Axis I: Regulatory-Sensory Processing Disorders[1]

200. Regulatory-Sensory Processing Disorder

Sensory Modulation Challenges (Type I)

201. Over-Responsive, Fearful, Anxious Pattern
202. Over-Responsive, Negative, and Stubborn Pattern
203. Under-Responsive, Self-Absorbed Pattern
    - 203.1 Self-Absorbed and Difficult to Engage Type
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204. Active, Sensory Seeking Pattern

Sensory Discrimination Challenges (Type II) and Sensory-Based Motor Challenges (Type III)

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    - 205.4 With Combinations of 205.1-205.3
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    - 206.2 With Postural Control Challenges
    - 206.3 With Dyspraxia
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Contributing Sensory Discrimination and Sensory-Based Motor Challenges

207. Mixed Regulatory-Sensory Processing Patterns
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    - 207.9 Mixed Regulatory-Sensory Processing Difficulties where Behavioral or Emotional Problems Are Not Yet in Evidence

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Regulatory-Sensory Processing Disorders (RSPD) should be viewed on a continuum of regulatory-sensory processing variations. All children evidence unique regulatory-sensory processing profiles. They vary in the ways they respond to different sensations (such as touch and sound), comprehend these sensations, and plan actions. Some children, however, have processing differences that are extreme enough to interfere with daily functioning at home, in school, and in interactions with peers or adults, as well as with routine functions such as self-care, sleeping, and eating. As we describe regulatory-sensory processing below, note that while we focus on the disorders end of the continuum, the same patterns can characterize children without challenges and can be very helpful in understanding individual differences and the best ways to promote healthy emotional, social, and intellectual functioning. While observations of variations in motor and sensory functioning in infants and young children have a long history (e.g., the writings of (Ayres, 1964); the concept of RSPD was first introduced in the 1980s and early 1990s when Greenspan introduced the concept of Regulatory Disorders (Greenspan et al., 1987; Greenspan, 1992). Along parallel lines, the concept of Sensory Processing Disorders has been developing since Ayres (1972). In 2004, a framework describing a new taxonomy for classifying classic patterns and subtypes of sensory processing problems was presented (Miller, Cermak, et al., 2004).(Greenspan, 1992)

Regulatory Disorders as a diagnostic entity was subsequently incorporated into the diagnostic classification system of Zero To Three: National Center for Infants, Toddlers, and Families. More recently, the Regulatory-Sensory Processing Work Group of the Interdisciplinary Council on Developmental and Learning Disorders (ICDL) has brought the two streams of thought together from the occupational therapy literature and the Developmental, Individual-Difference, Relationship-Based (DIR) model of Infant and Early Childhood Mental Health (Greenspan, 1992) and reformulated and added to the description of Regulatory-Sensory Processing Disorders, which is included in this section.

All children evidence their own unique regulatory-sensory processing patterns. These variations are always important to consider when constructing a developmental profile for a specific infant or child and her family. An RSPD, however, should be considered when the child's motor and sensory differences are contributing to challenges that interfere with age-expected emotional, social, language, cognitive (including attention), motor, or sensory functioning. RSPD gives rise to some of the same symptoms and behaviors as interactive disorders, including nightmares, withdrawal, aggressiveness, fearfulness and anxiety, sleeping and eating disturbances, and difficulty in peer relationships. However, RSPD involves clearly identifiable constitutional-maturational factors in the child.

CLINICAL EVIDENCE AND PREVALENCE OF REGULATORY-SENSORY PROCESSING DIFFERENCES

Recognition and work with regulatory-sensory processing differences have a long history. Occupational therapists have clinically assessed, treated, and researched sensory processing difficulties in children since the late 1950s. Based on both clinical experience and assessment findings, tactile defensiveness was first described by Ayres (Ayres, 1965; 1966a; 1980) as an over-responsiveness to touch sensations, particularly light or unex-

pected touch. Subsequently over-responsiveness to sensory input in a specific sensory system (e.g., the vestibular system) or within the whole body (i.e., sensory defensiveness) has been identified and defined (Ayres, 1972a; Parham & Mailloux, 2001). Under-responsiveness to sensation has also been clinically characterized (Knickerbocker, 1980; Royeen & Lane, 1991; Dunn, 1994).

Sensory responsiveness differences have been used to characterize populations of children with difficult temperament (Rothbart, 1981; Rothbart & Posner, 1985; Thomas & Chess, 1985); regulatory disorders (DeGangi & Greenspan, 1989; DeGangi, 1991; DeGangi, 2001; Greenspan, 1981; 1992; Williamson & Anzalone, 2001); and children with autism spectrum disorders (Greenspan & Wieder 1997; 2005). In a recent study of a representative population, a parent questionnaire on regulatory-sensory processing differences distinguished infants and young children with a number of developmental disorders, including autism and cognitive deficits, from infants and children without challenges (Greenspan, 2004). Functional problems associated with regulatory-sensory processing differences have been described to include: decreased social skills and participation in play; decreased frequency, duration or complexity of adaptive responses; impaired self-confidence and/or self-esteem; deficient adaptive or daily life skills; and diminished fine-, gross- and sensory-motor skill development (Bundy, 2002; Parham & Fazio, 1996; Parham & Mailloux, 2001). While parents may struggle with issues long before children enter school, problems related to Sensory Processing Disorder (SPD) may become more apparent once a child enters a day-care or school environment (Miller & Summers, 2001).

Empirical evidence matching the behavioral manifestations such as those identified above, with physiologic indicators of sensory processing impairments, is accumulating (Mangeot, Miller, McIntosh, 2001; McIntosh, Miller, Shyu, Hagerman, 1999; Miller, McIntosh, McGrath, et al., 1999; Schaff, Miller, Sewell, & O'Keefe, 2003). Electrodermal activity (EDA), as a marker of sympathetic nervous system activity, has recently been used to document physiologic responses during a sensory challenge protocol. The EDA of children with severe Sensory Processing Disorder and Fragile X syndrome differs significantly from the EDA of typically developing children after sensory stimulation (Miller, et al., 1999). Further, children with sensory processing impairments and no other diagnosis demonstrated significantly abnormal EDA after sensory stimulation (McIntosh, et al., 1999). Parent ratings of sensory processing impairment have been shown to correlate with EDA measures, as well (McIntosh, Miller, Shyu, & Dunn, 1999).

In addition, vagal tone has been used to measure parasympathetic nervous system functioning in children identified with sensory processing impairments (Schaaf, Miller, Sewell, & O'Keefe, 2003). Results indicate that children with sensory processing disturbances displayed significantly lower vagal tone than typically developing participants, consistent with other studies that found decreased parasympathetic functioning associated with stress vulnerability, developmental and cognitive delays, and emotional and behavioral over-reactivity.

Among children, prevalence estimates of Sensory Processing Disorder based on clinical experience have ranged from 5% to 10% for children without disabilities (Ayres, 1989; Ermer & Dunn, 1998). Estimated rates of Sensory Processing Disorder for children with disabilities such as autism, derived from reliable and valid survey results, are reported to be as high as 40%-88% (Adrien, Lenoir, P., Martineau, 1993; Dahl & Gillberg, 1989; Kientz & Dunn, 1997; Ornitx, Guthrie, & Farley, 1977; Talay-Ongan & Wood, 2000). A more recent investigation of prevalence placed the rate among the general population of kindergarten-aged children at 5% using conservative estimation procedures (Ahn, Miller, Milberger, & McIntosh, 2004).

Different views regarding an appropriate comprehensive theory or the effectiveness of particular intervention strategies must not distract attention from the compelling evidence for the existence of regulatory-sensory processing differences and their relevance to understanding a range of clinical phenomena. Studies supporting the existence of regulatory-sensory processing differences and difficulties in the general population and different clinical disorders should be separated from considerations of regulatory-sensory processing theories and intervention strategies. Research is underway to examine both of these areas of interest.

DEVELOPMENTAL PERSPECTIVES ON REGULATORY-SENSORY PROCESSING DIFFERENCES

To recognize problems as early as possible, it is important to emphasize that regulatory-sensory processing differences are evident very early in life. In a study of 8-month-old children (Doussard-Roosevelt, Walker, Portales, Greenspan, & Porges, 1990; Porges & Greenspan, 1990), we were able to show that a high percentage of the symptomatic infants had constitutional-maturational differences that contributed to their sleeping problems, eating difficulties, temper tantrums, and other symptoms (DeGangi & Greenspan, 1988). The babies were either under- or over-responsive in some sensory modality or had sensory processing, muscle tone, or motor planning difficulties, in addition to difficulties with physiological regulation. These differences seemed to contribute to a skewing of parent-infant interaction patterns, which, in turn, affected the infants' personality development (DeGangi, DiPietro, Greenspan, & Porges, 1991).

The infants' constitutional-maturational differences persisted and were evident at 18 months. The families also showed signs of distress (Portales, Porges, & Greenspan, 1990). A small group of these infants who were followed to age 4 displayed more behavioral and learning problems than a comparison group (DeGangi, Porges, Sickel, & Greenspan, 1993). Clearly, children with constitutional-maturational unevenness tend to be especially challenging. They have a harder time than other children in their relationships with caregivers; their families' functioning tends to be stressed; and they eventually may experience more behavioral and learning difficulties (Miller, Robinson, & Moulton, 2004).

One can see how a child's constitutional-maturational characteristics influence interaction patterns, and hence the child's developing organization of experience, by considering a fifteen-month-old who has difficulty processing sounds she hears. At this age, chil-

dren experiment with independence and negotiate separateness and connectedness by walking or crawling away from the parent, while maintaining contact through glances and vocalizations. The child who cannot process sounds across a room, however, cannot obtain reassurance from the parent's voice. If her mother says, "Hey, that's terrific! Look how nicely you're walking!" the child, unable to decode the rhythm of mother's voice, is confused and may simply stare, instead of smiling and brightening up. To feel secure, she has to come over and cling to her mother. If the mother is unaware of her daughter's difficulty in processing sound, she may feel angry or impatient at this clingy behavior and push the child away. When we talk on the phone to a loved one far away, our ability to decode the affect in the voice allows us to feel warmth and connection. The child who lacks this ability has greater than average difficulty in developing independence.

Children with visuospatial processing impairments may have difficulty maintaining their internal representations, especially under the pressure of intense affects. If a child cannot maintain a mental image of her parents or other significant caregivers, she is likely to feel a sense of loss and may experience anxiety, fear, or depression. We hypothesize that the biologic vulnerability for depression may be mediated in part through a visuospatial vulnerability that, in turn, creates vulnerability in the stability of mental representations. The loss of internal representations leads to dysphoric affects. The dysphoria experienced in depression is, in this model, in part secondary to the processing disturbance.

