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Sensory Issues in Children with Asperger Syndrome and Autism

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Abstract: The purpose of this study was to examine whether children with Asperger Syndrome and children with autism exhibit difference sensory profiles. The Sensory Profile (Dunn, 1999), completed on 86 individuals with Asperger Syndrome and 86 persons with autism matched for age, revealed differences in three of 23 areas evaluated: (a) Emotional/Social Responses, (b) Emotional Reactivity, and (c) Inattention/Distractibility. Implications regarding these similarities and differences in profile are discussed.

During the past several years, researchers and practitioners have sought to determine commonalities and differences among characteristics of autism and Asperger Syndrome (AS), collectively referred to as autism spectrum disorders (ASD). To date results have been equivocal at best. For example, studies of general clinical characteristics of individuals with autism and AS (Eisenmajer et.al, 1996; Gilchrist, Green, Cox, Rutter, & Le Couteur, 2001; Kurita, 1997; Szatmari, Archer, Fisman, Streiner, & Wilson, 1995) have revealed no consistent significant differences in attributes between the groups. Further, investigations of cognitive profiles (Ehlers et al., 1997; Szatmari, Tuff, Finlayson, & Bartolucci, 1990), neuropsychological and language profiles (Ozonoff, Rogers, & Pennington, 1991; Rinehart, Bradshaw, Moss, Brereton, & Tonge, 2001; Szatmari et al., 1990), and behavioral and psychiatric problems (Ghaziuddin, 2002; Ghazziudin, Alessi, & Greden, 1995; Kim, Szatmari, Bryson, Streiner, & Wilson, 2000; Tonge, Brereton, Gray, & Einfeld, 1999) have yielded equivocal results in differentiating the two disabilities.

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Despite its global impact on individuals with ASD one area of functioning that has not been compared across autism and AS, is sensory processing. Since Kanner's investigation of individuals with autism in 1943, it has been recognized that children and youth with autism manifest sensory integration problems that include (a) low endurance and tone, (b) poor registration, (c) tactile challenges, (d) fine-motor/perceptual problems, (e) self-regulation, and (f) oral sensory sensitivity (Ayres & Tickle, 1980; Bagnato & Neisworth, 1999; Ermer & Dunn, 1998; Kientz & Dunn, 1997).

Fewer investigations on sensory issues in individuals with AS exist. Asperger (1944) recognized sensory deficits in children with AS in his clinical writings and professionals, parents, and individuals with AS themselves have acknowledged anecdotally that sensory issues are apparent in this disability (Attwood, 1998; Myles, Cook, Miller, Rinner, & Robbins, 2000; Stagnitti, Raison, & Ryan, 1999; Willey, 1999). Despite this discussion, only one empirical article has been published in a peer-refereed journal on sensory issues of persons with AS (Dunn, Myles, & Orr, 2002). In this investigation, Dunn et al. found that children and youth with AS differed from typical peers on 22 of 23 categories identified in the Sensory Profile (Dunn, 1999), a norm-referenced measure that describes responses to sensory events in daily life.

A small database in autism and an even more meager one in AS suggest that sensory differences are a salient part of the disabilities. However, the question of whether specific sensory processing patterns exist that can differentiate the groups has not been investigated. Thus, the purpose of this study was to identify the sensory characteristics of children and youth with autism and AS and further determine whether these characteristics are sufficiently salient to differentiate the two disorders.

Method

Participants

Eighty-six children and adolescents with Asperger Syndrome and 86 individuals with autism, matched by chronological age (mean age: 7 years, 6 months; range = 6 years 9 months to 16 years 8 months), participated. The investigation was a part of an extensive study conducted by a large midwestern university. The 80 male and six female participants with AS had a mean intelligence quotient (IQ) of 98.48 (*SD* = 24.81). IQ was not available for the 80 males and six females with autism; however, their records included scores from the Psychoeducational Profile – Revised (PEP-R; Schopler, Reichler, Bashford, Lansing, & Marcus, 1990). Aggregate score on PEP-R for the children with autism was 22 months (*SD* = 10.34), suggesting that this group was more impaired overall than participants with AS. All participants were Caucasian and had been diagnosed by a licensed psychiatrist or multidisciplinary team in a university-based clinical program using criteria stated in the *Diagnostic and statistical manual of mental disorders – fourth edition* (American Psychiatric Association, 1994).

