Defining Spoken Language Benchmarks and Selecting Measures of Expressive Language Development for Young Children With Autism Spectrum Disorders

Helen Tager-Flusberg,
Boston University School of Medicine, Boston, MA

Sally Rogers,
University of California, Davis/Medical Investigation of Neurodevelopmental Disorders (MIND) Institute, Sacramento, CA

Judith Cooper,
National Institute on Deafness and Other Communication Disorders, Bethesda, MD

Rebecca Landa,
Kennedy Krieger Institute, Johns Hopkins School of Medicine, Baltimore, MD

Catherine Lord,
University of Michigan, Ann Arbor

Rhea Paul,
Yale Child Study Center, New Haven, CT

Mabel Rice,
University of Kansas, Lawrence

Carol Stoel-Gammon,
University of Washington, Seattle, WA

Amy Wetherby, and
Florida State University, Tallahassee

Paul Yoder
Vanderbilt University, Nashville, TN

Abstract

Purpose—The aims of this article are twofold: (a) to offer a set of recommended measures that can be used for evaluating the efficacy of interventions that target spoken language acquisition as part of treatment research studies or for use in applied settings and (b) to propose and define a common terminology for describing levels of spoken language ability in the expressive modality and to set benchmarks for determining a child's language level in order to establish a framework for comparing outcomes across intervention studies.

Method—The National Institute on Deafness and Other Communication Disorders assembled a group of researchers with interests and experience in the study of language development and disorders in young children with autism spectrum disorders. The group worked for 18 months through a series

Contact author: Helen Tager-Flusberg, Department of Anatomy and Neurobiology, Boston University School of Medicine, 715 Albany Street L-814, Boston, MA 02118. htagerf@bu.edu.

of conference calls and correspondence, culminating in a meeting held in December 2007 to achieve consensus on these aims.

Results—The authors recommend moving away from using the term *functional speech*, replacing it with a developmental framework. Rather, they recommend multiple sources of information to define language phases, including natural language samples, parent report, and standardized measures. They also provide guidelines and objective criteria for defining children's spoken language expression in three major phases that correspond to developmental levels between 12 and 48 months of age.

Keywords

autism; autism spectrum disorders; language acquisition

Autism is a neurodevelopmental disorder characterized by primary impairments in social interactions, communication, and repetitive and stereotyped behaviors (American Psychiatric Association, 2000). In addition, autism often results in significant disability, including intellectual deficits and language and adaptive behavior deficits, as well as problem behaviors. It is now recognized that classic autism is part of a spectrum of related disorders that includes pervasive developmental disorder, not otherwise specified (PDD-NOS), and Asperger syndrome; this set of diagnoses, collectively, is referred to here as *autism spectrum disorders* (ASDs). Outcomes for children with ASD represent a broad continuum, with only a small percentage achieving independence and full employment as adults (Howlin, Goode, Hutton, & Rutter, 2004). ASDs are no longer thought to be rare. Current reports indicate that 1 in every 150 children in the United States will receive an ASD diagnosis (Bertrand et al., 2001; Kuehn, 2007; Yeargin-Allsopp et al., 2003).

Children with ASD have long been known to respond to interventions that target specific skills and behaviors (National Research Council [NRC], 2001), and numerous studies have demonstrated the positive effects of early intervention on language development for the majority of children with ASD (Dawson & Osterling, 1997; Koegel & Koegel, 1988; Lovaas, 1987; Rogers, 2005; Rogers & Vismara, 2008), with some, though sparse, evidence of long-lasting benefit. The fact that language development can be positively affected by early treatment has tremendous potential significance, because the emergence of spoken language is one of the most important variables predicting better outcomes in later childhood and adulthood (Gillberg & Steffenburg, 1987; Howlin et al., 2004; Venter, Lord, & Schopler, 1992). Thus, given the role of language acquisition in shaping long-term outcomes, it has become important to identify the most successful strategies for facilitating language acquisition in young children with ASD, who uniformly demonstrate significant delays in at least some aspects of language and communicative development, especially in the domain of pragmatics (Tager-Flusberg, Paul, & Lord, 2005).

Although various intervention approaches teach and measure language acquisition in different ways, depending on the philosophy and underlying theory of the approach (see Rogers, 2005, for a review), consumers of this literature must be able to compare language outcomes from different treatment approaches. Despite the numerous published language outcome studies of early intervention in ASD (Rogers, 2005), it is not possible to compare language outcomes across reports, because of the lack of uniform measurement approaches to assessing language skills and the lack of uniform terminology for describing language outcomes in ASD. Many intervention programs for children with ASD aim to facilitate the development of functional speech. However, because there has never been consensus on the definition of *functional speech*, it is impossible to compare the longer term efficacy of different treatment programs. In this article, we offer an alternative framework for describing spoken language acquisition in children with ASD. The proposal described here replaces the arbitrary singular

categorical distinction encompassed by the terminology of functional speech with a framework that captures the continuous developmental processes that underlie language acquisition.

