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The Oral and Written Language Scales: Is it useful for older children with autism spectrum disorder?

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Abstract

Communication impairment is a defining feature of autism spectrum disorders (ASD). Little research attention has been devoted to establishing standardized methods for defining and identifying language impairment in children with known or suspected ASD. The present study examines the feasibility and utility of the Oral and Written Language Scales (OWLS) among 70 children with ASD and matched controls (aged 6–21 years). More than 87% of children with ASD were able to complete the OWLS and achieve a true basal score. Scores on the OWLS differentiated children with ASD from their typically developing peers and non-ASD children matched on nonverbal cognitive functioning. Findings suggest that the OWLS is a feasible measure for the large majority of older children with ASD and useful in identifying a variety of language impairments. Findings have implications for standardizing ASD evaluations and achieving greater diagnostic consistency.

Keywords: Autism spectrum disorder; Language; Diagnosis; Oral and Written Language Scales

Communication impairment is a defining feature of autism spectrum disorders (ASD) along with limitations in social relatedness and interaction and unusual, repetitive or restricted interests and activities (American Psychiatric Association, 2000; World Health Organization, 1992). Deficits in communication common to ASD include lack of or delays in spoken language, limited comprehension of verbal and nonverbal language, difficulty initiating and maintaining conversations, and repetitive or stereotyped language (Lord & Paul, 1997; Tager-Flusberg, 2001; Tager-Flusberg, Paul, & Lord, 2005). Little research attention has been devoted to

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establishing standardized methods for defining and identifying this impairment in children with known or suspected ASD. The present study examines the feasibility and utility of the Oral and Written Language Scales (OWLS; Carrow-Woolfolk, 1995) among older children with ASD.

Deficits in verbal language are a well-recognized feature of ASD (e.g., Noens & van Berckelaer-Onnes, 2005; Tager-Flusberg, 2001; Tager-Flusberg et al., 2005; Wilkinson, 1998). Practice parameters set forth by several different organizations call for the inclusion of formal measures of language, along with parent report and informal observations, in the diagnostic evaluation of ASD to document linguistic skill deficits (American Academy of Child and Adolescent Psychiatry, 1999; Cure Autism Now Foundation Consensus Group, 1998). Efforts to document impairment in verbal language are of particular importance given that recent epidemiological studies suggest that the number of children with ASD that use spoken language has risen to between 70 and 80% (e.g., Eaves & Ho, 1996; Lord & Bailey, 2002; Turner, Stone, Pozodol, & Coondrod, 2006). Despite the increasing need to evaluate and better understand the verbal skills of children with ASD, few studies have systematically examined the feasibility and diagnostic utility of standardized language measures among children with ASD. Children with ASD evidence extreme variability in type and severity of language impairment (e.g., Howlin, 1999; Kjelgaard & Tager-Flusberg, 2001; Lord & Paul, 1997). Evidence is mounting that there are likely to be subgroups of children with ASD with unique language profiles, ranging from children with widespread delays in phonological skills, vocabulary, syntax and morphology, to children with sophisticated linguistic abilities but poor pragmatic use of language (Tager-Flusberg, 2001; Tager-Flusberg & Joseph, 2003; Tager-Flusberg et al., 2005). Moreover, children with ASD present unique behavioral challenges that make testing difficult (Akshoomoff, 2006; Koegel, Koegel, & Smith, 1997; Korkman, Kirk, & Kemp, 1998). In order to be appropriate for the diagnostic process, language measures must be able to capture this broad range of impairment and ability level in a format that is palatable to children with ASD.