Instrument

The Sensory Profile is a 125-item questionnaire that describes responses to sensory events in daily life. The caregiver reports on a 5-point Likert scale how frequently the child or adolescent uses a given response to particular sensory events (e.g., always, frequently, occasionally, seldom or never).

Normed on more than 1,000 children without disabilities and 150 children with disabilities (Dunn, 1999), the Sensory Profile measures the degree to which children exhibit problems in (a) sensory processing, (b) modulation, and (c) behavioral and emotional responses– called Section scores. Examiners can also calculate Factor scores, which are clusters of scores derived from a factor analysis study indicating that a child's level of responsivity was an important consideration (i.e., hyporesponsive, hyperresponsive).

The Sensory Profile provides information about the possible contributions of sensory processing to a child's individual performance patterns, provides information about the child's responses to stimuli, and identifies sensory systems that may be contributing to or creating barriers to functional performance. A lower score reflects poorer performance (i.e., a higher rate of behavior, because items are written to reflect potential difficulty with the sensory experience). That is, if a child never engages in a given behavior, he or she obtains a raw score of five, whereas if the child always engages in the behavior, he or she receives a raw score of one.

Using raw scores, Dunn (1999) designed the following classification system for recording children's performance in comparison to a national sample of children without disabilities:

1. Typical Performance - Scores are at or above one standard deviation below the mean. This classification includes the top 84% of the research sample.
2. Probable Difference - This classification indicates questionable areas of sensory processing abilities. Approximately 14% of the research sample had scores between one and two standard deviations below the mean.
3. Definite Difference - Only 2% of the research sample met this classification, which includes scores below two standard deviations below the mean.

Internal consistency estimates (range = .47 to .91) and standard error of measurement (range = 1.0 to 2.8) support instrument reliability. Dunn (1999) also reported on content and construct validity (i.e., convergent, discriminant). Validity findings indicate high

correlations with measures of sensory perception and behavioral regulation. Table 1 provides an overview of the 9 factors and 14 sections assessed by the Sensory Profile.

Procedure

Participants were located through a database of members of a parent support group for families of individuals with AS. Letters were sent to members informing them of the study. Interested parties contacted the researchers expressing their willingness (and that of their child) to participate. Information regarding children with autism was gathered retrospectively from assessment files at the child developmental center at the participating university.

Assessments were administered individually in a clinical setting. Testing sessions took place in a small classroom with work tables, adequate lighting and minimal auditory and visual distractions. All assessments were given by clinicians and graduate students enrolled in an autism/AS graduate program. The graduate students had extensive experience administering the assessment measures as members of an AS/autism assessment team. In addition, they had received in-depth training in AS and autism through academic study and practicum experiences.

Data Analysis

Two multivariate analyses of variance (MANOVA) were conducted to identify sensory differences in individuals with AS and children and youth with autism. The first MANOVA addressed comparisons on the Sensory Profile Section scores and the second addressed differences on the Factor scores.

Results

The study was designed to compare sensory processing characteristics of children and youth with AS to those of individuals with autism. Specifically, the investigation sought to determine whether the (a) sensory processing, (b) modulation, (c) behavioral and emotional responses, and (d) responsiveness characteristics as identified on the Sensory Profile (Dunn, 1999) differed among the two groups.

Section scores of the two groups, compared using a MANOVA, were statistically significant ($F = 2.84$; $p < .05$ by Roy's Largest Root Criterion [Kendall, 1999]; power = .99; effect size = .29). Of 14 possible statistical comparisons, one was significantly different (using the Bonferroni-corrected probability $p < .003$), with participants with AS performing more poorly than the children with autism. Specifically, differences existed in the factor score Emotional/Social Responses ($F = 25.62$; $p < .003$). Tables 2 and 3 show the means and standard deviations for the two groups on each of the section and factor scores.

The MANOVA using Sensory Profile Factor scores was found to be significant ($F = 4.39$, $p < .05$ by Roy's Largest Root Criterion [Kendall, 1999]). Thus, the power estimate of .99 and an effect size .24 suggest that differences in this study could be clinically meaningful. Of nine possible statistical comparisons, two were significantly different (using the Bonferroni-corrected probability $p < .005$). In both areas, Emotionally Reactive and Inattention/Distractibility, individuals with AS received a lower score than their counterparts with autism (see Tables 4 and 5), indicating poorer performance.

