Performance of Typical Children on the Sensory Profile: An Item Analysis

Winnie Dunn

Key Words: activities of daily living • sensation • sensory integration

Objectives. The purpose of this study was to obtain data about typical children on the 99-item Sensory Profile, a newly developed tool derived from sensory history items reported in the literature and designed to assess children's responses to commonly occurring sensory events.

Method. Parents of 64 typical children 3 to 10 years of age completed the Sensory Profile; parents used a five-point Likert scale to report the percentage of time their children engaged in each behavior. Researchers then analyzed these percentages to determine differences by age and gender.

Results. Sixty-seven of the items on the Sensory Profile were found to be uncommon for these typical children. On further analysis with a multivariate analysis of variance and appropriate follow-up procedures, one item was more common for younger children, and four items were more common for girls.

Conclusion. Two thirds of the items on the Sensory Profile were uncommon for typical children and thus may contribute useful information about children with disabilities who respond to these sensory events.

A critical issue in the application of the sensory integrative frame of reference to children's needs is proper identification of the behaviors that indicate a sensory integrative deficit (Fisher, Murray, & Bundy, 1991). Therapists have employed a number of ways to gather data about children's sensory integrative abilities and performance, including standardized tests, interviews, observations, and checklists.

Among standardized tests, occupational therapists have most frequently administered the Southern California Sensory Integration Tests (SCSIT). The SCSIT is the most well known method for testing sensory integrative substrates (Ayres, 1972), including sensory assessment of somatosensory, kinesthetic, visual, and visuomotor functions. The Southern California Postrotary Nystagmus Test (SCPNT) (Ayres, 1975) incorporates a measure of vestibular processing ability into the test battery. The Sensory Integration and Praxis Tests (SIPT) (Ayres, 1989) update the previous tests while retaining subtests evaluating tactile, kinesthetic, visual, and visuomotor processing abilities. For these three tests, normative data are available on children 4 to 8 years of age.

Although the results of these tests are useful for developing a diagnosis and planning effective interventions, these assessments have limitations. The person administering the tests must have special training and competencies. Furthermore, the entire SIPT should be given, a commitment of several hours that may not be feasible in community organizations such as public schools and early intervention programs. Additionally, the scores do not reveal how the child performs in natural settings.

Another standardized test therapists employ is the DeGangi-Berk Test of Sensory Integration (TSI) (DeGangi & Berk, 1983), which screens for overall sensory processing problems in younger children and is useful as an indicator of ability or problems (King-Thomas & Hackler, 1987). The TSI is designed to be easy to administer and score, making it useful in a variety of pediatric settings. Because the TSI emphasizes vestibular and proprioceptive sensory systems, it is not as sensitive to tactile processing problems. Additionally, like the other standardized tests, the scores do not reveal the child's performance in typical situations.

Therapists also use observational and checklist measures to record sensory integrative processing. The Functional Assessment of Sensory Integration (FSI) is an example of a criterion-referenced checklist that charts the sensorimotor aspects of functional skills. Cook (1991) built on the work of Smith and McEnulty (1980) to develop this measure, which contains four levels of descriptors for behaviors related to sensory processing abilities measured during several functional tasks (e.g., dressing, eating, learning). For example, for bathing, level 1 is "cannot tolerate shower spray, does not dry off or allow someone else to dry him; doesn't use washcloth to scrub body or..."
parts of body” (p. 46). Teachers, parents, and therapists complete certain sections, marking the description that sounds most like the child from their experiences observing the child’s behaviors. The FSI has proven useful to chart progress on children for whom other formal tests are impractical; Cook (1990) demonstrated improvements on the FSI after intervention in children with autism. Cook (1994) has also demonstrated developmental trends on the FSI with increasing age.

Royeen and Fortune (Royeen, 1987; Royeen & Fortune, 1990) have developed interview assessment tools to gather data about children’s tactile processing abilities. The Touch Inventory for Preschoolers (TIP) (Royeen, 1987) assesses tactile defensiveness in preschool-aged children by asking teachers to use a 5-point Likert scale to answer 46 questions about the children’s responses to various tactile experiences. An initial pilot study of the TIP indicated that it may be useful in evaluating tactile defensiveness in children through interviews with important adults (in this case, the teachers). However, the TIP assesses only the tactile system, and therapists are often concerned with assessing all basic sensory systems. The TIP must be studied further to validate its ability to identify discrete tactile processing deficits.