Standardized language tools developed for the general population may document communication deficits required in the diagnosis of ASD. A small body of research demonstrates that many standardized language measures can capture verbal language impairments in children with ASD. Using the Clinical Evaluation of Language Fundamentals (CELF; Semel, Wiig, & Secord, 1995; Wiig, Secord, & Semel, 1992), children with autism scored approximately 1 standard deviation below the mean compared to their peers in the general population in several expressive and receptive language areas (Condouris, Meyer, & Tager-Flusberg, 2003). On the Peabody Picture Vocabulary Test, Third Edition (PPVT-3; Dunn & Dunn, 1997) and Expressive Vocabulary Test (EVT; Williams, 1997) children with ASD had significantly lower vocabulary skills than typically developing peers matched for verbal and nonverbal intelligence scores (Joseph, McGrath, & Tager-Flusberg, 2005). Similarly, a study examining the pragmatic language abilities of children with autism using the Tests of Pragmatic Language (TOPL; Phelps-Teraski & Phelps-Gunn, 1992), reported that children with autism scored approximately 1.5 standard deviations below that of a normal control group (Young, Diehl, Morris, Hyman, & Bennetto, 2005). These previously studied language measures however each only assess a restricted set of skills, such as vocabulary and grammar (PPVT-3 and EVT), pragmatic skills (TOPL), or receptive and expressive language but not pragmatic ability (CELF). A comprehensive test of language is needed in the diagnostic evaluation process to capture the great heterogeneity in verbal communication deficits within an ASD population.

In selecting standardized language measures for inclusion in the diagnostic evaluation process for ASD, it is also necessary to consider feasibility of administration in an ASD population. Concern has been raised that many challenging behaviors, such as difficulties with social

interaction, inattention, and disruptive behavior, common in children with ASD, make administration of formal language measures difficult (Akshoomoff, 2006; Koegel et al., 1997; Koegel & Mentis, 1985). Studies indicate that a significant percentage of children with ASD are unable to complete many standardized language measures. In one study, almost 50% of children with ASD were unable to complete the CELF or CELF-III and Repetition of Nonsense Words, a subtest from the NEPSY (Korkman et al., 1998). These measures involve complex tasks and a lengthy administration time. Language measures with a shorter administration time and arguably simpler tasks report better response rates. Only 9.1–11.3% of children with ASD were found to be unable to complete or achieve a score above a basal level on one or more of the following measures: Goldman–Fristoe Test of Articulation (Goldman & Fristoe, 1986), PPVT-3 and EVT (Kjelgaard & Tager-Flusberg, 2001).

The OWLS has several qualities that suggest it may be both a feasible and comprehensive measure in the diagnostic evaluation process for ASD. The OWLS is a test that measures understanding and use of language in a broad way. Items are presented that not only test meaning of a variety of word types and word combinations, but also measure meaning derived from word order, elaborated sentences, and negation. Test items also measure situational inferencing, non-literal and sarcastic language, and pragmatic language (the ability to use language effectively in social contexts, such as discourse roles and types of discourse, including lecture versus a conversation), which are of primary concern in at least a subgroup of children with ASD (Lord & Paul, 1997; Tager-Flusberg, 1981, 2000). Language measures for widespread use in a diagnostic setting must include pragmatic skills in addition to more general linguistic abilities. Moreover, the OWLS is designed to capture a wide range of ability levels and ages (3–21 years) and thus may provide a good fit to the diverse abilities of older children with ASD. The OWLS has relatively simple tasks with no manipulables to allow for an easy administration to children with behavioral challenges. The stimulus materials are black and white, which may help children with ASD remain focused on the testing questions without getting distracted by colorful or visually appealing aspects of pictures. These qualities may make it a feasible, comprehensive language-screening tool for the diagnostic evaluation process.

The present study examined the feasibility and utility of the OWLS in 70 older children with ASD aged 6–21 years by comparing scores to the norms reported for the general population and scores of children without ASD matched on nonverbal cognitive functioning. Establishing feasible and valid measures for identifying language impairment in children with ASD has implications for enhancing the diagnostic process. Valid measures of language impairment are needed to standardize ASD evaluations and subsequently achieve greater diagnostic consistency.

1. Methodology

1.1. Participants

Seventy children with ASD aged 6–21 years (M = 9.85 years, S.D. = 3.16 years) participated in the study. Fifty-six children were male and 14 children were female. Ethnicity data were collected on 36 of the children (51.4%), of which 32 (88.89%) were Caucasian, 1 (2.78%) was African-American, 1 (2.8%) was Hispanic, and 2 (5.56%) were Asian/Pacific Islander. Children were referred to an autism clinic in the northwest region of the United States by their primary medical care provider. Children completed a battery of assessments including: standardized test of cognitive functioning (20 children received the Wechsler Intelligence Scale for Children, Fourth Edition (Wechsler, 2003), 21 children received the Stanford-Binet Intelligence Scales,

