The Incidence of Caregiver Reported Sensory Processing Disorders in Children Who Are Experiencing Traumatic Stress Reaction

Ann K. Viviano

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THE INCIDENCE OF CAREGIVER REPORTED SENSORY PROCESSING DISORDERS IN CHILDREN WHO ARE EXPERIENCING TRAUMATIC STRESS REACTION

by

Ann K. Viviano, OTR, MA CCC-SLP

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the requirements for the Degree of Master of Science
Department of Occupational Therapy

Western Michigan University
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Ann K. Viviano, OTR, MA CCC-SLP
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Ann K. Viviano, OTR, MA CCC-SLP
Western Michigan University, 2001

The purpose of this research project was to determine whether children who are experiencing traumatic stress reaction to childhood neglect or abuse demonstrate sensory processing disorders. It was hypothesized that since neurodevelopment has been disrupted in children who have been exposed to trauma or neglect, sensory processing abilities may also be disrupted.

The Sensory Profile, a judgment-based caregiver questionnaire, provides a standard method to measure a child's sensory processing abilities and to profile the effect of sensory processing on a child's functional performance. A convenience sample of 25 children, with documented traumatic stress reaction due to abuse and/or neglect, was evaluated.

The results were scored and interpreted according to the classification system of the Sensory Profile: typical performance, probable difference, and definite difference. Results indicated 80% of the children who are experiencing traumatic stress reaction were reported by caregivers to have difficulties with sensory processing.
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A major tragedy in the United States is that at least 5 million children are victims of and/or witnesses to physical abuse, domestic violence, or community violence (Perry, 1997). The U. S. Department of Health and Human Services reported in *Child Maltreatment 1998* that an estimated 903,000 children were victims of maltreatment nationwide, which is a rate of victimization of 12.9 per 1,000 children. More than half (53.5%) of the child victims suffered neglect, 22.7% suffered physical abuse, 11.5% were sexually abused; and victims of psychological abuse and medical neglect accounted for 6% or fewer each. In addition, a quarter (25.3%) of victims were reported to be victims of more than one type of maltreatment. Nationally, an estimated 144,000 child victims were placed in foster care (U.S. Department of Health and Human Services, 2000). Clearly, child abuse and neglect and the resulting devastation are issues that must be addressed on a national level, on a state level, and in each and every community.

In Kalamazoo, Michigan the team of professionals at The Southwestern Michigan Children's Trauma Assessment Center (CTAC) addresses the needs of children who are experiencing traumatic stress reaction following abuse and/or neglect. CTAC accepts referrals from community agencies; and the team completes family-centered evaluations and makes intervention recommendations that are presented to the child's caregivers. Components of a child's evaluation include determination of the status of cognitive, language, emotional, physical, and psychological...
development. One of the specific areas assessed is a child’s ability to process sensory information, that is, how the child registers, responds, and regulates normal environmental stimuli.
THE AFTERMATH OF ABUSE AND NEGLECT

Post-traumatic stress disorder is marked by clear biological changes as well as psychological symptoms (National Center for Post Traumatic Stress Disorder, 2000) that can be observed by individuals who are knowledgeable about the affects of abuse and neglect on the physical and mental states of children. However, these changes and symptoms may not be as clear or obvious to caregivers who lack familiarity with the effects of abuse and neglect. Childhood trauma of abuse or neglect has a profound impact on the emotional, behavioral, cognitive, social, and physical functioning of children. Children exposed to trauma may have a range of traumatic stress reactions with symptoms of behavior disorders, anxieties, phobias, and depression (Schwarz & Perry, 1994). Perry (1994) reviewed information on childhood post-traumatic stress disorder with specific focus on the neurobiological sequelae of childhood trauma. He presented preliminary evidence of altered functioning of brainstem functions associated with prolonged ‘alarm reactions’ induced by traumatic events, which alter cardiovascular regulation, affective lability, and behavioral impulsivity; and increases anxiety, startle responses, and sleep abnormalities.

Perry (1997) asserted the human brain develops in a ‘use-dependent’ manner, growing, organizing, and functioning in response to developmental experience. Experience results in the critical neurobiological factors associated with violence and/or neglect. The brain makes internal representations of the external world and stores associations between the sensory information from specific events and allows
the individual to generalize to sensory information present in current or future events. The brain stores elements of the traumatic events as cognitive memory, motor memory, emotional memory, and state memory, altering the functional capacity of the traumatized individual (Perry, 1999a).

