PARENT AND TEACHER REPORT:

COMPARING RESULTS FROM THE *SENSORY PROFILE* AND *SENSORY PROFILE SCHOOL COMPANION*

BY

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Jessica Saiter Clark

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in Occupational Therapy and the Graduate Faculty
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PARENT AND TEACHER REPORT:

COMPARING RESULTS FROM THE *SENSORY PROFILE* AND *SENSORY*

PROFILE SCHOOL COMPANION

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Abstract

OBJECTIVE. This study investigated the similarities and differences between parent and teacher report on the *Sensory Profile* and the *Sensory Profile School Companion* (School Companion).

METHOD. Using data gathered during the standardization of the School Companion, scores of 173 children with and without disabilities were analyzed. Results were based on the entire sample and subgroups organized by child, parent, and teacher demographics.

RESULTS. Analyses of the entire sample demonstrate that parents and teachers have many significant similarities (16/18) and few significant differences (2/18). Scoring relationships between reporters for subgroups followed the pattern found in the literature for other parent/teacher questionnaires.

CONCLUSION. Parents and teachers provided a combination of similar and unique information when evaluating a child using the *Sensory Profile* and the School Companion thus adding to their construct validity. Therefore, best practice indicates that evaluators should interpret results from both versions when evaluating children with these tools.

Introduction

Pediatric multi-informant questionnaires offer breadth and depth in the evaluation process by gathering information from multiple people about one child (see Achenbach, McConaughy, & Howell, 1987 for a review). Due to the recent publication of the *Sensory Profile School Companion* (Dunn, 2006a), hereafter referred to as the School Companion, teachers may now contribute to a child's sensory processing evaluation along with parents who complete the *Sensory Profile* Caregiver Questionnaire (Dunn, 1999). This review of the literature focuses on two topics as they relate to assessing children with the School Companion and the *Sensory Profile*: (a) the role of multi-informant questionnaires, and (b) how this information relates to sensory processing assessments.

Role of Multi-Informant Questionnaires

The construct validity of questionnaires let us know if we're asking the right questions to measure the area of interest (Portney & Watkins, 2000). Two subcomponents of construct validity are (a) convergent validity and (b) discriminant validity that examine the relationship between parent and teacher raters. Multi-informant questionnaires demonstrate convergent validity when parents' and teachers' scores are significantly similar on the same child. The differing, or unique, information from parents and teachers about the same child contributes to multi-informant questionnaires' discriminant validity.

Parents and Teachers

When comparing and contrasting responses between informants with different roles (e.g., teacher and parent), resulting scores have low but significant correlations (~ .2) while respondents with the same roles, such as two parents, have moderate correlations (~ .6; Achenbach et al., 1987). More recent studies continue to follow this trend of low, significant relationships between reporters with distinct roles (Bishop & Baird, 2001; Cohen, Schmidt-Lackner, Romanczyk, & Sudhalter, 2003; Essex et al., 2002; Gadow, & Nolan, 2002; Gasman et al., 2002; Goodman, 2001; Haberstick, Schmitz, Young, & Hewitt, 2006; Huziak et al., 2003; Kohen et al., 1997; Kroes, Veerman, & De Bruyn, 2005).

No clear relationship appears to exist between the informant's role and frequency of behavior reported. Some studies have noted parents (Deng, Liu, & Roosa, 2004; Jones, Trudinger, & Crawford, 2004) reporting a higher frequency of behavior than teachers while Kroes et al., (2005) noted the opposite trend. The relationships between parents and teachers may increase for specific areas such as externalized behaviors (Achenbach et al.; Essex et al., 2002; Gasman et al., 2002; Kumpulainen et al., 1999) or on highly objective items (Kohen et al., 1997).

Impact of Other Variables

This is not to say that the respondent's role is the sole determinant in the relationship between sources (DuPaul, 2003). The child's age (Achenbach et al., 1987) or severity of the child's diagnosis (Deng et al., 2004) may impact scoring patterns between informants. In additon, areas such as the context (Achenbach et al., 1987; Felder-Puig, di Gallo, Waldenmair, Gadner, & Topf, 2004; Nijs, 2004), and

other informant characteristics (Briggs-Gowan, Carter, & Schwab-Stone, 1996; Deng et al., 2004; Kroes et al., 2005) may impact the scoring patterns between multiple reporters.

Assessing Sensory Processing

Miller & Lane (2000) define the concept of sensory processing as an expansive term related to the central nervous system receiving and processing information from all senses. Measuring sensory processing is important since it provides unique information to guide intervention planning for children with many issues (see Dunn, 2001 for a review). With the publication of additional standardized sensory processing evaluations (Dunn, 2006a; Miller-Kuhaneck, Henry, & Glennon, 2007; Parham & Ecker, 2007), evaluators may now use multi-informant questionnaires to assess children's sensory processing patterns.

The Sensory Profile

Of these recently published tools, the School Companion and the *Sensory Profile* are explored here. Both tools are based on Dunn's Conceptual Model of Sensory Processing (Dunn, 1997), which describes four patterns, or quadrants, of sensory processing involving multiple sensory systems rather than one. This model has been substantiated in all five versions of the Sensory Profile (Brown & Dunn, 2002; Dunn, 1999; Dunn, 2002, Dunn, 2006a; Dunn, 2006b). Researchers have already published on the validity of the *Sensory Profile* (Brown, Tollefson, Dunn, Cromwell, & Filion, 2001; Dunn, 1997; Dunn, 1999; Dunn, 2001; Dunn & Brown, 1997) so we will highlight the School Companion's initial construct validity from the

standardization process as it pertains to multi-informant questionniares. Dunn (2006a) explored the similarities of the four quadrant scores between parents and teachers of children without disabilities. The low to moderate correlations (.34-.62) between the reporters were higher than the findings reported by Achenbach et al. (1987).

While this initial data is informative, less than half of the nine common scores were analyzed. In addition, no information is available about potential differences between parents and teachers or the impact of child and rater characteristics on the scoring patterns. This study explores these two issues by asking: (a) when comparing responses on the *Sensory Profile* and the School Companion, what scores will be similar and different? and (b) how do demographic variables of the child, parent, and teacher impact scoring patterns on the *Sensory Profile* and the School Companion?

Methods

Research Participants

This study's participants were drawn from the de-identified data of the standardization sample for the School Companion. The standardization sample includes 585 children without disabilities and 126 students with disabilities (i.e., autism, Asperger syndrome, and attention-deficit hyperactivity disorder). One hundred eighteen teachers from across the United States provided the data for these students directly to the publisher. The sample for this study will include the subset of subjects (n = 173) of whom both parents and teachers completed their respective

questionnaires. This group includes children with (n = 47) and without disabilities (n = 126). See Tables 1 and 2 for details about these children.

Teachers usually had contact with students without disabilities three or more days a week (68.1%) and contact with students with disabilities one to two days a week (85.8%). Teachers had varying levels of experience ranging from 0-10 years (28.9%), 11-20 years (35.8%), and 21 or more years (35.3). Parents (mother/father) attended or graduated from high school (38.7%/42.2%), college (48.6%/39.3%), or graduate school (11.5%/11.6%). No information was available for some parents (1.2%/6.9%).

Instruments

Teachers completed a demographic form that included questions about the child, teacher, and parent. Child variables included standard information (e.g., age, gender, etc.) along with details about special education services and diagnosis. Teachers shared information about their level of education, years of teaching experience, weekly contact with student, number of months with student, and reported the educational level of each parent.

Teachers completed the 104-item pilot version of the School Companion of using a five-point ordinal scale from *almost always* to *almost never* (Dunn, 2006a). The scores were derived from responses to the 62 scores that were published in the School Companion. Parents completed the *Sensory Profile*, a 125-item questionnaire using a five-point ordinal scale from *always* to *never* (Dunn, 1999). It was standardized on a normative sample of 1000+ children ages three to ten years old.

The resulting scores were combined with scores from the *Sensory Profile Supplement* (SPS; Dunn, 2006b), an addendum that adds quadrant scores and expanded categories for all scores. For both of the questionnaires, lower scores indicate a higher frequency of behavior and higher scores indicate a lower frequency of behavior. For both of the questionnaires, lower scores indicate a higher frequency of behavior and higher scores indicate a lower frequency of behavior.