DIAGNOSIS OF REGULATORY-SENSORY PROCESSING DISORDERS (RSPD)

The diagnosis of RSPD involves a distinct behavioral pattern *and* a sensory modulation, sensory-motor, sensory discrimination or attentional processing difficulty. When both a behavioral and a sensory pattern are not present, other diagnoses may be more appropriate. For example, an infant who is irritable and withdrawn after being abandoned may be evidencing an expectable type of relationship or attachment difficulty. An infant who is irritable and overly responsive to routine interpersonal experiences, in the absence of a clearly identified sensory, sensory-motor or processing difficulty, may have an anxiety or mood disorder. Sleep and eating difficulties, in the absence of identifiable sensory responsivity or sensory processing differences, are classified as disorders in their own right. Further evaluation is then needed to determine whether the cause is an interactive disorder or some other underlying problem that does not fall within our three categories.

Presenting problems that can indicate an underlying RSPD include behavior control difficulties, sleeping and feeding difficulties, fearfulness and anxiety, poor motor skills, avoidance or craving of activities involving different sensations, difficulties in speech and language development, organizational difficulties (pre-executive functioning challenges), and impaired ability to play alone or with others. Parents may also complain that a child gets upset easily, loses his temper frequently, and has difficulty recovering and/or adapting to change.

Poorly organized or modulated responses in infants and children may show themselves in the following domains:

1. The physiological or state repertoire (e.g., irregular breathing, startles, hiccups, gagging)
2. Gross motor activity (e.g., motor disorganization, jerky movements, constant movement)
3. Fine motor activity (e.g., poorly differentiated movements or sparse, jerky or limp movements)
4. Oral motor activity (e.g., picky eater, food texture sensitivities, drooling)
5. Attentional organization (e.g., "driven" behavior, inability to settle down or, at the other extreme, perseveration about a small detail)
6. Affective organization, including the predominant affective tone (e.g., sober, depressed or happy); the range of affect (e.g., broad or constricted); the degree of modulation expressed (e.g., infant shifts abruptly from being completely calm to screaming frantically); and the capacity to use and organize affects as part of relationships and interaction with others (e.g., avoidant, negativistic, clinging and demanding behavior patterns)
7. Behavioral organization (e.g., aggressive or impulsive behavior)
8. Sleep, eating or elimination patterns (e.g., unable to fall or stay asleep, eats little, or has a poor schedule, difficulty eliminating or incontinent)
9. Language (receptive and expressive) and cognitive difficulties

Many attentional, affective, motor, sensory, behavioral control and language problems that have traditionally been viewed as difficulties in their own right may in some children stem from a broader, more basic RSPD. General terms such as "overly sensitive," "difficult temperament," or "reactive" have commonly been used to describe infants and children with motor and sensory processing differences. But clinicians have tended to use such terms without specifying the sensory system or motor functions involved. There is growing evidence that constitutional and early maturational patterns contribute to the difficulties of such infants, but it is also clear that early caregiving patterns can exert considerable influence on how constitutional-maturational patterns develop and become part of the child's evolving personality. As interest in these children increases, it is important to systematize descriptions of the sensory, motor, and integrative patterns, as well as the caregiving patterns presumed to be involved.

To make the diagnosis of Regulatory-Sensory Processing Disorder in an infant or young child, the clinician must observe one or more behavioral challenges and a sensory processing challenge including sensory modulation, sensory-motor, sensory discrimination or attentional problems from the list below.

Sensory Modulation Symptoms

1. Over- or under-responsivity to loud, high-pitched, or low-pitched noises
2. Over- or under-responsivity to bright lights or new and striking visual images, such as colors, shapes, and complex fields

3. Tactile defensiveness (e.g., over-responsivity to dressing, bathing, or stroking of arms, legs, or trunk; avoidance of touching "messy" textures) or oral hyper-responsivity (e.g., avoidance of food with certain textures)
4. Under-responsivity to touch or pain
5. Gravitational insecurity—that is, over-responsivity in a child with normal postural responses (e.g., balance reactions) to the changing sensations involved in brisk horizontal or vertical movements (e.g., being tossed in the air, riding a merry-go-round, or jumping)
6. Under- or over-responsivity to odors
7. Under- or over-responsivity to temperature
8. Qualitative deficits in ability to modulate motor activity, such as extreme activity or passivity (not secondary to anxiety or interactive difficulties)

Sensory-Motor Symptoms

1. Oral-motor difficulties or poor oral coordination influenced by low muscle tone, motor planning difficulties, or oral tactile over-responsivity (e.g., chewing, sucking, blowing, taking deep breaths)
2. Poor muscle tone and muscle stability (e.g., hypotonia, hypertonia, postural fixation, or lack of smooth movement quality)
3. Qualitative deficits in fine motor planning (e.g., difficulty in sequencing the hand movements necessary to explore a novel or complex toy, difficulty climbing a jungle gym). Qualitative deficits in fine motor skills including handwriting, coloring, matching construction tasks, puzzles, eye hand coordination.
4. Qualitative deficits in gross motor planning, including movements in space, obstacle courses, automatic movements while doing another task like talking
5. Qualitative deficits in articulation capacity (e.g., for an 8 month-old, difficulty imitating distinct sounds; for a 3 year-old, difficulty pronouncing words to describe an intended or completed action)
6. Poor components of movement patterns (e.g., flexion, extension, weight shifting, rotation, and balance reactions)

Sensory Discrimination Symptoms

1. Qualitative deficits in visuospatial processing (e.g., for an 8 month-old, difficulty recognizing different facial configurations; for a 2½ year-old, difficulty knowing in which direction to turn to get to another room in a familiar house; for a 3½ year old, difficulty using visuospatial cues to recognize and categorize different shapes)
2. Qualitative deficits in aspects of auditory processing, such as difficulty distinguishing between closely related sounds
3. Qualitative deficits in aspects of tactile discrimination (e.g., unable to distinguish objects through touch)

Attentional Symptoms

1. Qualitative deficits in capacity for sustained attention, including the capacity for shifting back and forth between two objects (such as a person and a toy), not related to anxiety, interactive difficulties, or clear auditory-verbal processing, visuospatial processing, or motor planning problems

TYPES OF REGULATORY-SENSORY PROCESSING DISORDERS (RSPD)

As suggested earlier, regulatory-sensory processing is an encompassing term referring to the way the nervous system manages incoming sensory information. It is the means by which sensory information is perceived and organized from external stimuli in the environment or from internal stimuli within the body to produce an adaptive response. In this context, adaptive response is defined as an effective behavioral response. Although traditionally considered from a behavioral perspective, adaptive responses may also be considered from a physiologic perspective. From this perspective, adaptive responses include an efficient physiologic response to a sensory challenge or demand.

Also, as discussed earlier, some individuals have difficulty processing sensory information and responding to it appropriately. When the sensory and motor difficulties are severe enough that an individual's daily routines and activities are disrupted and there are related emotional and/or behavioral challenges, the condition is diagnosed as RSPD. Difficulties with motor, emotional, attentional, or daily living skills may be markers of how sensory stimuli are perceived and interpreted.

RSPD is divided up into a number of specific disorders, and also contains a category of "mixed" disorders based on the predominant characteristics of the child, including behavioral patterns and emotional inclinations, as well as motor and sensory patterns. Note that the descriptions of the different types include a discussion of caregiving patterns (therapeutic strategies) that promote better regulation and organization in the child, as well as caregiving patterns that intensify the child's difficulty. Because the daily routines of caregiving involve continual sensory, motor, and affective experiences for the infant and young child, irregular conditions in the environment, changes in routine, or handling that is not sensitive to individual differences can strongly affect infants and children with RSPD, as well as their caregivers.

There are a number of specific types of Regulatory-Sensory Processing Disorders. Each is characterized by different types of regulatory-sensory processing and behavioral patterns. While each type of disorder is identified separately, there are three broad patterns that characterize them.

1. Sensory modulation problems, such as over-responsivity, under-responsivity, and sensory-seeking (Type I)
2. Sensory discrimination problems (Type II)
3. Sensory-based motor challenges (dyspraxia and postural regulation difficulties) (Type III)

SENSORY MODULATION CHALLENGES (TYPE I)

The first group of Regulatory-Sensory Processing Disorders to be described involves challenges in *sensory modulation*. Sensory modulation challenges are characterized by an inability to grade the degree, intensity, and nature of responses to sensory input. Often the child's responses do not fit the demands of the situation. The child therefore demonstrates difficulty achieving and maintaining an optimal range of performance and adapting to challenges in daily life. (See Guide for Observations in Appendix III for suggestions on observing sensory modulation differences.)

There are three subtypes of RSPD related to sensory modulation challenges.

201. Over-Responsive, Fearful, Anxious Pattern

Children who demonstrate over-responsivity to sensory stimuli have responses to sensations that are more intense, quicker in onset or longer lasting than those of children with typical sensory responsivity under the same conditions. Their responses are particularly pronounced when the stimulus is not anticipated. Children may demonstrate over-responsivity in only one particular sensory system, for example, "auditory defensiveness" or "tactile defensiveness," or they may demonstrate over-responsivity in multiple sensory systems. Over-responsivity to sensory stimuli in multiple modalities is often referred to as sensory defensiveness. Children are usually particularly over-responsive to specific types of stimuli within a sensory domain (e.g., in the tactile domain they respond defensively to light touch but not to deep pressure), rather than to all stimuli within a domain.

Responses to sensory stimuli occur along a spectrum. Some children manage their tendency towards over-responsivity most of the time, while other children are over-responsive almost continuously. Responses may appear inconsistent because over-responsivity is highly dependent on context. While children may generally attempt to avoid particular sensory experiences, sensitivities may vary throughout the day, and from day to day. Since sensory input tends to have a cumulative effect, the child's efforts to control responses to sensory stimuli may build up and result in a sudden behavioral disruption in response to a seemingly trivial stimulus.

A child's behavioral characteristics when faced with uncomfortable stimuli can fall within a broad range. At one end of this spectrum, the child shows fearfulness and anxiety, often avoiding many sensory experiences. At the other end of the spectrum, the child shows negativity and stubbornness, or obstinacy exemplified by attempts to control the environment. This latter tendency is described as a separate type below. This range of responses is often termed the "fight, flight, fright, or freeze" response, and is attributed to sympathetic nervous system activation. Secondary behavioral characteristics include: irritability, fussiness, poor adaptability, moodiness, inconsolability and poor socialization. In general, children who are over-responsive to sensation have difficulty with transitions and unexpected changes.

Sensory over-responsivity is often seen with other sensory reaction patterns. For example, children may show over-responsiveness to tactile stimuli while seeking proprioceptive stimuli. Sensory over-responsivity also may be observed concomitantly with sensory discrimination problems and dyspraxia.