Goals

In December 2006, the National Institute on Deafness and Other Communication Disorders (NIDCD) assembled a group of experts in language disorders and language acquisition in young children with ASD to address these issues.[1] Over the next year, the group worked together through a series of conference calls and correspondence, with their efforts culminating in a meeting held in December 2007. This article summarizes the group's recommendations relating to our primary goal of providing benchmarks for defining the acquisition of spoken language in the expressive modality in young children with ASD.

The working group set the following two major objectives:

1. To develop a set of recommended measures that can be used for evaluating the efficacy of interventions that target spoken language acquisition as part of treatment research studies or for use in applied settings.[2]

2. To propose and define a common terminology for describing levels of spoken language ability and set benchmarks for determining a child's spoken language level in order to establish a framework for comparing outcomes across intervention studies.

As such, this article is addressed primarily to researchers; however, practitioners and other consumers are also relevant audiences. For researchers in early autism intervention who may come from a wide range of theoretical backgrounds and practices, our goal is to provide common terminology and a suggested approach to defining language abilities before, during, and after treatment. The varying measurement approaches used in language intervention research require different levels of financial and human resources and expertise. In addition, researchers have differing aims and hypotheses that may require specialized descriptions of language acquisition of their participants. Thus, we propose a measurement approach that may be applied in a "bare bones" fashion (e.g., relying on direct assessments and parent reports) as well as a more elaborated measurement system (e.g., adding in measures derived from natural language samples), covering the full range of language domains that could be included in treatment programs. By proposing these guidelines, we hope to move beyond the ambiguously defined treatment goal of functional speech to a more standardized approach, using common measures and common definitions that will allow comparison of outcomes across studies.

For practitioners, the proposed measures and benchmarks presented here provide a framework for describing the language progress of their clients during treatment. By providing a common framework, we hope to facilitate the assessment process for clinicians, allowing them to measure their clients' language gains in relation to the research literature. Thus, we aim to enhance the relationship between treatment research and clinical practice in the field of language intervention in ASD.

Our final target group of readers includes parents, early intervention professionals, and others who work to extract evidence of progress, be it research effectiveness or clinical efficacy, from clinical reports and research articles that use language measures to chart change in children

---

[1]The group was co-chaired by Helen Tager-Flusberg, Sally Rogers, and Judith Cooper (NIDCD). Members included Rebecca Landa, Catherine Lord, Rhea Paul, Mabel Rice, Carol Stoel-Gammon, Amy Wetherby, and Paul Yoder.

[2]We have limited our recommendations on measures and benchmarks to spoken language, although we recognize that many children with ASD who do not speak can successfully acquire some expressive language skills using augmentative or alternative communication (AAC) systems such as vocal output devices or manual signing. We have not included a detailed presentation of how our framework might apply to interventions that target AAC systems, as there are no clear guidelines available for how to measure nonspoken language skills that are comparable to those available for spoken language.

with ASD. Clearly defined benchmarks of speech and language development will aid families, early childhood educators, and others who turn to the language research literature to understand language growth in young children with ASD.

Some additional comments are in order. First, we focus here exclusively on the development of spoken language through the preschool years, omitting consideration of measures and benchmarks for defining preverbal communicative skills. Although the working group recognizes that sophisticated language skills take many forms, including both verbal and nonverbal means for effective communication, and that children with ASD continue to make important advances in language well into the school years, we selected these constraints because outcome studies are uniform in the predictive power of spoken language (i.e., speaking in sentences that serve a variety of functions; e.g., Paul & Cohen, 1984) by age 5 years for individuals with ASD (e.g., Howlin et al., 2004; Venter et al., 1992). Second, we limited our focus to the development of expressive language skills in children with ASD because most intervention studies target expressive language as the primary outcome and also because expressive language is more reliably assessed, especially in children with ASD (cf. Tager-Flusberg, 2000). Third, we have limited our recommendations for measures and benchmarks to English, in part because almost all current studies have focused on English-speaking children with ASD. We hope, however, that the overall framework and guidelines presented here can be readily translated into other languages with some modifications.

Recommendations for Measuring Expressive Language

In order to capture the spoken language and communicative abilities of young children with ASD and to avoid sampling effects, assessments in this domain should include measures derived from multiple sources. These sources should ideally include (a) natural language samples, (b) parent report, and (c) direct standardized assessment.