The resulting raw scores for the School Companion and the *Sensory Profile* fall onto the bell curve.The category scores reflect the section of the bell curve where the raw score resides. There is an average category (scores between -1 SD and +1 SD), two categories below average (i.e., one or two standard deviations, and two above average categories (i.e., one or two standad deviations).

Across the questionnaires, the parent and teacher versions have 9 similar scores with the *Sensory Profile* containing 18 unique scores and the School Companion, 4. The common scores between parents and teachers are the section scores (Auditory, Visual, Movement, Touch, and Behavior) and quadrant scores: a) Seeking = high sensation to respond and active about obtaining sensation, b) Registration = high sensation to respond and passive about obtaining sensation, c) Avoiding = low sensation to respond and active about limiting sensation, and d) Sensitivity = low sensation to respond and passive about limiting sensation (Dunn, 1997).

Statistical Analyses

SPSS Graduate Pack 14.0 for Windows® will be utilized to analyze the data. For convergent validity, the primary analyses will include Pearson *r* to compare raw scores between the *Sensory Profile* (with the SPS scores) and the School Companion and Spearman *r* for the resulting standardized categories. The 2-tailed tests were selected since the research questions do not anticipate directionality (i.e., parent scores could be higher or lower than teacher scores) . For discriminant validity, the differences between parents and teachers were explored via paired t-test. Since the total raw scores and resulting categories are not identical across the questionnaires, raw scores and resulting standardized categories were converted to Z scores prior to analysis to equalize the scales for both measures. To protect against Type I errors, significance is set at .01 for all the correlations and paired t-tests.

Additional analyses will take into account child and rater characteristics that may impact the relationship between the raters per the literature review (See Table 3). Again, Pearson *r*, Spearman *r*, and paired t-tests will analyze the similarities and differences between parents and teachers for each subgroup (e.g., parent level of education, teacher experience).

Results

A total of 18 results were calculated for each analysis (nine raw scores and nine resulting categories). For the entire sample, the correlations between parents and teachers are significant for 16 of the 18 results ranging from .2 to .5 with $\alpha \leq .01$ in all areas except Visual (see Table 4). As for significant differences, the overall paired t-tests indicated significant differences for 2 of the 18 areas. Parents reported a higher

frequency of behaviors for the categories of Seeking $t(144) = -5.17$, $p < .001$ (two-tailed) and Sensitivity $t(129) = -4.89$, $p < .001$ (two-tailed).

The results of the demographic analysis are listed in Table 5 with the number of significant correlations, range of these correlations, and number of significant paired t-tests noted for the entire sample and each demographic subgroup. Subgroups with $n < 30$ were too small for complete analysis (i.e., Kindergarten-6th grade, African-American, Asian, Hispanic, Other/multiracial, Asperger syndrome, and mothers with graduate level education). Additional analysis indicates no significant relationship between teacher contact with student and student's diagnosis indicating these variables did not impact the outcomes for each other.

Regardless of the subgroup, parents and teachers agreed on a majority of the areas for Behavior, Registration, and Sensation Avoiding with no significant differences in the area of Touch. Of the 11 significant differences within the demographic subgroups, teachers reported a higher frequency of behavior than parents 4 times and parents, 7 times. Over half of these differences matched the significant statistics noted for the entire sample.

For those significant paired t-tests of a sample with 30 or fewer subjects (1st grade, 2nd grade, 3rd grade, 5th grade, 6th grade, African America, Hispanic, Other/multiracial, and mothers with graduate school education), confidence intervals (CIs) set at 95% were analyzed. If the mean of a significant paired t-tests fell within the other CIs of the variable, the results were not considered to be clinically relevant.

Of the 14 significant t-tests analyzed, 6 met this criterion and those totals are noted in Table 6.

Discussion

In response to the first research questions, most of the responses between reporters on *Sensory Profile* and the School Companion were significantly similar adding to the convergent validity of *Sensory Profile* and the School Companion. The lack of significant correlations for Visual scores may be due to distinct demands from each reporter (e.g., breadth and depth of visual processing with the teacher compared to with the parent). The two significant differences between informants on Sensation Seeking and Sensory Sensitivity categories add to the discriminant validity of these tools. These results inform us that parents may permit more active (Sensative Seeking) and off-task (Sensory Sensitivity) behaviors.

This pattern of low to moderate correlations follow the pattern found in the literature. If the correlations had been higher, the information would have been redundant. Lower correlations could have been not significant, reducing the convergent validity of these questionnaires. These results of similar but not indentical reports indicate it is best practice to integrate the information provided by parents and teachers on the *Sensory Profile* and the School Companion rather than choosing one informant over the other. As one research group succinctly put it, "to treat one source of information arbitrarily as the ideal informant increases the risk of obtaining the right answer to the wrong question." (Kraemer et al., 2003, p. 1567). In addition, multiple studies conclude that no one reporter is the "gold standard" for

questionnaire use and multiple reporters are preferable (Bartels et al., 2003; Bishop & Baird, 2001; Gasman et al., 2002; Goodman, Ford, Simmons, Gatward, & Meltzer, 2000; Jones, Trudinger, & Crawford, 2004; Kraemer et al., 2003).

As for the second research question, the patterns based on the demographic subgroups added to the overall construct validity of these multi-informant questionnaires. The data indicates that regardless of the group, informants continue to have low to moderate correlations with minimal to no significant differences (see Table 5). A closer analysis of the significant similarities and differences indicate one would not expect significant differences due to a child or reporter demographic adding to the tools' convergent validity. Although, an evaluator may benefit from looking at the amount of contact per week when choosing an informant to complete the School Companion. Choosing a teacher who has contact with a student 3 or more days a week may provide more valid results than a teacher who sees the child less than that.

Children with a diagnosis of autism have the most significant differences of any subgroup. At closer analysis, the results reveal that teachers uniformly rated the frequency of the behavior higher than parents. Father's with graduate school level education, and teachers with 0-10 years and 21 or more years of experience may have a fewer similarities with the other informant. All of these findings add to the discriminant validity of the questionnaires.

Some issues may limit the results' relevancy to clinical practice, such as the data collection method and the sampling. In practice, teachers would complete only

the published items. While only scores derived from these items were analyzed, the teachers completed the unpublished items and that may impact the overall response pattern. Also, two similar items from the pilot were combined into one item for published version. In analyses, these two items were averaged together to compute the Sensation Avoiding and Behavior scores on the School Companion. Another limit of this study design relates to sampling. Many of the subgroups based on child demographics were too small for complete analysis. Thirdly, the teachers reported the parent's education level, so it's difficult to know the accuracy of this indirect information. These concerns could limit the generalization of the results.

Overall, this study builds on the initial data for multi-informant results between parents and teachers for these questionnaires. The author recommends further study of the relationship between reporters on these measures with teachers completing the published version and improved sampling. Continued study will build on the literature available to occupational therapists and other evaluators to guide their interpretation of the *Sensory Profile* and the School Companion via multiple informants.

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Table 1

Child Characteristics with Data from the School Companion and the Sensory Profile

Characteristics	Without Disabilities n = 47	With Disabilities n = 126
Grade	n (%)	n (%)
Preschool-Kindergarten	23 (48.9)	41 (32.6)
1st-3rd grade	16 (27.6)	35 (27.7)
4th-6th grade	11 (23.4)	50 (39.6)
Gender[a]		
Male	20 (42.6)	107 (84.9)
Female	27 (57.4)	18 (14.3)
Race		
African American	4 (8.5)	12 (9.5)
Asian	4 (8.5)	2 (1.6)
Hispanic	2 (4.3)	5 (4.0)
White	35 (74.5)	103 (81.7)
Other/Multiracial	2 (4.3)	4 (3.2)

Note. Due to averaging, not all areas total 100%.

[a]Missing data for one subject in the "with disabilities" group.