Table 1
Number and percentage of children with autism spectrum disorder ($N = 70$) who were administered and received valid scores on the Oral and Written Language Scales

	Number	Percentage
Administered	64	91.43%
Completed and valid scores	61	87.14%
Completed but not valid scores	3	4.29%
Not administered/not completed	6	8.57%
Not completed because of behavioral challenges	1	1.43%
Not administered because language judged to be too low	4	5.71%
Not administered because blind	1	1.43%

Fifth Edition (Roid, 2003), 9 children received the Wechsler Preschool and Primary Scale of Intelligence, Third Edition (Wechsler, 2002), 7 children received the Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999) and 13 children were not administered a cognitive test due to recent testing elsewhere), Autism Diagnostic Observation Schedule (ADOS-G; Lord et al., 2000), OWLS, and an assortment of fine and gross motor measures. Caregivers completed the Vineland Adaptive Behavior Scales, Parent/Caregiver Rating Form ($N = 38$; Sparrow, Cicchetti, & Balla, 2005) or Adaptive Behavior Assessment System, Second Edition ($N = 26$; Harrison & Oakland, 2003) and were interviewed regarding DSM-IV-TR criteria for Autistic Disorder. Of the 70 children with ASD, 44 received an ADOS-G Social and Communication score 'at cutoff for autism' or 'above cutoff for autism' and an exiting diagnosis of Autistic Disorder. Twenty-six children received an ADOS-G Social and Communication score 'at cutoff for an autism spectrum disorder' or 'above cutoff for autism spectrum disorder' and an exiting diagnosis of Pervasive Developmental Disorder Not Otherwise Specified. Children with an exiting diagnosis of Asperger's Disorder were not included in the present study given that general language delays are not present in this diagnosis.

A control group of children without ASD matched on Nonverbal/Performance IQ scores served as a comparison group. These children were recruited through the same autism clinic but received an ADOS-G Social and Communication score of 'below the cutoff for autism spectrum disorder' and did not have an exiting diagnosis of an ASD. Table 1 displays the subject characteristics of children with ASD and the matched control group.

1.2. Measures

The OWLS is a standardized language measure for use with children age 3 through 21 years. The developers of the OWLS included test items designed to assess a child's understanding and use of four structural categories including lexical (word meanings), syntactic (grammar), pragmatic (social use), and supralinguistic (non-literal and idiomatic expression). These categories combine to yield a Listening Comprehension Scale and Oral Expression Scale, which sum to provide the Oral Composite score. These scores have a mean of 100 and standard deviation of 15. Standardization of the OWLS was based on item analyses from 1795 children and adults selected to match the U.S. Census data in terms of geographic region, socioeconomic status, gender, and ethnicity. The OWLS has been shown to have adequate reliability and validity. Test–retest reliability across 20–165 days ranged from .73 to .86 for scale scores and from .81 to .89 for the Composite score. Inter-rater reliability for the Oral Expression Scale items for various age groups ranged from .90 to .99. Internal Reliability of the Comprehension and Oral Expression Scales ranged from .76 to .90 and were above .86 for the Composite score. Construct

validity was also satisfactory, in that the OWLS Scale raw score, increased, as predicted, with age and there were moderately correlated with each other. Finally, the OWLS manual reports good criterion validity (Carrow-Woolfolk, 1995); the OWLS positively correlated with the Test for Auditory Comprehension of Language-Revised (Carrow-Woolfolk, 1985), PPVT-R (Dunn & Dunn, 1981), and CELF-R (Semel, Wigg, & Secord, 1987).

The ADOS-G is a semi-structured, standardized, play-based assessment measure designed to elicit autistic behaviors that are then coded and entered into a diagnostic algorithm. The ADOS-G is divided into four separate modules, based on expressive language ability, and in order to reduce possible biasing effects of differences in language skills (Lord et al., 2000). Eight children were administered module 1, 21 children were administered module 2, 33 children were administered module 3, and 8 children were administered module 4. Scoring of the ADOS-G occurs immediately after administration and utilizes algorithms created by summing the items with the highest inter-rater reliabilities that discriminated individuals with Autism, ASD, and non-spectrum in the standardization sample (Lord et al., 2000). Items used in the algorithms are divided into four areas: Communication, Social Interaction, Play/Creativity, and Restricted/Repetitive Behaviors or Interests. Cutoff scores in the domains of Communication, Social Interaction, and Combined (Communication + Social Interaction), allow an individual to be placed in a(n) Autism, ASD, or Non-spectrum category. The authors report good to excellent reliability of the items, domains, and classification categories and satisfactory ability to differentiate children with autism from non-spectrum individuals (Lord et al., 2000).