Natural Language Samples

Natural language samples (NLSs) that are collected in different communicative contexts provide excellent measures of a child's expressive language abilities, including phonological repertoire, lexical and grammatical knowledge, and pragmatic/communicative skills; the last (i.e., pragmatic/communicative skills) are especially difficult to measure using other types of assessment. An NLS may be collected during either experimenter/clinician–child or mother–child interactions. Contexts during which an NLS may be collected include the administration of the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000), the Communication and Symbolic Behavior Scales (CSBS; Wetherby & Prizant, 2002), the Early Social and Communication Scales (ESCS; Mundy et al. 1996; Siebert, Hogan, & Mundy, 1982), or equivalent contexts that include social communicative presses. The specific context should be determined based on the goals of the assessment. For example, if a primary outcome measure of a treatment program includes the functional use of specifically targeted forms, then adequate sampling of a range of different communicative contexts (e.g., contexts for requesting, protesting, sharing) would be needed.

Typically, natural language samples will be at least 30 min in length to provide adequate time and opportunity to sample a sufficient number and range of utterances. For children with ASD, one may need to concatenate several short language samples to obtain 30 min of language behavior. Following the collection of an NLS (see Miller & Chapman, 2000, for a discussion of methods), the data must be transcribed and coded to derive useful measures of the child's language. The particular level of transcription (e.g., phonetic, lexical, inclusion of adult language) will again depend on the specific focus of the assessment. Transcription and analyses can be supported by computer-based software, including the widely used Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2008), Child Language Data Exchange

System (CHILDES; MacWhinney, 2000), Lingquest (Mordecai & Palin, 1982), or
Computerized Profiling (Long & Fey, 2004).

Parent Report

Parent report measures, administered in questionnaire or interview format, can provide useful
information about a child's language skills that may not be observed in a laboratory or clinic
setting. The most widely used measure is the MacArthur-Bates Communicative Development
Inventory (MCDI; Fenson et al., 1993; 2007). The MCDI can be used to assess children's
expressive vocabulary and grammatical knowledge between the ages of 8 and 42 months.
Although there are concerns that some parents may over- or underreport their child's language
repertoire, parent report instruments have generally been shown to provide valid assessments
of young children's language as measured by evidence that early predictors of language also
predict MCDI productive raw scores in children with ASD (Charman et al., 2003; Luyster,
Qui, Lopez, & Lord, 2007). There is also evidence that MDCI scores are highly correlated with
other measures of language in children with autism (Luyster, Kadlec, Connolly, Carter, &
Tager-Flusberg, 2008).

Direct Assessment/Standardized Tests

Direct assessment of a child's language skills should be accomplished using standardized tests
that have good psychometric properties, with particular attention paid to the reliability and
validity of the measures that are derived from such tests for children with ASD. Standardized
tests can be used to assess expressive language skills in phonological, lexical, grammatical,
and pragmatic domains of language. We note, however, that few standardized assessment
instruments provide opportunities for assessing language skills aside from basic naming ability
in children younger than 24 months of age. In addition, most elicited production tests have
very few items during this early language period, which means that age equivalency or standard
scores can change dramatically with a difference of only one or two raw score points.

Imitation/Echolalia

Many children in the process of acquiring language use imitation and repetition of spoken
language, especially during the early stages, to serve some functional communicative goals.
Echolalia and stereotyped language, consisting of scripts heard in previous contexts repeated
in a noncommunicative way, are atypical imitation behaviors that are part of the symptom
pattern of ASD (Kanner, 1946; Prizant, 1983). During the early stages of language acquisition,
it may be difficult to discriminate typical from atypical verbal repetition in young children,
and there are no clear criteria for defining delayed echolalia (Prizant & Duchan, 1981).
Nevertheless, when characterizing the complexity of children's language, we recommend that
echolalic (and imitative) language be omitted from analyses, as well as from speech samples
used to classify children according to the benchmarks described later in this article.

Framework for Describing Spoken Language Acquisition in ASD

We take as our starting point a developmental approach in which we benchmark criteria for
the acquisition of spoken language and recommend measures for expressive language at
different development levels. For each level, we provide approximate age ranges, although
these ranges should be viewed as overlapping and not necessarily definitive. A developmental
perspective provides a conceptual framework to guide intervention and evaluation of children
with ASD, ensuring that researchers and clinicians strategically plan to target key language
milestones within language intervention programs for children with ASD. Within a
developmental framework, we identify five key phases of expressive language acquisition:

Phase 1: Preverbal Communication

Children in this phase communicate using preverbal intentional communication through vocal (babble) and gestural means. This phase generally covers the age range of 6–12 months in typically developing children. As noted previously, we have not included measures or benchmarks for this developmental phase as it is outside the scope of our goals.

