touch</li> </ul>	<ul style="list-style-type: none"> <li>❖ Ability to scan environment, balance and reading</li> <li>❖ Eventually move to a standing position</li> <li>❖ Holding objects, eye-hand coordination, voluntary release of an object.</li> </ul>
4 <sup>th</sup> to 6 <sup>th</sup> Months	<ul style="list-style-type: none"> <li>❖ Controlled arm movement</li> <li>❖ Airplane Position</li> <li>❖ Joy of Movement</li> </ul>	<ul style="list-style-type: none"> <li>❖ Looking at hands</li> <li>❖ Coordinating what the brain sees and feels</li> <li>❖ Pull against gravity</li> <li>❖ Using muscle in neck, back, arms and legs</li> <li>❖ Being rocked, held up, swung, turned over and moved about.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Hands at midline</li> <li>❖ Rotating wrists and manipulating objects</li> <li>❖ Planned movements</li> <li>❖ Rolling over, eventually standing up and walking</li> <li>❖ Integration of movement and gravity makes experience a joy</li> </ul>
6 <sup>th</sup> to 8 <sup>th</sup> Months	<ul style="list-style-type: none"> <li>❖ Locomotion</li> <li>❖ Spatial Perception</li> </ul>	<ul style="list-style-type: none"> <li>❖ Righting reflexes</li> <li>❖ Space and distance</li> </ul>	<ul style="list-style-type: none"> <li>❖ Rolling, creeping and crawling</li> <li>❖ Ability to judge how large an object is and judge</li> </ul>

	<ul style="list-style-type: none"> <li>❖ Finger &amp; eye control</li> <li>❖ Motor planning</li> <li>❖ Babbling</li> </ul>	<ul style="list-style-type: none"> <li>❖ Sense of touch and precise eye control</li> <li>❖ Sequencing actions in correct order</li> <li>❖ Mentally visualize objects</li> <li>❖ Listen to sounds</li> <li>❖ Sensations of jaw, muscles, and skin of mouth</li> </ul>	<p>distance</p> <ul style="list-style-type: none"> <li>❖ Pick things up, stick finger in hole</li> <li>❖ Put things together and take them apart</li> <li>❖ Look for covered objects</li> <li>❖ Say “ma” and “da”</li> <li>❖ Hear detail</li> <li>❖ Eventually form more complex words</li> </ul>
9 <sup>th</sup> to 12 <sup>th</sup> Months	<ul style="list-style-type: none"> <li>❖ Play</li> <li>❖ Stand</li> <li>❖ Words</li> </ul>	<ul style="list-style-type: none"> <li>❖ Bangs things together, reaches across body, or throws things</li> <li>❖ Put things together</li> <li>❖ Scribble</li> <li>❖ Integration of gravity, movement, muscles and joints and eye and neck muscles</li> <li>❖ Sensations of hearing and movement</li> </ul>	<ul style="list-style-type: none"> <li>❖ Cross midline</li> <li>❖ Sequencing</li> <li>❖ Learning about new tools and how to use them</li> <li>❖ Standing up alone and eventually walking</li> <li>❖ Speak a few words</li> <li>❖ Understand a great deal</li> </ul>
2 <sup>nd</sup> Year	<ul style="list-style-type: none"> <li>❖ Localization of touch</li> <li>❖ Moving and climbing</li> <li>❖ Mapping the body</li> <li>❖ Selfhood</li> </ul>	<ul style="list-style-type: none"> <li>❖ Sense of touch tells brain things that vision does not</li> <li>❖ Sensory awareness about body and world around them.</li> <li>❖ Gravity and movement</li> <li>❖ Information from the world allows them to map out their body</li> <li>❖ All the sensations felt up until this point.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Ability to tell where they are being touched</li> <li>❖ Ability to tell where body begins and ends</li> <li>❖ Walking, pushing, pulling, exploring, climbing</li> <li>❖ Gives them a feeling of how gravity works, how their bodies move, how to interact with others, what feels good or bad and what they can and cannot do.</li> <li>❖ Feeling of independence</li> <li>❖ Good relationships with others</li> </ul>
3 <sup>rd</sup> to 7 <sup>th</sup> Years	<ul style="list-style-type: none"> <li>❖ Using tools</li> </ul>	<ul style="list-style-type: none"> <li>❖ Integration of many sensation</li> </ul>	<ul style="list-style-type: none"> <li>❖ Becoming proficient in using tools such as a: fork, knife, scissors, pencils, etc.</li> </ul>

According to Ayers (1979), by the end of the seventh year, children's sensory systems are mature. The final polishing is done in the seventh year with boys doing strength and sporting activities, while girls are learning more motor skills through games. Children are able to balance themselves, tell where they are being touched, sequence activities and speak and understand language. "Seven or eight years of moving and play are required to give the child a sensory-motor intelligence that can serve as the foundation for intellectual, social, and personal development" (Ayers, p.24). If a person is unable to accomplish the task of integrating their senses they will inevitably have problems along the way.

### Sensory Integration Dysfunction

Imagine now, if you were unable to interpret these sensations appropriately. What if the tag on your shirt or the seams on your socks were so bothersome that you were unable to participate in your daily activities? "People have different thresholds for noticing, responding to, and becoming irritated with sensations; these thresholds, in turn, affect their daily choices and are reflected in their moods, temperament, and in ways of organizing their lives" (Dunn, 2001, p.609). The inability to take in, integrate and have a meaningful response to sensory stimulation is sensory integration disorder or dysfunction (SID) (Kapes, 1995). Sensory integration dysfunction is not a term to describe one particular problem, but a group of disorders involving multi-sensory systems (Case-Smith, 2001). It is estimated that 12 to 17 percent of children today have some degree of sensory integration dysfunction (Kranowitz, 1999). These children may be oversensitive or under sensitive to touch and/or movement. In either case these children are out of

synchronization (Kranowitz). According to Schaaf et al., (2003), “Approximately 10% of the pediatric population in the United States have severe over or under responsiveness to sensory stimuli that interferes with daily life activities” (p.442). Sensory integration dysfunctions generally begin to appear in infancy, but by the time children enter preschool it rarely goes unnoticed (Sherman, 2000, and Kranowitz). These children may have behaviors that point to attention-deficit disorder, but children with sensory integration dysfunction have signs and symptoms of their own (Kranowitz). If sensory information is not being processed effectively the brain cannot direct behavior appropriately (Ayers, 1979). The following symptoms are merely that, they are not the real problem, but the result of a sensory integration dysfunction (Ayers).