Table 2

Information about Subjects with Diagnoses

Diagnosis	n (%)
ADHD	57 (45.2)
Asperger syndrome	11 (8.7)
Autism	49 (39.0)
More than 1 diagnosis	1 (0.8)
Other diagnosis	8 (6.3)

Table 3

Grouping Subjects for Correlations by Child and Rater Characteristics

	Rater	
Child	Parent	Teacher
Gender	Mother's educational level	Weekly contact with student
Grade	Father's educational level	Years of experience
Race		
Diagnosis		

Table 4

Correlations Between Reporters

Area	Raw Scores	Categories
Auditory	.39*	.27*
Visual	.13	.09
Movement	.30*	.28*
Touch	.46*	.40*
Behavior	.46*	.47*
Seeking	.33*	.23*
Registration	.49*	.39*
Avoiding	.58*	.46*
Sensitivity	.36*	.32*

* $p<.01$

Table 5

Significand Correlations and Paired T-tests Across Child and Reporter Demographics

Group (n)	Number of Correlations	Range of Correlations	Number of Paired T-tests
Entire sample (173)	16/18	.27-.58	2/18
Girls (47)	13/18	.34-.63	0/18
Boys[a] (127)	16[a]/18	.20-.61	0/18
Preschool (39)	15/18	.42-.82	0/18
White (138)	15/18	.22-.56	0/18
No diagnosis (47)	0/18	-	0/18
ADHD (57)	5/18	.27-.44	1/18
Autism (49)	11/18	.35-.62	4/18
Mother high school (67)	13/18	.28-.53	0/18
Mother college (84)	16[a]/18	.26-.67	0/18
Father high school (73)	14/18	.31-.64	0/18
Father college (68)	12/18	.27-.62	0/18
Father graduate school (32)	7/18	.58-.69	0/18
1-2 days of contact (34)	1/18	.47	1/18
3-5 days of contact (139)	16[a]/18	.28-.42	2[a]/18
0-10 years of experience (50)	9/18	.30-.42	0/18
11-20 years experience (62)	17/18	.30-.67	2[a]/18
21+ years experience (61)	8/18	.31-.60	1/18

Note. Demographic subgroups with n < 30 are not reported.

[a]Followed same pattern as the entire sample.

Appendix A: Comprehensive Literature Review

Parent and Teacher Report:

Comparing Results from the *Sensory Profile* and *Sensory Profile School Companion*

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Introduction

Pediatric multi-informant questionnaires offer breadth and depth in the evaluation process by gathering information from multiple people about one child (see Achenbach, McConaughy, & Howell, 1987 for a review). Due to the recent publication of the *Sensory Profile School Companion* (Dunn, 2006a), hereafter referred to as the School Companion, a child's sensory processing may now be evaluated with this method. Pairing teacher report on the School Companion with the *Sensory Profile* Caregiver Questionnaire (Dunn, 1999), multiple informants may provide standardized responses about sensory processing across contexts. Exploring the scoring patterns between informants will inform the construct validity of these tools and support evaluators who assess sensory processing (e.g., occupational therapists) when interpreting the results.

Literature Review

This review of the literature focuses on the following four topics as they relate to assessing children with the *Sensory Profile* and the School Companion: (a) the attributes of multi-informant questionnaires, (b) the validity of multi-informant questionnaires, (c) the findings between multiple informants, and (d) and how this information relates to sensory processing assessments.

Attributes of Questionnaires

Questionnaires are one of many avenues to gain standardized information for planning interventions. Portney and Watkins (2000) report this method has multiple advantages and disadvantages. The most useful attribute may be the ability to collect

data on phenomena otherwise unavailable to an evaluator. Informants may consider responses at their own pace and professionals may be more efficient with collecting information since clients may complete questionnaires on their own time. Concerns include error due to biased responses or misunderstood items. Well-constructed questionnaires meet test standards of validity and reliability, which reduces concerns over their use (Portney & Watkins; Sullivan, 2001) lending questionnaires to provide direct insight into the client's (or a care provider's) perspective.

Once a professional decides to use a questionnaire, the next question is who will provide the desired information. When serving children, it may be an adult's responsibility to complete the questionnaire. DePaul (2003) reminds readers that this type of indirect report is a measurement of the reporters' perceptions about the subject's behavior, not the behavior itself.

Two main reasons may steer an evaluator towards indirect report for a child. First, the child's diagnosis or symptom may limit the child's ability to complete the questionnaire. For example, a child with autism may not have the communication skills to understand, read, or respond to the questionnaire in a standardized manner. Secondly, the child's age may interfere with self-report. Achenbach et al. (1987) completed a meta-analysis of over 115 pediatric multi-informant studies spanning quarter of a century. The majority of studies that included child report (either self-report or peer-report) sampled children at least 8 years old. On the converse side, studies that had exclusively adults as informants assessed children who were mainly 6 years old and younger. Therefore, younger children may be limited in their ability to

complete questionnaires. While older children may be able to complete the questionnaire independently, they are still dependent on multiple adults for much of their daily activities, the children may lack insight about the impact of their behaviors on their participation and therefore the adults' perspective continues to be relevant. For these reasons, indirect reporters are a relevant part of evaluating children.

To clarify, the terms informant, source, reporter, rater, and respondent are used interchangeably to indicate a person providing information. Younger respondents include the children being evaluated and sometimes their peers. Parents, educators, daycare providers, and healthcare providers are common adult informants. Some evaluations utilize information from those who fit these general categories, while others require a specific role, such as mother or father, nurse or therapist, general educator or special education teacher.

Multi-Informant Questionnaires for Childhood Issues

Many permutations of direct, indirect, adult, and child reporters are possible and have been researched. The number of informants typically ranges from two to four sources, with two informants being the most commonly studied. Multi-informant questionnaires are available for evaluators to study a wide variety of populations and issues.

Children studied.

Researchers have gathered data from multi-informant questionnaires to study a broad array of populations. Some researchers study typical children in epidemiological studies both nationally and internationally (e.g., United States

(Haberstick, Schmitz, Young, & Hewitt, 2006; Kamphaus, DiStefano, & Lease, 2003), Europe (Bartels, Boomsma, Hudziak, Rietveld, van Beijsterveldt, 2003; Gasman et al., 2002; Goodman, Ford, Simmons, Gatward, & Meltzer, 2000; Huziak et al., 2003), and Asia (Deng, Liu, & Roosa, 2004)).

Research interests also include children with various diagnoses or at-risk concerns. The most common issues focus on mental health. Some researchers study questionnaire results for a variety of psychiatric labels (Becker, Woerner, Hasselhorn, Banaschewski, & Rothenberger, 2004; Gadow, & Nolan, 2002; Gomez, Burns, Walsh, & Hafetz, 2005; Kroes, Veerman, & De Bruyn, 2005) while others focus is on one diagnosis such as ADHD (de Nijs et al., 2004) or autism spectrum disorders (Cohen, Schmidt-Lackner, Romanczyk, & Sudhalter, 2003). Researchers explore topics ranging from educational diagnoses (Bishop & Baird, 2001) to diseases, such as cancer (Felder-Puig, di Gallo, Waldenmair, Gadner, & Topf, 2004). Studies may also include children with issues that could cause difficulties later on such as history of abuse (Jones, Trudinger, & Crawford, 2004), low birth weight (Kohen, Brooks-Gunn, McCormick, & Graber, 1997), patterns of delinquent behavior (Bank, Duncan, Patterson, & Reid, 1993; Kumpulainen et al., 1999), or low socioeconomic status (Dornbusch, Hastorf, Richardson, Muzzy, & Vreeland, 1965).

Measures utilized.

These studies compare results from multiple reporters by using the same or related versions of a questionnaire. Related versions may be a "mirrored" format in which the statement only varies in the perspective (i.e., "The child…" for parent

version and "You…" for self-report). Some studied administered measures with a handful of items unique to one or two raters, mainly related to context (e.g., Becker et al., 2004; Cohen et al., 2003; Essex et al., 2002). For example, parents may be the only respondent for observations made at home while teachers answer school-specific items.

Researchers typically use written measures with an ordinal scale with three to five categories although some studies vary from this norm. For example, Dornbusch et al. (1965) administered a uniform oral questionnaire to collect data. Some studies collect dichotomous data, especially for child self-report, in addition to the ordinal data (Essex et al., 2002; Kamphaus et al., 2003).