Behavioral patterns include excessive cautiousness, inhibition, and fearfulness. The child avoids sensation in an effort to control unexpected incoming sensory stimuli. In early infancy, one sees a restricted range of exploration and assertiveness, dislike of changes in routine, and a tendency to be frightened and clinging in new situations. Young children's behavior is characterized by excessive fears or worries and by shyness in new experiences, such as forming peer relationships or engaging with new adults. Occasionally, the child behaves impulsively when overloaded or frightened. He tends to become upset easily (e.g., irritable, often crying); cannot soothe himself readily (e.g., finds it difficult to return to sleep); and cannot quickly recover from frustration or disappointment, especially in environments that include multiple or intense sensory stimuli. The fearful and cautious child may have a fragmented, rather than an integrated, internal representational world, and may therefore be easily distracted by different stimuli.

Further examples include:

- Avoids group activities and often plays alone
- Excessively cautious and afraid to try new things, resulting in a restricted range of exploration
- Prefers uniformity in the environment
- Prefers repetition and the absence of change or, at most, change at a slow or predictable pace
- Difficulty with transitions and unexpected changes
- Tends to be frightened, clinging, worried or shy in new situations
- May have difficulty forming peer relationships or engaging with new adults
- Becomes upset easily and quickly
- Perfectionist and compulsive
- Can appear under-responsive ("shut-down") as coping mechanism to over-arousal

Caregiver patterns that are characterized by soothing, regulating interactions; that respect the child's sensitivities; and that do not convey that the child has bad behaviors are helpful. Supportive parents anticipate noxious environments and minimize them or prepare the child for them. Enhancing flexibility and assertiveness in fearful and cautious children involves empathy, especially for the child's sensory and affective experience; very gradual and supportive encouragement to explore new experiences; and gentle, but firm, limits. Inconsistent caregiver patterns intensify these children's difficulties, as when caregivers are overindulgent or overprotective some of the time and punitive or intrusive at other times.

202. Over-Responsive, Negative, and Stubborn Pattern

Children with this pattern tend to evidence the same physiologic responses described above for the over-responsive, fearful and anxious type. However, this type of child seeks to control the sensory environments in which they find themselves and, thus, may prefer repetition and the absence of change or, at most, change at a slow, predictable pace. Rather than being overloaded and becoming fearful, anxious, and cautious, these children attempt to control their environments so that they can minimize fear and anxiety.

Behavior patterns may appear negative, stubborn, and controlling. The child can become aggressive and impulsive in response to sensory stimulation. He often does the opposite of what is requested or expected. Infants with this pattern tend to be fussy, difficult, and resistant to transitions and changes. Preschoolers tend to be negative, angry, and stubborn, as well as compulsive and perfectionistic. However, these children can display joyful, flexible behavior in certain situations.

In contrast to the fearful or cautious child, the negative and stubborn child does not become fragmented but organizes an integrated sense of self around negative patterns. In contrast to the impulsive, sensation-seeking child (described below) the negative and stubborn child is more controlling, tends to avoid or be slow to engage in new experiences rather than to crave them, and is not generally aggressive unless provoked.

Further examples include:

- Aggressive or impulsive when overloaded by sensory stimuli
- Hit, kick or bite in response to unexpected sensory stimulation, such as being accidentally jostled in line
- Defiant (child does the opposite of what is requested or expected)
- "Difficult" and hard to soothe
- Controlling
- May be irritable, fussy, difficult, not adaptable, moody, and unsociable

Caregiver patterns that enhance flexibility involve soothing, empathetic support of slow, gradual change and avoidance of power struggles. (Caregivers can avoid power struggles by offering the child choices and opportunities for negotiation whenever possible.) Caregivers' warmth, coupled with gentle, firm guidance and limits—even in the face of negative or impulsive responses that may feel like rejection—and encouragement of symbolic representation of affects, especially dependency, anger, and annoyance, also helps children with this pattern become more flexible. In contrast, caregiver patterns that are intrusive, excessively demanding, over-stimulating, or punitive tend to intensify negative patterns.

203. Under-Responsive, Self-Absorbed Pattern

Children who are under-responsive to sensory stimuli are often quiet and passive, disregarding or not responding to stimuli of typical intensity available in their sensory environment. Alternatively, they may be so enthralled by a world of their own imagination that they have trouble engaging in the here and now. They may appear withdrawn, difficult to engage, and/or self- absorbed because they have not registered the sensory input in their environment. The term "poor registration" is often used to describe their behavior, as they do not appear to detect or "register" incoming sensory information. They may also appear apathetic and lethargic. They may seem to lack the inner drive that most children have for socialization and motor exploration when, actually, they do not notice the possibilities for action that are around them. Their under-responsivity to tactile and proprioceptive inputs may lead to poorly developed body scheme, clumsiness, or poorly modulated movement. These children may fail to respond to bumps, falls, cuts or scrapes that can present a danger, as they may not notice pain, such as injuries to the skin, and objects that are too hot or too cold.

Children who are under-responsive to sensation often do not seek greater intensity in sensory input even though they may require it for optimal environmental interaction. Children with this pattern may be overlooked or thought of as the "good baby" or "easy child" simply because they fail to make demands on people and things in the environment. These children often need high intensity and highly salient input in order to become actively involved in the environment, the task, or the interaction.

In some instances, children who are easily overloaded by sensory stimulation may appear to be under-responsive when in fact they are extremely over-responsive. The observable behavior is one that suggests withdrawal and shutdown, perhaps as a defense mechanism. Children with sensory under-responsivity also may have sensory discrimination challenges and dyspraxia.

As indicated above, there are two patterns observed. Some children tend to be self-absorbed, unaware, and disengaged, while others are self-absorbed, but very creative and overly focused on their own fantasy lives. Therefore, we describe two subtypes for the Under-Responsive Self-Absorbed Pattern.

203.1. Self-Absorbed and Difficult to Engage Type

Behavior patterns include seeming disinterest in exploring relationships or even challenging games or objects. Children may appear apathetic, easily exhausted, and withdrawn. High affective tone and saliency are required to attract their interest, attention, and emotional engagement. Infants may appear delayed or depressed, lacking in motor exploration and social overtures. In addition to continuing the above patterns, preschoolers may evidence diminished verbal dialogue. Their behavior and play may present a limited range of ideas and fantasies. Sometimes, children seek out desired sensory input, often engaging in repetitive sensory activities, such as spinning on a sit-n-spin, swinging,

or jumping up and down on the bed. The child needs the intensity or repetition of these activities in order to experience them fully.

Further examples include:

- Often quiet, passive or withdrawn
- May be overlooked or thought of as "a good baby" or "an easy child" simply because of a quiet demeanor and lack of demands
- Disinterested in exploring games or objects
- Apathetic, easily exhausted
- May seem delayed or depressed
- Lacking in motor exploration and social overtures
- Difficult to engage – often fail to register others' attempts at engagement
- May have diminished verbal dialogue
- May present only a limited range of ideas and fantasies
- May engage in repetitive sensory activities, such as spinning or playing on a sit-n-spin, swinging, or jumping up and down on the bed

Caregiver patterns that provide high-energy interactive input help engage the child in activities and relationships and foster initiative. These patterns involve energized wooing and robust responses to the child's cues, however faint. In contrast, caregiver patters that are low-key, "laid back," or depressive in tone and rhythm tend to intensify these children's patterns of withdrawal.

203.2. Self-Absorbed and Creative Type

Behavioral patterns of self-absorbed children, many of whom are also creative, include a tendency for the child to tune into his own sensations, thoughts, and emotions rather than to communications from other people. Infants may become interested in objects through solitary exploration rather than in the context of interaction. Children may appear inattentive, easily distracted, or preoccupied, especially when they are not pulled into a task or interaction. Preschoolers tend to escape into fantasy when faced with external challenges, such as a demanding preschool activity or competition from a peer. They may prefer to play by themselves if others do not actively join their fantasies. In their fantasy life, they may show enormous imagination and creativity.

Further examples include:

- Highly intelligent children who are in their own world
- Out of touch with actions happening around them
- Prefer to spend time on the computer or reading or in their own fantasy world
- May be difficult to engage because they are so involved in their cognitive processing

Caregiver patterns that are helpful include a tendency to tune into the child's non-verbal and verbal communications and help the child engage in two-way communication, that is, to "open and close circles of communication." Caregivers should also encourage a

good balance between fantasy and reality and help a child who is attempting to escape into fantasy stay grounded in external reality (e.g., by showing sensitivity to the child's interests and feelings; by promoting engagement and discussion of daily events, feelings, and other real-world topics; and by making fantasy play a collaborative endeavor between parent and child rather than a solitary activity). In contrast, a caregiver's self-absorption or preoccupation, as well as confusing family communications, tends to intensify the child's difficulties.

204. Active, Sensory Seeking Pattern

Children with this pattern actively seek or crave sensory stimulation and seem to have an almost insatiable desire for sensory input. They energetically engage in activities or actions that are geared toward adding more intense "feelings" of sensation to satisfy a basic need or desire for sensory input. They tend to be constantly moving, crashing, bumping, and jumping, they may have a need to touch everything and have difficulty inhibiting this behavior, they may play music or the TV at loud volumes, may fixate on visually stimulating objects or events, or may seek unusual olfactory or gustatory experiences that are more intense and last longer than those of children with typical sensory responsivity.

Atypical responses occur along a spectrum; some sensory seeking behavior is normal. Often these children prefer a higher level of arousal than adults feel is appropriate in a given environment. Sensory seeking may also be seen as a means to obtain enhanced input for individuals with reduced awareness of sensation. Sensory seeking may be done in an effort to influence (increase) their level of arousal. For children who are sensory seekers, the need for constant stimulation is difficult to fulfill and may be particularly problematic in environments where children are expected to sit quietly such as in school, in movies, and in libraries. Obtaining additional sensory stimulation, if unstructured, may increase the child's overall state of arousal and result in disorganized behavior. However, if directed, specific types of additional sensory input can have an organizing effect.

The behavioral characteristics of these children when their sensory needs are not met include demanding and insistent behavior. They may be impulsive, almost explosive, in their attempts to fill their quota for sensation. They have a tendency to "get in trouble," creating situations around themselves that others perceive as "bad" or "dangerous." Secondary behavioral characteristics that describe these children include: overly active or aggressive, impulsive, intense, demanding, hard to calm, restless, overly affectionate, and craving attention. Extreme seeking or craving of sensory input can also disrupt children's ability to maintain attention for learning. Activities of daily living are frequently disrupted. Children may have trouble in school because they are distracted as they are "driven" to attempt to obtain extra sensory stimulation instead of focusing on tasks.

Behavioral patterns involve high activity, with children seeking physical contact and stimulation, for example through deep pressure and intense movement. Frequently, the motorically disorganized child's tendency to seek contact with people or objects leads to

disruptive behavior (e.g., breaking things, unprovoked hitting, intruding into other people's physical space). Behavior that begins as a result of craving sensations may be interpreted by others as aggression rather than excitability. Once others react aggressively to the child, his own behavior may become aggressive in intent.