The ABAS-II is a caregiver rating of adaptive skills through 10 skill areas. The Communication Skill Area addresses verbal and nonverbal communication. The ABAS-II has been shown to have high internal consistency (reliability coefficients ranging from .97 to .99), and test–retest reliability (reliability coefficients ranging from .86 to .99) across six standardization samples. The ABAS-II has also been found to have good validity; the ABAS-II scores were correlated with the VABS Composite ($r = .70$ to .84) and the Wechsler Adult Intelligence Scale-3rd Edition scales ($r = .50$ to .72) in the expected directions (Harrison & Oakland, 2003). The VABS-II is also a caregiver rating of adaptive skills. The VABS-II assesses three domains of adaptive behavior (Communication, Daily Living skills, Socialization), which combine to form the Adaptive Behavior Composite score. The Communication domain assesses receptive, expressive, and written skills. The VABS-II has satisfactory reliability and validity; spit half reliability for domains ranging from .83 to .90 and is correlated with the Wechsler Intelligence Scale for Children-4th Edition, in the expected direction (Sparrow et al., 2005).

1.3. Procedure

All standardized instruments were individually administered by licensed professionals as part of a comprehensive diagnostic evaluation. The ADOS-G was administered and scored by a pair of professionals, at least one of which had reached clinical reliability standards. Data from each participant's diagnostic evaluation was entered into a de-identified database following approval from the University's Institutional Review Board. Scores from the OWLS, ADOS-G, Vineland, and standardized intelligence tests were used for analyses using SPSS version 14.0.

2. Results

Of the 70 children with ASD involved in the study, 64 (91.43%) were administered and completed the OWLS. The OWLS was attempted but not completed due to behavioral challenges

for 1 child with ASD (1.43%). The language ability of 4 children (5.71%) with ASD was judged to be too low to understand instructions on the OWLS and the measure was not administered. One child with ASD (1.43%) was blind and the OWLS, which utilizes visual stimuli, was not administered because of this disability. Of the 64 children with ASD for whom the OWLS was administered and completed, a true basal (i.e., 7 items correct in a row) for the Oral Expression and/or Listening Comprehension scale was not reached for 3 children (4.69%). Thus, in all, 87.14% of children with ASD were administered the OWLS and received valid OWLS scores.

The association between the OWLS and ADOS-G Communication Total score, which is a more ecologically valid measure of language in quasi-social settings, was assessed. There was a significant correlation in the expected direction between the OWLS Composite score and the ADOS-G Communication Total score ($r = -.27$, $p = .03$). Correlations were also assessed between the OWLS and communication scores on the VABS-II and ABAS, also more indicative of language in everyday life. There was a positive correlation between the OWLS Composite score and the VABS-II Communication Domain score ($r = .66$, $p < .01$). There was a positive correlation between the OWLS Composite score and the ABAS subtest score that approached significance ($r = .33$, $p = .07$). In addition, there was a significant positive correlation between OWLS Composite score and Nonverbal/Performance IQ scores ($r = .45$, $p < .01$).

An independent samples *t*-test was conducted to examine OWLS scores in children with Autistic Disorder (i.e., ADOS-G score at or above cutoff for autism and exciting diagnosis of Autistic Disorder) and children with Pervasive Developmental Disorder Not Otherwise Specified (i.e., ADOS-G score at or above cutoff for autism spectrum disorder and exciting diagnosis of Pervasive Developmental Disorder Not Otherwise Specified). There was not a significant difference in the Listening Comprehension scores between children with Autistic Disorder ($M = 78.25$, S.D. = 17.79) and children with Pervasive Developmental Disorder Not Otherwise Specified ($M = 83.88$, S.D. = 25.81), $t\ (59) = -1.03$, $p = .31$. There was not a significant difference in Oral Expression scores between children with Autistic Disorder ($M = 79.00$, S.D. = 20.63) and Pervasive Developmental Disorder Not Otherwise Specified ($M = 85.24$, S.D. = 26.35), $t\ (59) = -1.04$, $p = .30$. Correspondently, there was not a significant difference in Composite scores between children with Autistic Disorder ($M = 77.49$, S.D. = 18.96) and