Measuring a child's behavior appears to be the most common trait of interest when utilizing multi-informant questionnaires. One common tool is the Achenbach scale with the current version being the Achenbach System of Empirically Based Assessment (ASEBA; Achenbach & Rescorla, 2000; Achenbach & Rescorla, 2001). Evaluators may assess externalized behaviors such as anger, hyperactivity, or sociopathy and internalized behaviors such as anxiety, depression, or withdrawal from 18 months to old age using a 3-point Likert scale. The pediatric portion of the ASEBA consists of a pre-school and school-aged version of the Child Behavior Checklist for parent report and a report form for caregivers and teachers (Spies & Plake, 2005). Additional tools include a Youth Self-Report form for adolescents to complete, a Direct Observational Form to gather data about the child's performance

in a natural environment, and a Semistructured Clinical Interview for Children and Adolescents to collect additional information from the child (Spies & Plake).

Another common option is the Strengths and Difficulties Questionnaire (SDQ; Goodman, 2000a; Goodman, 2000b). Using a 3-point Likert scale, parents, teachers and children (when they are at least 11 years old) can report on 5 behavioral subscales. All versions mirror each other except for two additional items for the parent and child version that are not part of the teacher questionnaire. A supplement also measures perceived difficulties caused by the behaviors, the chronicity of the behaviors, and their impact on daily life (Goodman, 1999).

Authors administered other tools to measure behavior through many sources including the Behavior Assessment System for Children (Kamphaus et al., 2003), the Disruptive Behavior Questionnaire (Gomez et al., 2005), and the Rutter questionnaires (Kumpulainen et al., 1999).

Additional areas studied via multi-informant questionnaires include communication skills (Bishop & Baird, 2001), information related to diagnoses (Cohen et al., 2003; de Nijs et al., 2004; Gadow, & Nolan, 2002), temperament (Gasman et al., 2002), competence (Kohen et al., 1997), coping (Felder-Puig et al., 2004), and overall health (Essex et al., 2002).

Similar and differing information.

At first glance, one may hypothesize that questionnaires with strong psychometric properties produce matching results between informants for the same child. In practice, if the information from each reporter across roles and setting were

identical, then utilizing multiple reporters would be unnecessary. Research in this area explores the patterns of scoring between different reporters. Depending on the authors' perspective, the results may focus on the level of similarity or difference between sources. De Los Reyes & Kazdin (2005) and Kraemer et al. (2003) provide theoretical frameworks to analyze both points of view.

Typically, studies conclude that each source provides unique information that would have been missed if only one rater completed a questionnaire, strengthening the use of a multi-informant approach. For example, Kohen et al., (1997) hypothesized that this unique information is due to (a) different past and current experiences of each observer with the child and (b) the child's behavioral issues may differ across contexts or be difficult to observe in some settings. With antecedent and consequences unique to each adult, the child may perform distinctly in the contexts of home and school (DuPaul, 2003). To expand on this point, let us review the psychometric properties of multiple raters.

Validity of Multi-Informant Questionnaires

When examining the relationship between two reporters, two main goals may be achieved, test reliability and test validity. Reliability looks at the consistency of the answers from different informants while validity examines the proposed purpose of the assessment between informants (Portney & Watkins, 2000). Reliability lets us know if we're getting the right *answers*. Validity lets us know if we're asking the right *questions*. This review focuses on the validity of the measures examined.

Construct Validity

One specific type of validity is construct validity. This category shows the degree to which an evaluation tool measures an abstract construct, or trait, of the child rather than an unknown factor (Portney & Watkins, 2000). While construct validity includes many subcomponents, this topic focuses on two: convergent validity (similar constructs) and discriminant validity (differing constructs).

Of these two types, it may seem that convergent validity is more desirable than discriminant validity when looking at patterns between reporters. Yet Kraemer et al. (2003) recommended focusing on discriminant validity by purposefully using informants that provide complimentary data, rather than repetitive information. Perhaps convergent and discriminant validity are equally important and necessary psychometric properties for multi-informant questionnaires. Evaluators benefit when knowing what information is typically similar across informants (convergent) and what unique contributions each reporter has to make (discriminant).

As we explore construct validity for multi-informant questionnaires, it is important to consider the two contributing factors to the data. The first is the trait variance, or the scoring pattern attributed to the child's trait being evaluated. For example, parents and teachers may complete a questionnaire designed to evaluate children's attention-based behaviors. If the questionnaire is designed appropriately, the scores regarding children with attention differences will be significantly different than children with typical attention patterns. The second factor is source variance. This includes the reporter bias about the child or behavior and the impact of context in which the reporter observes the child (DuPaul, 2003). An example of source

variance is that children being observed in the same context would be scored similarly regardless of the children's actual traits. As with any type of evaluation, measurement error may also contribute to source variance (DuPaul). Kraemer et al. (2003) looked across three studies with more than one rater and found that the variance was mainly due to the trait being measured. Of the remaining variance from the source, reporters had more impact than the context, and measurement error had the lowest impact on variance.

Convergent validity looks at similarities between reporters who are questioned about the same subject. Gomez et al. (2005) found that convergent validity on multi-informant assessments requires that each measure to contain a statistically significant amount of trait variance. Valid patterns between reporters are based on the child's behavior in question, not due to other child or reporter variables. Multi-informant questionnaires demonstrate construct validity when relationships are significant.

Discriminant validity for multi-informant evaluations requires that measures contain more trait than source variance (Gomez et al., 2005). Therefore, one may observe significant relationships due to the child's trait with source variance having a weaker impact. Patterns of differing responses between informants are not limited to formal assessment. De Los Reyes & Kazdin (2005) found that reporters tend to also differ on a variety of matters ranging from the child's diagnosis to the desired goals for the child.

Valid Interpretation of Multi-Informant Results

To make multiple sources an efficient and effective tool during evaluations, results would contain a combination of convergent and discriminant validity rather a uniform consensus. Kenny (1991) made the point that consensus is different than accuracy. With low or moderate consensus one may infer that all informants provide partial accuracy. High consensus does not guarantee accuracy since multiple people could strongly agree on a wrong answer. Yet when faced with information that is unique and possibly discrepant, an evaluator may be tempted to choose one reporter over another rather than analyze the potentially complex patterns between multiple sources.

This approach is ineffective for two reasons. First, the elimination of an informant may skew the results. As one research group succinctly put it, "to treat one source of information arbitrarily as the ideal informant increases the risk of obtaining the right answer to the wrong question." (Kraemer et al., 2003, p. 1567). These researchers also recommend integrating the information of these multiple reporters so as to reduce the likelihood of false results when interpreting results individually. Goodman et al. (2000) also found better sensitivity when integrating the reporters' scores rather than using results from one reporter in isolation. Secondly, multiple studies conclude that no one reporter is the "gold standard" for questionnaire use and multiple reporters are preferable (Bartels et al., 2003; Bishop & Baird, 2001; Gasman et al., 2002; Goodman et al., 2000; Jones et al., 2004; Kraemer et al., 2003). So

choosing the response of one source when more than one is available would be subjective, at best.

Findings between Multiple Informants

After looking at the attributes and validity of multi-informant questionnaires, let us review the specific findings in the research. To focus the topic of interest, we have selected studies that all have the following in common: (a) the mean age of the children being evaluated is between three and eleven years old, (b) informants complete role-specific versions of measures with the same theoretical framework, and (c) the results provide evaluation information for intervention planning. Since these parameters apply to children being evaluated with *Sensory Profile* and the School Companion, the literature reviewed will be more salient. The age range boundary is also important since findings suggest different patterns between reporters for younger children than for older children (Achenbach et al., 1987).

Researchers make use of a wide variety of strategies when analyzing results from more than one source. Common trends include a variety of correlations, and factor analyses. Less common statistics are multiple regression analyses, multivariate kurtosis between reporters, and ROC (receiver operating characteristics) analyses. Unique approaches include looking at the ability of the reporters to predict future difficulties (Bank et al., 1993).