Infants in this group are most satisfied when provided with strong sensation in the form of movement, sound, touch, or visual stimulation. They may be content only when held or rocked. Toddlers may be very active. Preschoolers often show aggressive, intrusive behavior and a daredevil, risk-taking style, as well as preoccupation with aggressive themes in pretend play. When the young child is anxious or unsure of himself, he may use counterphobic behaviors such as hitting another child first, in anticipation of possibly being hit, or repeating unacceptable behavior after being asked to stop. When older and able to verbalize and observe his own patterns, the child may describe his need for activity and stimulation as a way to feel alive, vibrant and powerful. Children who have extreme sensory needs that are not met may become demanding and insistent on getting their own way. They may be impulsive, almost explosive in their attempt to fill their quota for sensation. They have a tendency to "get in trouble" as they create situations around them that others perceive as bad or dangerous.

Further examples include:

- Energetically engage in activities or actions that are geared to adding more intense "feelings" of sensation (seeming to satisfy a basic need or desire for sensory input)
- Crave sensory input in one or more sensory channels; may look like attention-seeking behavior, but actually craving sensation. Craving may be seen as:
  - Constantly moving and crashing, bumping and jumping
  - Playing music/TV extremely loudly
  - Watching visually stimulating scenarios for hours
  - Seeking olfactory or gustatory experiences that are more intense and last longer than children with normal sensory responsivity desire
- May seem hyperactive and have difficulty sitting quietly (at school, during worship situations, at the dinner table); can disrupt other children's ability to maintain attention
- May be restless, impulsive, almost explosive (in their attempt to fill their quota for sensation), and have a difficult time controlling their aggressive or impulsive behaviors ("out of control"). This results in a tendency to "get in trouble" or create situations around them that others perceive as "bad" or "dangerous."
- Child's overall state as it appears behaviorally is one of high arousal; the child gets "wound up" with increasing amounts of stimulation
- May become demanding and insistent on getting his own way

Caregiver patterns characterized by continuous, warm relating, a great deal of nurturing, and empathy, together with clear structure and limits, enhance flexibility and adaptivity. Caregivers should understand the need for extra stimulation and give the child many opportunities to acquire more stimulation, preferably through interactive,

modulated play. Encouraging the use of imagination and verbal dialogue to explore the external environment and elaborate feelings further enhances the child's flexibility. Advocacy in settings outside the home is required so that others understand the child's behavior, adapt these constructive caregiver patterns, and avoid labeling the child a "behavior problem." In contrast, caregiver patterns that lack warm, continuous engagement (e.g., frequent changing of caregivers); that over- or underestimate the child; that are overly punitive; or that vacillate between overly punitive limit-setting and insufficient limit-setting may intensify the child's difficulties.

SENSORY DISCRIMINATION CHALLENGES (TYPE II) AND SENSORY-BASED MOTOR CHALLENGES (TYPE III)

As indicated earlier, in addition to challenges related to sensory modulation, there are regulatory-sensory processing disorders related to sensory discrimination challenges and to sensory-based motor challenges (postural control problems and dyspraxia). See the Guide for Observations in Appendix III for suggestions on observing these capacities.

The two Regulatory-Sensory Processing Disorders based on challenges in these processing areas involve inattentive, disorganized behavioral patterns and school performance and academic problems. Both these disorders may involve various combinations of difficulties in sensory discrimination, as well as sensory-based motor performance (including postural control problems and dyspraxia).

First, we describe each of these Regulatory-Sensory Processing Disorders in terms of its behavioral characteristics and the caregiver patterns that worsen or improve them. Then we describe the sensory discrimination challenges and sensory-based motor challenges (including postural control problems and dyspraxia) that are associated with these two Regulatory-Sensory Processing Disorders. We are describing the processing contributors to these disorders together (rather than individually), because they share various combinations of the same contributing sensory processing and motor planning challenges.

205. Inattentive, Disorganized Pattern

205.1 With Sensory Discrimination Challenges
205.2 With Postural Control Challenges
205.3 With Dyspraxia
205.4 With Combinations of 205.1 – 205.3

Behavioral patterns that are related to sensory discrimination, motor planning and/or postural control challenges include a tendency to be inattentive and disorganized. For example, the child may have difficulty following through on tasks or school assignments. In the middle of a homework assignment or household chore, the child may wander off to some other activity, seemingly unmindful of the original goal. In the extreme, the child's behavior may appear fragmented. As others put more pressure on the child, he

may become more disorganized. When these challenges continue over a period of time, the child can easily become demoralized and feel depressed and/or angry. Impulsive or defiant behavior is not uncommon, nor is passivity, avoidance, and preference for activities, such as video games, which is experienced as less demanding (in terms of sequencing and organizing complex plans of action).

When challenged to be involved in tasks that are difficult, one often sees increasing avoidance, fragmentation, and disorganization, as well as "inattentiveness." It's not unusual for parents to describe a child as "organized" and "attentive" when getting ready to go to the video arcade or out for his favorite ice cream and yet "fragmented," "inattentive," and "disorganized," when attempting a multi-step math problem. Clinicians as well as caregivers often ask whether the patterns described above are different from what is often described as attentional problems or Attention Deficit Disorder. The descriptions of the different processing challenges that contribute to this type of behavioral pattern help clinicians observe the relationship between specific regulatory-sensory processing patterns and attentional and organizational challenges.

Caregiver patterns that recognize the underlying challenges can help the child strengthen the processing areas contributing to his difficulties. In addition, while the child is working to strengthen underlying processing challenges, caregivers and educators who can help the child break down complex tasks into manageable steps and provide patient, multi-sensory support (visual, auditory, and motor cues) also tend to help the child make progress. On the other hand, caregiving patterns that characterize the child as "unmotivated," "bad," or "lazy," and pressure and punish the child, rather than help him set up doable goals that can be associated with a sense of mastery, inevitably intensify the child's challenges. The key to constructive caregiver patterns is to understand and strengthen the contributing processing differences that are described in some detail below.

206. Compromised School and/or Academic Performance Pattern

206.1. With Sensory Discrimination Challenges
206.2. With Postural Control Challenges
206.3. With Dyspraxia
206.4. With Combinations of 206.1 – 206.3

Behavioral patterns associated with motor planning and sequencing challenges (dyspraxia), postural control, and sensory discrimination difficulties may include circumscribed school performance or academic challenges. For example, difficulties with motor planning and postural control can make handwriting very difficult. Sensory discrimination difficulties may make distinguishing shapes or letters difficult. Visuospatial challenges may make lining up columns in math or in understanding concepts involving graphs or diagrams difficult. Motor planning and sequencing difficulties may also con-

tribute to problems with sequencing ideas into sentences. If the contributing processing contributions to these types of school performance and academic challenges are not addressed, the child may become avoidant, disinterested, and/or demoralized. A sense of failure, rather than a can-do, positive attitude may follow. School itself can become viewed as a place of failure and all activities in school, or school as a whole, may be avoided.

Caregiver patterns that recognize the processing contributions to the child's school performance and academic challenges and provide supportive, step-wise help tend to improve the child's overall functioning. Caregivers who can break the challenge down into small enough steps for the child to experience a sense of mastery 70% to 80% of the time are likely to be especially helpful. Caregivers who are punitive, rejecting, or overly expectant often increase the difficulties. When a child has difficulty with a particular motor or sensory discrimination task, there is little intrinsic sense of mastery or pleasure in performing it. In comparison, when a child is naturally gifted at an activity, there is intrinsic pleasure in the activity itself. Therefore, support, guidance, incentives, and breaking the challenge down into easily-mastered steps are essential to helping the child overcome his challenges and feel a sense of pride and accomplishment.

SENSORY DISCRIMINATION AND SENSORY-BASED MOTOR CHALLENGES (INCLUDING POSTURAL CONTROL PROBLEMS AND DYSPRAXIA) THAT MAY CONTRIBUTE TO INATTENTIVE, DISORGANIZED PATTERNS AND COMPROMISED SCHOOL PERFORMANCE PATTERNS

Sensory Discrimination Challenges

Sensory discrimination is the process by which specific qualities of sensory stimuli are perceived and meaning attributed to them. Children with sensory discrimination difficulties have problems discerning the characteristics of sensory stimuli. The result is a lessened capability to interpret or give meaning to the specific qualities of stimuli, to detect similarities and differences among stimuli, and to differentiate the temporal and/or spatial qualities of stimuli. Children can perceive that stimuli are present and can modulate their responses to the stimuli, but cannot tell precisely what or where the stimulus is. Children with this challenge have difficulty interpreting the spatial and temporal qualities of sensory input and, as such, cannot use time and space information or other specific characteristics of the sensory experience to guide performance.

Sensory discrimination challenges may be seen in any sensory system, and often co-occur with dyspraxia (see below). It may be seen in children who are sensory over-responsive. In these children the more primitive protective system (over-responsivity) can override detailed (discriminative) information about attributes of objects in the environment, resulting in decreased discrimination. It also frequently occurs with sensory under-responsiveness. A child who is lethargic and unable to arouse is disinterested and has difficulty engaging with people. He may lack exploration of objects and overtures to others which over time would grow his discriminative system.

Children with poor sensory discrimination may appear awkward in both gross and fine motor abilities and/or inattentive to people and objects in their environment. They may take extra time to process the salient aspects of sensory stimuli, thus appearing "slow." They may display significant frustration with an inability to make sense out of the world. This problem may lead to lowered self-confidence, attention seeking behavior, and temper tantrums when their efforts are not met with success.

Behavioral Indicators of Sensory Discrimination Challenges by Sensory System

One way to conceptualize sensory discrimination problems is by the domain that is involved. The divergent validity of the subgroups below is yet to be empirically established; hence, they are theoretical at this point.