Phase 2: First Words

Children in this phase use nonimitated spontaneous single words referentially and symbolically to communicate about objects and events, including those outside the immediate context. At least some of their speech is intelligible and incorporates the most frequent consonant sounds heard in typical babble (Oller, 2000; Stoel-Gammon, 1998). Children in this phase use speech with a variety of people in different settings to serve several functions, including, but not limited to, labeling, requesting, and commenting on (directing joint attention to) some objects or activities. This phase generally covers the age range of 12–18 months in typically developing children.[3]

Phase 3: Word Combinations

Children in this phase have a vocabulary that is rapidly increasing in size and includes a variety of parts of speech (nouns, verbs, descriptors). They are able to combine words creatively to refer to objects and events. Two- and three-word combinations are used for several different communicative functions. This phase generally covers the age range of 18–30 months in typically developing children.

Phase 4: Sentences

Children in this phase combine words into clausal structures, or sentences, and use some morphological markers such as plurals, prepositions, and some verb endings. Their vocabulary is sufficiently large to serve their communicative needs in everyday situations. They communicate a wide range of functions in different settings with both familiar and unfamiliar people. The portion of this phase relevant for the proposed benchmarks defined here corresponds to typically developing children between the ages of 30–48 months.

Phase 5: Complex Language

By the end of the preschool years, typically developing children have large and rich vocabularies that they use to communicate a wide range of topics (including abstract or hypothetical ideas) using complex grammatical constructions (e.g., relative clauses, sentential complements, anaphora) in different discourse contexts (e.g., conversation, narrative). We do not include either measures or benchmarks for this developmental phase (excluding measures not designed for children below the age of 48 months), as our focus is primarily on younger children with ASD. (For further reading, see Hoff & Schatz, 2007; Menn & Bernstein Ratner, 2000.)

Language Benchmarks

Table 1 provides a summary of our proposed benchmarks that define the key developmental phases for spoken language expression (First Words, Word Combinations, Sentences) across the different domains of language, with examples of how each type of measure can be used to assess children's level of language use. As noted earlier, our objective in presenting this frame-

---

[3]Children with ASD will often have a very small spoken vocabulary used primarily to regulate others' behavior; however, unless the criteria for the definition of the First Words phase (as specified in Table 1) are met, they should be considered to be in the Preverbal Communication phase.

work of benchmarks in each language domain at different developmental phases is explicitly designed to move away from the commonly used term *functional speech* as the outcome goal for intervention studies.

The benchmarks presented in Table 1 can be used for multiple purposes: (a) to evaluate whether a child meets criteria for achieving the various language phases in the context of treatment research; (b) as measures to be incorporated into intervention studies; or (c) as a means for monitoring a child's progress in ongoing community treatment. Although we present our benchmarks in each of the developing phases of language, it is important to keep in mind that these phases are dynamic and overlapping periods that, in reality, have no clear boundaries.

Criteria for Defining a Child's Language Level

Some treatment studies include goals to advance a child's language to a particular level. For example, in studies that begin with very young or preverbal children (i.e., children who do not meet the criteria for being in the First Words phase), the goal might be to provide interventions that lead the child into becoming "verbal"— which might then be defined as the First Words level. Other studies might have a more flexible goal of advancing children to the next level within a prescribed treatment period, or to chart language gains based on continuous measures (e.g., number of different consonants, words, or communication functions). Across all intervention studies, criteria for defining each language phase will facilitate the comparison of different treatment studies that may have different designs or measures.

For each language phase, we defined the minimum criteria for evaluating a child's language level: In order for a child to be considered to be at a particular level of expressive language functioning, the child's measured language must meet at least one of the defined minimum benchmarks in every language domain that defines that phase. This stringent approach recognizes the comprehensive developmental approach to language acquisition in children with ASD that we have proposed, one which encompasses all aspects of language used to communicate effectively with others in everyday life.

Although each phase contains benchmarks for all language domains based on how language develops in typically developing children, we recognize that, particularly in children with ASD, there is likely to be asynchrony across different language domains (e.g., vocabulary development may be significantly more advanced than pragmatics). This will result in a mixed phase profile for many children. A child might meet minimum criteria for one phase in all domains and may also meet criteria for the more advanced level in one or two domains assessed. Researchers or clinicians may choose to describe a child's language separately for each language domain in place of the criteria defining the language phase.