Table 2
Subject characteristics of children with autism spectrum disorder (ASD) and matched comparison group of non-autism spectrum disorder children (non-ASD)

	ASD, $N = 53$	Non-ASD, $N = 53$
Age (years)	9.78 (3.19)	9.17 (2.47)
Sex		
Male	43	39
Female	11	15
Ethnicity		
Caucasian	24	14
Hispanic	1	1
African-American	1	2
Asian/Pacific Islander	1	0
Other	0	19
Nonverbal/Performance IQ	86.88 (22.40)	89.39 (20.68)

Note. Subject characteristics reflect the 53 children with valid Orals and Written Language Scale scores and cognitive testing.

Table 3
Mean and standard deviation in parentheses of Oral and Written Language Scale scores for children with autism spectrum disorder (ASD) and matched comparison group of non-autism spectrum disorder children (non-ASD)

	ASD, $N = 53$	Non-ASD, $N = 53$
Listening Comprehension**	81.58 (20.72)	91.19 (19.44)
Oral Expression*	83.06 (23.13)	89.79 (19.33)
Composite*	82.12 (20.07)	90.21 (19.01)

Note. Paired samples *t*-test indicate that non-ASD group is significantly higher at $^{*}p < .05$ or $^{**}p < .01$.

children with Pervasive Developmental Disorder Not Otherwise Specified ($M = 83.76$, S.D. = 26.90), $t\ (59) = -1.06$, $p = .29$.

Table 2 displays the participant characteristics of the 53 children with ASD who had valid IQ and OWLS scores and the non-ASD matched comparison group. Table 3 presents the means and standard deviations of OWLS scores for children with ASD who had valid IQ scores and OWLS scores and the matched control group. Paired sample *t*-tests were conducted to examine potential differences in OWLS scores between the children with ASD and the matched comparison group. Children with ASD had significantly lower Listening Comprehension scores than the matched control group ($t\ (52) = -4.38$, $p < .01$). Children with ASD also had significantly lower Oral Expression scores than the matched comparison group ($t\ (52) = -2.34$, $p = .02$).

In the ASD group, paired samples *t*-tests indicated that Nonverbal/Performance IQ was significantly higher than OWLS Listening Comprehension ($t\ (52) = 2.02$, $p = .05$). Nonverbal/Performance IQ was also significantly higher than OWLS Oral Expression ($t\ (52) = 2.28$, $p = .03$). Nonverbal/Performance IQ scores were $\geq$1 standard deviation (15 points) higher than either the OWLS Listening Comprehension or Oral Expression score for 22 (42.31%) of children with ASD. In the matched comparison group, there was not a significant difference between Nonverbal/Performance IQ and OWLS Listening Comprehension scores ($t\ (52) = -1.83$, $p = .07$). There was also not a significant difference between Nonverbal/Performance IQ and OWLS Oral Expression scores ($t\ (52) = -0.76$, $p = .45$).

3. Discussion

Communication impairments are a defining feature of ASD and have long been described in research (Tager-Flusberg, 2001; Tager-Flusberg et al., 2005; Wilkinson, 1998). In the past decade practice parameters for diagnosing ASD have included formal language measures to capture a history of language delay as well as current language deficits (American Academy of Child and Adolescent Psychiatry, 1999; Cure Autism Now Foundation Consensus Group, 1998). Despite the existence of these practice parameters, little research attention has been devoted to identifying feasible and valid measures to document verbal language deficits in the diagnostic evaluation process. Children with ASD exhibit a wide range of type and severity of language impairments and present numerous challenging behaviors that can hinder the administration of standardized assessments (Korkannon et al., 1998; Tager-Flusberg & Joseph, 2003; Tager-Flusberg et al., 2005). Language measures suitable for the ASD diagnostic process must therefore assess a comprehensive array of language skills, span a broad range of ability levels, and use a quick and easy administration procedure. The present study suggests that the OWLS has these qualities and is a useful component for the diagnostic evaluation process. Establishing feasible and valid measures for identifying language impairment in children with ASD is the first step toward achieving greater diagnostic consistency in ASD.