Visual

- The discrimination of the spatial characteristics of objects and letters (e.g., "b" and "d") and difficulty with spatially guided movement
- Appears clumsy as he moves his whole body through space or as he moves parts of his body through space for tasks such as reach and grasp
- May have trouble playing games that require discriminating objects in space such as catching, batting a ball, or throwing to a target
- May have difficulty finding his way within a building or around a community environment
- With vision occluded, may not be able to find objects when they are mixed in with others or may have difficulty rotating puzzle pieces to fit correctly in the space
- Difficulty with visual motor integration activities, such as being able to manipulate objects in space mentally, in order to complete a motor activity (e.g., putting puzzles together, putting away materials or clothes in a box)

Auditory

- Difficulty identifying and distinguishing different sounds such as: "t" and "p" as in cat and cap; "b" and "k" as in bag and back
- Processes auditory information slowly, word by word, and thus may miss content in a sentence
- May appear to "stop listening" at times and it can appear as though he is not paying attention
- May not be able to discriminate the salient features of the sounds from noise in the milieu
- May "tune out" if flooded by sounds (this may look like inattention)
- May have trouble following directions and need directions repeated

Tactile

- May have difficulty identifying precisely what is touching them
- May have difficulty identifying objects with his hands (stereognosis) or identifying what type of stimulus is touching him with vision occluded

Proprioception

- Difficulty judging timing, force and distance (e.g., may hold a pencil too tightly or loosely, not use enough force to tear the scotch tape off, or kick a ball either too hard or not hard enough)
- May have low muscle tone

Vestibular

- Difficulty sensing direction of movement with eyes closed
- Difficulty sensing displacement of body center of gravity, resulting in poor balance[2]
- Difficulty sensing speed of movements

Postural Challenges

Postural challenges refer to difficulty stabilizing the body during movement or at rest in order to meet the demands of the environment or of a given motor task. Postural problems are characterized by inappropriate muscle tension, hypo- or hypertonic muscle tone, inadequate control of movement, and/or inadequate muscle contraction to achieve movement against resistance. Postural difficulties frequently occur in the presence of vestibular, proprioceptive, and visual-motor problems, and include poor stability in the trunk, poor righting and equilibrium reactions, poor trunk rotation and/or poor ocular control.

Postural control provides a stable yet mobile base for refined movement of the head, eyes, trunk, and limbs. When postural control is good, the child is able to execute functional behaviors such as reaching, pushing, pulling, and resistance against force. The sensory input supporting postural control is typically vestibular/proprioceptive and visual in nature. The degree of postural control is affected by the arousal level of the individual, as well as the modulation and the discrimination of sensory information. An individual who is under-responsive to sensory input or who has poor discrimination may not display the necessary postural tone to respond successfully to the demands of a given task or situation. Likewise, the postural control of an individual who is over-responsive may be overly rigid, leading to difficulty performing smooth graded movements.

Motorically, children with poor postural control often do not have the body control to maintain a good standing or sitting position. In addition, they may have difficulty automatically adjusting and maintaining a body posture that enables them to perform tasks efficiently. For example, when writing at a desk, they may bend far over the paper or lay their head on their arm as they write. They may have difficulty alternately raising their head and extending their neck to look up from their paper to copy words from a chalkboard and then repositioning their head, neck and eyes back onto the paper to write.

Postural challenges can occur with or without a motor planning disorder, although it is often observed with dyspraxia, particularly in difficulty with bilateral integration activ-

2 To balance, at least two of the following three systems are required: vestibular, visual, proprioception.

ities (e.g., doing activities that require use of both sides of the body together such as riding a bike, pumping a swing, etc.) and with rhythmical activities (e.g., bouncing a ball, clapping on the beat).

Behavioral Indicators of Postural Challenges

- Poor trunk stability (often called co-contraction) at rest and/or during movement
- Tendency to fixate (often called "fix") or stabilize the trunk using flexion or extension patterns resulting in poor fluidity of movement
- Difficulty stabilizing at shoulders and hips resulting in poorly refined movements of upper and lower extremities
- Tendency to avoid weight bearing in upper extremities
- Poor righting and equilibrium reactions
- Poor trunk rotation
- Avoidance of climbing and discomfort on uneven surfaces
- Avoidance or discomfort crossing the midline of the body
- Poor ocular control, such as smooth pursuits and visual shifting (e.g., localization from near distance to far distance)
- Difficulty isolating head and eye movements (e.g., can't move eyes only to look at something to his right or left; instead his whole head must move to turn his eyes)
- May appear to have visual distractibility due to problems maintaining visual focus in busy environments or during movement

The postural problems above often lead to one of the following types of patterns:

- Tendency to avoid moving around and dislike of unexpected movement
- Tendency to be very physically active but lacking control and safety awareness

Dyspraxia

Dyspraxia is an impairment in the ability to plan, sequence and execute novel or unfamiliar actions. It is characterized by awkward and poorly coordinated motor performance, which can be observed in gross motor, fine motor and/or oral motor abilities. To be diagnosed with sensory-based dyspraxia, deficits must manifest in processing of sensory information in one or more of the following sensory domains: tactile, kinesthetic, proprioceptive, or vestibular. Visual-motor deficits usually accompany this difficulty also.

Dyspraxia is most clearly characterized by inadequate planning and poor performance of new and/or novel motor tasks. These children learn by trial and error, with decreased ability to generalize skills to other similar motor tasks. Execution of discrete motor skills (e.g., standing, walking, pincer grasp) may be adequate. However, the performance of complex tasks may be compromised, including tasks that require one or more of the following: significant sequencing, important timing aspects, rhythm of motor action, or subtle adaptation in the "moment of action."

Children with dyspraxia have difficulty knowing where their body is in space, and they have trouble judging their relationship to objects, people and space well. As a result, they may be accident-prone and tend to trip or bump into objects or others. They may break toys because of difficulty with planning. They often have poor skills in ball activities and other sports. They may have difficulty with projected action sequences that require timing (e.g., jumping over, into, and through moving ropes or throwing balls at targets, especially when both the child and the target are moving). Many children have trouble with fine motor manipulative activities such as handling small objects and handwriting. Daily activities such as using utensils and dressing are often slow to develop. Due to poor planning, children are often disorganized and may look disheveled.

Some children with dyspraxia are highly creative verbally, and may prefer fantasy games to "doing." They may try to mask their dyspraxia by acting like a "class clown" or they may be reticent to participate in new group activities. Often children with dyspraxia have difficulty with ideation (or formulating goals or ideas) for actions. Because these children are unable to generate new ideas of what to do, they may resort to rigid or inflexible strategies. They may perseverate and prefer the familiar to the novel.

Children with dyspraxia are often inactive, preferring sedentary activities such as watching TV, playing video games, reading a book, or playing fantasy games. This can result in weight problems. Self-esteem may be poor as a result of dissatisfaction with their abilities and repeated failure. Children often have low frustration tolerance. They may be perceived as manipulative and controlling. These children may have an over-reliance on language to compensate for the dyspraxia, although dyspraxia can occur with language impairments. Dyspraxia often occurs with sensory discrimination challenges. In addition, it may be accompanied by sensory under-responsivity or sensory over-responsivity

Behavioral Indicators of Dyspraxia

Ideational

- Inability to formulate a goal (or idea) for action
- The child does not have an idea of what to do and may resort to rigid or inflexible behavior
- May prefer fantasy games to "doing"

Gross Motor

- Tend to be accident-prone and trip, bump into objects or people
- Generally poor in ball activities and other sports
- Difficulty participating in team sports, especially as they become more competitive
- Performance characterized by trial and error; takes the child more time and practice to learn new skills
- May break toys because of difficulty with planning and force modulation

- Difficulty generalizing previously learned motor tasks to new situations and contexts
- Fatigue easily and have decreased endurance
- Some children may have an over-reliance on language to compensate for motor problems (e.g., talking through each new motor activity or trying to turn attention away from task)
- May be reluctant to participate in new group activities
- May prefer sedentary activities such as watching TV, playing video games, reading a book, playing fantasy games
- May try to mask their dyspraxia by acting like "class clowns"

Fine Motor

- Difficulty with fine motor manipulative activities (e.g., cutting, coloring, pasting, construction toys) and (pre) handwriting
- Daily activities such as using utensils and dressing are often slow to develop due to difficulty with planning
- Often disorganized and may be disheveled-looking
- May perseverate or prefer simpler play activities

Oral Motor

- Difficulty with articulation and sometimes with sucking, chewing, and swallowing sequences
- Prolonged/excessive drooling

207. Mixed Regulatory-Sensory Processing Patterns

It is quite common for children to display mixed regulatory-sensory processing patterns. Combinations of patterns and/or subtypes in one child are common and differences among various sensory domains in the same child may be observed. For example, it is not uncommon for a child to experience sensory over-responsivity in the tactile system and sensory-seeking in the vestibular and proprioceptive systems. In addition, atypical response patterns to sensation can vary as a function of time or day, environmental context, stress, fatigue, level of arousal and many other factors. First, we discuss mixed sensory modulation patterns. Second, we discuss mixed motor and sensory processing patterns. Finally, we outline a few of the common behavioral challenges that are often related to mixed regulatory-sensory processing patterns.

Mixed Sensory Modulation Patterns

Sensory Over-Responsivity with Sensory Seeking

It is common for children to be over-responsive in one domain (e.g., tactile) while sensory seeking in another domain (e.g., movement and proprioceptive). It appears that intense movement and proprioceptive input is used by some children as a method to self-

regulate their aversion to other types of sensory input. For other children sensory seeking is a way to feel active, excited and engaged (it just feels good).

Sensory Under-Responsivity with Sensory Over-Responsivity

Some children are under-responsive to stimuli at first, but when stimuli are provided systematically they quickly meet their quota and become over-responders. This is believed to be related to a narrowed band of tolerance for sensory input. It may appear from the outside as if the child is labile, swinging from one responsiveness extreme to the other. Different sensory modalities can be differentially affected, e.g., the child may remain under-responsive to olfactory stimuli (e.g., intrusively trying to smell people and objects) but show over-responsiveness to touch.

Sensory Over-Responsivity with Sudden Sensory Under-Responsivity

Some children start out with extreme over-responsivity and suddenly appear under-responsive, appearing almost to shut down. These children are also believed to have a narrow band of normal responsiveness. Perhaps they are so over-responsive that their system may actually be shutting down as a defensive mechanism so that no additional sensory input is registered by their nervous systems. They may look extremely under-responsive, but may actually be having extreme defensive reactions to stimuli.

Mixed Motor and Sensory Processing Patterns

In addition, to mixed sensory modulation patterns, there are a number of other mixed patterns that should be mentioned. These include:

- Sensory over-responsivity with sensory discrimination difficulties
- Sensory over-responsivity with dyspraxia
- Sensory under-responsivity with dyspraxia
- Sensory discrimination challenges with dyspraxia
- Postural control challenges with sensory over-responsivity
- Postural control challenges with sensory under-responsivity
- Postural control challenges with dyspraxia

Common Behavioral Challenges Related to Mixed Regulatory-Sensory Processing Patterns

The mixed regulatory-sensory processing patterns listed above can occur with and without behavioral or emotional challenges. There are a number of well-known symptom patterns that are often related to mixed types of regulatory-sensory processing problems. A few of these are listed and briefly described below. Before describing these, however, it should be noted that the challenges listed below may be related to interactive difficulties and/or unique motor and sensory processing challenges. Where the interactive elements (i.e., caregiver-child interaction patterns) are the predominant contributor, a diagnosis under interactive disorders should be considered. Where the predominant contributor is a unique motor or sensory processing pattern, the diagnosis of RSPD should be consid-

ered. Once a diagnosis of Regulatory-Sensory Processing Disorder is considered, the clinician should determine if the challenges are related to a specific pattern, such as sensory over-responsivity, or a mixed pattern, as described above. The challenges listed below are usually related to mixed regulatory-sensory processing patterns when this dimension is the main contributing factor. As with all mental health and developmental disorders in infancy and early childhood, there are always regulatory-sensory processing and interactive dimensions. The multi-axial framework recommended in this diagnostic system takes these multiple factors into account. Therefore, even if the clinician finds it difficult to emphasize one or another feature of the complex problems listed below, the multi-axial framework, nonetheless, permits a full description of the child's functioning. The very common problems listed below are included in both the interactive and regulatory-sensory processing categories because for different children, one or the other feature often predominates. It would, therefore, be an oversimplification to list them arbitrarily in only one or the other category.