First words

This phase represents the emergence of spoken language covering the age range of 12–18 months in typically developing children. The benchmarks targeting this phase are placed at the 15-month age-equivalent level. To conclude that a child has reached the First Words phase, he or she must meet the following criteria within each of the following domains:

- Phonology: Meets one of the two phonological criteria presented in Table 1 based on an NLS

- Vocabulary: Meets criterion for number of different words used on the NLS, or the age-equivalent criterion on a parent report measure, or the age-equivalent criterion on a direct assessment measure.

- Pragmatics: Meets criterion of a minimum of two communicative functions, including use of spoken language to comment.

Word combinations

The phase covers the age range of 18–30 months in typically developing children. The benchmarks targeting this phase are placed at the 24-month age-equivalent level. The following criteria define meeting the benchmarks for this phase:

- Phonology: Meets one of the four phonological criteria presented in Table 1 based on an NLS.

- Vocabulary: Meets criterion for number of different words used on the NLS or the age-equivalent criterion on a parent report measure, or the age-equivalent criterion on a direct assessment measure. The table lists one measure that focuses exclusively on vocabulary at this age range; in addition, a number of direct assessment tests—for example, the Mullen Scales for Early Learning (Mullen, 1995), the Reynell Developmental Language Scales (Reynell & Gruber, 1990), and the Preschool Language Scale–4 (Zimmerman, Steiner, & Pond, 2002)—all provide measures of expressive language that combine vocabulary and word combination/grammar items. These measures may be used as an alternative to cover the vocabulary and grammar domains for this phase.

- Grammar: Meets the criteria on the NLS, parent report, or direct assessment measures (see previous bullet) listed.

- Pragmatics: Meets criterion for one of the three measures based on the NLS or the age-equivalent score on a parent report measure.

Sentences

This phase covers the broad age range from 30 to 48 months in typically developing children. The benchmarks are targeted to the 36-month age-equivalent level. The following criteria need to be met for this phase:

- Phonology: Meets criterion of 75% intelligible in an NLS, or a 36-month level on a direct assessment measure.

- Vocabulary: Meets criterion for number of different words used on the NLS or the age-equivalent criterion on a direct assessment measure.

- Grammar: Meets criterion for a 36-month age-equivalent score on a direct assessment measure or the mean length of utterance (MLU) criterion on an NLS. By this phase, it is strongly preferred that the NLS include a minimum of 100 spontaneous (nonimitative/echolalic) child utterances, to obtain a more reliable MLU estimate.

- Pragmatics: Meets criterion based on an elicited narrative, or the criterion for a conversational NLS, or a 36-month age-equivalent on parent report or direct assessment measures.

Conclusions

This report represents the consensus of our working group based on discussions carried out over the course of 18 months. We offer here the following summary and conclusions.

We recommend a move away from using the term *functional speech* as a goal for intervention research and practice, replacing it with a developmental framework. We recognize that the impetus for the use of the term came from studies suggesting that achieving functional speech

by age 5 years is an important prognostic indicator in children with ASD. Nevertheless, it is not clear from the literature what definitions earlier studies relied on, though the descriptions in these studies suggest that children with optimal outcomes were able to speak in full sentences serving a range of communicative functions (Paul & Cohen, 1984). In our view, given the significant changes in the age of diagnosis and the increased access to early intensive intervention, it is time to reopen the question of the timing and role of language acquisition as key prognostic indicators in ASD.

In evaluating treatment outcomes, we depend on objective measures, but we recognize that the measures available to us are imperfect. This is particularly evident when assessing the earliest phases of language in the emergence of words, grammatical combinations, or the pragmatic uses of communication for which few if any standardized direct assessments are available for children under the age of 2. To address these limitations, we encourage the use of measures derived from natural language samples and parent report. We recognize that the collection, transcription, and coding of natural language samples involves increased labor costs in research and clinical settings. However, we believe this cost cannot be avoided if we are to ensure that the data gathered have the highest degree of validity possible.

We provide objective criteria for defining children's expressive language development in order to provide guidance to researchers and clinicians who assess language in young children with ASD. These may be used to guide intervention research as well as treatment offered in clinical settings. The use of benchmarks based on typical development for charting children's progress reflects findings that language development in early ASD generally follows a similar developmental pathway as in other children (Tager-Flusberg et al., 2005). Using benchmarks from typical development also draws attention to those typical language milestones that should be targeted by early intervention programs. These definitions and benchmarks will allow comparisons of outcomes across different studies.