### *Types of Sensory Integration Dysfunction*

Ayers (1979) describes the four main categories of sensory integration dysfunctions as: disorders involving the vestibular system, developmental dyspraxia: a motor planning problem, tactile defensiveness, and visual perception and auditory language disorders. These four areas will be described in greater detail in the following section.

#### *Disorders involving the vestibular system.*

The vestibular system is the system that is responsible for keeping people from feeling dizzy and losing their balance. “The vestibular system tells us where our heads and bodies are in relation to the surface of the earth” (Kranowitz, 1998, p.98). This is an innate system that is with a person from early fetal life until death. The brain receives input from gravitational sensations, takes that information and produces an appropriate

response or output. Every movement made with our head stimulates the vestibular receptors in the brain. The brain is able to respond to vestibular stimulation before we are able to process the visual and auditory input. One of the most important parts of the vestibular system is modulation of its activity. According to Ayers (1979), “Modulation is the process of increasing or reducing a neural activity to keep that activity in harmony with all the other functions of the nervous system. All of the functions of the brain must be in harmony with each other to produce the most effective adaptive response” (p.70).

The neck and eye muscles also play a role in organizing the vestibular system. The vestibular system is in charge of orienting our head and body so that we may understand the meaning of information provided by our eyes. The vestibular system also has the responsibility of maintaining a stable visual field so that things do not appear blurred or fuzzy. If the vestibular system is not working correctly, it becomes difficult for a person to keep his/her head and eyes steady in order to focus on an object.

There are two types of vestibular disorders. Generally, a person is either over reactive or under reactive to vestibular stimulation (Ayers, 1979). This person is inefficient at integrating information about movement, gravity, balance and space (Kranowitz, 1998). The first type of vestibular disorder is an under active vestibular system. This results from the information not getting through to where it should go. The physical signs of this may be demonstrated by spinning the child a couple of times. If the child does not become dizzy or queasy even after several minutes of spinning the child likely has an under reactive vestibular system.

Two other disorders associated with under reactive vestibular systems are vestibular-bilateral disorder and vestibular-language disorder. The symptoms of

vestibular-bilateral disorder are often subtle and may go unnoticed until the child enters school. These children often have problems with reading, math and other academic subjects. They are of average intelligence, but words and numbers seem to get mixed up in their brains, causing them to have difficulty with academic activities. Vestibular-language disorder may cause children to have difficulty with articulation, speech and language. This is due to the way the vestibular center of the brain is not functioning in conjunction with the other areas of the brain. This, too, is caused by an under reactive vestibular system (Ayers, 1979).

Children who have an under reactive vestibular system may also have deficiencies in postural responses and eye muscle control. These children may not be able to follow an object with their eyes and may have difficulty looking from one spot to another. Children who have difficulty with postural responses, may have trouble holding their head up and may become tired during play. This is due to the vestibular system not receiving enough input to send out an impulse to the muscles in order for them to contract (Ayers, 1979). Children with under reactive vestibular systems do not get the amount of information necessary to feed their vestibular system and therefore do not have the inner drive to develop their skills. They may also have difficulty coordinating the two sides of their bodies and may become easily confused by directions or instructions. As children get older they may be able to compensate for their poor vestibular system and may not appear to have deficiencies unless learning a new skill (Ayers).

At the other end of the spectrum is the over reactive vestibular system. “The normal brain processes vestibular sensations and uses their information to form an adaptive response. To use the vestibular input, the brain must inhibit impulses that are

not useful. Some brains, however, cannot inhibit or modulate vestibular activity, and so they overreact to vestibular stimulation” (Ayers, 1979, p.83). There are two types of over reactive vestibular systems: gravitational insecurity and intolerance to movement.

Gravitational insecurity makes children feel uncomfortable because there is a mistake in the vestibular processing of the brain. Children with gravitational insecurity feel fear, anxiety and distress when in a position they are not used to or when someone is trying to control their movements for them. These children fear falling and goes to great lengths to avoid it even though they are generally less likely to fall than children with the under reactive vestibular system. When children do not feel secure in their relationship to the world around them, it makes personal relationships less optimal as well (Ayers).

The other over reactive vestibular disorder is intolerance to movement. These children feel great discomfort during rapid movements, such as swinging or spinning. They often become car sick or may even become sick when they watch someone else spinning. It seems as though the input from the semicircular canal is not being modulated appropriately. It is still unknown whether or not this intolerance to movement interferes with learning or not. Many therapists believe that it effects personality development more than academic development. As people get older it is normal to have less tolerance to movement, therefore if an adult does not enjoy movement, it is not indicative of neurological problems (Ayers, 1979).

#### *Developmental Dyspraxia: A Motor Planning Problem.*

Developmental dyspraxia is a disorder of poor coordination that results in sensory integration dysfunction in motor planning; the ability to carry out an unfamiliar task is called praxis. If children are dyspraxic, they have slow or inefficient motor

planning. If they are unable to motor plan at all, they have apraxia. These children are of normal intelligence, but the problem lies within the bridge between the intellect and the muscles. “Developmental dyspraxia is a brain dysfunction that hinders the organization of tactile, and sometimes vestibular and proprioceptive, sensations and interferes with the ability to motor plan” (Ayers, 1979, p.101). Children with dyspraxia want to learn and try hard, but their bodies won’t allow them to learn it. They must repeat an activity over and over again because it does not “sink in”. These children do not have a good sense of their body and what they can do with it. These children’s clumsiness makes them messy and accident-prone. Many children with developmental dyspraxia have learning difficulties, and although it may be more difficult for them to learn it is possible (Ayers).