Discussion

Findings from this study contribute additional evidence to the overall picture of autism and AS. In previous studies (Dunn, Myles et al., 2002; Kientz & Dunn, 1997), researchers reported on significant differences in sensory processing and related behaviors in comparisons of children with autism and children with AS to age-matched neuro-typical peers. The present study adds to the emerging picture by illustrating some significant differences between these two pervasive disorders, suggesting that the sensory processing patterns of autism and AS are distinct in some areas.

The first area of distinction, emotional/social responsiveness is characterized by two significant scores (i.e., Emotional/ Social Responses and Emotionally Reactive) on the Sensory Profile. The authors describe the behaviors represented by these items as "psychosocial coping strategies," or products of sensory processing (Dunn, 1999). It is important here to remember that both children with

TABLE 1

Sensory Profile Item Categories

Sensory Processing

Auditory Processing. The items included in the Auditory section measure the child's responses to things heard (e.g., "Is distracted or has trouble functioning if there is a lot of noise around").

Visual Processing. The Visual section includes items that measure the child's responses to things seen (e.g., "Is bothered by bright lights after others have adapted to the light").

Vestibular Processing. This section measures the child's responses to movement (e.g., "Becomes anxious or distressed when feet leave the ground").

Touch Processing. The Touch section measures the child's responses to stimuli that touch the skin (e.g., "Becomes irritated by shoes or socks").

Multisensory Processing. Items in this section measure the child's responses to activities that contain a combined sensory experience (e.g., "Seems oblivious within an active environment").

Oral Sensory Processing. The oral Sensory section measures the child's responses to touch and taste stimuli to the mouth (e.g., "Limits self to particular food textures/temperatures").

Modulation

Sensory Processing Related to Endurance/Tone. This section measures the child's ability to sustain performance (e.g., "Poor endurance/tires easily").

Modulation Related to Body Position and Movement. Items in this section measure the child's ability to move effectively (e.g., "Takes movement or climbing risks during play that compromise personal safety").

Modulation of Movement Affecting Activity Level. This section measures the child's demonstration of activeness (e.g., "Spends most of the day in sedentary play").

Modulation of Sensory Input Affecting Emotional Responses. These items measure the child's ability to use body senses to generate emotional responses (e.g., "Rigid rituals in personal hygiene").

Modulation of Visual Input Affecting Emotional Responses and Activity Level. Items in this section measure the child's ability to use visual cues to establish contact with others (e.g., "Stares intensively at objects or people").

Behavioral and Emotional Responses

Emotional/Social Responses. Items in this section indicate the child's psychosocial coping strategies (e.g., "Has fears that interfere with daily routine").

Behavioral Outcomes of Sensory Processing. Items in this section indicate the child's ability to meet performance demands (e.g., "Has difficulty tolerating changes in plans and expectations").

Items Indicating Thresholds for Response. This section includes items that indicate the child's level of modulation (e.g., "Jumps from one activity to another so that it interferes with play").

Factor Scores

Sensation Seeking. The items included in this factor reflect the child's interest in and pleasure with sensory experiences in everyday life.

Emotionally Reactive. The items included in this factor reflect the child's affective responses to sensory experiences in every day life.

Low Endurance/Tone. The items included in this factor reflect the child's ability to use muscle tone to support self while engaging in activity.

Oral Sensory Sensitivity. The items included in this factor reflect the child's responses to textures, tastes and smells, particularly related to foods.

Inattention/Distractibility. The items included in this factor reflect the child's tendency to be pulled away from activities due to external stimuli, particularly sounds.

Poor Registration. The items included in this factor reflect the child's tendency to miss cues from sensory experiences in everyday life.

Sensory Sensitivity. The items included in this factor reflect the child's level of detection of movement stimuli during everyday life experiences.

Sedentary. The items included in this factor reflect the child's tendency to be passive during everyday life.

Fine Motor/Perceptual. The items included in this factor reflect the child's ability to use hands.