A growing body of evidence suggests that exposure to violence or trauma alters the developing brain by altering normal neurodevelopmental processes. Trauma influences the pattern, intensity and nature of sensory, perceptual, and affective experiences of events during childhood. Threat activates the brain’s hyperarousal stress-response neurobiology, which can affect the development of the brain by altering neurogenesis, migration, synaptogenesis, and neurochemical differentiation. If a child uses dissociative adaptation patterns of survival, there is also overactivation of neurochemical responses in the central nervous system that may result in behaviors of ‘freezing,’ with mental and emotional disengagement from the immediate situation rather than a ‘fight or flight’ response to the threat, abuse, or neglect. Most children’s response to trauma is a mixture of these two primary adaptive patterns, arousal and dissociation, and the specific symptoms a child develops will be related to the intensity and duration of the adaptive style present during the threat. If the neurobiology of the specific response is activated long enough, there will be molecular, structural and functional changes in those systems. As children adapt to violence, their brain acts to sense, process, perceive, store, and act on information from outside and inside the body to promote survival. Disruptions during critical periods of learning may lead to major abnormalities or deficits in neurodevelopment and behavior (Perry, 1999b;
Children who survive a traumatic event may have persistence of a low-level fear state; be impulsive, hyper-vigilant, hyperactive, withdrawn, depressed; have sleep difficulties and anxiety, show loss of previous functioning, have a slow rate of acquiring new developmental tasks, act in a regressed fashion, and/or have persisting physiological hyperactivity (Perry, 1999c). Traumatic stress in childhood increases risk for attachment problems, eating disorders, depression, suicidal behavior, anxiety, alcoholism, violent behavior, mood disorders, and/or chronic post-traumatic stress disorder. Adults victimized by sexual abuse in childhood are more likely to have difficulty in childbirth, a variety of gastrointestinal and gynecological disorders, and other somatic problems such as chronic pain, headaches, and fatigue (Perry, 1999d).

Children who suffer from neglect have a higher probability of emotional, behavioral, cognitive, social, and physical delays and dysfunction than 'comparison' children. Findings strongly suggest that when early life neglect is characterized by decreased sensory input (relative poverty of words, touch and social interactions), brain growth and organization are altered. Results of neuroimaging indicated more scans of the children with global neglect were read with "enlarged ventricles" or "cortical atrophy." Few focal abnormalities were noted. The relative impact of neglect on the brain, as opposed to other physical growth, indicated that the actual lack of experiences played a major role in addition to inadequate nutrition (Perry & Pollard, 1997).

Developmental experiences determine the organizational and functional status
of the mature brain. The acute adaptive states of the brain, when they persist, become maladaptive traits (Perry, Pollard, Blakely, Baker, & Vigilante, 1995). The presentation and course of post-traumatic stress symptoms depend on how far a person has progressed in his development. Assessments and interventions in the aftermath of trauma must consider presenting symptoms and the individual’s ability to cope, as well as the biopsychosocial development and the impact of trauma on the child’s maturation and development. Additionally, it is critical to intervene with the child’s caregivers to elicit their assistance and provide them with support (Schwarz & Perry, 1994). In order to meet the needs of traumatized children it is necessary to evaluate the child’s strengths and weaknesses across all domains of functioning and from the perspectives of different observers through an interdisciplinary assessment (Ludy-Dobson et al., 1999).
SENSORY PROCESSING AND INTEGRATION

The profession of occupational therapy involves the therapeutic use of purposeful and meaningful occupations (goal directed activities) to evaluate and treat individuals who have a disease or disorder, impairment, activity limitation, or participation restriction that interferes with the ability to function independently in daily life roles, and to promote health and wellness (American Occupational Therapy Association, 1999). Child abuse and maltreatment results in a variety of problems that have been reviewed in the literature in areas of play (Howard, 1986); development, cognitive competence, emotional development, and social development (Wright, 1994); and motor skills (Hughes & Di Brezzo, 1987). Several authors, including Howard (1986), Wright (1994), and Davidson (1995), have noted implications for occupational therapy intervention. Davidson (1995) suggested documentation of the child’s physical appearance, affect, and social behavior, a comprehensive developmental assessment, and observations of the child’s sensory integration.