#### *Tactile Defensiveness.*

“Tactile defensiveness is the tendency to react negatively and emotionally to touch sensation” (Ayers, 1979, p.107). Children with tactile defensiveness are often hyperactive and distractible, which may hinder learning. These children are often emotionally insecure and are easily emotionally upset. Children with tactile defensiveness may be overly reactive to things that the average person may not even feel. The disruption in the nervous system causes a negative emotional and behavioral response. The average person is able to inhibit tactile sensations such as clothes that touch our bodies. Children with tactile defensiveness are unable to inhibit these sensations, which feel extremely uncomfortable to them. These children may have difficulty making friends because the other children do not realize it makes the child uncomfortable when they touch them. They may have difficulty in school because it is difficult to pay attention when you are uncomfortable. Tactilely defensive children

actually need more tactile stimulation than other children, but have more difficulty tolerating it than other children (Ayers).

There are two modes to tactile stimulation: defensive or protective mode and discriminative mode. The defensive mode is an automatic reaction to a situation such as putting your hand on a hot stove. Your body instinctively tells you to take your hand off of the hot stove without you even having to think about it. The discriminative mode allows us to tell one object from another, such as the difference between a penny and a dime without even having to look at it. Our bodies use the vestibular and proprioceptive senses to balance the tactile modes. If these senses are not working properly the two modes may not be well balanced. Tactilely defensive children generally have too much of the protective mode and not enough of the discriminative mode, therefore they react to these sensations in an ineffective manner (Ayers, 1979).

*Visual perception and auditory-language disorders.*

Children with visual perception disorders do not have the ability to recognize how much space they have around them and may not be able to orient themselves in the space around them. This is a skill that the average person begins attaining in the womb. These children will have difficulty interacting with the environment around them. They may have difficulty coloring, writing, or throwing a ball. Ayers (1979) states, “Any disorder in the processing of vestibular or eye and neck sensations will probably upset visual perception” (p.116). In order for a person to integrate visual and motor processes they must be able to determine their own movements, which is called self-determined movement. We are able to perceive space and orient ourselves to that space with

adaptive responses. Adaptive responses are key to the development of visual perception (Ayers).

Sensory systems develop simultaneously and the auditory and vestibular system work closely together. The auditory system is often involved when several other sensory systems have problems. Many children who have auditory-language problems often have developmental dyspraxia. The development of speech should occur around the ages of 2½ or three years, but children with auditory-language disorders may not develop these speech skills by this age and it may be necessary to have them checked out by a therapist trained in sensory integration (Ayers, 1979).

Sensory integration is an important part of our lives. When people have deficits in any of the areas of sensory integration it can affect many areas of their life and should be assessed and treated as soon as possible in order to decrease long-term effects.

### Assessment for Sensory Integration

Assessment tools used to determine if children have sensory integration dysfunction may include: interviews and questionnaires, informal and formal observation, and standardized testing (Case-Smith, 2001). The assessment used may depend on the type of dysfunctions being demonstrated as well as the age of the child. Interviews and questionnaires are generally completed by family members, teachers or other caregivers who may spend a large amount of time with the children and are able to give information regarding their actions and behaviors. The first step in the assessment process is to identify presenting problems and their influence on the child's ability to function (Case-Smith). The parent of the child may be able to give pertinent

developmental information, which may be helpful in identifying early signs of sensory integration dysfunction (SID). Three of the most common questionnaires used are the Sensory Profile, the Evaluation of Sensory Processing and the Sensory Rating Scale (Case-Smith). The information from these interviews and questionnaires will determine if further assessment is required.

The next step in the assessment process is informal and formal observations of the child. Informal observation consists of observing children in their natural environment and should be done if at all possible (Case-Smith, 2001). The information that is gathered from this informal observation will allow the therapist to guide therapy by determining how the sensory integration disorder is interfering with their ability to carry on with daily occupations. This type of observation may also be done in the clinic to see how the children react to new and different situations in an unfamiliar setting, which may also assist in the intervention process (Case-Smith).

Formal observation or clinical observation is the next step in the assessment process. This form of observation is highly structured and similar to test items. Clinical observation typically involves a set of specific tasks that are associated with the sensory integration process. Occupational therapists use their skill and knowledge to interpret the data they get from this type of observation, but there is no standardization involved here (Case-Smith, 2001).

If the informal and formal observations show that a child may have SID, the next step is to do a standardized assessment. The primary assessment tool used to determine if a person has SID is the Sensory Integration and Praxis Test (SIPT). The SIPT consists of 17 subtests in the areas of (1) tactile, vestibular and proprioceptive processing; (2) form

and space perception, visual-motor coordination; (3) praxis; (4) bilateral integration and sequencing (Neistadt & Blesedell Crepeau, 1998). This test may be administered to children between the ages of 4 years and 8 years, 11 months. This test may only be administered and interpreted by someone who has been trained to do so. The SIPT is a norm-referenced standardized test and therefore there must be strict adherence to the standardized administration procedures (Neistadt & Blesedell Crepeau, & Case-Smith 2001).

The SIPT is not appropriate for children under the age of four; however there are many other assessment tools available for this age group including questionnaires and performance-based instruments. Standardized questionnaires may include: The Infant Toddler Symptom Checklist, The Sensorimotor History Questionnaire for Preschoolers, The Sensory Profile, The Short Sensory Profile, The Functional Behavior Assessment for Children with Sensory Integrative Dysfunction, and The Sensory Integration Observation Guide for Children From Birth To Three (Williamson & Anzalone, 2001). Standardized performance-based instruments that may be used are: The Test of Sensory Function in Infants, The Early Coping Inventory, and The Miller Assessment of Preschoolers (Williamson & Anzalone). These assessment tools can be used to determine if children under the age of four have a sensory integration dysfunction. From these assessment results, the therapist may then be able to determine the child's sensory needs and initiate an intervention plan.

Once all of the data is compiled, it is then time to interpret the data and recommend intervention, if necessary. Regardless if the child has SID or not, it is imperative to share the findings with the family and the referral source. The therapist

may want to educate the family on behavioral issues that may be exhibited by the child as well as on educational issues if necessary. When all of the assessment information is compiled and the test results have been conveyed to the family an intervention plan will need to be set up (Case-Smith, 2001). Determining the type of sensory integration dysfunction that children have can be a complex process, therefore great care needs to be taken in assessing and defining the appropriate intervention strategies for the children.