Of the 70 children with ASD in the present study, 91.43% were administered and able to complete the OWLS. However, three of the children who were administered and completed the OWLS did not achieve a true basal; thus their standard score on this measure may not truly reflect their language abilities. Overall, the OWLS was unable to validly document the language ability of only 12.76% of children with ASD sampled. This percentage is much lower than that reported for broad language measures (i.e., CELF) and comparable to that reported for more simple and straightforward language tools (Joseph et al., 2005; Kjelgaard & Tager-Flusberg, 2001; Young et al., 2005). Our results suggest that the OWLS is a comprehensive language measure that can be completed by the large majority of children with ASD.

A small but significant number of children with ASD ($N = 7$) were judged to have verbal language too low for the OWLS or did not reach a true basal on the OWLS. This finding is not unexpected given that researchers suggests that approximately 20–30% of children with ASD do not acquire functional speech (e.g., Eaves & Ho, 1996; Lord & Bailey, 2002; Turner et al., 2006). Verbal language measures, of any sort, are likely to be inappropriate for a subgroup of children with ASD. Past reports indicate that difficulties with inattention, lack of motivation, social aversion, and noncompliance often pose obstacles to the administration of standardized testing in children with ASD (e.g., Akshoomoff, 2006; Koegel et al., 1997). Behavioral challenges hindered the administration of the OWLS for only one child in the present study. The straightforward administration, lack of manipulables, and simple stimulus materials appear to make the OWLS aptly suited for older children with ASD. Further research is needed to investigate whether modifications to administration procedures such as the incorporation of different stimulus materials or more hands on tasks can reduce behavioral challenges even further. Alternatively, the potential for individualized systems of reinforcement for children with ASD in standardized testing situations (to account for insensitivities to the typical use of social praise) has been suggested by others (Koegel et al., 1997) and may further enhance the suitability of standardized language measures for this population.

In addition to being a feasible measure, the present study suggests that the OWLS is a useful measure for inclusion in the diagnostic evaluation process. Scores on the OWLS differed for children with ASD compared to the norms for their typically developing peers in the general population ($M = 100$, S.D. = 15). As a group, children with ASD had an OWLS Listening Comprehension, Oral Expression, and Composite score of 1.13–1.23 standard deviations below the mean for their same-aged typically developing peers. This finding is consistent with past reports, which also indicate a discrepancy of 1–1.5 standard deviations in language functioning between children with ASD and typically developing children (Condouris et al., 2003; Young et al., 2005). Moreover, in the present study children with ASD had significantly lower OWLS scores than non-ASD children matched on nonverbal/performance cognitive functioning. Thus, the OWLS is sensitive to impairments in language, even after accounting for cognitive functioning and may be useful in detecting the diverse array of language impairments seen in children with ASD. Receptive and expressive language scores on the OWLS were significantly lower than nonverbal cognitive functioning for children with ASD. In contrast, there was not a significant difference between OWLS scores and nonverbal cognitive functioning for the matched non-ASD comparison group. This finding also suggests that the OWLS can be used to successfully identify language deficits, independent of general cognitive functioning in an ASD population.

The OWLS can be positively compared to other measures of language ability commercially available and often used in clinical diagnostic settings. It provides more comprehensive and detailed information about language skills when compared to a vocabulary test such as the PPVT

or EVT. In addition, the OWLS takes less time to administer (approximately 10–40 min) than other comprehensive language measures, which is likely why only 1 child in the present study were unable to complete the OWLS due to behavioral difficulties. The OWLS also spans a greater age range than many other language measures, thus making it useful for research, when a single instrument is preferred over a number of instruments, as well as for documenting an individual's progress over time. In summary, the present findings suggest that the OWLS is sensitive to language impairments within various ASD subgroups, including both general linguistic abilities as well as pragmatic use of language, and thus offers a feasible and meaningful tool for the diagnostic evaluation process.