207.1. Attentional Problems

Children with problems in attending and sustaining their focus often evidence a number of regulatory-sensory processing challenges. Most evidence difficulties with motor planning and sequencing. It is difficult for them to carry out a planned series of actions to solve a problem unless there is a great deal of structure guiding them. In addition, many children with attentional problems also evidence sensory discrimination difficulties, for example, in figuring out complex visuospatial patterns and solving visuospatial problems (searching systematically for a hidden object in all parts of a room). In addition, some children with attentional problems are sensory-craving and, therefore, very active and sometimes aggressive. A small percentage of children with attentional problems are sensory over-responsive and, therefore, very distractible. They are distracted by different types of sounds or sights and easily become overloaded and more fragmented in a noisy or busy setting. Also, some children with attentional problems are sensory under-responsive and, therefore, ordinary sensations, such as the human voice, which would orient a child, don't draw their attention. Instead, they drift off into their own world. Some very bright children with this pattern wind up daydreaming a great deal. Clearly, many children with attentional problems evidence combinations of the above, such as motor planning problems and sensory under-responsivity. Environmental and caregiving patterns may contribute, as well.

207.2. Disruptive Behavioral Problems

Toddlers and preschoolers with disruptive behavior often evidence sensory craving, which leads them to be very active and, at times, aggressive, even without necessarily intending to be so. Some of these children may also have areas of sensory under-responsivity where, for example, they may be relatively insensitive to pain, making this pattern even more intense. Some children also evidence sensory discrimination challenges, such as auditory discrimination, making it harder to understand limits and guidelines. Each or any combination of these patterns can contribute to disruptive behaviors. Environmental, caregiver, and family patterns also contribute.

207.4. Sleep Problems

Many children with difficulties falling asleep or sustaining sleep evidence some degree of sensory over-responsivity. Some also evidence sensory discrimination challenges. Others evidence a great deal of sensory craving and are, therefore, very active. Often, these sensory patterns are compounded by a variety of environmental factors and caregiving practices, which may contribute to the sleep challenges. From an early age the child forms certain patterns with caregivers that reinforce sleep difficulties over time.

207.4. Eating Problems

Many children with eating difficulties evidence sensory over-responsivity, especially in their oral cavity. Some also evidence low muscle tone, including low tone in their oral-motor area, as well as motor planning and sequencing challenges. Their oral-motor functioning challenges contribute to making eating a very difficult task. Other children are under-responsive to sensation in the oral cavity, also making eating difficult because expectable sensations from food are not occurring. Environmental and caregiving patterns may further contribute.

207.5. Elimination Problems

Many children with elimination challenges evidence combinations of sensory under-responsivity, low muscle tone, and motor planning and sequencing difficulties. Some, however, are sensory craving and others are sensory over-responsive. Caregiver and environmental patterns contribute, as well. For example, the child who is unable to sense when his or her bladder is full and has a hard time regulating motor actions, is more prone to having accidents.

207.6. Elective Mutism

Children with elective mutism are often sensory over-responsive and, therefore, highly anxious. Typically, a school environment is a challenging setting because of the noise and other sensations. Although over-responsivity is the largest contributor, children with elective mutism may also have dyspraxia. Attention to these differences, coupled with increasing the level of security and the gradualness with which the child enters a new setting, like school, can be very helpful.

207.7. Mood Dysregulation, including Bipolar Patterns

Often infants and young children with fluctuating moods have an underlying challenge characterized by sensory over-responsivity coupled with sensory-seeking. Therefore, when overloaded, instead of retreating and becoming cautious, they become more agitated and impulsive. As they become symbolic, this can take the form of shifting from fearful and depressive themes to angry and power-oriented themes. See the Interactive Disorder section for a fuller description of infants and young children with mood fluctuations, including bipolar patterns.

207.8. Other Emotional and Behavioral Problems Related to Mixed Regulatory-Sensory Processing Difficulties

Children with mixed regulatory-sensory processing challenges may evidence emotional or behavioral problems or symptoms not listed above. These may include: anxiety, fearfulness, negativism, and so forth. When these challenges or problems are related to mixed regulatory-sensory processing challenges, that should be indicated in this category.

207.9. Mixed Regulatory-Sensory Processing Patterns where Behavioral or Emotional Problems Are Not Yet In Evidence

In the early years of life, many children present with mixed regulatory-sensory processing challenges, but do not yet evidence clear emotional, social, and/or behavioral problems. Their regulatory-sensory processing challenges may be noted by their parent, early childhood educators, or their primary healthcare provider. For example, they may be over-responsive to light touch and have difficulty with sequencing motor responses. The recognition of these challenges provides an ideal opportunity for preventive work and family guidance that is geared to improving functioning in these and related areas, and preventing the emergence of emotional, social, and/or behavioral problems. Many parents and educators already implement such preventive strategies intuitively. However, identifying these patterns can help systematize these efforts and broaden the number of children who are helped.

Case Illustrations of Regulatory-Sensory Processing Disorder

Mario: A Case Illustration of a Child with an Over-Responsive, Fearful, Anxious Pattern

Presenting Problems

Mario was 4½ years of age at the time of referral. His mother had become gradually more concerned about Mario, although no specific event prompted the current request for assessment. Referral had come through the pediatrician. Mario's mother had felt for some time that he was different from other children, although as he was her only child, she was not sure if this was a problem. While he was interactive with her and his dad, Mario was quiet and stand-offish around others, even members of his extended family with whom he spent a good deal of time. Mario was difficult to engage socially, and often did not seem to be able to have fun. He had no real friends in day care, and tended to play alone. He would engage others only if he was in control of the play activities. At the time of referral Mrs. Diaz had noticed increasing difficulties with eating (very picky), clothing choice, and very limited play activities. Major concerns revolved around transition to kindergarten.

Background and History

Mario was the product of a full term pregnancy, long labor, but otherwise normal delivery. His mother experienced serious complications following his birth and was hospitalized for several days. She continued to be under close medical scrutiny and care for nearly a year following Mario's birth. She was unable to provide care for Mario for approximately his first 2 weeks of life. Mario had remained at home, being cared for by his father and his aunts. It was a stressful time for all.

From the beginning Mario was difficult to bottle feed. He seemed to have a hard time settling into someone's arms for feeding, and this was accentuated when someone other than his parents fed him. Mario's mother became the primary feeder at home, and she generally either fed him in an infant seat or sitting on her lap facing away from her. Later, Mario's daycare teacher reported similar feeding difficulties.

Transition to solids foods was difficult. Mario greatly preferred the sweeter baby foods (fruits) and rejected nearly all vegetables. He ate some cereals and meats, but was picky in terms of temperature, taste, and texture. He did not tolerate foods of mixed consistency, and would simply refuse to eat if his preferences were ignored. Becoming concerned that he would develop poorly as a result of diminished food intake, Mrs. Diaz resorted to giving him what he preferred, and what she could be certain he would eat. As he transitioned off baby food onto chewable foods this pattern continued. From age 2 and through today he eats a very limited range of foods. As a toddler, he would finger

feed dry foods, noodles with no sauce, soft/well-cooked pieces of meat, and most fruits. He continued to refuse vegetables. He drank milk from a sippy cup, and a little juice. It was difficult to get him to add new foods or beverages to his limited repertoire.

Motor milestones were largely on time, although toilet training was very difficult. Mario did not seem to like the bathroom, but neither did he like being in dirty diapers or pull-ups. He would remove his pull-up immediately after it became dirty, leaving it in his room. He was finally fully trained by age 4.

Mario was not an environmental explorer as a toddler, preferring to sit and work with blocks, small animals and figures. He enjoyed swinging to some extent, although only slow controlled swinging. He climbed very little as a toddler, but recently has begun to climb more if the climbing activity was aligned with his real love: playing dress up and make-believe. Mario loves nothing better than to dress in a cape and don the weapons of a super hero. He plays out complex scenarios which often include having a home base hidden somewhere out of reach; thus he began to climb. His play themes are very complex, and Mario must direct all who participate in his elaborate plays.

Language skills had never been of particular concern. Mario's mother reported that Mario began using words and sentences roughly on time, according to her books on early development. She was unable to precisely recall when he first began talking, but was never concerned about it. The play scenarios in which he engages have always been very language rich.

An area of puzzlement for Mrs. Diaz is Mario's limited emotional expression. She described him as a child who rarely showed emotional extremes in any direction. As an infant he did not often cry from hunger, although he did fuss to have his diaper changed. He was generally content to be left in an infant seat rather than fussing to be held and carried. As he grew up, Mario rarely became excited about activities or gifts, and would walk away from a disagreement with another child rather than fight over a toy. He has never been very affectionate. She views this as emotional stability. Mario can and does become upset when he is hurt, and at those times seeks comfort from his mother.

Current Status

Mario remains very picky about food. He has developed a preference for spicy foods, and limits what he eats to certain meats, most fruits, white bread, buttered noodles, and some sweets. He drinks only orange juice and milk. Mario is equally as choosy about his clothes, preferring long sleeves regardless of the weather, pants without zippers, and shirts without buttons.

Although Mario has been in daycare since he was 9 months of age, he still does not seem connected to either his care providers or playmates. He prefers solitary play, unless he can get some of the children interested in his make-believe type of play. With this play he establishes strict rules and limits so that when one of the children chooses not to comply, the game ends.

Mario continues to be very attached to both of his parents. While he continues to show only a limited degree of overt affection, he makes frequent visual contact with his mother when they are in the same room. She reports that he looks for them to pick him up promptly from day care; the day care provider indicated that once departure time arrives, Mario looks for them each time an adult enters the room. He always seems relieved when his parents come to take him home. He gives a hug and kiss hello/goodbye on request, but generally does not offer either on his own. At day care he shows preference for a few children, and one provider. He continues to avoid conflict by simply walking away.

Mario has not formed close relationships with other adult family members. He is cared for one evening each week by an aunt, and appears very fond of his cousin in this household, but remains emotionally distant from the adults. He and his cousin play well together, but according to the aunt, Mario controls all aspects of play. If the game is not going his way, he walks away and starts something new. His mother reports that Mario talks about this cousin a great deal, and is animated in these discussions. She takes this as excitement and enjoyment over being with this cousin.