### Sensory Integration Intervention

Sensory integration intervention involves the use of graded sensory experiences in the context of child-directed and meaningful activity to elicit adaptive response. Sensory integration dysfunction may limit a child's ability to effectively process sensory information and produce adaptive motor or behavioral responses in a preschool or home environment. The most effective interventions for these types of children incorporate the desired and needed sensations into their daily life experiences (Barker Dunbar, 1999, p.234).

Sensory integration treatment with children is usually done on a 1:1 basis in a room with suspended equipment to facilitate different types of movement and sensory experiences. The goal of therapy is to follow the child's lead, and select and modify activities according to the child's response, not to teach new skills. Sensory integration intervention is child led; the therapist suggests and modifies activities that are most intrinsically motivating to the child in order to create the "just-right challenge". The "just-right challenge" are activities that neither over stimulate nor under stimulate the

children, but instead give the right amount of sensory stimulation (Dunkerley, Tickle-Degnen, & Coster, 1997). According to Ayres “the goal of sensory integration therapy was to help children ‘direct themselves meaningfully’” (Cohn & Cermak, 1998, p.542). Sensory integration intervention is not going to be the same for all children; it is not possible to use the cookbook approach with these children. The treatment sessions aim to foster the child’s inner drive and to create a balance between freedom and structure (Case-Smith, 2001).

#### *Direct Sensory Input.*

Ayers (1979) states, “The central idea of this therapy is to provide and control sensory input, especially the input from the vestibular system, muscles and joints, and skin in such a way that the child spontaneously forms the adaptive responses that integrate those sensations” (p.140). Although therapy is generally child directed, it might be necessary for the therapist to apply direct sensory stimulation to the child. Some of the techniques that may be used are brushing or rubbing, deep pressure, or vibration. Brushing is a technique that can either be a facilitatory or inhibitory sensation, depending on the part of the body brushed as well as the amount of pressure used (Ayers). The brushing technique needs to be taught and supervised by a trained professional who has expertise in the field of sensory integration (Yakes, Sutton, & Aquilla, 1998). Deep pressure is generally an organizing activity to help organize a child who is tactilely defensive, hyperactive or distractible. The therapist may push the bones in a joint together, or stretch them out to stimulate the sensory receptors of the joints (Ayers). Vibration may be used to stimulate sensory receptors throughout the body and send

information to the vestibular system (Ayers). It is important for children to actively participate in therapy in order to have successful adaptive responses to sensory input, therefore equipment is used to provide sensations that generally organize the brain (Ayers).

### *Therapeutic Activities.*

There are many types of equipment that provide sensory stimulation; two of them include the scooter board and the bolster swing. The scooter board is a piece of wood mounted on four wheels that allow it to roll and spin freely. The children generally lie on their stomachs on the board and then ride down a ramp and across the floor holding their upper and lower bodies up against gravity (Ayers, 1979). The scooter board provides sensory input to the tactile senses, the vestibular system, and the proprioceptive system, which in turn helps the eye muscles and makes visual perception easier. “The scooter board elicits sensory inputs and motor responses that cannot be obtained while sitting or standing up. As a child gradually masters these sensations and responses, his brain learns how to modulate sensory activity and forms a more accurate body percept” (Ayers, p.144).

The bolster swing is a long round tube that is approximately three feet around. It has a rope attached to each side and is suspended from the ceiling. Children can straddle the swing, sit on it like an average swing or even lie down on it. This swing promotes a flexor pattern, which is the ability to curl the arms and legs into a flexed position. Children with developmental dyspraxia may exhibit an inefficient flexor pattern (Ayers, 1979). The flexor pattern is dependent on the integration of tactile, vestibular and

proprioceptive sensations (Ayers). The bolster swing may also be used for motor planning activities by having the children lie on the swing and pick items up off of the floor. This activity also helps with tactile, vestibular and proprioceptive input. To an outsider looking in, it may appear that the therapist is merely playing, however it takes great skill and training to understand how the sensory system works and what will help the child integrate certain sensations (Ayers).

### *Sensory Diet.*

When treating children with SID, therapists aim to develop and teach strategies to adapt and compensate for the dysfunction with things like: environmental modifications, daily routine adaptations and changes in how people interact with the child (DiMatties & Sammons, 2003). The Wilbargers developed a program called the sensory diet, which is a strategy consisting of a carefully planned program of specific sensory activities that are scheduled according to each child's individual needs (DiMatties & Sammons). A sensory diet generally includes a combination of alerting, organizing and calming activities. The alerting activities may benefit an under stimulated children who need arousal. The organizing activities provide regulation to the children's responses. The calming activities help oversensitive children to decrease their response to stimulation (Kranowitz, 1998). The sensory diet consists of elements specifically designed to meet the children's sensory integration needs. The sensory diet is based on the thought that controlled sensory input will in turn affect one's ability to function effectively. This diet can help children to maintain age appropriate levels of attention, produce optimal function and reduce sensory defensiveness (DiMatties & Sammons).

### *Family Involvement.*

The family becomes of key importance when starting children on a sensory integration intervention program. The therapist aims to educate the family, caregivers and teachers to develop strategies to adapt and help compensate for dysfunction (DiMatties, & Sammons, 2003). Most therapists will provide the family with a home program consisting of specific types of activities and strategies to help the child with everyday problems (Henry, 1997). It is important to teach the parents about the nature of their child's sensory integration problems so they will better understand their child's behaviors. Helping parents to understand their children is important in facilitating more adaptive responses (Cohn & Cermak, 1998). Helping parents to understand sensory integration dysfunction helps them to understand, respond to, and live with the associated problems of having a child with the disorder (Cohn & Cermak). Ayers (1979) describes five important things that parents can do to help their children with sensory integration disorders: "(1) recognize the problem so that you will know what your child needs, (2) help your child to feel all right about himself, (3) control his environment, (4) help him learn how to play, and (5) seek professional help" (pg.159). Parents can make a world of difference in helping a child with SID, however their importance is vastly underestimated. Children with SID often lead worthwhile and satisfying lives with the support and understanding of their parents (Ayers).