The main variables impacting the results include the roles of reporters, the context where the informant observes the child, and characteristics of those involved in the evaluation process. The first section focuses on findings that indicate distinct

relationships between reporters who have similar roles (such as mothers and fathers) compared to those that have different roles (like parents and teachers) in the child's life.

Similar Roles

Achenbach et al. (1987) compared correlations between different informants about the same child. The meta-analysis found that informants with the same role evaluating the same child (e.g., two teachers or two parents) had moderate correlations of 0.6.

Parenting is one of the most common situations in which adults have similar roles for the same child. More recent studies continue to reflect moderate relationships between parents (Bank et al., 1993; Bartels et al., 2003; Essex et al., 2002; Huziak, van Beijsterveldt, Bartels, Rietveld, Rettew, Derks, E. M. et al., 2003). Not only are parents' scores found to be statistically similar, the examination of eleven studies comparing parent report demonstrated no statistical differences (Achenbach et al., 1987).

This is not to say that all studies show similar scoring patterns between parents for their child. One study found significant differences in mean scores between mother and father reports across all age groups (Huziak et al., 2003). Bartels et al., (2003) also found differences between parents with mothers rating the child's behavior with higher frequency than the fathers. According the to author, these differences appeared to be due to two systemic factors: unique and specific

experiences between each parent and child, and rater-specific behavioral views by each parent.

Parents are not the only similar reporters compared in the literatures. Other studies have explored the relationship between questionnaire results for two adults with similar professional roles. The trend of moderate correlations continues both for teachers (Cohen et al., 2003) and day-care workers (Kroes et al., 2005).

Different Roles

The story changes when comparing informants who have different roles. When analyzing responses based on roles, different informants (e.g., teacher and parent) had low but significant correlations in the .2s. (Achenbach et al., 1987). More recent studies continue to follow this trend of lower correlations for reporters with distinct roles (Bishop & Baird, 2001; Cohen et al., 2003; Essex et al., 2002; Gadow, & Nolan, 2002; Gasman et al., 2002; Goodman, 2001; Haberstick et al., 2006; Huziak et al., 2003; Kohen et al., 1997; Kroes et al., 2005).

DuPaul (2003) hypothesized that this lower level of agreement may be due a reporter bias toward the child, history with an individual child, the rater's response to the behavior being evaluated (regardless of the child), and demographic information (such as socioeconomic status). Let us review the two most common patterns of different roles, (a) parent and teachers, and (b) self- and observer-report.

Parents and teachers.

While parents and teachers typically have low statistically significant relationships, some variations occur across studies. For example, some studies show

higher agreement between parents and teachers when externalized behaviors are being assessed rather than internalized behaviors (Essex et al., 2002; Gasman et al., 2002; Kumpulainen et al., 1999). Reporters especially agree about externalized behaviors when the father reported or for older children and agree for internalized behaviors with younger children or more educated fathers (Deng et al., 2004). Studies exploring other categories followed the trend of easily observed behaviors tending to have higher agreement between reporters. These measured areas consist of topics such as verbal behavior, (Cohen et al., 2003), general health (Essex et al.), bullying, or truancy (Kumpulainen et al.). Mixed results presented when assessing attention concerns for the child (Deng et al.; Jones et al., 2004).

When these pairings of reporters have stronger relationships, it seems to be due to study limitations, such as small sample sizes (Cohen et al., 2003). It's interesting to note that even when parents and teachers respond about factual topics, agreement barely reaches the level of reporters with the same role. For instance, Kohen et al. (1997), reported only moderate correlations about the amount of special education services received by the student.

Multiple factors are likely to contribute to the differences between parents and teachers. While scores appear to be mainly due to role differences (Gomez et al., 2005), the child's traits may impact the patterns. Relationships tend to drop as the severity of the child's issues increases (Deng et al., 2004). Cohen et al. (2003) found that parents and teachers agreed the least when asked about behaviors related to sensory/perceptual issues, and social behaviors.

Parents appear to be better descriptors about a child's behavior. Parents' descriptions may be more detailed than teachers but not as clinically relevant to impairing behavior (Bank et al., 1993). Also, parents may have more awareness of the variability of their child's behavior. In a study that gathered information from parents and teachers about behavior in both the home and school settings, the parents scores acknowledged differences in behaviors across settings while teacher raters where more uniform regardless of the context (de Nijs et al., 2004). No clear relationship appears to exist between role and frequency of behavior. Studies have noted parents reporting higher frequency (Deng et al., 2004; Jones et al., 2004) and lower frequency (Kroes et al., 2005) of children's behavior compared to teachers.

Overall, parents and teachers appear to have equal ability to discriminate those with current issues and those without (de Nijs et al., 2004; Gadow, & Nolan, 2002). It may be that parents have more insight in this area as related to specific externalized behaviors (Becker et al., 2004) while teachers have more insight into global externalized problems (Goodman et al., 2000). Studies also vary in perspectives into which scores may be most affected by source variance. Gomez et al. (2005) found the parents may have more source variance than trait variance represented in their scoring compared to teachers while a study by Huziak et al. (2003) had the opposite outcome.

Teachers tended to be better predictors of externalized behavioral behaviors. If parents were restricted to questionnaire items found most relevant by teacher scoring, parents' scores became equally predictive (Bank et al., 1993), as anticipated

by the authors. Another study found that parents were better predictors of externalized behaviors related to emotions (Becker et al., 2004). These conclusions may help in item selection during evaluation development of questionnaires.

Occasionally, researchers differentiated between the pattern of each parent and teacher rather than viewing parental scoring as interchangeable. Some studies showed no difference between mother-teacher and father-teacher relationships for the same child (Essex et al., 2002; Huziak et al., 2003). One study did demonstrate that the relationships between the fathers and teachers were significantly higher than the relationships between the scores of mothers and teachers (Bank et al., 1993).

Self- and observer-report.

While self-report is not part of the *Sensory Profile* and School Companion multi-informant questionnaires, exploring the patterns between children and others may illuminate what information parents and teachers have to offer when compared to the child. De Los Reyes & Kazdin (2005) suggest that children tend not to view the issue being evaluated as negative or that the problem warrants personal change. The children may view their strategies as useful in order to change the physical setting or interactions with others.

Just like observers with different roles, comparing self-report to other reporters has the same trend of low but significant correlations for both adult and peer observers (Achenbach et al., 1987). More recent studies have confirmed the findings of the meta-analysis (Briggs-Gowan, Carter, & Schwab-Stone, 1996; Gasman et al.,

2002; Goodman, 2001) and continue the pattern of no significant differences between reporters for self- and observer-report (Kamphaus et al., 2003).

Results are mixed about what contribution each reporter brings to the table when comparing adult and child-report. Teachers may notice less internalizing behaviors than boys while parents with internalized issues may agree more with their sons about this topic (Briggs-Gowan et al., 1996). Children's report may match the theoretical structure behind the evaluation better than teachers or parents (Gasman et al., 2002).

For peer report, most researchers average the results of multiple raters that may increase the strength of the information (Achenbach et al., 1987). Additional advantages of peer report include: more experiences with the child than adults, an insider perspective to daily life, and increased awareness of internalizing behaviors since peers may contribute to stressors (Kamphaus et al., 2003).

The impact of source variance noted in comparing adult to self-report continues on in the peer and self-report literature for children. Dornbusch et al. (1965) consistently found that the scores from one reporter for two different peers demonstrated a stronger relationship than two different reporters for the same peer. In addition, the authors found that the lowest similarities occurred between pairs of reporter-reportees. This comparison assesses the context or the "common culture" of the setting by analyzing the presence and frequency of traits within the group. This finding indicates that the variance was more likely from the reporter than the environment. de Nijs et al. (2004) explored this pattern for parent and teachers and

found similar results. The same reporter across contexts had higher scores than different reporters for the same context.

Context

This is not to say that the setting or the context does not have an impact on the scoring patterns between multiple reporters. This mainly applies to adult reporters who see children in distinct settings (e.g., parents at home and teachers at school). Achenbach et al. (1987) found that the differences associated with informant role decreased when these roles occurred in the same setting. For example, mental health workers and teachers who observed the children in school had significantly higher similarities than those who observed the children in different settings.