The Touch Inventory for Elementary School Aged Children (TIE) (Royeen & Fortune, 1990) is another interview test that was designed for older children. The TIE discriminates between typical children and children who have tactile defensiveness (Royeen, 1986) and thus can be useful as a screening tool. However, the TIE evaluates only tactile processing, is limited to school-age children, and relies on children’s ability to report their feelings about particular experiences. Further evaluation is necessary to determine the relationship between these feelings and performance of functional skills such as dressing and eating.

Therapists also use less formal interviews or checklists to obtain a history of the child’s sensory processing abilities. This strategy addresses the need to identify critical behaviors in their natural context (Dunn, Brown, & McGuigan, 1994). For example, Ayres (1979) suggested that therapists ask parents particular questions about their child’s responses to particular situations. Dunn and DeGangi (1992) offered checklists and worksheets that can be used with parents and teachers to obtain sensory processing information. Larson (1982) reported on a method for questioning parents to obtain sensory processing data in a sample of children with and without developmental disabilities, and Cook (1991) provided a compiled version of the sensory history. The sensory history format usually consists of questions and statements about the child’s behavior in various life situations; informants typically report the rate of occurrence of the behaviors on a Likert scale. Generally, therapists have presumed that the more a target behavior is displayed, the more this display indicates difficulties with sensory processing.

Over time, statements in sensory histories have accumulated and seem to have face validity among therapists. Additionally, sensory histories provide an avenue for discussing a child’s problems and strengths, because the behaviors included on sensory histories are familiar to parents. The checklist format also provides validation to the parent that the child’s problems are real (Dunn, 1991). These tools are also functional, measuring children’s behaviors as they perform daily tasks, which can be useful for intervention planning. However, very little data on typical children’s reactions to various sensory experiences in natural situations exist, and so it is not clear whether the behaviors included on sensory histories are indeed unusual behaviors for children.

A few studies have reported on sensory history data in their analysis of the tactile system. Larson (1982) was able to discriminate between children with and without tactile defensiveness by interviewing mothers of children with developmental disabilities (N = 20). Royeen (1986) discriminated between school-age children with and without tactile defensiveness (N = 102), with children serving as their own informants. Royeen (1987) used teachers as her informants to obtain data about typical preschoolers’ reactions to tactile experiences. She found that it was feasible to obtain quantitative data about tactile responsiveness but indicated that further study was needed to expand the data set (N = 25) and the type of informants (i.e., to therapists and parents). Royeen and Fortune (1990) reported normative data on the TIE in 415 school-age children. The TIE data suggest that children themselves can report on their own reactions to touch, and that certain scores may indicate a need for further assessment.

Because studies that use interview and checklist assessments are limited, questions remain concerning the ability of the assessments to properly identify children with sensory processing deficits. Some of the test items thought to be representative of sensory processing problems may also be typical of children without sensory problems. Additionally, the relationship between findings on sensory histories and other data collection strategies (e.g., test scores or observations) has not been reported.

Therefore, the purpose of this study was to obtain data from parents of typical children on the Sensory Profile, a measure of children’s responses to sensory experiences that occur during home activities. The 99 items on the Sensory Profile are drawn from sensory histories and sensory processing tests reported in the literature (Ayres, 1979; Cook, 1991; Dunn & Oetter, 1993; Pratt & Allen, 1989; Royeen & Fortune, 1990).

Method

Subjects
The study used a convenience sample of 64 typical chil-
children (20 girls and 44 boys) aged 3 to 10 years; eight children were selected to represent each age group (e.g., group 1 consisted of eight children 3 years 0 months to 3 years 11 months of age). Children were considered typical if they were not taking medications regularly (i.e., for attention or seizure disorders) and if they were not receiving special services at school.

This convenience sample was part of a larger study on sensory integration in which eight occupational therapists participated as members of the research team. The therapists were selected on the basis of their background and experience in sensory integration and school-based practice, their current job placement in a public school, and their desire to learn about and participate in a research project. The research team included two therapists from Colorado, three from Massachusetts, one from Montana, one from New York, and one from Virginia. Each therapist selected one typical child in each age group from her school district to form the sample for this study.