### *Early Intervention*

According to McCarthy (2001a) "If you suspect your child may have sensory issues, the earlier you have an expert evaluate your child, the better off he or she will be,

and the sooner you and the therapist can start to reverse any damage that may already exist” (p.3). “Don’t take a wait and see attitude, the earlier treatment starts, the more robust the response is likely to be” (Sherman, 2000, p.4). It is thought that every time a child makes an adaptive response, changes occur in the brain. This change is a function of neural plasticity, which is the ability for a structure to change with it’s on going activity (Case-Smith, 2001). The younger a person is the more plasticity their brain has, making changes in young children more dramatic than older children (Case-Smith). This information makes it possible for infants who receive sensory integration therapy at a younger age to have a better prognosis than those children receiving therapy later in life.

### Conclusion

According to McMarthy (2001b) “If caught in time, evaluated properly, and given appropriate occupational therapy, vast improvements in your child’s developmental progress can be accomplished” (p.5). Although sensory integration therapy has been around for more than 20 years, it is still controversial and more research needs to be done to determine its long-term effects. Currently, occupational therapists are able to define sensory integration and sensory integration dysfunction, identify deficits through assessment and provide an intervention plan to alleviate future problems. Sensory integration is a specialized field of occupational therapy, but as described in the review of the literature, it is a facet of each and every person’s everyday life.

## CHAPTER THREE

### ACTIVITIES/METHODOLOGY

I have been interested in working with the pediatric population for many years, so I knew that I wanted to do something that revolved around children. I then began doing some research to see what topics were of interest to me. As I researched, I came across a lot of information on sensory integration. I found the information very interesting and determined that I would like to write a protocol for sensory integration intervention.

When I started working on the topic proposal, it was determined that my topic was too broad and that I should narrow it down. From there I decided to look at early intervention because, I feel, that the earlier treatment is initiated the greater the chance for success. The second step was to complete a review of literature that included current information on sensory integration dysfunction and intervention. I found a great deal of information; in fact, it was overwhelming how much I found. I began working with my two advisors at this point to narrow the focus of the literature to be reviewed. My literature review was a work in progress trying to incorporate all of the information, but I feel the process gave me a good understanding of what sensory integration is and how to treat it.

The next step was the development of the protocol. The guidelines and strategies included in the protocol are based on current literature. They are based on what I found as current best practice for sensory integration intervention. Sensory integration is not a new concept therefore I had to take to work of others and combine it to make a protocol

that could be used for children birth to three years of age. I have enjoyed writing this protocol and I feel that it will benefit me in many ways throughout my future as an OT.

During the process of doing this scholarly project, I have noticed that although sensory integration treatment has been around for more than twenty years, yet, there is still a great deal that is not known about it and it's outcomes. I feel that more research will need to be done on the effectiveness of treatment and additional outcome studies to determine it's usefulness.

## CHAPTER 4: PRODUCT

### SENSORY INTEGRATION PROTOCOL

#### Introduction

The intervention process of sensory integration begins with assessing the child to see what occupations are being disrupted by the dysfunction. There are six guiding principles for sensory integration intervention. These principles are outlined in Case-Smith (2001) as follows:

1. Controlled sensory input can be used to elicit an adaptive response.
2. Registration of meaningful sensory input is necessary before an adaptive response can be made.
3. An adaptive response contributes to the development of sensory integration.
4. Better organization of adaptive responses enhances the child's general behavioral organization.
5. More mature and complex patterns of behavior are composed of consolidations of more primitive behaviors.
6. The more inner-directed a child's activities are, the greater the potential of the activities for improving neural organization. (p.361)

Developing and carrying out a sensory integration intervention plan requires a great deal of expertise, which can be developed through advanced training and years of practice. The specialization of sensory integration assessment and intervention is a complex process. Due to its dynamic nature, it is important for practitioners to stay

abreast of new developments and changes. A typical intervention may follow three forms of delivery: individual, group sessions, and consultation. However, a combination of the three is often utilized rather than using one sole service delivery method (Case-Smith, 2001).

According to Williamson and Anzalone (2001), there are three strategies that are most effective in treating young children using the sensory integration approach. These three strategies include: “helping parents and caregiver’s to understand sensory contributions to the child’s behavior and to foster successful relationships between the child and significant others; modifying the environment to fit the child’s needs; and providing individualized direct intervention designed to remediate identified problems” (p.71). The following protocol will look at various strategies used in treating children with sensory integration dysfunction.

## Collaboration with Parents

The importance of parents is vastly underestimated in the world of sensory integration. Parents know their children better than anyone and are able to influence their behavior and developing skills. Collaboration with the parents is key to sensory integration intervention and does not necessarily mean sending them home with a “home program”. Teaching the parents to become astute observers of their child’s sensory strengths and needs during a typical day is more beneficial. Developing an intervention program with parents may include a combination of various strategies.

### *Intervention Strategies*

- Help parents understand the child’s sensory profile and how this may affect his or her behavior.
- Recognize the problem.
- Understand why a behavior occurs, which may be difficult for parents.
- Remember that not all behavior problems stem from a sensory basis.
- Teach parents to appreciate naturally occurring activities throughout a daily routine that foster or disrupt arousal, attention, affect and action.
- Modify the child’s sensory experience throughout the day in order to meet their sensory needs.
- Intervention may require decreasing sensory stimulation rather than adding sensory input.
- Help parents read their young child’s behaviors and cues as well as interpret them and responding appropriately.
- Practitioner should show great care and sensitivity due to the parents overwhelming amount of emotions.
- Build rapport with parents.
- Do not overwhelm parents with sensory integration jargon.

- Provide additional information to supplement what the parents may or may not already know about their children.
- Help your children feel good about themselves.
- Control the environment.
- Help the child learn how to play.

Adapted from Ayers (1979) and Williamson & Anzalone (2001)

## Modifying the Environment

Sensory integration intervention attempts to attain the just right challenge between the child's resources and the sensory demands of the physical and social environment. The goal for the practitioner is to determine how the child's sensations vary throughout the day and the affect this has on the child's ability to function. They then attempt to modify the environment to maximize the child's participation in adaptive behavior by using different strategies.