Another study demonstrated the impact of context on agreement between reporters in a hospital setting. Even though the respondents had various roles, the relationships were more typical of reporters with similar roles (Felder-Puig et al., 2004). The context has characteristics that limit the activities available to the child (e.g., existing space & supplies, timing of activities, social norms). Also, the child may act a certain way due to the setting (De Los Reyes & Kazdin, 2005) and if the reporter only observes the child in that setting, then the context may impact the results.

In order to reduce source variance due to context, Kraemer et al. (2003) recommends using informants with similar roles across contexts (e.g., parent and teachers across home and school settings) and those in the same context with different roles (e.g., mother and father at home).

Characteristics of People Impacting the Evaluation Process

Many perspectives are available about why informants provide discriminant information about the same child. Researchers have studied three large categories: a) the characteristics of the child, b) the characteristics of the child's family, and c) characteristics of the informants (Kraemer et al., 2003).

Child characteristics.

The impact of child characteristics on raters' responses is mixed. In the meta-analysis by Achenbach et al. (1987), the gender of the child did not generate significant differences while the type of issues and age did. In a review of the theoretical underpinnings in informant discrepancies, De Los Reyes & Kazdin (2005) found that child variables such as age, gender, or ethnicity may influence the questionnaire responses. For example, one study found that informants agreed more for girls and children with better academic performance (Deng et al., 2004).

Let's explore the specific characteristic of age. Theoretically, age may impact the amount of agreement between reporters, especially self-report. De Los Reyes & Kazdin (2005) proposed a framework for the impact of many variables, including age. For example, reports on younger children may have higher agreement with adults if they reflect what children hear about themselves. Conversely, reports on older children may have higher agreement because of greater maturity and insight into personal issues. Looking at it from the discrepancy perspective, younger children may not have enough insight about their issues in order to agree with adult informants, and older children may not agree with others' perspectives about their

behavior. In addition, as children get older, they may keep unobserved behaviors to themselves.

The research demonstrates that reporters tend to significantly weaker relationships with adolescents when compared to younger children (Achenbach et al., 1987). While this is not a hard and fast rule, the overall trend indicates that reporters tend to be more consistent when evaluating children in elementary school and younger. The child's condition also impacted the agreement between sources. Correlations between reporters for externalized behaviors were significantly higher than responses about internalized behaviors (Achenbach et al.).

It's up for debate how the variables of age and condition interact. A theoretical model of multi-informant assessment postulated that externalized behaviors may result in more consistent results about younger children since the behaviors are obvious while a similar pattern would hold for older children who can articulate their internalized behaviors more succinctly to others (De Los Reyes & Kazdin, 2005). Deng et al. (2004) studied this topic and found the opposite pattern of informants agreeing more about internalized behavior for younger children and less for externalized behavior for older children.

Family characteristics.

Family characteristics may also affect the patterns between reporters, especially when one informant is a parent. Variables to consider include marital status, birth order, number of siblings, the child's relationship with family members

(De Los Reyes & Kazdin, 2005), or parental age. For example, Deng et al. (2004) found higher agreement between reporters when parents were older.

Differences may also occur if a parent has a mental health issue, such as anxiety or depression. Briggs-Gowan et al. (1996) explored the relationship between mother and teacher report when maternal depression was a factor. The source variance due to maternal depression increased the most when measuring externalized behaviors and girls (compared to internalized behaviors and boys). In addition, as the severity of the mothers' depressive symptoms increased, so did the differences between the two reporters. The authors hypothesized these differences could be due to the mothers' increased awareness of psychological issues, the projection of depressive experiences on their children, or feeling overwhelmed with their child's behaviors.

Reporter characteristics.

Scoring patterns may also be due to characteristics of the reporter or due to specific experiences of the reporter with the child. Raters may interpret the same act differently or be impacted by internal factors such as current mood or initial impression of the child (Kenny, 1991). "It is assumed that all people tell us something about themselves as they describe others." (Dornbusch et al., 1965, p. 435).

It is also important for the evaluator to consider the interaction between the sources providing the information. Variables to consider include: amount of acquaintance with subject, overlap with other raters' experiences with the child,

shared meaning systems of raters, consistency of the child's behavior, rates based on extraneous information rather than observation, and communication with other raters about the child. Of these, the most important aspect appears to be the same meaning systems between reporters (Kenny, 1991). For example, Abikoff, Courtney, Pelham, & Koplewicz (1993) found that teachers' reports about students were more biased if the child had behavioral issues compared to those with just attention problems. This may indicate that teachers have a meaning system about classroom behavior that impacts the scoring.

The impact of reporter characteristics may relate to more subtle characteristics of the raters. One study compared the responses of teachers, day-care workers, and mothers based on their respective personalities (Kroes et al., 2005). The findings reflect that teachers and workers with higher scores of neuroticism reported significantly higher behavior scores for the children while mothers' level of neuroticism did not correlate to scoring patterns. This pattern continued for workers who also reported higher behavior scores if they had lower extraversion or openness personality scores. It appears that a combination of role and personality factors may affect sources' responses on questionnaires.

Assessing Sensory Processing

Now that we've reviewed the current state of multi-informant questionnaires, let us look at one set of questionnaires specifically. The *Sensory Profile* and the School Companion assess sensory processing of school-aged children through caregiver and teacher report, respectively. Miller & Lane (2000) define the concept

of sensory processing as an expansive term related to the central nervous system receiving and processing information from all senses. Measuring sensory processing is important since it provides unique information to guide intervention planning. Multiple studies show distinct sensory processing patterns for children with issues such as Asperger syndrome (Dunn, Myles, & Orr, 2002; Myles, Cook, Miller, Rinner, & Robbins, 2001), attention-deficit hyperactivity disorder (Mangeot et al., 2001; Yochman, Parush, & Ornoy, 2004), autism (Dunn, 1999; Dunn & Bennett, 2002; Ermer & Dunn, 1998; Kientz & Dunn, 1997; Watling, Deitz, & White, 2001), developmental disabilities (Baranek & Berkson, 1994; Larson, 1982), fragile X syndrome (Rogers, Hepburn, & Wehner, 2003; Miller et al., 1999), learning disabilities (Ayres, 1972) , institutionalization (Lin, Cermak, Coster, & Miller, 2005), and schizophrenia (Brown, Cromwell, Filion, Dunn, & Tollefson, 2002).

Studies have also shown a link between sensory processing difficulties and problems with occupational performance, such as activities of daily life (Smith, Roux, Naidoo, & Venter, 2005; Tarbell, & Allaire, 2002; Weatherston, Ribaudo, & Glovak, 2002), education (Dunbar, 1999), play (Baranek, et. al., 2002; Dunbar, 1999), and social participation (Cohn, 2001; Cohn, Miller, & Tickle-Degnen, 2000; Dunbar; Pfeiffer, Kinnealey, Reed, & Herzberg, 2005; Weatherston et al.). Providers with a background in neuroscience and the sensory integration models, such as occupational therapists, may benefit from standardized information about sensory processing for intervention planning and implementation.

Unfortunately, evaluators have a small number of standardized tools that assess sensory processing (Spitzer, Roley, Clark, & Parham, 1996). Besides the *Sensory Profile* questionnaires, standardized tests include the *DeGangi Berk Test of Sensory Integration* (TSI; DeGangi & Berk, 1983), the *Infant/Toddler Symptom Checklist* (I/TSC; DeGangi, Poisson, Sickel, & Wiener, 1995), the *Sensory Integration and Praxis Test* (SIPT; Ayres, 1989), the *Sensory Processing Measure* (SPM; Miller-Kuhaneck, Henry, & Glennon, 2007; Parham & Ecker, 2007), the *Temperament and Atypical Behavior Scales* (TABS; Neisworth, Bognato, Salvia, & Hunt, 1999), the *Test of Sensory Functions in Infants* (TSFI; DeGangi, & Greenspan, 1989), the *TIME® Toddler and Infant Motor Evaluation* (Miller & Roid, 1994), and the *Touch Inventory for Elementary-School-Aged Children* (TIE; Royeen & Fortune, 1990) (see Table 1 for a summary). Many of these evaluations are family-centered in that the parent completes a questionnaire or elicits the response of the child while the evaluator observes.