TABLE 2

MANOVA Results for Section Scores on the Sensory Profile

Section	*F*	*p*	*Power*
Auditory Processing	7.14	.009	.75
Visual Processing	.64	.443	.12
Vestibular Processing	.55	.46	.11
Touch Processing	7.37	.008	.77
Multisensory Processing	.47	.50	.10
Oral Sensory Processing	.71	.40	.13
Sensory Processing Related to Endurance/Tone	.74	.39	.14
Modulation Related to Body Position and Movement	.73	.40	.14
Modulation of Movement Affecting Activity Level	1.44	.23	.22
Modulation of Sensory Input Affecting Emotional Responses and Activity Level	7.09	.009	.75
Modulation of Visual Input Affecting Emotional Responses and Activity Level	1.04	.31	.17
Emotional/Social Responses	25.62	<.001**	1.00
Behavioral Outcomes of Sensory Processing	2.85	.094	.39
Items Indicating Thresholds for Response	1.41	.24	.22

** Statistical significance.

autism and children with AS differ significantly from their peers without disabilities in this area. The present finding adds important information by illustrating that children with AS are significantly more challenged in social-emotional responsiveness than their counterparts with autism. Indeed, it is possible that their emotional/social responses are in some way related to the tantrums, rage, and meltdowns often exhibited by children and youth with AS (Myles & Southwick, 1999; Myles & Adreon, 2001). That is, while individuals with

TABLE 3

Sensory Profile Section Means and Standard Deviations for Participants with Autism and Those with Asperger Syndrome

Section	*AS*	*Autism*
Auditory Processing	23.92 (5.22)	26.59 (5.37)
Visual Processing	31.15 (5.91)	32.08 (6.50)
Vestibular Processing	44.58 (6.21)	43.71 (6.22)
Touch Processing	61.03 (11.81)	66.75 (10.25)
Multisensory Processing	22.69 (4.00)	22.20 (3.66)
Oral Sensory Processing	41.48 (10.35)	43.18 (10.93)
Sensory Processing Related to Endurance/Tone	32.16 (8.92)	33.69 (9.97)
Modulation Related to Body Position and Movement	38.36 (6.86)	39.41 (6.20)
Modulation of Movement Affecting Activity Level	19.95 (3.87)	20.88 (4.38)
Modulation of Sensory Input Affecting Emotional Responses and Activity Level	11.89 (2.91)	13.39 (3.09)
Modulation of Visual Input Affecting Emotional Responses and Activity Level	12.47 (2.08)	12.90 (2.45)
Emotional/Social Responses	47.84 (10.48)	56.78 (8.70)
Behavioral Outcomes of Sensory Processing	16.08 (4.00)	17.35 (3.97)
Items Indicating Thresholds for Response	10.65 (2.52)	11.22 (2.56)

TABLE 4

MANOVA Results for Factor Scores on the Sensory Profile

Section	*F*	*p*	*Power*
Sensation Seeking	.002	.963	.05
Emotionally Reactive	31.30	<.001**	1.00
Low Endurance/Tone	1.77	.19	.26
Oral Sensory Sensitivity	2.45	.120	.34
Inattention/Distractibility	12.38	.001**	.94
Poor Registration	5.93	.016	.68
Sensory Sensitivity	.76	.384	.14
Sedentary	2.75	1.00	.38
Fine-Motor/Perceptual	.006	.938	.05

** statistical significance.

autism and those with AS both have sensory processing problems, sensory overload as represented in the behavioral responses included in these sections of the Sensory Profile are more likely to occur with persons who have AS.

There are several possible interpretations of this finding. First, the noted difference may reflect the higher awareness that children with AS have of their own behaviors compared to children who have autism. Thus, even though children with AS lack insight and sometimes have an inability to adjust a response even with feedback, they do express their ability to notice differences between themselves and others, particularly during adolescence.

Second, the higher rate of social/emotional behavior may reflect the greater interaction and language capacity of children with AS. Compared to children with autism, rules can be oblivious to people and contexts which, in turn, can reduce their responsiveness to environmental stimuli and cues. Thus, even though their responses are extreme and frequently maladaptive (as the scores illustrate), children with AS are responding to the environment (including people) at a higher rate than children with autism.

As mentioned, the "Inattention/Distractibility" score from the factor structure was also significantly different between the groups of participants, with children who have AS having more difficulty with attention than children with autism. When examining individual items that make up this factor, the items come from the Auditory Processing and Multisensory Processing sections of the Sensory Profile. Specifically, all items in the Inattention/Distractibility factor score require auditory processing. In addition, the Auditory Processing section showed a contrast between the groups ($F = 7.14$, $p = .009$, power = .75) as well, suggesting that auditory processing is difficult for children with AS, and that it is associated with attentional challenges.