### *Intervention Strategies*

- Consistent, predictable and structured daily routines help children self-regulate.
- Knowing the child's sensory profile will help practitioners modify the environment to provide support for interaction and self-regulation.
- Parents should anticipate the child's needs whenever possible.
- Remember it is more difficult to remediate a problem after the child is overloaded or sluggish than it is to anticipate the problem and stick to a routine.
- Having a routine helps the child to have more purposeful, self-initiated behavior, which in turn helps them cope with change and sensory discomforts.
- Remember that children are different in many ways including their response to sensory stimulation.
- One type of input may be calming and organizing to one child and arousing to another child.
- Carefully observe the child for their individual responses to stimulation and be aware of warning signs the child will give.
- Senses are unified therefore the input from one modality can regulate input in another modality.
- Changes in sensory diet should be made slowly and conservatively due to the latency period.
- Teach parents to help child organize time and objects.

- The sensory diet must fit the sensory needs of the child as they change throughout the day and with varying contexts.
- Children may experience difficulty at mealtime and bedtime.
- Adapting the physical and social environment may help children achieve the just right challenge.
- Hyperreactive children often need a calm setting with few distractions and controlled sensory flow.
- Hyporeactive children may require a more rich sensory environment that will provide opportunities for active sensory exploration.
- Be aware of the child's physical environment and its impact on self-regulation.
- View the environment from the child's view. Questions to ask yourself:
  1. What would an infant or toddler see and feel in this place?
  2. Does the environment support purposeful, self-initiated behavior?
  3. Does the environment provide spaces for calming down as well as active exploration?
  4. From the adult's perspective, is it an easy and comfortable place to be?
  5. Is the environment structured so that adults have time to interact with the child, rather than having to use their time setting up and taking down equipment, or managing the child's behavior? (Williamson & Anzalone, 2001, p.83)

Adapted from Ayers (1979) and Williamson & Anzalone (2001)

## Direct Intervention

Parents and caregivers can do a great deal in providing a child with a growth promoting sensory diet and environment, however it may be necessary to have a one-on-one direct sensory integrative intervention in order to acquire more adaptive behaviors. This treatment is usually provided by an occupational therapist in a clinical setting.

### *Intervention Strategies*

- Intervention is sensory enriched, not sensory stimulating.
- Child directed, rather than therapist directed and exploratory not verbally directive.
- Playful and flexible, active and not passive.
- Activities should be purposeful and linked to affect, intentions and intrinsic motivators. If activities are not purposeful they have little benefit to child.
- Based on the assumption that meaningful sensory exploration will lead to changes in behavior.
- The therapist forms a hypothesis and tests it with various sensory experiences to help the child acquire more adaptive responses.
- The goal is to provide the child with opportunities to engage in sensory enriched experiences that match their current needs and abilities.
- Cannot be preplanned. It evolves over time with interaction between therapist, child and environment.
- The therapist may observe the child's play interactions to determine their sensory profile and then provide alternative sensory input.
- Do not make too many changes at one time.
- Allow child to express their sensory needs. Usually in the form of facial expressions, gestures, body posture, vocalization, etc.
- Treatment is specialized and allows for flexibility and complexity, as the child gets older.

- The experience allows for more sensory exploration than in the home or traditional setting.
- The therapist must be trained in skilled observation and have the ability to grade activities to meet the needs of the child.
- The therapist must form a trusting relationship that will foster the risk-taking and sustained activity required for therapy.

Adapted from Ayers (1979) and Williamson & Anzalone (2001)

## Tactile Intervention

The parts of the environment that come into direct contact with the child's skin have the greatest effect on their nervous system. It is important to remember that not every sensory experience will be the same for every person. What may be comfortable to one person, may not register the same to another person. Always respect the child's response to tactile stimulation.

### *Intervention Strategies*

- Young children have not developed social norms regarding touch therefore, their physical responses are a good indicator of which tactile information is good and which is not.
- Watch and listen to the child.
- Negative reactions are clues that the child may need extra tactile input.
- Inform other family members that certain touch (i.e., hugs and kisses) may not be acceptable to the child's sensitive nervous system.
- Tactilely defensive children may strike out as an automatic response to unpleasant stimulation, this is not directed towards the person, but an automatic response.
- Extra rubbing on the face and arms after washing may be calming to some children.
- A dark tunnel that the child can enter may allow them to calm in an overly stimulating environment. Be sure the tunnel is well ventilated.
- Some children may enjoy being rolled up in a blanket in order to get touch and pressure sensation.
- Sleeping in terrycloth pajamas or between beach towels may help balance activity within the nervous system.
- After bathing giving the child an extra drying with a towel may be beneficial.
- At any time if the child does not like the input, respect their wishes and stop.

Adapted from Ayers (1979).

## Vestibular and Proprioceptive Intervention

The ability to provide vestibular and proprioceptive input is of great importance. This type of equipment may include such things as climbing equipment, various types of swings, scooter boards, tunnels or barrels and many other things to promote sensory exploration. To an outside observer, sensory integrative treatment may look like child-directed play, however this therapy requires a skilled practitioner and the appropriate environment.

### *Intervention Strategies*

- Do not impose vestibular stimulation on a child who cannot modulate it.
- Some children love to be tossed around while other children are threatened by rocking in a rocking chair.
- Observe children as they play to determine if there are abnormalities in their response to vestibular input.
- Give children who seek a great deal of vestibular information an environment they can move around in.
- Activities like running, jumping, or climbing allow the body to move a lot.
- Activities such as lifting, carrying, or pushing things provide proprioceptive input.
- Physical work provided sensory input and in turn helps the child acquire adaptive responses that organize the nervous system.
- Introduce children to gravity by picking them up, carrying them, rocking them and putting them in a cradle, stroller, or swing.
- Children who dislike these activities or tire easily are often the ones who need this input the most.
- Make these activities available, but don't force the child to participate in them. It may be more than their nervous system can tolerate at the time.