Limitations of the present study include the use of data collected as part of a clinical, diagnostic evaluation rather than data collected as part of a research project. First, the OWLS was administered by a variety of speech language pathologists based on clinic assignment and availability, which may increase variability in testing conditions. However, by collecting data in a clinical setting, the generalizability of results to other clinical settings, where diagnoses often occur, increases. Second, children with ASD may have communication deficits, such as understanding and using nonverbal communication, difficulties with pretend play, or stereotyped speech, which are not captured through the OWLS. Moreover, the OWLS, as well as other standardized language measures, assess language through structured tasks, which enhances consistency across participants but may be insensitive to more subtle language deficits in actual social interactions. Further research is needed to identify additional measures of language to detect other forms of language impairment as well as language deficits in a more ecologically valid manner. Third, as with most research in the area of ASD, results are limited by the relatively small sample size, the geographic region from which the sample was drawn, and limited ethnic diversity of the sample. Results should be replicated with a larger, more diverse, sample size.

References

Akshoomoff, N. (2006). Use of the Mullen Scales of Early Learning for the Assessment of Young Children with Autism Spectrum Disorder. *Child Neuropsychology, 12*, 269–277.

American Academy of Child and Adolescent Psychiatry. (1999). Practice parameters for the assessment and treatment of children, adolescents, and adults with autism and other pervasive developmental disorders. *Journal of American Academy of Child and Adolescent Psychiatry, 38*, 35S–54S.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: American Psychiatric Association Press.

Carrow-Woolfolk, E. (1985). *Test for Auditory Comprehension of Language: Examiner's manual* (Revised ed.). Allen, TX: DLM Teaching Resources.

Carrow-Woolfolk, E. (1995). *Oral and Written Language Scales*. Bloomington, MN: Pearson Assessment.

Condouris, K., Meyer, E., & Tager-Flusberg, H. (2003). The relationship between standardized measures of language and measures of spontaneous speech in children with autism. *American Journal of Speech Language Pathology, 12*, 349–358.

Cure Autism Now Foundation Consensus Group. (1998). Autism screening and diagnostic evaluation: CAN consensus statement. *CNS Spectrums Journal, 3*, 1–4.

Dunn, L. M., & Dunn, L. (1981). *Manual for the Peabody Picture Vocabulary Test-Revised*. Circle Pines, MN: American Guidance Service.

Dunn, L. M., & Dunn, L. M. (1997). *Peabody Picture Vocabulary Test* (3rd ed.). Circle Pines, MN: American Guidance Service.

Eaves, L. C., & Ho, H. H. (1996). Brief Report: Stability and change in cognitive and behavioral characteristics of autism through childhood. *Journal of Autism and Developmental Disorders, 26*, 557–569.

Goldman, R., & Fristoe, M. (1986). *Goldman–Fristoe Test of Articulation*. Circle Pines, MN: American Guidance Service.

Harrison, P. L., & Oakland, T. (2003). *Adaptive Behavior Assessment System* (2nd ed.). San Antonio, TX: Harcourt Assessment, Inc.