Auditory stimuli are transient; this is in contrast to visual stimuli, for example, which remain available to the person across time. Perhaps children who have AS have a particularly difficulty time capturing auditory information during the exact moment when it is available; across time, missing more and more auditory input can, create confusion about expecta-

TABLE 5

Sensory Profile Factor Scores Means and Standard Deviations for Participants with Autism and Those with Asperger Syndrome

Section	*AS*	*Autism*
Sensation Seeking	59.59 (12.37)	59.50 (9.33)
Emotionally Reactive	40.49 (10.51)	50.63 (10.64)
Low Endurance/Tone	33.06 (8.64)	35.13 (9.50)
Oral Sensory Sensitivity	29.93 (8.30)	32.28 (9.22)
Inattention/Distractibility	19.44 (4.40)	22.04 (4.23)
Poor Registration	28.74 (4.39)	30.94 (6.04)
Sensory Sensitivity	15.44 (3.76)	15.99 (3.50)
Sedentary	10.09 (4.28)	11.31 (4.31)
Fine-Motor/Perceptual	9.29 (3.22)	9.25 (3.34)

tions. There may be a relationship between this difficulty with auditory processing and the rigidity children with AS exhibit in their social interactions as well. For example, if children are missing parts of the auditory message, they may have a greater tendency to latch on to the parts that they have been able to capture, placing greater emphasis on these captured parts than is appropriate to the overall situation. In this scenario, children with AS can appear rigid and perseverative.

A final area that may be significant to consider for education, community, and home situations is the difference in the Touch Processing scores. Both groups, children with AS and children with autism (Dunn, 1999; Kientz & Dunn, 1997), demonstrate difficulty with touch processing compared to typical peers. From this study, it appears that children with AS had more difficulty with touch processing than children with autism. Thus, while F scores did not reach statistical significance, raw score means fell in the "Definite Difference" category for children with AS (i.e., more than two standard deviations from the mean for typical children) and in the "Probable Difference" category for children with autism (i.e., between one and two standard deviations from the mean for typical children). Since case reports of children with AS include issues with body awareness and sensitivity to touch (Dunn, Saiter, & Rinner, 2002; Myles et al., 2000), this difference might be important to consider both for intervention planning and in future studies of children with pervasive developmental disorders. That is, when children receive inaccurate or unreliable information from the surface of their skin, this can contribute to distortions in body perception, leading to inaccurate planning for movements (Dunn, 1999). Difficulties with touch processing, therefore, might be contributing to the clumsiness and awkwardness often seen in children with AS.

It appears that a database is emerging that clearly documents the sensory challenges experienced with individuals with AS. This study and its predecessor revealed that children with AS, while having sensory issues that differentiate them from their neurotypical peers (Dunn, Myles et al., 2002), show marked similarities with the profile of children with autism. Thus, it seems that commonalities exist between the two populations despite differences in functioning levels. Differences that exist represent behavioral and attentional challenges that are more striking for children and youth with AS. Future research is needed to determine the validity of these findings to (a) determine if specific sensory issues can serve as a marker to differentiate children with autism from those with AS and (b) to aid practitioners, parents, and researchers in better understanding the complex needs of children and youth with AS.

References

Asperger, H. (1944). Die autistischen Psychopathen im kindesalter. *Archiv fur Psychiatrie und Nervenkrankheiten, 117,* 76–136.

American Psychiatric Association. (1994). *Diagnostics and statistical manual of mental disorders* (4th ed., rev). Washington DC: Author.

Attwood, T. (1998). *Asperger's Syndrome: A guide parents and practitioners.* London: Jessica Kingsley

Ayres, A. J., & Tickle, L. (1980). Hyper-responsivity to touch and vestibular stimulation as a predictor of responsivity to sensory integrative procedures by autistic children. *Journal of Occupational Therapy, 34,* 375–381.

Bagnato, S. J., & Neisworth, J. T. (1999). Normative detection of early regulatory disorders and autism: Empirical confirmation of DC: 0–3. *Infants and Young Children, 12,* 98–106.

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

Dunn, W., Myles, B. S., & Orr, S. (2002). Sensory processing issues associated with Asperger Syndrome: A preliminary investigation. *The American Journal of Occupational Therapy, 56,* 97–102.

Dunn, W., Saiter, J., & Rinner, L. (2002). Asperger Syndrome and sensory processing: A conceptual model and guidance for intervention planning. *Focus on Autism and Other Developmental Disabilities, 17,* 172–185.

Ehlers, S., Nyden, A., Gillberg, C., Sandberg, A. D., Dahlgren, S., Hjelmquist, E., & Oden, A. (1997). Asperger Syndrome, autism and attention deficit disorders: A comparative study of cognitive profiles of 120 children. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 38,* 207–217.