Adapted from Ayers (1979) and Williamson & Anzalone (2001)

## Brushing

Practitioners who are wanting to use a brushing program need to have extensive training in the techniques before applying them as an intervention strategy. Brushing is a technique used to decrease general hypersensitivity or activate children who are hyporeactive. Practitioners, parents or caregivers use a non-scratchy surgical brush to apply deep firm pressure on a child's limbs and back. They then provide joint traction and compression to the joint of the arms and legs. This procedure only takes a few minutes and children who are sensory defensive generally enjoy the experience. The brushing program usually begins by repeating the process every two hours, but soon decreases as the child is able to stay in an organized state for longer periods of time. This process should not be used on children that find the sensory input unpleasant or on children that are medically fragile. Another factor that needs to be looked at before prescribing a brushing program is the relationship between the child and the parent or caregiver. This process may not be appropriate for children who have an unstable relationship with the caregiver or toddlers who are reaching autonomy from their parents. It is important for the practitioner to consider all possibilities when approaching an intervention process.

### *Intervention Strategies*

- Apply heavy, constant pressure on the arms, hands, back and legs and feet in an up and down motion.
- Always use the brush provided by the occupational therapist.
- Always keep physical contact with the child either with the brush or with your hand.
- Hold the brush at a horizontal angle when providing input to the arms and legs.

- Brushing over the clothes is acceptable if the child is uncomfortable with the brush directly on their skin. For this input the brush should be held vertically.
- Repeat the brushing procedure every 90 minutes to two hours in order to keep the input to the nervous system consistent. The information only lasts in the nervous system for approximately two hours. Try to commit to this routine for two weeks.
- The order of body parts to be brushed does not matter, but follow up with joint compressions is essential.
- Brush up and down both of the arms three times while holding the arm and rotating it to brush all surfaces of the arm.
- Brush the back of both hands in the same manner, but scrub the palm of the hands for five seconds in a quick manner.
- Brush the back up and down, side to side and in circles.
- Brush legs and feet in the same manner as the arms. Also scrub the bottom of the feet.
- Brushing must be followed by joint compressions, repeating each compression ten times. Make sure the joints are in proper alignment before completing compression.
- Instructions for joint compressions are as follows:
  1. Hand to Elbow- hold hand in handshake position, stabilize elbow and quickly press hand back into direction of elbow.
  2. Elbow to Shoulder- stabilize elbow and quickly press down at shoulder.
  3. Hips to Knees- Preferable in seated position, press knees back into hips.
  4. Knee to Foot- Press down on knees through the ankles and onto the floor.
  5. Fingers to Elbow- Stabilize palm and quickly pull out and in on fingers.
  6. Shoulders- press down on both shoulders ten times.
  7. For the final step, apply three quick compressions on the chest, pressing down and back against the sternum. Stabilize one hand on the back (Yack, Sutton, & Aquilla, 1998, p.59).

Adapted from Williamson & Anzalone (2001) and Yack, Sutton, & Aquilla (1998)

## Intervention for Children with Hyperreactivity

Infants with hyperreactivity have a low sensory threshold and have a tendency to have over-activation of arousal, attention, affect and action. Intervention, according to Williamson and Anzalone (2001), aims to “1) decrease or prevent sensory overload and assist modulation of sensory reactivity; 2) achieve an optimal level of arousal and attention; and 3) create a safe and predictable social and physical environment to support more effective engagement” (p.95).

### *Intervention Strategies*

- Children need to feel a sense of security and freedom from anxiety.
- Parents need to be sensitive to the early behavioral and autonomic signs of over-stimulation.
- Allow for recovery time if over-stimulation occurs.
- Calming techniques should be used rather than moving to other activities.
- Parents need to be aware of their own emotional responses, as these children are often irritable and hard to be with.
- Schedule breaks. This will make it easier to determine what specific stimulus over-stimulates the child rather than the accumulation of stimulation throughout the day.
- Some children may appear flat or disconnected, while other will show behavioral signs of over-stimulation.
- The goal of intervention is to prevent or discontinue sensory overload, not provide sensory stimulation.
- These children may want to bathe rather than shower.
- Have parents give the child a back rub to allow another person’s touch.
- Encourage child to slow down and be calm.

Adapted from Williamson & Anzalone (2001) and Kranowitz (1999)

## Intervention for Children with Hyporeactivity

Children who are hyporeactive have a high sensory threshold and are under-reactive to arousal, attention, affect and action. Williamson and Anzalone (2001) describe intervention for these children to “1) provide sensory experiences that enable the child to achieve and maintain a desired sensory threshold; 2) help the child attain an optimal level of arousal and attention; and 3) support the child’s interaction with people and things in the environment” (p.102).

### *Intervention Strategies*

- These children need to be activated in order to engage in effective exploration and social interaction.
- Practitioner aims to provide arousing input.
- It needs to be determined that the child is for sure hyporeactive before alerting activities are started.
- Pressure touch and proprioception are two of the most alerting and organizing inputs.
- Remember that some children have high thresholds, but slow reaction times. Allow enough time for the child to respond before offering additional input.
- When the child is motivated they are more likely to organize, integrate and use sensory input.
- Participate in stimulating activities like bouncing a ball, jumping, eating crunchy foods, or showering instead of bathing.

Adapted from Williamson & Anzalone (2001) and Kranowitz (1999)

### Intervention for the Child with Dyspraxia

Intervention for children with dyspraxia is generally complex and requires a specialized environment as well as a therapist with advanced training. “The guiding principle for the practitioner is to modify the environment to provide a motivating, sensory-enriched situation that requires repeated, complex, coordinated action by the child” (Williamson & Anzalone, 2001, p.106).