Finally, we set ourselves a practical goal: to provide a common vocabulary for discussing language acquisition with a wide interdisciplinary professional and lay audience. The terms selected for the benchmarks are intended to be transparent, reflecting important language features that define them. For each benchmark, we have provided definitions for behavior that can be objectively assessed by a broad range of early intervention professionals.

The framework we have developed here should be expanded in several ways, by (a) incorporating benchmarks for identifying a range of preverbal communication skills; (b) developing valid and reliable measures of language comprehension for children with ASD; (c) adapting the framework for assessing children who communicate using AAC systems; and (d) evaluating the relative merits of different types of measures for children with ASD. Further research is needed to address these important issues; nevertheless, we hope that the concepts and recommendations presented in this article will enhance early intervention research targeting spoken language development in ASD and will provide clinical professionals with the ability to extract and clearly define important information about treatment effectiveness in their work.

Acknowledgments

References

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed., text rev.. Washington, DC: Author; 2000.

Bertrand J, Mars A, Byle C, Bove F, Yeargin-Allsopp M, Decoufle P. Prevalence of autism in a United States population: The Brick Township, New Jersey, investigation. Pediatrics 2001;108:1155–1161. [PubMed: 11694696]

Carrow-Woolfolk, E. Comprehensive Assessment of Spoken Language. Bloomington, MN: Pearson Assessments; 1999.

Charman T, Baron-Cohen S, Swettenham J, Baird G, Drew A, Cox A. Predicting language outcome in infants with autism and pervasive developmental disorder. International Journal of Language and Communication Disorders 2003;38:265–285. [PubMed: 12851079]

Dawson, G.; Osterling, J. Early intervention in autism: Effectiveness and common elements of current approaches. In: Guralnick, MJ., editor. The effectiveness of early intervention: Second generation research. Baltimore: Brookes; 1997. p. 307-326.

Dawson, J.; Stout, C. The Structured Photographic Expressive Language Test. 3rd ed.. DeKalb, IL: Janelle; 2003.

Fenson, L.; Dale, PS.; Reznick, S.; Thal, D.; Bates, E.; Hartung, JP., et al. MacArthur Communicative Development Inventories: User's guide and technical manual. Baltimore: Brookes; 1993.

Fenson, L.; Marchman, V.; Thal, D.; Reznick, S.; Bates, E. MacArthur–Bates Communicative Development Inventories: User's guide and technical manual. 2nd ed.. Baltimore: Brookes; 2007.

Gardner, MF. Expressive One Word Vocabulary Test. Rev. ed.. Los Angeles: Western Psychological Services; 1990.

Gillberg C, Steffenburg S. Outcome and prognostic factors in infantile autism and similar conditions: A population-based study of 46 cases followed through puberty. Journal of Autism and Developmental Disorders 1987;17:273–287. [PubMed: 3610999]

Goldman, R.; Fristoe, M. Goldman-Fristoe Test of Articulation–2. Circle Pines, MN: AGS; 2000.

Hoff, E.; Schatz, M. Handbook of language development. Oxford, United Kingdom: Blackwell; 2007.

Howlin P, Goode S, Hutton J, Rutter M. Adult outcome for children with autism. Journal of Child Psychology and Psychiatry 2004;45:212–229. [PubMed: 14982237]

Kanner L. Irrelevant and metaphorical language. American Journal of Psychiatry 1946;103:242–246.

Koegel, R.; Koegel, LK. Generalized responsivity and pivotal behavior. In: Horner, RH.; Dunlap, G.; Koegel, RL., editors. Generalization and maintenance: Lifestyle changes in applied settings. Baltimore: Brookes; 1988. p. 41-66.

Kuehn BM. CDC: Autism spectrum disorders common. Journal of the American Medical Association 2007;297:940. [PubMed: 17341698]

Long, S.; Fey, M. Computerized Profiling (Version 6.9) [Computer program]. Milwaukee, WI: Marquette University; 2004.

Lord C, Risi S, Lambrecht L, Cook EH, Leventhal BL, DiLavore PS, et al. 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 2000;30:205–223. [PubMed: 11055457]

Lovaas OI. Behavioral treatment and normal educational and intellectual functioning in young autistic children. Journal of Consulting and Clinical Psychology 1987;55:3–9. [PubMed: 3571656]

Luyster R, Kadlec MB, Connolly C, Carter A, Tager-Flusberg H. Language assessment and development in toddlers with autism spectrum disorders. Journal of Autism and Developmental Disorders 2008;38:1426–1438. [PubMed: 18188685]

Luyster R, Qui S, Lopez K, Lord C.). Predicting outcomes of children referred for autism using the MacArthur–Bates Communicative Development Inventory. Journal of Speech, Language, and Hearing Research 2007;50:667–681.