Instrument

The Sensory Profile tool was developed for this study by the eight members of the research team and myself. It consists of 99 items divided into six sensory categories (auditory = 9 items, visual = 12 items, taste/smell = 6 items, movement = 18 items, body position = 10 items, and touch = 21 items) and two behavioral categories (emotional/social = 20 items and activity level = 3 items) (see Table 1). Items were selected and adapted from the literature that (a) described behavior in customary environments for children, and (b) were believed to be understandable to parents. Using a 5-point Likert scale, the parents responded to each behavioral statement as follows: 1 = always: when presented with the opportunity, the child responds in the manner described every time, or 100%; 2 = frequently, or at least 75%; 3 = occasionally, or 50%; 4 = seldom, or 25%; and 5 = never: when presented with the opportunity, the child never responds in this fashion, or 0%.

Procedure

After explaining the study to the parents, the researchers left the Sensory Profile, which included written instructions, with the parents so that they could complete the profile form at their convenience. Completion of the form indicated permission to participate in the study. Researchers forwarded the completed profile forms to me.

### Table 1

Percentages of Typical Children Who Seldom or Never Displayed the Behaviors on the Sensory Profile

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auditory</strong></td>
<td></td>
</tr>
<tr>
<td>1. Responds negatively to unexpected or loud noises (i.e., vacuum cleaner, dog barking, hair dryer)</td>
<td>90.6</td>
</tr>
<tr>
<td>2. Is distracted or has trouble functioning if there is a lot of noise around</td>
<td>73.4</td>
</tr>
<tr>
<td>3. Enjoys strange noises/tries to make noise for noise sake</td>
<td>57.9</td>
</tr>
<tr>
<td>4. Appears not to hear what you say</td>
<td>59.4</td>
</tr>
<tr>
<td>5. Holds hands over ears</td>
<td>90.6</td>
</tr>
<tr>
<td>6. Can't work with background noise (i.e., fan, refrigerator)</td>
<td>96.9</td>
</tr>
<tr>
<td>7. Doesn't respond when name is called</td>
<td>79.7</td>
</tr>
<tr>
<td>8.talks self through task</td>
<td>82.8</td>
</tr>
<tr>
<td>9. Seems oblivious within an active environment</td>
<td>89.1</td>
</tr>
<tr>
<td><strong>Visual</strong></td>
<td></td>
</tr>
<tr>
<td>1. Expresses discomfort or avoids bright lights (i.e., sunlight through window in car)</td>
<td>68.7</td>
</tr>
<tr>
<td>2. Happy to be in the dark</td>
<td>71.9</td>
</tr>
<tr>
<td>3. Looks carefully or intensely at objects/people</td>
<td>37.5</td>
</tr>
<tr>
<td>4. Has difficulty putting puzzles together</td>
<td>89.0</td>
</tr>
<tr>
<td>5. Hesitates going up or down curbs or steps</td>
<td>98.4</td>
</tr>
<tr>
<td>6. Gets lost easily</td>
<td>93.8</td>
</tr>
<tr>
<td>7. Has a hard time finding objects in competing backgrounds (i.e., shoes in a messy room, favorite toy in the &quot;junk drawer&quot;)</td>
<td>67.2</td>
</tr>
<tr>
<td>8. Has trouble staying between the lines when coloring or when writing</td>
<td>78.1</td>
</tr>
<tr>
<td>9. Covers eyes or squints in bright lights</td>
<td>73.4</td>
</tr>
<tr>
<td>10. Watches everyone when they move around the room</td>
<td>67.2</td>
</tr>
<tr>
<td>11. Avoids eye contact</td>
<td>87.5</td>
</tr>
<tr>
<td>12. Doesn't notice when people come into the room</td>
<td>92.2</td>
</tr>
<tr>
<td><strong>Taste/Smell</strong></td>
<td></td>
</tr>
<tr>
<td>1. Deliberately smells objects</td>
<td>65.7</td>
</tr>
<tr>
<td>2. Shows strong preference for certain smells (list: )</td>
<td>70.4</td>
</tr>
<tr>
<td>3. Shows preference for certain tastes (list: )</td>
<td>50.0</td>
</tr>
<tr>
<td>4. Chews/licks on nonfood objects</td>
<td>81.3</td>
</tr>
<tr>
<td>5. Craves certain foods(list: )</td>
<td>71.9</td>
</tr>
<tr>
<td>6. Does not seem to smell strong odors</td>
<td>98.4</td>
</tr>
<tr>
<td><strong>Movement</strong></td>
<td></td>
</tr>
<tr>
<td>1. Becomes anxious or distressed when feet leave ground</td>
<td>96.9</td>
</tr>
<tr>
<td>2. Fears falling or heights</td>
<td>87.5</td>
</tr>
<tr>
<td>3. Dislikes activities where head is upside down (i.e., somersaults) or rough-housing</td>
<td>96.9</td>
</tr>
<tr>
<td>4. Avoids climbing, jumping, bumpy or uneven ground</td>
<td>98.4</td>
</tr>
<tr>
<td>5. Avoids playground equipment or moving toys</td>
<td>100.0</td>
</tr>
<tr>
<td>Item</td>
<td>Percentage</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>6. Rocks unconsciously during other activities (i.e., while watching television)</td>
<td>96.9</td>
</tr>
<tr>
<td>7. Continually seeks out all kinds of movement activities (i.e., being whirled by adult, merry-go-rounds, playground equipment, moving toys)</td>
<td>56.3</td>
</tr>
<tr>
<td>8. Takes excessive risks during play (i.e., climbs high into a tree, jumps off tall furniture, etc.)</td>
<td>73.4</td>
</tr>
<tr>
<td>9. Dislikes riding in a car</td>
<td>93.8</td>
</tr>
<tr>
<td>10. Holds head upright, even when bending over or leaning</td>
<td>98.5</td>
</tr>
<tr>
<td>11. Holds onto walls or banisters</td>
<td>79.7</td>
</tr>
<tr>
<td>12. Becomes disoriented after bending over sink, table</td>
<td>100.0</td>
</tr>
<tr>
<td>13. Becomes overly excitable after a movement activity</td>
<td>87.5</td>
</tr>
<tr>
<td>14. Turns whole body to look at you</td>
<td>98.4</td>
</tr>
<tr>
<td>15. Prefers sedentary activities</td>
<td>67.2</td>
</tr>
<tr>
<td>16. Poor endurance/tires easily</td>
<td>90.7</td>
</tr>
<tr>
<td>17. Appears lethargic</td>
<td>96.8</td>
</tr>
<tr>
<td>18. Prefers sedentary activities</td>
<td>95.3</td>
</tr>
</tbody>
</table>