Ayres (1979) defined ‘sensory integration’ as the organization of sensory stimuli (particularly body position, movement, and touch) in order to produce an adaptive response. Without the ability to properly organize sensory information, children lack the foundation to make adaptive responses to the environmental demands of daily tasks. Sensory integration is considered to be the foundation for appropriate occupational behavior, including self-care, self-management, play, and academic skills (Fisher, Murray, & Bundy, 1991). Sensory integration is one
component of sensory processing. ‘Sensory processing’ is an encompassing term that refers to the way in which the central nervous system and the peripheral nervous system manage incoming sensory information from the peripheral sensory systems. The reception, modulation, integration, and organization of sensory stimuli, as well as the behavioral responses to sensory stimuli, are the components of sensory processing (Miller & Lane, 2000). Disruptions of sensory processing can lead to a variety of problems developing skills necessary to complete activities of daily living. Wilbarger and Stackhouse (1998) reviewed information in the area of sensory processing and modulation that has been documented within the occupational therapy literature.

Occupational therapists have studied child development and functioning from the perspective of sensory integration using the *Sensory Profile* (Dunn, 1999), a standardized questionnaire, which assesses a child’s responses to basic sensory systems and the behavioral outcomes of sensory processing.
THE SENSORY PROFILE CAREGIVER QUESTIONNAIRE

Dunn and colleagues collected data about children's performance and responses to sensory experiences during daily activities and developed a formal measure of children's ability to process sensory information, the Sensory Profile (1999). The Sensory Profile is a questionnaire on which caregivers report the frequency at which a child's behaviors occur. Dunn (1994, 1997; Dunn & Brown, 1997; Dunn & Westman, 1997) reported on studies with children without disabilities and assessed children's responses to commonly occurring sensory events.

Dunn (1997) proposed a conceptual model that describes sensory processing as an important factor in a child's development and ability to perform daily activities. Professionals and parents are recognizing that reduced sensory processing abilities affect social, cognitive, and sensorimotor development. When considering young children's basic needs, Dunn proposed a continuum of behavioral responses in which children respond to their environment in accordance with or to counteract their neurological thresholds. Neurological thresholds indicate the amount of stimulation needed for the nervous system to notice or react to stimuli. When children act in accordance with their threshold, children with high thresholds respond to very few stimuli and children with low thresholds respond to many stimuli. When children respond to counteract their threshold, children might either exert excessive energy seeking stimulation to meet high thresholds or exert energy to avoid triggering low thresholds.
Case-Smith (1997) related how the Sensory Profile contributes to the evaluation and intervention process. Asking a caregiver to complete the Sensory Profile as part of the evaluation process has several benefits, including demonstrating the importance of the caregiver’s knowledge of the child, helping the caregiver to be an active participant in the child’s program, facilitating communication between the therapist and caregiver, and increasing the caregiver’s understanding of the child’s behaviors within certain situations and how to adapt the environment to meet the child’s needs. The fundamental behavior patterns identified by the Sensory Profile help to determine the most effective style for interacting with a child. The Sensory Profile determines a child’s general reactivity to sensory input, his activity level, and his ability to cope with a variety of environments and social situations. By matching a child’s sensory thresholds and needs, the therapist can foster engagement, effort, attention, and development. Additionally, Dunn, Brown, and McGuigan (1994) proposed the Ecology of Human Performance with five types of intervention (establish/restore, adapt, alter, prevent, and create) as one framework for developing types of interventions that include the person, the task, and the context.

The Sensory Profile has been useful for determining the presence of sensory processing disorders in children with disabilities, and discriminating among certain groups of children with disabilities. Kientz and Dunn (1997) demonstrated the Sensory Profile identified and differentiated the sensory processing skills of children with autism or pervasive developmental delay from those children without autism who were typically developing. Ermer and Dunn (1998) indicated that the Sensory
Profile discriminated children with disabilities from children without disabilities, and discriminated among children with autism or pervasive developmental disorder and children with attention deficit hyperactivity disorder.
A significant number of children suffer from traumatic stress reaction to maltreatment, which affects their ability to function in the family, school, and community. In order to help these children, appropriate evaluations and treatments need to be determined. Many of the aspects of reduced ability to regulate sensory processing (over-responsivity or lack of responsivity) which are assessed on the *Sensory Profile* are also aspects of a child’s behavior when the child is experiencing reactions to traumatic life stressors of neglect and abuse. This research project had one objective: to determine if children who are experiencing traumatic stress reaction to childhood neglect or abuse have sensory processing disorders as reported by caregivers completing the *Sensory Profile*. The purpose of this study was to show relationship between traumatic stress reaction from abuse and neglect and sensory processing disorder.