Howlin, P. (1999). *Children autism and Asperger syndrome. A guide for practitioners and carers*. Chichester, UK: Wiley.
Joseph, R., McGrath, L., & Tager-Flusberg, H. (2005). Executive dysfunction and its relation to language ability in verbal school-Age children with autism. *Developmental Neuropsychology, 27*, 361–378.
Kjelgaard, M., & Tager-Flusberg, H. (2001). An investigation of language impairment in autism: Implications for genetic subgroups. *Language and Cognitive Processes, 16*, 287–308.
Koegel, L. K., Koegel, R. L., & Smith, A. (1997). Variables related to differences in standardized test outcomes for children with autism. *Journal of Autism and Developmental Disorders, 27*, 233–243.
Koegel, R. L., & Mentis, M. (1985). Motivation in childhood autism: Can they or won't they? *Journal of Child Psychology and Psychiatry, 26*, 185–191.
Korkman, M., Kirk, U., & Kemp, S. (1998). *NEPSY: A developmental neuropsychological assessment*. San Antonio: The Psychological Corporation, Harcourt Brace & Co.
Lord, C., & Bailey, A. (2002). Autism spectrum disorders. In M. Rutter & E. Taylor (Eds.), *Child and adolescent psychiatry* (4th ed., pp. 636–663). Oxford, UK: Blackwell.
Lord, C., & Paul, R. (1997). Language and communication in autism. In D. J. Cohen & F. R. Volkmar (Eds.), *Handbook of autism and pervasive developmental disorders* (2nd ed., pp. 195–225). New York: John Wiley & Sons.
Lord, C., Risi, S., Lambrecht, L., Cook, E. H., Leventhal, B. L., DiLavore, P. C., et al. (2000). The Autism Diagnostic Observation Schedule-Generic: A standard measure of social and communication deficits associated with the spectrum of autism. *Journal of Autism and Developmental Disorders, 30*, 205–223.
Noens, I. L. J., & van Berckelaer-Onnes, I. A. (2005). Captured by details: Sense-making, language and communication in autism. *Journal of Communication Disorders, 38*, 123–141.
Phelps-Teraski, D., & Phelps-Gunn, T. (1992). *Test of Pragmatic Language*. Austin, Tx: Pro-Ed.
Roid, G. (2003). *Stanford-Binet Intelligence Scale* (5th ed.). Chicago: Riverside.
Semel, E., Wigg, E. H., & Secord, W. (1987). *Clinical Evaluation of Language Fundamentals–Revised*. San Antonio, Texas: Psychological Corporation.
Semel, E., Wiig, E. H., & Secord, W. A. (1995). *Clinical Evaluation of Language Fundamentals* (3rd ed.). San Antonio: The Psychological Corporation, Harcourt Brace & Co.
Sparrow, S. S., Cicchetti, D. V., & Balla, D. A. (2005). *Vineland Adaptive Behavior Scales* (2nd ed.). Circle Pines, MN: AGS Publishing.
Tager-Flusberg, H. (1981). On the nature of linguistic functioning in early infantile autism. *Journal of Autism and Developmental Disorders, 11*, 45–46.
Tager-Flusberg, H. (2000). Language and understanding minds: Connections in autism. In L. M. Tager-Flusberg & D. J. Cohen (Eds.), *Understanding other minds. Perspectives from developmental cognitive neuroscience* (2nd ed., pp. 124–149). Oxford, NY: University Press.
Tager-Flusberg, H. (2001). Understanding the language and communication impairments in autism. *International Review of Research in Mental Retardation, 23*, 185–205.
Tager-Flusberg, H., & Joseph, R. M. (2003). Identifying neurocognitive phenotypes in autism. *Philosophical Transactions of the Royal Society B: Biological Sciences, 358*, 303–314.
Tager-Flusberg, H., Paul, R., & Lord, C. (2005). Language and communication in autism. In F. R. Volkmer, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of autism and pervasive developmental disorders* (pp. 335–364). Hoboken, NJ: Wiley and Sons.
Turner, L. M., Stone, W. L., Pozodol, S. L., & Coondrod, E. E. (2006). Follow-up of children with autism spectrum disorder from age 2 to age 9. *Autism: The International Journal of Research and Practice, 10*, 243–250.
Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence*. San Antonio, TX: Harcourt Assessment.
Wechsler, D. (2002). *Wechsler Preschool and Primary Scale of Intelligence* (3rd ed.). San Antonio, TX: Harcourt Assessment.
Wechsler, D. (2003). *Wechsler Intelligence Scale for Children* (4th ed.). San Antonio, TX: Harcourt Assessment.
Wiig, E. H., Secord, W., & Semel, E. (1992). *Clinical Evaluation of Language Fundamentals-Preschool*. San Antonio: The Psychological Corporation, Harcourt Brace & Co.
Wilkinson, K. M. (1998). Profiles of language and communication skills in autism. *Mental Retardation and Developmental Disabilities, 4*, 73–79.
Williams, K. T. (1997). *Expressive Vocabulary Test*. Circle Pines, MN: American Guidance Service.
World Health Organization. (1992). *ICD-10 International statistical classification of diseases and related health problems*. Geneva: WHO.
Young, E., Diehl, J., Morris, D., Hyman, S., & Bennetto, L. (2005). The use of two language tests to identify pragmatic language problems in children with autism spectrum disorders. *Language, Speech, and Hearing Services in Schools, 36*, 62–72.