**Touch**

1. Avoids getting "messy" (i.e., in paste, sand, finger paint, glue, tape) | 91.6       |
2. Expresses distress during grooming (i.e., hair cutting, face washing, fingernail cutting) | 81.2       |
3. Prefers long-sleeved clothing when it's warm or short-sleeved clothing when it's cold | 95.3       |
4. Expresses discomfort at dental work or tooth brushing | 100.0      |
5. Is sensitive to certain fabrics (i.e., is particular about certain clothes or bed sheets) | 90.7       |
6. Avoids going barefoot, especially in sand or grass | 92.2       |
7. Reacts emotionally or aggressively to touch | 95.3       |
8. Rigid rituals in personal hygiene | 90.6       |
9. Picky eater, especially regarding textures | 76.6       |
10. Withdrawing from splashing water | 89.1       |
11. Has difficulty standing in line or close to other people | 92.2       |
12. Rubs or scratches out a spot that has been touched | 100.0      |
13. Gags easily with food textures, food utensils in mouth | 96.9       |
14. Displays unusual need for touching certain toys, surfaces, or textures | 93.8       |
15. Avoids wearing shoes; loves to be barefoot | 70.3       |
16. Mouths objects frequently (i.e., pencil, hands) | 79.7       |
17. Decreased awareness of pain and temperature | 93.8       |
18. Always touching people and objects | 76.6       |
19. Doesn't seem to notice when someone touches arm or back | 95.3       |
20. Doesn't seem to notice when face or hands are messy | 84.4       |
21. Leaves clothing twisted on body | 89.1       |

**Activity Level**

1. Always "on the go" | 9.4        |
2. Prefers quiet, sedentary play (i.e., watching television, books, computers) | 56.0       |
3. Difficulty paying attention | 76.6       |