It was hypothesized that since neurodevelopment has been disrupted in children who have been exposed to trauma or neglect (Perry, 1997), sensory processing abilities may also be disrupted. The statistical evidence from the completed questionnaires of the children with traumatic stress reaction will prove or disprove the null hypothesis:

$Ho=\text{Children who are experiencing traumatic stress reaction do not}$
have sensory processing disorders;

Ha=Children who are experiencing traumatic stress reaction have sensory processing disorders.

Statistical evidence in the form of percentages will then answer the question proposed for this study: What is the incidence of caregiver-reported sensory processing disorders in children who are experiencing traumatic stress reaction?

Value of Study

This applied and clinical research study was significant to the field of occupational therapy, the children and their families, and to the community-at-large for several reasons. Violence and traumatic events of many different types have become a factor in American life, resulting in a significant number of children experiencing traumatic stress reaction to abuse and/or neglect. The review of the literature showed that high levels of stress can change the way a child’s brain functions, which can impact the child’s ability to function in his family, school, and community; and limit a child’s activities of daily living, play, and leisure skills. If this study demonstrated a high incidence rate of sensory processing disorders in children with traumatic stress reaction, there may be a large number of children whose lives may be enhanced by identification and intervention of sensory processing disorders.

Since occupational therapists work to remediate performance abilities, adapt tasks, teach disability prevention, and promote health strategies, the field of occupational therapy has many skills to offer children and their families who have been
impacted by trauma and abuse. One important specialty area occupational therapy offers is diagnosis and treatment of sensory processing disorders, which may be one important factor affecting children experiencing traumatic stress reactions.

This study was timely regarding the need for the profession of occupational therapy to determine the incidence of sensory processing disorders in various populations, how sensory processing disorders affect various populations and individuals, and the usefulness of the recently published *Sensory Profile* evaluation tool; and to add to the base of knowledge concerning sensory processing and integration disorders.

Individual children who have been affected by high levels of stress and violence need appropriate evaluation and treatment to reach their highest levels of performance; the families of these children need to know how to structure the environment to help their children; and the community-at-large needs children who can successfully function at school, leisure, and play activities. Intervention programs based on a child's level of sensory processing, as determined by the *Sensory Profile*, may take advantage of the brain's malleability to help the child perform in daily life, which would benefit the child, his family, and the community.

Method

**Sample**

A sample of 25 caregivers of children who have a history of maltreatment, abuse, and/or neglect provided the data for this study. The children were diagnosed
and evaluated by the transdisciplinary team of Southwestern Michigan Children's Trauma Assessment Center (CTAC) at Western Michigan University in Kalamazoo, Michigan. Inclusion criteria for this study were caregivers of children between the ages of 3 to 10 years who are experiencing traumatic stress reaction to abuse or neglect and who did not have any concurrent diagnosis of physical disorders or syndromes. The research sample of 1,037 children without disabilities from the *Sensory Profile* normative data served as the comparison group. The data was taken between 9-29-00 and 2-16-01, and consisted of the first 25 caregivers to complete the *Sensory Profile*.

The sample of children with traumatic stress reaction who ranged in age from three years to ten years, are presented in Table 1, with 13 being male and 12 being female, as presented in Table 2.

<table>
<thead>
<tr>
<th>Age (year.month)</th>
<th>Number</th>
<th>% of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0-3.11</td>
<td>4</td>
<td>16%</td>
</tr>
<tr>
<td>4.0-4.11</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>5.0-5.11</td>
<td>3</td>
<td>12%</td>
</tr>
<tr>
<td>6.0-6.11</td>
<td>3</td>
<td>12%</td>
</tr>
<tr>
<td>7.0-7.11</td>
<td>4</td>
<td>16%</td>
</tr>
<tr>
<td>8.0-8.11</td>
<td>6</td>
<td>24%</td>
</tr>
<tr>
<td>9.0-9.11</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>10.0-10.11</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 2
Sample by Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number</th>
<th>% of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>13</td>
<td>52%</td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>48%</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100%</td>
</tr>
</tbody>
</table>

Procedure

The Human Subjects Institutional Review Board of Western Michigan University approved this research study. The children’s caregivers answered the Sensory Profile questionnaire at CTAC or at their home. A member of the CTAC team was present to explain the questionnaire and answer any of the caregiver’s questions. The caregivers signed a letter of consent to indicate their agreement to participate in the study. The original questionnaire was placed in the child’s medical record at CTAC. The results were scored and interpreted according to the classification system of the Sensory Profile: typical performance, probable difference, and definite difference. The data was coded in order to ensure anonymity for each child and family.