Although early developmental milestones were on time, at 4½ years of age Mario does not ride a tricycle, pump on a swing, or slide. He does not seem to enjoy games with balls or any other outside activities that involve tools. He has become good at climbing up a ladder to get into a clubhouse, and generally incorporates this into his make-believe plots. He tends to develop make-believe scenarios that involve good guys and bad guys, and weapons of some sort.

Language skills continue to be a strength. Mario creates his make-believe play activities with a wealth of language detail, and plays a role in these scenarios like an actor. He enjoys being read to, but has shown no interest in independent reading. His preferred quiet time activity is watching TV, particularly movies. He and his father spend many hours together watching videos, and the father is pleased that Mario watches either cartoon types of movies or more realistic movies. As with his play themes, he mostly enjoys movies with good guys and bad guys.

The family is intact. Mrs. Diaz described her relationship with her husband as loving, but not demonstrative. Both parents work full-time outside of the home. The mother is the primary wage earner, but also the primary caregiver for Mario. The father spends time with Mario in the evenings and on weekends.

Assessment

Mario was first observed in his home, in order to evaluate him in his best environment. He was not excited about playing with a stranger, and played only reluctantly and only with his mother during this assessment session. He did show the observer his stash of weapons, and the different capes he wore when playing. He did not want to play outside on the swings and when invited to go to the park he declined. His preference was to watch TV and let his mother and the examiner talk. The mother seemed quite comfort-

able with this situation and did not encourage Mario to interact. During the discussion between the examiner and mother, Mario interrupted only once, requesting juice. Informal observation was not fruitful given his reluctance to interact, move or play.

Mario and his parents live close to his aunt and cousins. He is fond of his cousins, and plays well with them. It was decided that further observation would take place in their house and yard, using them to motivate Mario to engage in activities.

Play at his cousins began outside on the swing set. Mario sat on the glider while his two cousins swung, climbed, and played to some extent. The mother remained close by, but did not interfere as the children engaged. The cousins invited Mario to climb and swing, but it was not until he decided they should be Batman, Robin, and Catwoman that Mario became more involved. After donning the appropriate outfits, the three engaged in a "catch the bad guys" activity that had them running, doing some climbing up the slide, and playing in the clubhouse at the top. While the cousins slid back down the slide Mario carefully walked down the ladder. Overall movements and skills seem to be within expected ranges, but it was difficult to be certain. All children were very animated in their pretend roles. The game came to a natural conclusion as all three children became bored. Mario wandered away from the swing set, indicating an interest in watching TV. Mrs. Diaz responded by suggesting all three children move inside to play. At the second request for TV, Mario was told no, that he and his cousins should find something else to play inside. Mrs. Diaz accompanied the children inside and worked at finding an activity that all would want to play.

Mario and one of his cousins decided to play with GI Joe dolls. Mario owns a cadre of these toys and their various accessories. It was clear he was very familiar with them. He was able to move the dolls, get them into position, put them in and out of vehicles and structures, and act out the activities. He had some difficulty dressing and undressing them for action, but this was to be expected at his age. He appeared very imaginative in his play with the dolls, but during discussion Mrs. Diaz indicated that his play scenarios are often very similar.

Throughout the discussion at the Diaz' home, and play at the cousin's house, Mrs. Diaz responded to Mario in a manner both encouraging and respectful. While she allowed him a great deal of TV during our initial conversation, it may have been what allowed Mario time to accommodate to the presence of the examiner. When at the cousins' house Mrs. Diaz tended to be involved to get things started, and then she pulled back to allow them to unfold. When Mario began to lose interest, Mrs. Diaz again intervened. She appeared very adept at guiding Mario through transitions, and making his world run smoothly.

Because his milestones appeared generally on time, and he did not seem to have developmental delays, no formalized early motor or language assessment had been carried out. However, given his mother's concerns about his limited display of gross motor skills at present, and his impending move to kindergarten, the Peabody Developmental

Motor Scales was administered. In addition, Mario's mother was given The Sensory Profile to complete, based on her concerns about Mario's difficulty engaging in activities and social events, and her suggestion of some sensory sensitivities.

Peabody Developmental Motor Scales (PDMS)

Fine and gross motor components of the PDMS were administered. Mario was generally cooperative with the assessment process, although at times he needed some encouragement from his mother to try or to continue with the process. At times his attention seemed to wander, and items were repeated. Overall the assessment was felt to be reliable, reflecting his actual skill level.

Mario's PDMS scores indicated that he performed just above the 50th percentile in gross motor skills, and right at the 50th percentile in fine motor skills. On the gross motor subtests his lowest area was Locomotion, primarily due to difficulties on balance and jumping items. His standard score was 8 (M of 10, SD of 3). In the fine motor area, Mario also scored below average but well within normal limits. For example, on the Grasping Subtest his standard score was 9. Of considerable interest was his unusual grasp pattern. Mario held the writing tools with fingertips of his right index, middle, ring finger and thumb. His grasp appeared very awkward, although his performance was adequate. This odd grasp pattern accounts for his relatively lower score in this area. No overall motor delays were notable.

Sensory Profile

Mario's responses on the Sensory Profile (SP) were compared with those for children age 4 (see below). At this age there are more differences in typical sensory processing than at older ages and a separate scoring profile is included in the manual.

First examining his scores by SP section scores, Mario demonstrates "definite differences" (poorest scoring category of scale) in Auditory, Tactile, and Oral Sensory Processing, and "possible difference" (2nd poorest scoring category of scale) in Vestibular Processing. He showed a "definite difference" in Emotional/Social Responses and Modulation of Sensory Input Affecting Emotional Responses, along with "possible difference" in Sensory Processing Related to Tone and Endurance, and Modulation of Movement Affecting Activity Level and Movement.

On the SP factor scores Mario showed a "definite difference" in Emotionally Reactive, Oral Sensory Sensitivity, and Sensory Sensitivity. Factors on which he demonstrated "possible difference" included Low Endurance/Tone and Fine Motor/Perceptual. There was no indication of Inattention/Distractibility or Poor Registration.

Impressions

Mario shows sensory over-responsivity to auditory and tactile sensation. This is demonstrated by his scores on the Sensory Profile and supported by behaviors he shows in play. He was observed to have a tendency to be more sensitive than would be expected

to movement activities as well, confirmed by the probable difference score in this domain. Overall these sensory sensitivities lead to his reluctance to engage in play with a variety of materials, and a variety of friends. He is reported to be a difficult child to get to know, and a difficult child to enjoy playing with by adults outside of his mother and father. He tends to be very quiet, appears fearful, anxious, and cautious, and tends to use avoidance as a coping strategy. He interacts little in family events.

Mario also tends more often toward sedentary play activities, or activities in which he is in control. While the PDMS results do not support motor delays, he is qualitatively less skilled than other children his age in terms of balance and movement, and tool use. With tools (e.g., pens, pencils, scissors) his grip is light and awkward, although at present, skills with drawing and writing are within expected age limits. Mario appears to compensate for somewhat limited motor skills through creativity. His IQ was not tested.

Further, Mario's oral sensory sensitivities lead to his limited food choices, and tactile sensitivity leads to clothing intolerances. While these behaviors can be tolerated at home, and to some extent in day care, they present increasing challenges when Mario begins school. One might expect that when he gets to school the combination of a loud cafeteria environment and his limited food tolerance would make lunch a very difficult experience for him. Clothing limitations may become more of a social issue as Mario gets older.

Mario's sensory sensitivity appears linked to diminished social interactions, and a limited repertoire of emotional expression. His history suggests difficulty at the earliest emotional developmental level, that of shared attention and regulation. Engagement and relating with his parents was and is characterized by attenuated affect. Mario's ability to read and respond to the cues of others likewise appears limited, although his mother's ability to read and respond to Mario's emotional cues was very strong. Observationally it is difficult to determine Mario's ability to engage in integrated problem-solving in affective interactions as so few opportunities for such observation were present. The one behavioral pattern used most consistently in affective problem-solving was that of withdrawal or escape. He does not demonstrate insight into motivations for his actions, nor does he often use words to describe how he is feeling. His mother reports that she is working with him on putting words to his feelings, on the recommendation of his day-care teacher. Both of these adults sense that this helps Mario to get more involved with his peers. Globally, Mario's social and affective skills appear immature. The combination of sensory sensitivity with immaturity in social and affective expression characterizes Mario as a child with sensory over-responsivity, withdrawal subtype.

Mario's mother provides a great deal of support for him. She is artful at smoothing out transitions and creating environments in which Mario can best function. During this observation she did not encourage him to challenge himself with anything that might make him uncomfortable. The father was not available during this assessment, so these dynamics could not be assessed.

Conclusion

Mario presents with a primary Regulatory-Sensory Processing Disorder of Over-Responsive, Fearful, Anxious Pattern (201.). His diminished emotional expression and tendency toward constricted affect are consistent with this finding. His mother is adept at meeting his sensory needs, and allows him the freedom he needs to withdraw, while at the same time encourages him to become engaged in another activity. It is recommended that he be referred to an occupational therapist with experience in sensory-based approaches to treatment or another professional with knowledge of and skills in working with children with sensory modulation challenges and their families.

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Emily: Case Illustration of a Mixed Regulatory-Sensory Processing Disorder

Emily, a 4 year, 3 month-old girl, was referred for an evaluation at the urging of her preschool due to concerns about her ability to follow the flow of school activities. Although Emily appeared to be a bright little girl who was highly verbal and imaginative in her own play, she had difficulty joining other children. She often appeared lost and in her own world. She tended to isolate herself on the playground and in the classroom. Transitions were difficult because she seemed to get confused or lost. It was hard to orient her to what was happening; she needed help with each step of the transition.

Background

Emily is the older child in an intact two-parent family. Her younger brother was born about ten months before the referral and has no reported problems. Emily's father is a psychology professor and her mother is a mental health professional. Emily was born full term following an uncomplicated pregnancy. She was slow to catch on to breast-feeding, but eventually was successful. Her early motor milestones occurred within an average age range and she was walking by 12 months. She has a history of frequent ear infections between 6 months and 2 years of age but she did not require surgical intervention. She is toilet trained for urine, but continues to have difficulty with bowel movements.

Her parents describe her as clumsy with frequent falls. She is not yet able to ride a tricycle. They report that she "W-sits" (the opposite of sitting cross-legged, so that her legs are folded back on their sides and look like w's, very hard on the hips) and she sometimes looks stiff when she is standing. They stated that her arms and hands seem weak. She prefers imaginative play with dolls and figures and avoids manipulative play and fine motor activities. She does not yet have a hand preference. Emily's parents are concerned about how difficult it is for her to connect to other children. They describe her as "spacey" and inattentive. She has trouble keeping track of her belongings and finding things in visually cluttered environments such as the preschool room. They were curious to find out why her ability to attend and connect varies from day to day and within different situations.