**Body Position**

1. Hangs onto other people, furniture, objects even in familiar situations | 87.5       |
2. Seems to have weak muscles | 96.8       |
3. Tires easily, especially when standing or holding particular body position | 92.2       |
4. Locks joints (e.g., elbows, knees) for stability | 98.5       |
5. Walks on toes | 100.0      |
6. Appears to enjoy falling | 76.6       |
7. Moves stiffly | 100.0      |
8. Has a weak grasp | 96.9       |
9. Can't lift heavy objects | 93.7       |
10. Prop to support self | 93.7       |

**Emotional/Social**

1. Uses inefficient ways of doing things | 82.8       |
2. Seems to have difficulty liking self | 90.6       |
3. Needs more protection from life than other children | 93.8       |
4. Has trouble "growing up" | 95.3       |
5. Is overly affectionate with others | 84.4       |
6. Is sensitive to criticisms | 45.3       |
7. Has definite fears | 62.5       |
8. Seems anxious | 76.1       |
9. Seems accident prone | 76.6       |
10. Has difficulty tolerating changes in plans and expectations | 71.4       |
11. Is stubborn or uncooperative | 61.0       |
12. Has temper tantrums | 82.8       |
13. Has nightmares | 87.5       |
14. Doesn't express emotions | 87.5       |
15. Doesn't perceive body language or facial expressions | 89.1       |
16. Poor frustration tolerance | 65.6       |
17. Cries easily | 65.7       |
18. Doesn't have a sense of humor | 95.3       |
19. Overly serious | 90.7       |
20. Has difficulty making friends | 93.8       |

*Bold items denote behavior items that 80% or more of the parents reported that their child displayed Seldom or Never*
Data Analysis

I completed a descriptive analysis of the total data set to identify the distribution of responses on each item and then completed a multivariate analysis of variance (MANOVA) to identify possible differences between boys and girls and between younger (5 to 6 years of age) and older (7 to 10 years of age) children on each item. The MANOVAs were completed on each of the eight sections of the Sensory Profile, and follow-up univariate analyses were completed on significant groupings (Hotelling’s T²).

Results

One subject had a previous record of participation in special education but was no longer receiving special education services and was not taking medication regularly and therefore met the inclusion criteria; findings were similar with and without data from this subject in the analyses. Therefore, the analyses were completed with all 64 subjects.

Frequency of Occurrence of Behaviors

Researchers established the following specific criterion to identify an item as an uncommon behavior for typical children: If 80% or more of the parents reported that their child displayed the behavior seldom or never (n = 51 or more), the criterion was met. Sixty-seven of the 99 items (67%) on the Sensory Profile met this criterion. Table 1 lists in bold type the items that met the criterion and therefore were considered uncommon behaviors for the subjects. The following percentages of items met the uncommon behavior criterion in each category: auditory - 6 of 9 items (66%); visual - 5 of 12 items (42%); taste/smell - 2 of 6 items (33%); movement - 15 of 18 items (83%); touch - 18 of 21 items (86%); body position - 9 of 10 items (90%); emotional/social - 12 of 20 items (60%); and activity level - 0 of 3 items (0%).

The remaining 32 items did not meet this criterion, because subjects more commonly engaged in these behaviors (see items not in bold type on Table 1). The following common items were very common for these typical children (i.e., more than 50% of the subjects performed these behaviors occasionally, frequently, or always): visual 3 - “looks carefully or intensely at objects/people”; taste/smell 3 - “shows preference for certain tastes”; socialization 6 - “is sensitive to criticism”; activity level 1 - “always ‘on the go’”; and activity level 2 - “prefers quiet, sedentary play (i.e., watching television, books, computers).”

For three categories on the Sensory Profile, fewer than half of the items in the category met the uncommon behavior criterion (activity level, 0%; taste/smell, 33%; and visual, 42%). For three other categories on the Sensory Profile, a high percentage of items met the uncommon behavior criterion (touch, 86%; body position, 90%; and movement, 83%).

Age Comparisons

Younger and older subjects performed significantly differently on only one item (F < .05) based on the MANOVA, which revealed a Hotelling’s T² of 2.92488 (p = .004) for the visual section on the Sensory Profile. On follow-up univariate analysis of the visual items to determine what contributed to the section significance rating, only one item, visual 8 (“Has trouble staying between the lines when coloring or when writing”) was significant (F = 20.28944; p < .0001). Younger children were more likely to display this behavior than older children.