Instrument

An evaluation tool, the Sensory Profile (Dunn, 1999), was used to provide uniformity of data collection and to determine a child’s sensory processing abilities as reported by the child’s primary caregivers. The Sensory Profile, a judgment-based caregiver questionnaire, provided a standard written method to measure a child’s sensory processing abilities and to profile the effect of sensory processing on
functional performance in the daily life of a child. The Sensory Profile has 125 items assessing sensory processing, modulation, and behavioral and emotional responses. The caregivers reported the percentage of time their children engaged in each of the 125 behaviors listed on the profile using a 5-point Likert scale: 1 = always, when presented with the opportunity, the child responds in the manner described 100% of the time; 2 = frequently, when presented with the opportunity, your child frequently responds in this manner, about 75% of the time; 3 = occasionally, when presented with the opportunity, your child occasionally responds in this manner, about 50% of the time; 4 = seldom, when presented with the opportunity, your child seldom responds in this manner, about 25% of the time; and 5 = never, when presented with the opportunity, your child never responds in this manner, 0% of the time.

Validity Statement for Instrument

Validity refers to evidence that establishes that a test measures what it was designed to measure. The Sensory Profile includes content validity through literature review, expert review, and category analysis; and construct validity including both convergent and discriminant validity.

Reliability Statement for Instrument

Test reliability is an indication that a test provides a precise and stable score. The reliability of the Sensory Profile was estimated using internal consistency, which indicates the extent to which the items in each section measure a single construct.
Confidence intervals and standard error of measurement values have also been determined.

Scoring

The children's scores were divided into three groups according to the classification system of the *Sensory Profile* (typical performance, probable difference, and definite difference). Cut off scores were determined for each section and factor, according to the classification system listed in the *Sensory Profile User's Manual*, as follows: Typical performance consisted of scores at or above the point of one standard deviation below the mean for children without disabilities. This range indicated that the child represented the top 84% of the *Sensory Profile* research sample of children. Probable difference consisted of scores at or above the point of two standard deviations below the mean of children without disabilities, but lower than one standard deviation below the mean. This range indicated that the child performed between the 2nd and 16th percentile, representing 14% of the *Sensory Profile* research sample of children. Definite difference consisted of scores below the point of two standard deviations below the mean of children without disabilities. This range indicated that the child was performing like a child in the lowest 2% of the *Sensory Profile* research sample of children.

The item scores were summarized into two groups according to the scoring system of the *Sensory Profile* (factor and section scores). The nine factor scores were as follows: sensory seeking, emotionally reactive, low endurance/tone, oral sensory
sensitivity, inattention/distractibility, poor registration, sensory sensitivity, sedentary, and fine motor/perceptual. The fourteen section scores were as follows: auditory processing, visual processing, vestibular processing, touch processing, multisensory processing, oral sensory processing, sensory processing related to endurance/tone, modulation related to body position and movement, modulation of movement affecting activity level, modulation of sensory input affecting emotional responses, modulation of visual input affecting emotional responses and activity level, emotional/social responses, behavioral outcomes of sensory processing, items indicating thresholds for response.

Results

Five (20%) of the children’s scores were within the typical performance range on all of the factor summary scores, and three of those five children also scored within the typical performance range on all of the section summary scores. The remaining twenty (80%) of the children had some scores that fell within the probable difference and/or definite difference range on both the factor and the section score summaries.

Table 3 lists the percentages of occurrence in the sample of twenty-five children for the factor scores and Table 4 lists the percentages for the section scores.