MacWhinney, B. The CHILDES Project: Tools for analyzing talk. 3rd ed.. Mahwah, NJ: Erlbaum; 2000.

Menn, L.; Bernstein Ratner, N. Methods for studying language production. Mahwah, NJ: Erlbaum; 2000.

Miller J, Chapman R. The relation between age and mean length of utterance in morphemes. Journal of Speech and Hearing Research 1981;24:154–161. [PubMed: 7265928]

Miller, J.; Chapman, R. Systematic Analysis of Language Transcripts (SALT). Madison, WI: University of Wisconsin–Madison, Waisman Center; 2000.

Miller, J.; Chapman, R. Systematic Analysis of Language Transcripts (SALT) [Computer software]. Madison, WI: University of Wisconsin–Madison, Waisman Center; 2008.

Mordecai, D.; Palin, M. Lingquest 1 and 2 [Computer program]. East Moline, IL: Lingquest Software; 1982.

Mullen, E. Mullen Scales of Early Learning. Circle Pines, MN: AGS; 1995.

Mundy, P.; Hogan, A.; Doehring, P. A preliminary manual for the abridged Early Social Communication Scales (ESCS). Coral Gables, FL: University of Miami; 1996.

National Research Council. Educating children with autism. Washington, DC: National Academy Press; 2001.

Oller, K. The emergence of the speech capacity. Mahwah, NJ: Erlbaum; 2000.

O'Neill D. The Language Use Inventory for Young Children: A parent-report measure of pragmatic language development for 18- to 47-month-old children. Journal of Speech, Language, and Hearing Research 2007;50:214–228.

Paul R, Cohen DJ. Outcomes of severe disorders of language acquisition. Journal of Autism and Developmental Disorders 1984;14:405–422. [PubMed: 6084003]

Prizant BM. Echolalia in autism: Assessment and intervention. Seminars in Speech and Language 1983;4:63–77.

Prizant B, Duchan J. The functions of immediate echolalia in autistic children. Journal of Speech and Hearing Disorders 1981;46:241–249. [PubMed: 7278167]

Rescorla L. The Language Development Survey: A screening tool for delayed language in toddlers. Journal of Speech, Language, and Hearing Research 1989;54:587–599.

Reynell, JK.; Gruber, CP. Reynell Developmental Language Scales. Los Angeles: Western Psychological Services; 1990.

Rice, ML.; Wexler, K. Rice/Wexler Test of Early Grammatical Impairment. San Antonio, TX: Pearson Education; 2001.

Rogers, SJ. Evidence-based practices for language development in young children with autism. In: Charman, T.; Stone, W., editors. Social and communication development in autism spectrum disorders. New York: Guilford; 2005. p. 143-179.

Rogers SJ, Vismara LA. Evidence-based comprehensive treatments for early autism. Journal of Clinical Child and Adolescent Psychology 2008;37:8–38. [PubMed: 18444052]

Siebert J, Hogan A, Mundy P. Assessing social interactional competencies: The early social-communication scales. Infant Mental Health Journal 1982;3:244–258.

Stoel-Gammon, C. Sounds and words in early language acquisition: The relations between lexical and phonological development. In: Paul, R., editor. Exploring the speech–language connection. Baltimore: Brookes; 1998. p. 25-52.

Tager-Flusberg, H. The challenge of studying language development in autism. In: Menn, L.; Bernstein Ratner, N., editors. Methods for studying language production. Mahwah, NJ: Erlbaum; 2000. p. 313-332.

Tager-Flusberg, H.; Paul, R.; Lord, CE. Language and communication in autism. In: Volkmar, F.; Paul, R.; Klin, A.; Cohen, DJ., editors. Handbook of autism and pervasive developmental disorder. 3rd ed.. Vol. Vol. 1. New York: Wiley; 2005. p. 335-364.

Venter A, Lord C, Schopler E. A follow-up study of high-functioning autistic children. Journal of Child Psychology and Psychiatry 1992;33:489–507. [PubMed: 1577895]

Wetherby, A.; Prizant, B. Communication and Symbolic Behavior Scales. Baltimore: Brookes; 2002.

Yeargin-Allsopp M, Rice C, Karapurkar T, Doernberg N, Boyle C, Murphy C. Prevalence of autism in a U.S. metropolitan area. Journal of the American Medical Association 2003;28:249–255.

Zimmerman, IL.; Steiner, VG.; Pond, RE. Preschool Language Scale. 4th ed.. San Antonio, TX: Harcourt Assessment; 2002.

Table 1

Expressive language benchmarks for children with ASD.