Gender Comparisons

Gender differences were evident on four items (F < .05) (see Table 2). The girls displayed these behaviors more than the boys.

Discussion

Researchers performed the first of a series of analyses to validate what the Sensory Profile tests and the accuracy of the data derived from the profile data. Specifically, the results identified how typical children performed on

<table>
<thead>
<tr>
<th>Item</th>
<th>Power</th>
<th>F level</th>
<th>Significance of F</th>
<th>Who is More Likely to Display This Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multivariate analysis of body position using Hotelling’s T²</td>
<td>6.1452</td>
<td>2.18392</td>
<td>.034</td>
<td>Girls</td>
</tr>
<tr>
<td>Body Position 7 (“Move, Stiffly”)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multivariate analysis of touch using Hotelling’s T²</td>
<td>9.7428</td>
<td>15.82508</td>
<td>.000</td>
<td>Girls</td>
</tr>
<tr>
<td>Touch 14 (“Displays unusual need for touching certain toys, surfaces, or textures”)</td>
<td>9.7445</td>
<td>15.84990</td>
<td>.000</td>
<td>Girls</td>
</tr>
<tr>
<td>Touch 15 (“Avoids wearing shoes, loves to be barefoot”)</td>
<td>5.0650</td>
<td>4.05191</td>
<td>.049</td>
<td>Girls</td>
</tr>
<tr>
<td>Touch 18 (“Always touching people and objects”)</td>
<td></td>
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</table>
items on the Sensory Profile thought to represent sensory processing difficulties. The underlying premise was that if an item on the Sensory Profile has the potential to represent sensory processing problems, then very few typical children should display that behavior regularly.

**Frequency of Occurrence of Behaviors**

The finding that two thirds of the 99 items describe behaviors that were uncommon for these typical children suggests that these items may indeed differentiate children who have sensory processing problems from those who do not. To verify the differentiation ability of these items, further study involving children with sensory processing disorders is necessary. The data presented here merely verify that the behaviors are not typical for typical children.

Five of the behaviors on the Sensory Profile occurred commonly in these subjects. These common behaviors are not likely to be appropriate items for a test of sensory development or because of dysfunction.

Further consideration suggests that these items may have been worded poorly or suggested a desirable trait to a parent. For example, a therapist might consider a child who "looks carefully or intensely at people/objects" (visual 3) as slow to process visual data or needing more input, whereas a parent might perceive this behavior as exhibiting curiosity. As worded, these items are unacceptable for a diagnostic tool. Further refinement of these items may improve their ability to differentiate the behaviors of interest.

In addition, in three categories (activity level, taste/smell, and visual) fewer than half of the items met the uncommon behavior criterion (see Table 1). This suggests that the items in these categories may be poorly written or unclear to parents and therefore do not capture salient behaviors. Alternatively, these behaviors may not be indicative of difficulties because they are prevalent in the typical population. In either case, it will be important to edit current items or create new items that will be more discriminatory in these categories, because activity level, taste/smell, and visual processing are important parts of a comprehensive picture of a child's sensory processing and performance.

Three categories (movement, body position, and touch) had a high number of items meet the uncommon behavior criterion. These are the most commonly examined sensory systems in the occupational therapy literature on sensory integration (Fisher et al., 1991). It is likely that therapists have developed more advanced observational and interviewing skills in these areas and therefore have been able to identify more items that are better discriminators for an assessment tool.

**Age Comparisons**

Younger children, because they are just developing eye-hand coordination, usually have more difficulty controlling writing and drawing utensils than do older children. The significant difference between the older and younger children on one item, visual 8 ("has trouble staying between the lines"), indicates that this item reflects the sensitivity of eye-hand coordination to developmental trends.

The two instruments that screen for tactile defensiveness, the TIP for pre-school-age children and the TIE for school-age children (Royeen, 1986; 1987) share 24 items. The TIP contains 22 unique items, whereas the TIE contains two unique items. Royeen used similar scale construction processes to create these two instruments, but fewer of the items were useful for the older children. Although more data must be collected on these instruments, some indicators of tactile defensiveness may also follow a developmental continuum, thereby supporting Royeen's decision to make two separate scales.