Table 5 lists the mean and standard deviation of the factor scores for the sample of twenty-five children, and Table 6 lists the mean and standard deviation of the section scores.
Table 3
Percentages (n=25) for Factor Scores

<table>
<thead>
<tr>
<th>FACTOR SCORES (indicates the child's responsiveness to sensory input--either overly responsive or underresponsive)</th>
<th>Typical Performance (Scores at or above the point 1 SD below the mean)</th>
<th>Probable Difference (Scores at or above the point 2 SD below the mean, but lower than 1 SD below the mean)</th>
<th>Definite Difference (Scores below the point 2 SD below the mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sensory Seeking</td>
<td>40%</td>
<td>24%</td>
<td>36%</td>
</tr>
<tr>
<td>2. Emotionally Reactive</td>
<td>32%</td>
<td>20%</td>
<td>48%</td>
</tr>
<tr>
<td>3. Low Endurance/Tone</td>
<td>56%</td>
<td>12%</td>
<td>32%</td>
</tr>
<tr>
<td>4. Oral Sensory Sensitivity</td>
<td>80%</td>
<td>20%</td>
<td>0%</td>
</tr>
<tr>
<td>5. Inattention/ Distractibility</td>
<td>44%</td>
<td>8%</td>
<td>48%</td>
</tr>
<tr>
<td>6. Poor Registration</td>
<td>52%</td>
<td>20%</td>
<td>28%</td>
</tr>
<tr>
<td>7. Sensory Sensitivity</td>
<td>64%</td>
<td>16%</td>
<td>20%</td>
</tr>
<tr>
<td>8. Sedentary</td>
<td>92%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>9. Fine Motor/Perceptual</td>
<td>52%</td>
<td>38%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Table 4
Percentages (n=25) for Section Scores

<table>
<thead>
<tr>
<th>SECTION SCORES</th>
<th>Typical Performance</th>
<th>Probable Difference</th>
<th>Definite Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory Processing (indicates child’s responses to the basic sensory systems)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Auditory Processing</td>
<td>52%</td>
<td>8%</td>
<td>40%</td>
</tr>
<tr>
<td>B. Visual Processing</td>
<td>68%</td>
<td>20%</td>
<td>12%</td>
</tr>
<tr>
<td>C. Vestibular Processing</td>
<td>48%</td>
<td>8%</td>
<td>44%</td>
</tr>
<tr>
<td>D. Touch Processing</td>
<td>52%</td>
<td>24%</td>
<td>24%</td>
</tr>
<tr>
<td>E. Multisensory Processing</td>
<td>40%</td>
<td>16%</td>
<td>44%</td>
</tr>
<tr>
<td>F. Oral Sensory Processing</td>
<td>68%</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>Modulation (indicates the child’s regulation of neural messages through</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>facilitation or inhibition of various types of responses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. Sensory Processing Related to Endurance/Tone</td>
<td>56%</td>
<td>12%</td>
<td>32%</td>
</tr>
<tr>
<td>H. Modulation Related to Body Position and Movement</td>
<td>40%</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>I. Modulation of Movement Affecting Activity Level</td>
<td>80%</td>
<td>16%</td>
<td>4%</td>
</tr>
<tr>
<td>J. Modulation of Sensory Input Affecting Emotional Responses</td>
<td>52%</td>
<td>16%</td>
<td>32%</td>
</tr>
<tr>
<td>K. Modulation of Visual Input Affecting Emotional Responses and Activity Level</td>
<td>36%</td>
<td>20%</td>
<td>44%</td>
</tr>
<tr>
<td>Behavior and Emotional Responses (indicates the child’s behavioral outcomes of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sensory processing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L. Emotional/Social Responses</td>
<td>36%</td>
<td>12%</td>
<td>52%</td>
</tr>
<tr>
<td>M. Behavioral Outcomes of Sensory Processing</td>
<td>20%</td>
<td>32%</td>
<td>48%</td>
</tr>
<tr>
<td>N. Items Indicating Thresholds for Response</td>
<td>44%</td>
<td>36%</td>
<td>20%</td>
</tr>
</tbody>
</table>
Table 5