Table 1

Standardized Evaluations to Assess Sensory Processing

Test	Description	Administration Time	Age Range
I/TSC	Criterion-referenced parent questionnaire for sensory integration and regulatory disorders	10 minutes	7-30 months

SIPT	Norm-referenced child performance on 17 subtests to identify sensory integration deficits [requires advanced training]	2 hours or 10 minutes per subtest.	4-8 years 11 months
SPM	Norm-referenced parent and teacher questionnaire w/ criterion-referenced form for other school personnel to assess sensory processing difficulties	15-20 minutes for parents and teachers; 5 minutes for others	5-12 years
TABS	Norm-referenced 55-item parent/professional questionnaire for temperament and regulatory issues	15 minutes	11-71 months
TIE	Norm-referenced 26-item screening tool for tactile defensiveness	10 minutes	6-12 years
TIME®	Norm-referenced child performance with parent on 8 subtests of motor development	15-45 minutes	Birth-3½ years

TSFI	Criterion-referenced performance of infant with parent to 24 items to assess sensory processing and reactivity	20 minutes	4-18 months
TSI	Criterion-referenced responses after manipulating 36 items to detect early sensory processing deficits	30 minutes	3-5 years

Note. Information integrated from the following sources (Conoley & Impara, 1995; Conoley & Kramer, 1989; Glennon, Miller-Kuhaneck, Henry, Parham, & Ecker, 2007; Kramer & Conoley, 1992; Plake & Impara, 2001; Royeen & Fortune, 1990; Spitzer et al., 1996).

Except for the multi-informant questionnaires, all have narrow age ranges (from 1 to 6 years) and most focus solely on toddlers and/or pre-school age children. Of those that assess school-aged children, limitations include a focus on only one sensory system (TIE), high cost and required training to administer (SIPT), and an indirect focus on sensory integration (TABS, TIME®). Also, psychometric properties of some of these evaluations may be questionable. The I/TSC (Plake & Impara, 2001), TSFI (Kramer & Conoley, 1992), and TSI (Conoley & Kramer, 1989) have small standardization samples that may limit the generalization of criterion scores. In addition, the TSFI has limited test-retest reliability (Jirikowic, Engel, & Deitz, 1997). As for the SIPT, Mulligan (1998) did not confirm its theoretical model of sensory integration dysfunction in a factor analysis study of over 10,000 children.

The Sensory Profile

Only the *Sensory Profile* questionnaires provide a primary focus on many areas of sensory processing throughout the entire lifespan (Brown & Dunn, 2002; Dunn, 1999; Dunn, 2002). The *Sensory Profile* consists of four full versions, delineated by age range or informant. All questionnaires use a 5-point Likert scale (e.g., Always to Never) to be completed by the specified reporter. Caregivers complete the *Infant/Toddler Sensory Profile* (I/TSP; Dunn, 2002) for children birth to 36-months-old, and the *Sensory Profile* for school-aged children from 3- to 10-years-old (Dunn, 1999). Teachers may complete the School Companion for students aged 3 to 11 years old (Dunn, 2006a). Covering the remainder of the lifespan, the *Adolescent/Adult Sensory Profile* (A/ASP) (Brown & Dunn) provides results through self-report for those who are 11 years and older. Evaluators also have the *Sensory Profile Supplement* (SPS; Dunn, 2006b), an addendum with expanded scoring and the *Short Sensory Profile* (Dunn, 1999), an abbreviated version of the *Sensory Profile*, for screening or research purposes for use with the school-aged population.

Dunn (1997) developed the theoretical model behind these tools during the standardization process of the *Sensory Profile*. Statistical analysis of the results revealed stronger relationships between items based on sensory processing patterns involving multiple sensory systems, rather than one sensory system (Dunn, 1999; Dunn, & Brown, 1997). The resulting theoretical model, Dunn's Conceptual Model of Sensory Processing, purports four distinct sensory processing patterns, or "quadrants" based on amount of sensation and behavioral response.

- Low Registration – one requires a high amount of sensation to respond and is passive about obtaining sensation
- Sensation Seeking – one requires a high amount of sensation to respond and is active about obtaining sensation
- Sensory Sensitivity – one requires a low amount of sensation to respond and is passive about limiting sensation
- Sensation Avoiding– one requires a low amount of sensation to respond and is active about limiting sensation

The versions discriminate between people who demonstrate these patterns less than, same amount as, more than other people their age. These categories are norm-referenced based on a typical population.

Validity.

Multiple types of validity have been established for the *Sensory Profile*, such as face validity, content validity, criterion-related validity, and construct validity. The following discussion will explain these terms and the methods used to establishing the different types of validity.

Face validity may be accomplished through a post hoc analysis of whether a test measures the intended area of interest. Since sensory processing is an abstract and complex concept, face validity serves to increase relevance to the user and not as a true validation method. For example, face validity supported item selection in the development of the I/TSP. Parents of infants and toddlers were asked which *Sensory Profile* items were relevant to their young children. Similarly, teachers shared which

items on the *Sensory Profile* they felt they could answer most of the time for the development of the School Companion.

Content validity provides similar subjective information about the items, but it utilizes experts in the field. Dunn (1999) applied three distinct approaches to increase the content validity of the *Sensory Profile*. One action was a literature review to identify potential test items that would be relevant based on current research and evidence. Another source of included experts in the field providing their insights about the items and the overall structure of the measure. A third source was a category analysis of the items completed via a national study with 150+ therapists. The therapists' input guided the development and assignment of items to categories. As for content validity for the School Companion, Dunn (2006a) organized a team of teachers and therapists to collaborate and design items that were relevant to sensory processing that teachers could rate. In addition, Dunn compared teacher ratings on the research version to the parent ratings on the *Sensory Profile* Caregiver Questionnaire. The findings indicate that over half of the correlations between all quadrants scores were significant.

Criterion-related validity relates to comparing a target test to an established one. The publisher has developed Spanish versions of the questionnaires from the established English version of the I/TSP and the school-aged *Sensory Profile* (Dunn, 1999; Dunn, 2002). This first step supports the exploration of further cross-cultural validation (a specific type of criterion-related validity) of the theoretical model. Many other translations into European, Asian, and Australian-based languages and cultures

are underway or being considered by the publisher (W. Dunn, personal communication, March 2004).

The construct validity of the *Sensory Profile* includes the subcomponents of convergent and discriminant validity, known groups, and factor analysis. For convergent and discriminant, Dunn (1999) compared the results on the *Sensory Profile* to a measure of occupational performance, the *School Function Assessment* (SFA). Convergent findings include overall similarities between results from both assessments. Students who required higher level of assistance and adaptations also had statistically different sensory processing patterns. This applies to students who have needed assistance or adaptations for behavior regulation and/or positive interactions. Additional convergent findings report similarities between sensory processing difficulties in areas such as fine motor/perceptual responses, most behavior and emotional responses, low endurance & tone, and sedentary responses correlated with scores on the SFA. Meanwhile, the discriminant patterns indicated non-significant correlations between scores on the SFA and sensory processing areas of oral sensory processing, touch processing, emotional reactivity, and sensory seeking.

Dunn (2006a) also explored the convergent and discriminant validity between the quadrant scores for the *Sensory Profile* and the School Companion of children without disabilities. The low to moderate correlations between reporters follow the patterns reported across the literature of some similar and some unique information from each source.

Known groups method is another way to establish construct validity. For this area, one may compare results between groups of subjects in which the sensory processing is assumed to be distinct. If the sensory processing scores are significantly different between the groups, the measure demonstrates construct validity. During the standardization process, Dunn (1999) compared results of typical children to those with the diagnoses of autism and ADHD. Children with autism demonstrated global differences compared to typical children reflecting the pervasive nature of the diagnosis. Children with ADHD mainly had distinct scores in the areas of sensory seeking, emotional reactivity, and inattention/distractibility reflecting a relationship to key attributes of the diagnosis and resulting in a scoring worksheet for children with this diagnosis. Research results support these findings for these and other diagnoses (Brown et al., 2002; Dunn & Bennett, 2002; Dunn et al., 2002; Ermer & Dunn, 1998; Kientz & Dunn, 1997; Mangeot et al., 2001; Miller et al., 1999; Rogers et al., 2003; Smith et al., 2005; Watling et al., 2001; Yochman et al., 2004). Dunn (2006a) completed a similar analysis for the School Companion comparing typical students, and those with diagnoses (autism, ADHD, and Asperger syndrome). The findings indicate that the scores differentiate between students without disabilities and each diagnosis. For example, children with autism have more different scores than children with ADHD on the School Companion.