Lang. phase	Lang. domain	Measure(s)	Variables	Range in typical development	Examples	Minimum criteria
First Words 12–18 months	Phonology	NLS	CV combinations	CV–CVC	Hi, Mommy	CV
		NLS	Consonant inventory	2–8 different consonants	m, b, y, n, w, d, p, h (Early 8)	4 consonants
	Vocabulary	NLS	# different words used referentially in 20 min	2–15 words	More, bubble, go, open, ball	5 types and 20 tokens
		Parent report	# different word roots	(range for 13–18 months)	MCDI	AE for 15 months
		Direct assessment	Confrontation naming	(range for 13–18 months)	Mullen; Reynell	AE for 15 months
	Pragmatics	NLS	# different communicative functions	2–5 functions	Comments; request	Comments + 1 other
		Direct assessment	# communication functions	(range for 13–18 months)	CSBS	AE for 15 months
Word Combinations 18–30 months	Phonology	NLS	CV combinations Word structures % fully intelligible	CV–CCVCC 1- to 3-syllable words 40%–80%	Go, drink	Closed syllables CVC and 2-syllable words 50% intelligible
			# consonants	8–18 consonants	Early 8 + t, ng, k, g, f, v, ch, j	10 consonants
	Vocabulary	NLS	# different words used referentially in 20 min	10–50 words		30 words
		Parent report	# different words	(range for 21–27 months)	MCDI; LDS	24-month AE
		Direct assessment	Confrontation naming	21–27 months (age range)	EOWVT-R	24-month AE
	Grammar	NLS	MLU	MLU:1.1–2.4 (in morphemes)		MLU = 1.8
		Parent report	Mean length in words of 3 longest utterances	(range for 21–27 months; on MDCI: 2.6–5.5)	MCDI	MCDI: 3.8
		Direct assessment			See article text	24-month AE
	Pragmatics	NLS	# different communicative functions	3–6 functions	Comments, request; turn-taking	Comments, request, turn-taking
		Parent report	Proportional use of JA + Social/Total Comm acts	.3–.7		0.5
			Conversational functions	Responds and initiates	Answers/asks question	2 initiations + 2 responses
			Inventory of child's communicative use	21–27 months (age range)	LUI	24-month AE
Sentences 30–48 months	Phonology	NLS	% fully intelligible	70%–100%		75% intelligible
		NLS	Consonant inventory	16–24 different CS; 75% correct	sh, th, s, z, l, zh	

Lang. phase	Lang. domain	Measure(s)	Variables	Range in typical development	Examples	Minimum criteria
		Direct assessment	AE score		GFTA-2	36-month AE
	Vocabulary	NLS Direct assessment	# different word roots AE score	70–136 in 65 utterances (range for 30–48 months)	SALT norms	92 in 65 utterances 36-month AE
	Grammar	NLS Direct assessment	MLU in morphemes AE score	2.7–4.0 MLU		MLU = 3.0 36-month AE
	Pragmatics	Elicited NLS	Discourse functions	Narration	TEGI; SPELT-3 Pretense, talk about past/future	1 narrative
		NLS	Conversational topic-related turn-taking			2 full turns on same topic following adult utterance
		Parent report	Inventory of child's communicative use	30–48 months (age range)	LUI	36-month AE
		Direct assessment	Communicative functions	30–48 months (age range)	CASL	36-month AE on Pragmatics subtest

Note. ASD = autism spectrum disorder; Lang. = language; NLS = natural language sample; CV = consonant–vowel; CVC = consonant–vowel–consonant; MCDI = MacArthur–Bates Communicative Development Inventory; AE = age equivalent; Mullen = Mullen Scales of Early Learning (Mullen, 1995); Reynell = Reynell Developmental Language Scales (Reynell & Gruber, 1990); CSBS = Communication and Symbolic Behavior Scales (Wetherby & Prizant, 2002); LDS = Language Development Survey (Rescorla, 1989); EOWVT-R = Expressive One Word Vocabulary Test–Revised (Gardner, 1990); MLU = mean length of utterance; JA = joint attention; Comm = Communicative; LUI = Language Use Inventory (O'Neil, 2007); GFTA-2 = Goldman-Fristoe Test of Articulation–2 (Goldman & Fristoe, 2000); SALT = Systematic Analysis of Language Transcripts (Miller & Chapman, 1981); TEGI = Test of Early Grammatical Impairment (Rice & Wexler, 2001); SPELT-3 = Structured Phonographic Expressive Language Test–3 (Dawson & Stout, 2003); CASL = Comprehensive Assessment of Spoken Language (Carrow-Woolfolk, 1999).