Mean and Standard Deviation of Factor Scores

<table>
<thead>
<tr>
<th>FACTOR SCORES</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sensory Seeking</td>
<td>56.68</td>
<td>14.62</td>
</tr>
<tr>
<td>2. Emotionally Reactive</td>
<td>48.68</td>
<td>14.07</td>
</tr>
<tr>
<td>3. Low Endurance/Tone</td>
<td>38.0</td>
<td>7.76</td>
</tr>
<tr>
<td>4. Oral Sensory/Sensitivity</td>
<td>37.92</td>
<td>5.90</td>
</tr>
<tr>
<td>5. Inattention/Distractibility</td>
<td>21.96</td>
<td>7.20</td>
</tr>
<tr>
<td>6. Poor Registration</td>
<td>31.88</td>
<td>5.30</td>
</tr>
<tr>
<td>7. Sensory Sensitivity</td>
<td>16.52</td>
<td>3.61</td>
</tr>
<tr>
<td>8. Sedentary</td>
<td>16.32</td>
<td>2.98</td>
</tr>
<tr>
<td>9. Fine Motor/Perceptual</td>
<td>10.0</td>
<td>2.52</td>
</tr>
</tbody>
</table>

Table 6

Mean and Standard Deviation of Section Scores

<table>
<thead>
<tr>
<th>SECTION SCORES</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Auditory Processing</td>
<td>28.04</td>
<td>7.77</td>
</tr>
<tr>
<td>B. Visual Processing</td>
<td>34.96</td>
<td>7.26</td>
</tr>
<tr>
<td>C. Vestibular Processing</td>
<td>44.28</td>
<td>7.87</td>
</tr>
<tr>
<td>D. Touch Processing</td>
<td>70.6</td>
<td>14.09</td>
</tr>
<tr>
<td>E. Multisensory Processing</td>
<td>23.96</td>
<td>6.16</td>
</tr>
<tr>
<td>F. Oral Sensory Processing</td>
<td>48.96</td>
<td>8.20</td>
</tr>
<tr>
<td>G. Sensory Processing Related to Endurance/Tone</td>
<td>38.0</td>
<td>7.76</td>
</tr>
<tr>
<td>H. Modulation Related to Body Position and Movement</td>
<td>38.2</td>
<td>9.14</td>
</tr>
<tr>
<td>I. Modulation of Movement Affecting Activity Level</td>
<td>24.92</td>
<td>3.90</td>
</tr>
<tr>
<td>J. Modulation of Sensory Input Affecting Emotional Responses</td>
<td>14.4</td>
<td>3.55</td>
</tr>
<tr>
<td>K. Modulation of Visual Input Affecting Emotional Responses and Activity Level</td>
<td>12.28</td>
<td>3.23</td>
</tr>
<tr>
<td>L. Emotional/Social Responses</td>
<td>54.6</td>
<td>14.66</td>
</tr>
<tr>
<td>M. Behavioral Outcomes of Sensory Processing</td>
<td>17.84</td>
<td>4.45</td>
</tr>
<tr>
<td>N. Items Indicating Thresholds for Response</td>
<td>11.12</td>
<td>2.78</td>
</tr>
</tbody>
</table>
DISCUSSION

According to the Sensory Profile User's Manual (Dunn, 1999), the Sensory Profile is designed to facilitate comparisons of a child's performance with a sample of children without disabilities (n=1,037) using the cut off scores for typical performance, probable difference, and definite difference. In this study, 80% of the children experiencing traumatic stress reaction had some scores in the probable and/or definite difference range, indicating a need for further assessment. At least 50% of the children scored in the probable difference or definite difference in the factor scores of 1. Sensory Seeking, 2. Emotionally Reactive, and 5. Inattention/Distractibility; and the section scores of C. Vestibular Processing, E. Multisensory Processing, H. Modulation Related to Body Position and Movement, K. Modulation of Visual Input Affecting Emotional Responses and Activity Level, L. Emotional/Social Responses, M. Behavioral Outcomes of Sensory Processing, and N. Items Indicating Thresholds for Response.

Means and standard deviation ranges for the children experiencing traumatic stress reaction were reported, but not compared to the Sensory Profile research sample, since composite numeric data for the children without disabilities was not listed in the Sensory Profile User’s Manual. However, since means and standard deviations for children with autism and children with attention deficit and hyperactivity disorder were given in the Sensory Profile User’s Manual, as well as a visual graph with comparisons of means and 1 standard deviation ranges for children with and
without disabilities, interested readers may compare the scores of the children experiencing traumatic stress reaction. Comparison of scores goes beyond the objective of this paper.

Information from the Sensory Profile, which provided the caregiver’s perspective on the child’s performance at home, would need to be combined with other information from the child’s history, formal evaluations, observations, and reports in order to make decisions and interpret the child’s Sensory Profile in relationship to the child’s performance in daily life in home, school, and the community. The Sensory Profile provided a pattern of the child’s strengths and weaknesses in sensory processing, and it gave information concerning the child’s tendencies to over- or underrespond to environmental stimuli and concerning which sensory systems might enhance or hinder functional performance.