As stated earlier, Dunn (1999; Dunn, & Brown, 1997) found that items grouped by multi-sensory processing patterns, not by single sensory systems during the standardization of the *Sensory Profile*. These patterns (or constructs) were

derived from a statistical tool called factor analysis, another aspect of construct validity. With factor analysis, items group on the underlying dimensions measured. The author then refined the factors into the four quadrants of Dunn's Model of Sensory Processing. Statistical analyses of these quadrants during the standardization of the I/TSP, the A/ASP, and the School Companion continued to support the validity of this model (Brown & Dunn, 2002; Dunn, 2002; Dunn, 2006a). In addition, a factor analysis of the School Companion supported a teacher-based model with the continued trend on sensory processing patterns rather than sensory systems (Dunn, 2006a). Kumpulainen et al. (1999) also found that parents and teachers had unique contributions to the factor structure of a multi-informant assessment.

The relationship between caregiver and teacher report brings up new questions related to the construct validity of the *Sensory Profile* and the School Companion, especially the convergent and discriminant psychometric properties. What will the typical pattern of responses between the reporters on these two school-aged measures? Will certain characteristics of the children, parents, or teachers impact the level of agreement? Will certain items or categories have stronger or weaker relationships than others? Let us explore these questions in more detail and review a study designed to shed light on these questions.

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Appendix B: Data & Output Information

Raw data and output files are saved on the enclosed CD-R titled "Appendix B". The files included are as follows:

- SPSS file with all the raw data (matched pairs ONLY.sav)
- Frequency of demographic information for the entire sample, children without disabilities, and children with disabilities (demographic frequencies.spo)
- Pearson and Spearman correlations for the entire sample (correlations.spo)
- Pearson and Spearman correlations based on the child demographics (correlations by ethnicity.spo; correlations by gender and diagnosis.spo; correlations by grade.spo)
- Pearson and Spearman correlations based on the parent demographics (correlations by parent education.spo)
- Pearson and Spearman correlations based on the teacher demographics (correlations by contact & experience.spo)
- Paired t-tests based on the entire sample (paired t tests.spo)
- Paired t-tests based on child demographics (paired t tests by child demographic.spo)
- Paired t-tests based on parent demographics (paired t tests by parent demographic.spo)
- Paired t-tests based on teacher demographics (paired t tests by teacher demographic.spo)

- Analysis of the relationship between the child's diagnosis and the teacher's level of contact (crosstabs dx & contact.spo)
- Summary of the results from the correlations and paired t-tests (table of similarities and differences.doc)

Appendix C: Instrument Information

The instruments utilized in this study are copyrighted. Information about the tools may be obtained from the copyright holder.

Dunn, W. (1999). *Sensory Profile* Caregiver Questionnaire. San Antonio, TX:The Psychology Corporation.

Dunn, W. (2006). *Sensory Profile Supplement* Summary Score Sheet. San Antonio, TX: The Psychology Corporation.

Dunn, w. (2006). *Sensory Profile School Companion* Teacher Questionnaire. San Antonio, TX: The Psychology Corporation.

Dunn, W. (2006). *Sensory Profile School Companion* Scoring Summary. San Antonio, TX: The Psychological Corporation.

Dunn, W. (2005). Classroom Questionnaire – Pilot Edition. San Antonio, TX: Harcourt Assessment.[a]

[a] This edition contains 104 items.

Appendix D: Human Subjects Information

The Human Subject Committee (HSC) of the University of Kansas Medical Center reported that the data analyzed was not under its purview (HSC #9962).

Table E1

Summary of Significant Correlations

CORRELATIONS	Auditory	Visual	Movement	Touch	Behavior	Sensory Seeking	Low Registration	Sensation Avoiding	Sensory Sensitivity
SAMPLE	**.386/.269**		**.296/.281**	**.464/.395**	**.461/.473**	**.317/.233**	**.236/.387**	**.434/.455**	**.501/.321**
Girls	.398/.358		.402/.365	.353/-	.572/.568		.491/.358	.597/.630	.437/.343
Boys	.341/.202		.248/.234	.470/.458	.415/.414	.302/.250	.489/.360	.573/.614	.333/.298
White	.340/.221		.368/.243	.432/.416	.363/.389	.239/-	.418/.271	.523/.563	.303/.252
Black*					.519/.533		.620/-	.540/.692	
Hispanic*	.845/.949				.888/1.00	.912/.949	.911/1.00		
Asian*					.919/-		-/missing		
Multi-racial*			.920/-		.931/-		-/missing	.951/-	
Pre-School	.727/.493		.646/.673	.693/.602	.653/.528	.709/.495	.584/-	.792/.816	.500/.424
Kindergarten*							.520/.654		
1st grade*					.739/.789				
2nd grade*		.533/.577		.798/.563	.656/.613			.661/.704	.845/-
3rd grade*									
4th grade*								.612/.639	.483/-
5th grade*					-/.609		.795/.704	.649/.685	
6th grade*					.465/.602				
Typical									
ADHD					.316/.268		.328/-	.436/.324	
Asperger*							.706/-		
Autism	.620/.354		.466/.578	.424/-	.461/.426	.428/.363		.564/.561	
Mother High Sch	.367/.319		.277/.292	.275/.275	.394/.338	.292/-	.501/.444	.498/.527	.319/-
Mother College	.430/.260		.435/.374	.563/.515	.530/.575	.412/.260	.534/.341	.634/.670	.415/.371
Mother Grad Sch*				.661/.557	.557/.508			.729/.640	
Father High Sch	.402/.353		.362/.342	.399/.372	.408/.403		.484/.428	.546/.638	.404/.313
Father College			.279/-	.487/.380	.477/.439	.417/.272	.472/.327	.616/.542	.309/-
Father Grad Sch	.675/-			.590/.652	.688/.620			.584/.583	
1-2 days of contact							.471/-		
3+ days of contact	.401/.284		.318/.316	.484/.414	.478/.522	.373/.307	.480/.369	.577/.635	.409/.386
0-10 yrs teaching			.338/-	.345/.300	.320/.373		.421/.310	.364/.413	
11-20 yrs teaching	.524/.470	.301/-	.350/.406	.602/.590	.588/.526	.431/.365	.605/.479	.669/.724	.562/.554
21 + yrs teaching	.384/.355			.305/-	.380/.450		.414/-	.558/.602	

significant statistic for raw score/significant statistic for category

- = not significant * = sample size <30

Highlighted= Majority of correlations are significant for that row or column

Table E2

Summary of Significant Paired T-tests

PAIRED T-TESTS	Auditory	Visual	Movement	Touch	Behavior	Sensory Seeking	Low Registration	Sensation Avoiding	Sensory Sensitivity
SAMPLE						**- /.000 T**			**- /.000 T**
Girls									
Boys									
White									
Black*									
Hispanic*							-/.008 P		
Asian*									
Multi-racial*								.010 P/-	
Pre-School									
Kindergarten*									
1st grade*									
2nd grade*		.009 P/ .003P							
3rd grade*									
4th grade*									
5th grade*									
6th grade*									
Typical									
ADHD					-/.006T				
Asperger*									
Autism	.000 P/ -		.006 P/ -		.002 P/-			.009 P/ -	
Mother High Sch									
Mother College									
Mother Grad Sch*									
Father High Sch									
Father College									
Father Grad Sc									
1-2 days of contact						- /.003T			
3+ days of contact						- /.000T			- /.000T
0-10 yrs teaching									
11-20 yrs teaching						- /.001T			- /.000T
21 + yrs teaching						- /.004T			

significant statistic for raw score/significant statistic for category

- = not significant * = sample size <30 T = teacher scored higher P = parent scored higher

Highlighted = No significant differences for that row or column