According to Williamson and Anzalone (2001),

General principles of intervention to improve the performance of children with dyspraxia relate to which component of praxis is problematic for a child. Intervention may include the following:

- if the child has problems in ideation, the practitioner works to improve sensory modulation and/or the ability to interact flexibly with the environment;
- if the child has problems with motor planning, one works to improve body scheme by increasing tactile and proprioceptive feedback from movement, and to expand the ability to initiate and sequence motor strategies; and
- if the child has problems in executing motor acts, the practitioner integrates practice of motor skills into activities that may also be designed to improve ideation or motor planning. (p.105)

*Intervention Strategies*

- Practitioners seek to increase the child's body awareness and motor control through somatosensory input.
- Therapist follows the child's lead and allows enough time for the child to respond.
- Therapist asks questions that allow the child to problem solve independently.
- The therapist introduces changes in the environment in a gradual manner.
- Children with dyspraxia often take longer to learn something than typically developing children. They need time for repetition and practice.
- Children need engage in child directed play with little therapist direction.
- Praxis is about the child's development and sensory capabilities, problem solving and motivation.
- Dyspraxia is not about what a child does, but rather what they do not do developmentally.

Adapted from Ayers (1979) and Williamson & Anzalone (2001)

## Intervention for Children with Sleep Disorders

It is important that a sensory diet fit the child throughout the changing contexts of the day. Bedtime is often quite problematic for children with sensory integration dysfunctions and may require some special planning and changes to the environment or routine to accommodate for this. Children who are hypersensitive may need help going to bed, falling asleep, or self-calming after waking in the night.

### *Intervention Strategies*

- Gather assessment data and rule out any other medical or psychological reasons interfering with the child's ability to sleep.
- Promote a regular sleep-wake cycle that increases nighttime sleep rather than daytime sleep.
- Emphasize calming input in the evening hours.
- Put child in crib when they are drowsy, but still awake to allow them to self-soothe.
- Support the child's efforts to self-calm with a pacifier or other calming techniques.
- Make sure the bed is sensorially compatible with the child.
- Provide soothing background noise that supports falling and staying asleep.
- Make sure child's sleepwear is compatible with their sensory comfort.

Adapted from Williamson & Anzalone (2001)

## Intervention for the Child with Feeding Disorders

Children with sensory problems may also have feeding disorders as a result of dysfunction in this area of sensation. There are different strategies that may be used to help children self-regulate who are hypersensitive to foods.

### *Intervention Strategies*

- Recognize that not all feeding disorders stem from a sensory basis and try to identify when the feeding problems started.
- Feeding time should be distraction free, when the child is alert and responsive and when the adult is calm and relaxed.
- Have a routine associated with the beginning and end of a meal.
- Use calming or alerting techniques prior to feeding time.
- Introduce changes in texture slowly.
- Start child with finger foods as they may be more likely to tolerate this oral stimulation.
- Remember that the face is the most sensitive area of the body, so touching in or around it can be very threatening to the child.
- When wiping the face use a firm pat rather than a soft swipe or let the child do it independently.
- Do not scrape food off the spoon with the child's teeth or upper lip.
- Child should sit in a supportive chair for postural stability and to decrease extraneous sensory stimulation.
- Introduce tooth brushing slowly and grade the activity until they are able to tolerate a traditional toothbrush.
- Make minimal changes in daily routines and feeding practices.

Adapted from Williamson & Anzalone (2001)

## Calming and Alerting Elements

Williamson & Anzalone (2001), p.77

The following is a chart of information regarding calming and alerting activities. These activities may be used in various situations, but should be introduced slowly to assure the child will be able to tolerate them.

<i>Elements</i>	<i>To Calm</i>	<i>To Alert</i>
<i>Visual</i>	Soft or natural colors Muted colors Room dividers, screens Keep visual input steady	Bright lights and colors Move objects toward face Focused lighting on objects Move objects at irregular speed
<i>Sound</i>	Classical music White noises Low-key humming Speak or sing in monotone or slow rhythm	Vary intensity, pitch, or beat Loud music
<i>Vestibular</i>	Rhythmical swinging Slow rocking Maintain head or body position Sustained movement	Dysrhythmic or changing speed of movement Change position of head Rock, jiggle, bounce or jump Upright positioning Rotary activities (spinning)
<i>Touch/Pressure</i>	Rhythmical patting and stroking (massaging the back) Wrap in soft, warm blanket Hold firmly for a hug Help child stroke plush toy	Light touch (especially face, palms, and abdomen) Gently and quickly rub skin
<i>Oral-motor</i>	Suck on pacifier Suck on mild flavors Induce slow breathing and blowing Maintain temperature and texture of food and liquid	Suck or eat citrus, salty or sour flavors Drink cold liquid or frozen pops Vary temperature and texture of food Chew before or during focused tasks
<i>Proprioception</i>	Resistive activities Rhythmical motor activities	Resistive activities Changeable motor activities

## Behavioral and Autonomic Signs of Distress

Williamson & Anzalone (2001), p.92

The following is a chart describing behavioral and autonomic signs of over-stimulation. If these signs are observed the activity should be stopped and the child will need time to recover.

<u>Autonomic</u>	<u>Behavioral</u>
Yawning	Fussing
Sneezing	Crying
Hiccoughing	Grimacing
Sweating	Sighing
Gagging	Startling
Spitting up	Stiffening
Breathing irregularly	Averting gaze
Changing skin color	Pushing away
Abruptly changing state	Arching back
Producing a bowel movement	Staring into space

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## CHAPTER FIVE

### SUMMARY

This protocol is designed to provide intervention strategies and guidelines that could be used with children ages birth to three years with a diagnosis of sensory integration dysfunction. It is not intended to provide all of the information needed in treating these children, but rather various ideas to draw upon. As stated in the review of literature, the earlier intervention is initiated the better the prognosis for a successful life. Sensory integration treatment cannot follow one specific protocol due to the diversity among children and their individual sensory diet. In order to become proficient in treating these children continued training is required.

Any occupational therapist wanting to use sensory integration assessment and intervention should have extensive training in the area. Sensory integration is a specialized field and requires continued education and practice before intervention can be used. Although sensory integration intervention has been around for over twenty years, continued research is needed on the effectiveness of the intervention strategies. Future studies should be done on the effects of various techniques and the implications this may have on a child's future.

Sensory integration is a treatment that can be used with many different people and in many contexts. This protocol for intervention will be a useful guide to treating children with sensory integration problems who have been identified as needing a specific sensory diet. In the future, it would be helpful to write another protocol using

information from clinical experience rather than literature. There is a great wealth of information on this topic, but experience is usually the best teacher.

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