It is recommended that the Sensory Profile be included in evaluation protocols for children who have backgrounds that include abuse and/or neglect. The advantages to using the Sensory Profile includes established reliability and validity data; and that the Sensory Profile has been used to discriminate among other groups of individuals who have sensory processing difficulties (Ermer & Dunn, 1998; Kientz & Dunn, 1997). Another advantage is that the Sensory Profile provides a format for organized reporting by the caregiver concerning the child’s behavior at home, which may be very different than the child’s behavior in a testing situation. Additionally, individuals from many different professions can administer the Sensory Profile; therefore, the Sensory Profile can be administered as soon as a child is referred for
evaluation by a pediatrician, social worker, psychologist, speech and language pathologist, or occupational therapist. The need for an interdisciplinary evaluation process has been discussed in the literature (Ludy-Dobson et al., 1999).

One significant drawback to this study was that there was no control group to determine the significance level of the findings; although, the research for the Sensory Profile included a sample of 1,037 children without disabilities between the ages of 3 and 10 years. Although the research sample for the Sensory Profile excluded children who were receiving special education services and were on regular prescription medication, some of the children in the research study for the Sensory Profile may have had undiagnosed traumatic stress reaction. Traumatic stress disorder may be either undiagnosed or misdiagnosed in any given population of children due to observable but often misunderstood affects of abuse and neglect on the physical and mental states of children. Additionally, five of the children in this research sample were reported to have typical sensory processing abilities; and these types of children may have been included in the sample of children in the research study for the Sensory Profile.

Another drawback involved the reliability of the caregiver’s report. Even though a CTAC staff member was present to answer any questions or confusion over terminology on the questionnaire, it is possible that some of the caregivers may have over- or under-reported their child’s behaviors on the questionnaire. For example, some of the caregivers may have had children with behaviors that the caregivers were not used to dealing with, so the behaviors may have been reported in the more
deficient range. It is possible that some of the caregivers may have had children whose behaviors improved since placement in foster care, so the behaviors may have been reported in the typical range due to improvement even though the behavior was not at the typical level.

Information from a child’s reports and other evaluations needs to be compared and interpreted with the information form the Sensory Profile in order to determine the functional implications of a child’s sensory processing abilities. Since the sample of 25 children was small and did not match the characteristics of the population sample used in the research group of the Sensory Profile, these findings indicate a general tendency, and may not represent all children who are experiencing traumatic stress reaction. Future research would need to involve a larger sample group that matches normative demographic data.
CONCLUSIONS

This study established that 80% of children experiencing traumatic stress reaction were reported to demonstrate some degree of difficulty in the area of sensory processing. There is a need for further studies involving comparison of scores from children experiencing traumatic stress reaction with a matched control group. Additionally, the specific types and patterns of sensory processing disorders exhibited by children experiencing traumatic stress reaction with sensory processing disorders needs to be determined. Preliminary data from this research study indicated definite differences in sensory processing in the following 10 areas of sensory processing: sensory seeking, emotionally reactive to stimuli, inattention/distractibility, vestibular processing, multisensory processing, modulation related to body position and movement, modulation of visual input affecting emotional responses and activity level, emotional/social responses, behavioral outcomes of sensory processing, and items indicating threshold for response. Finally, effective types of intervention, as well as duration and frequency of intervention strategies, needs to be established for specific population groups in order to provide children with appropriate and effective services.

It is recommended the Sensory Profile be added to the evaluation process for children who have experienced neglect and/or abuse to help determine a child’s areas of strengths and weaknesses, as well areas that need intervention and adaptations for successful performance in daily life occupations.
Appendix A

Approval Letter From the Human Subjects
Institutional Review Board
Date: 20 September 2000

To: Ben Atchison, Principal Investigator
   Ann Viviano, Student Investigator for thesis

From: Sylvia Culp, Chair  

Re: HSIRB Project Number: 00-09-05

This letter will serve as confirmation that your research project entitled “The Incidence of Caregiver Reported Sensory Processing Disorders in Children Who are Experiencing Traumatic Stress Reaction” has been approved under the expedited category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: 20 September 2001