Evaluation

Emily was evaluated in the clinic with her mother present using the Pediatric Examination of Educational Readiness (PEER), (Levine, 1985) and clinical observations of her sensory and motor functioning. The PEER assesses a child's performance on 29 tasks in six different areas of development: orientation, gross motor, visual-fine motor, sequential, linguistic, and pre-academic learning. The child is also rated on selective attention and activity, processing efficiency, and adaptation. Emily's parents filled out the Sensory Profile (Dunn, 1999) and the examiner completed a school observation.

During the standardized assessment, Emily was cooperative but difficult to engage and poorly oriented. She was neither able to receive nonverbal social cues nor read body

language. She became confused by directions presented at a conversational speed, but could respond if she was reoriented and time was unlimited. However, her ability on language items was at or above age level. Emily has a rich vocabulary, which is most evident when she is engaged in solitary imaginative play. In conversation, she has difficulty with language processing due to slow processing speed. Her expressive language is poorly organized and she has difficulty maintaining conversational reciprocity. Social pragmatics such as social referencing and use of non-verbal gestures are poorly developed. At times Emily seemed internally distracted, which increased with anxiety. Her attention could be sustained if the examiner used very high affect, slow speech, and physical support. This was striking for a child who performed at or above age level on pre-academic areas such as letters and numbers, naming days, and counting.

Emily's mother appeared anxious while observing the evaluation and frequently attempted to help focus her daughter by moving very close, holding her at the shoulders, and calling her name until she got eye contact. She spoke rapidly and with very high affect that was successful in breaking into Emily's self-absorption, but this interactive style at times appeared to be too much for Emily. The amount of language and the rapid delivery as well as the high intensity of the input seemed to get Emily's attention for a brief response, but shut down her ability to stay connected for continuous interactive flow.

Standardized Results on the PEER

Emily had difficulty with three of the five items on the Orientation subtest, which evaluates body awareness and localization of specific sensory input. She appropriately identified body parts. Finger movements were difficult with or without visual monitoring. She was poor at recognizing shapes drawn on the back of her hand (graphesthesia), but she did better matching blocks that were felt with her vision occluded (stereognosis). Her ocular smooth pursuits were impaired and she was unable to follow a moving object with her eyes unless her head moved.

Emily had great difficulty with gross motor tasks, particularly those that required balance and postural control, falling below normal limits on all six gross motor items. Her resting muscle tone was somewhat low, but her postural control during movement was remarkably poor due to lack of stability through the trunk as well as poor head control. She was unable to walk on her heels or her toes. While attempting these activities she demonstrated a transient increase in upper body tone with posturing that had a dystonic quality. She was unable to stand on one foot or to catch a ball. She lacked rotation through the trunk and was unable to sustain flexion or extension. She was also unable to maintain a stable, erect motor stance with arms extended and eyes closed, suggesting difficulty with vestibular/proprioceptive processing. Rapid pronation and supination were impossible for her to complete, suggesting cerebellar involvement. A marked asymmetry was noted, with the left side having greater impairment.

Emily also demonstrated weaknesses in visual and fine motor capacities. Emily demonstrated a weak, inconsistent grasp pattern with a pencil even within a task, rang-

ing from a static tripod to a fisted grasp. The difference between her cognitive ability, which is at or above age level, and her delayed fine motor skills was notable. Emily copied vertical and horizontal lines, but could not imitate a circle or shapes using small sticks. Her difficulty manipulating the sticks indicated poor tactile and proprioceptive discrimination. When she dropped a stick she was unaware that the stick had fallen. She did better copying block constructions but had difficulty sustaining visual attention. She missed task details and lost track of the task, using the blocks to build her own buildings. Though her visual shape matching was age appropriate, the examiner had to structure her and use verbal redirection for her to focus on the task.

On the Sensory Profile, "Probable Differences" (sensory under-reactivity) were reported in Auditory Processing, Vestibular Processing and Multi-sensory Processing. Emily was age appropriate on the sensory modulation sections, but had scores of "Probable Difference" on Emotional/Social Response and fell in the range of "Definite Difference" on the section reflecting Behavioral Outcomes of Sensory Processing. The factor indicating "Probable Difference" was Inattention/Distractibility; "Definite Difference" factors were Emotionally Reactive and Fine Motor/Perceptual.

During testing, Emily responded well to structure and to well-defined demands for simple verbal responses, but she became anxious when asked to perform specific gross and fine motor tasks. She was able to have a conversation as long as she generated it. If the examiner tried to expand an idea or if a new idea was introduced, she became confused and exhibited silly or avoidant behavior.

In open-ended play, Emily responded best to sensory motor play more typical of a younger child, such as chase games. Her ability to sustain attention and interaction was best under conditions of high affect and no requirement for discrete skill output. In simple playful games she sustained reciprocal interaction for 15- 20 interactive turns. If the activity involved much language, moved quickly, or had much movement, she became disorganized. She had difficulty sustaining a play activity interrupted by motor planning or balance problems. Her activity level escalated when she moved though space. Her parents described her as "always on the move," but she was observed in this assessment to be withdrawn and slow to respond.

School Observation

In the school observation, it was clear how the impairments seen in the evaluation affected her school functioning. Emily's class had gathered in small groups where they freely moved among classroom activity centers. During this observation many of the children were playing actively around the climbing structure. The noise level was high but not overwhelming. Emily sat at a far corner of the room with her back to the rest of the group playing alone with a set of large dinosaurs. At one point a boy approached and attempted to join her play. When Emily did not respond to him he lost interest. Emily then stood up and looked in his direction as he moved across the room. She watched several groups from a distance and then moved over to the group of children playing house. She stood at the periphery, watched, and made one or two quiet comments but she was not successful in joining the group.

During a circle music activity, Emily needed adult direction to join the class, and external postural support provided by a teacher's assistant to be able to attend to the task. When the class stood for a movement song, Emily approximated the movements but was slow and out of sync with the group. When she lost her balance, she became disoriented and was unable to join back into the song. She was not able to use the help that the assistant tried to give her. Emily required adult direction to join the class line for a toilet break. She left with the children but did not return. A teacher finally found Emily looking at a bulletin board where she had become overly absorbed in the pictures.

Emily rejoined the rest of the class in a smaller room. She went to her favorite activity center and pulled out a box of materials that she examined with her back to the rest of the class. Another child tried to join her and was successful. She followed Emily's directions and the two had a nice interaction. When the other child made a suggestion, Emily became confused and tried to revert back to her previous play. Her play partner became frustrated and left. The teacher encouraged Emily to pick another area of the room. She avoided the art project and moved from one area to another, unable to settle and explore the activities. The teacher expressed her frustration at trying to get Emily to explore the various activities in the room, the difficulty they had with transitions, and the difficulty with getting her to interact with other children. The teachers feel that she is a bright, delightful girl who has trouble attending to interactions and learning. They expressed confusion and concern about her seeming day-to-day variability.

Social Emotional Functioning

Emily's social emotional functioning has been greatly impacted by her sensory processing and motor deficits. Her attention and regulation for a wide range of sensory experiences is constricted due to variable sensory reactivity and poor sensory processing that make it difficult for her to draw meaning from sensory events around her. Emily tends to be under-reactive to many sensations, but can be over-reactive to others. Her postural instability and difficulty with ocular control make it difficult for her to stabilize herself while standing to view the world around her and to follow the movements and actions of her peers. Her slow processing speed for visual and auditory input causes her to miss details needed to interpret the nuances in the flow of social interactions. Emily tends to over-focus on static objects in near space and to become absorbed in her own internal thoughts rather than to orient to the activity around her.

Emily initiates engagement and enjoys moments of rich engagement with her parents, but because Emily uses self-absorption as a coping mechanism, she can also be difficult to engage. She responds well to rich affect when is it delivered slowly and timed to her processing speed. It is important for those interacting with Emily to monitor the volume of their speech and to use facial expression and vocal intonation rather than loudness to bring affect to their interactions. Her engagement can be quite good when she is stable and the demand for postural control is low, but when she is upright and moving, it is difficult for her to sustain engagement. Emily is able to engage in two-way intentional affective communication when the timing and intensity of the interaction is a good fit for her processing abilities. She enjoys simple back and forth interactions and is best

when the language and movement demands are low. The flow of her interaction and her ability to stay engaged for longer chains is easily disrupted by the demands of movement and balance, by motor planning challenges, by language processing challenges, and by gaps in her sensory processing. Unless she has a well-attuned partner, Emily quickly becomes confused and reverts to self-absorption. She has difficulty repairing breaks that occur in interactive flow and needs help to recover from interruptions. She can engage in brief islands of shared social problem solving, but the idea must be one that comes from her. She has difficulty incorporating others' ideas and shifting her own action and thoughts around others' ideas. This impacts her ability to play with peers. She does well when a friend follows her lead, but when a friend injects her own ideas into the play, Emily often becomes lost and disengages. Emily's slow processing speed and difficulty with social pragmatics also interrupt the flow of interaction with others because it can appear that she is not responding or is not still engaged. This can cause her play partner to disengage. However, if she is given time to respond, she often can continue the interaction. The inconsistency in Emily's responses makes it difficult for family and friends to know what to expect and how to respond to help her stay in the moment.

Emily has a relative strength in her capacity for solitary representational play. She can engage in long periods of representational play that at times have the beginnings of symbol content, e.g., acting out sequences of daily life and simple emotional themes such as care giving, dependency and simple conflicts or problems. She has difficulty letting others into her play and in logically bridging her ideas. Her own affect is not yet well differentiated and this is apparent in the constriction to the emotional content of her play.

Summary

Emily demonstrates a Regulatory-Sensory Processing Disorder characterized by (1) Self-Absorbed and Creative Patterns (203.2) and (2) Inattentive, Disorganized Patterns with contributing postural control problems and dyspraxia (205.4).

She is under-responsive to vestibular, tactile and proprioceptive information. At times she is alert to visual information and other times under-responsive to visual details in her environment. Visually, she functions better in near space than across space or while moving. This may be due to poor postural ocular functioning related to her postural disorder. Emily has auditory processing deficits for speech sounds and has slow processing speed. She is over-reactive to loud, unexpected sounds and has auditory discrimination difficulties.

The variability of her attention, awareness, and self-absorption suggests a modulation disorder rather than a discrimination disorder. Emily has marked deficits in motor functioning that are most apparent in her postural control, stability, balance, and control and gradation of gross and fine movements during functional activities. The motor planning deficits that accompany her postural issues are based on poor tactile and proprioceptive processing. Emily's postural instability has a significant impact on attention and orientation in busy environments and contributes to her self-absorption and anxiety.

A referral for a comprehensive DIR-based intervention program is recommended that focuses both on her regulatory-sensory processing challenges (i.e., occupational therapy) and her emotional, social, and educational challenges (e.g., a mental health professional to help construct a home program, consult to the school, and work with Emily and her family).

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