Inclusion of developmentally sensitive items on a screening or assessment of unusual behaviors may be somewhat risky. The desire to include developmentally sensitive items is high, because persistence of these behaviors beyond typically expected times might also indicate dysfunction. However, it may be important to separate assessment of behaviors that are never expected from assessment of behaviors that indicate problems only because of their delayed presence in the child's repertoire. Behaviors that are never expected may indicate a different type of dysfunction than do behaviors that occur later than typically expected.

**Gender Comparisons**

Girls were more likely than boys to display the behaviors represented by four items on the Sensory Profile (see Table 2). Three of these behaviors were related to tactile input, which suggests that the girls in this study had a higher need to obtain tactile input. It may also be that parents perceived the girls to be more engaged with the people and objects around them than were boys, thereby leading to this difference being noted. Perhaps girls tend to use tactile input to map their environments. Additionally, parents may generally discourage boys from touching people and objects around them by suggesting that they might break things or hurt people; parents may also believe that it is less appropriate for boys to be touching people and objects. Further study of this difference is warranted.

The body position 7 item ("moves stiffly") may have been perceived differently by parents than by therapists. Therapists frequently interpret stiffness as potential avoidance of movement by either displaying spasticity or locking joints or limbs. Parents may associate stiff-
Inclusion of items that have significant gender differences in an assessment tool shifts the bias in one direction or the other and increases the risk of errors in identifying sensory processing deficits for boys or girls. A larger sample is needed to explore the gender differences of particular items and how these differences may contribute to an important picture of a child's performance.

Limitations of the Study and Directions for Future Research

This study has several limitations. A convenience sample does not represent all children 3 to 10 years of age, and the small sample within each age group is not indicative of all children in that age group. Therefore, the results provide only an indication of overall trends for the population. Data about cultural background were not solicited, and this sample is not likely to contain sufficient diversity to make generalizations. A larger sample would allow further analyses that might be useful in better understanding the appropriateness of the Sensory Profile items for a broad population. It would be helpful to conduct studies with larger samples of typical children to verify and expand the findings of this initial study.

Comparison studies between typical children and children who have sensory processing difficulties are necessary to verify the discrimination ability of the Sensory Profile items. Those items not representative of typical children's behaviors but common in children with sensory processing difficulties will be the most appropriate items for the Sensory Profile.

Validity studies of the Sensory Profile are also needed. Even if the items discriminate between typical children and children with sensory processing difficulties, this does not indicate what the items actually tell about the sensory systems in question. For example, a validity study that tested children on the sensory portions of the SIPT and the Sensory Profile, or on the TIE and the Sensory Profile, would confirm the relationship between these established tests and the appropriate sections of the Sensory Profile.

The researchers analyzed only the item data and not groups of items. Examination of the groups of items in each sensory category will help validate the placement of items into the sensory categories after the individual items are validated. For example, a behavior such as "becomes anxious or distressed when feet leave the ground" (movement 1) was very uncommon for these typical children. This behavior is currently placed in the movement category but may be associated with the emotional/social category in a factor analysis. Further study of the clustering of the items on the Sensory Profile will expand therapists' ability to identify a child's strengths and concerns in particular areas.

Conclusion

The Sensory Profile has the potential to make a unique contribution to the overall assessment of children with sensory processing difficulties. It solicits information about functional behaviors that are likely to be related to referral concerns and draws on the distinct information available from family members about the child's performance. The five items on the Sensory Profile that were found to be common behaviors for the subjects (typical children) in this study may not be appropriate items for identifying sensory processing difficulties. The other items, because they were unusual behaviors for these subjects, hold promise for distinguishing children with sensory processing problems from those without such difficulties. Because the information is based on functional performance, the Sensory Profile may also be useful to document progress made after occupational therapy intervention. Further work is needed to clarify the contribution of the Sensory Profile to knowledge about children with sensory processing difficulties.

Acknowledgments

This project was partially supported by an American Occupational Therapy Foundation grant. Occupational therapy students Hilary Brown, Tammy Christiansen, Melanie Lynn, and Sara Scannan worked on the data and provided insights. Andrea Bilics, OTR, Mary Carter, OTR, Marie Caret, OTR, Debbie Kugel, OTR, Resanne Myers, MS, OTR, June Holmstrom, MS, OTR, Kathryn Grace, MA, OTR, and Tamara Saracino, MS, OTR, collaborated to construct the Sensory Profile and collected data as part of an American Occupational Therapy Foundation grant. Tamara Saracino assisted with data analysis.

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