Eisenmajer, R., Prior, M., Leekam, S., Wing, L., Gould, J., Welham, M., & Ong, B. (1996) Comparison of clinical symptoms in autism and Asperger's Disorder. *Journal of the American Academy of Children and Adolescent Psychiatry, 35,* 1523–1531.

Ermer, J., & Dunn, W. (1998). The Sensory Profile: A discriminant analysis of children with and with-

out disabilities. *American Journal of Occupational Therapy, 52,* 283–290.

Ghaziuddin, M. (2002). Asperger Syndrome: Associated psychiatric and medical conditions. *Focus on Autism and Other Developmental Disabilities, 17,* 145–151.

Ghaziuddin, M., Alessi, N., & Greden, J. F. (1995). Life events and depression in children with pervasive developmental disorders. *Journal of Autism and Developmental Disorders, 25,* 495–502.

Gilchrist, A., Green, J., Cox, A., Rutter, M., & Le Couteur, A. (2001). Development and current functioning in adolescents with Asperger Syndrome: Comparative study. *Journal of Child Psychology and Psychiatry, 42,* 227–240.

Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child, 2,* 217–250.

Kendall, P. C. (Ed.). (1999). Clinical significance [Special section]. *Journal of Consulting and Clinical Psychology, 67,* 283–339.

Kientz, M. A., & Dunn, W. (1997). A comparison of the performance of children with and without autism on the Sensory Profile. *American Journal of Occupational Therapy, 51,* 530–537.

Kim, J. A., Szatmari, P., Bryson, S. E., Streiner, D. L., & Wilson, F. J. (2000). The prevalence of anxiety and mood problems among children with autism and Asperger Syndrome. *Autism, 4,* 117–132.

Kurita, H. (1997). A comparative study of Asperger Syndrome with high-functioning atypical autism. *Autism: International Journal of Research and Practice, 2,* 11–32.

Myles, B. S., & Adreon, D. (2001*). Asperger Syndrome and adolescence: Practical solutions for school success.* Shawnee Mission, KS: Autism Asperger Publishing Company.

Myles, B. S., Cook, K. T., Miller, N. E., Rinner, L., & Robbins, L. (2000). *Asperger Syndrome and sensory issues: Practical solutions for making sense of the world.* Shawnee Mission, KS: Autism Asperger Publishing Company.

Myles, B. S., & Southwick, J. (1999). *Asperger Syndrome and difficult moments: Practical solutions for tantrums, rage, and meltdowns.* Shawnee Mission, KS: Autism Asperger Publishing Company.

Ozonoff, S., Rogers, S. J., & Pennington, B. F. (1991). Asperger's Syndrome: Evidence of an empirical distinction from high functioning autism. *Journal of Psychology and Psychiatry, 32,* 1107–1122.

Rinehart, N. J., Bradshaw, J. L., Moss, S. A., Brereton, A. V., & Tonge, B. J. (2001) A deficit in shifting attention present in high functioning autism but not Asperger's disorder. *Autism, 5,* 67–80.

Schopler, E., Reichler, R. F., Bashford, A., Lansing, M. D., & Marcus, L. M. (1990). *Individualized assessment and treatment for autistic and developmentally disabled children: Psychoeducational Profile-Revised: Volume I.* Austin, TX: Pro-Ed.

Stagnitti, K., Raison, P., & Ryan, P. (1999). Sensory defensiveness syndrome: A paediatric perspective and case study. *Australian Occupational Therapy Journal, 46,* 175–187.

Szatmari, P., Archer, L., Fisman, S., Streiner, D., & Wilson, F. (1995). Asperger's Syndrome and autism: Differences in behavior, cognition, and adaptive functioning. Journal of the American *Academy of Child and Adolescent Psychiatry, 34,* 1662–1670.

Szatmari, P., Tuff, L., Finlayson, M. A. J., & Bartolucci, G. (1990). Asperger's Syndrome and autism: Neurocognitive aspects. *Journal of the American Academy of Child and Adolescent Psychiatry, 29,* 130–136.

Tonge, B. J., Brereton, A. V., Gray, K. M., & Einfeld, S. L. (1999). Behavioural and emotional disturbance in high-functioning autism and Asperger Syndrome. *Autism, 3,* 117–130

Willey, L. H. (1999). *Pretending to be normal: Living with Asperger Syndrome.* London: Jessica Kingsley.

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