

LANGUAGE DEVELOPMENT IN AUTISM

Morton Ann Gernsbacher¹, Emily M. Morson²
and Elizabeth J. Grace³

¹University of Wisconsin-Madison, Madison, WI, USA; ²Indiana University, Bloomington, IN, USA;
³National Louis University, Chicago, IL, USA

ABSTRACT

Abnormal language development used to define autism, but no longer does. Indeed, language development no longer even figures into contemporary diagnostic criteria, although early delays in language often lead to parents' concerns. In this chapter, we review recent empirical research on language development in autism. To paint a contemporary picture, we restrict our review to studies published in the 21st century. We conclude that language development in autism is often delayed, but not deviant; that a delay in language development is not unique to autism; and that language development in autism is remarkably heterogeneous.

The diagnostic criteria for autism in the American Psychiatric Association's most recent *Diagnostic and Statistical Manual* (2013) are mute with regard to language development. Instead, the most recent diagnostic criteria mention only aspects of socio-cultural communication, such as eye contact, facial expressions, or hand gestures. Language itself – the perception and production of speech or writing – is not referenced; neither is language development.

In contrast, over thirty years ago, when autism first appeared in the *Diagnostic and Statistical Manual* (1980), “gross deficits in language development” were considered so dispositive of the autistic phenotype that this diagnostic criterion was not only required but was one of only a handful of criteria (Gernsbacher et al., 2005a, b). Seven years later, the focus moved away from how language developed to how language was produced. “Marked abnormalities in the production of speech, including volume, pitch, stress, rate, rhythm, and intonation” and “marked abnormalities in the form or content of speech, including stereotyped and repetitive use of speech” appeared as diagnostic criteria. But these two criteria were among more than a dozen other criteria, and they need not be met to warrant a diagnosis (APA, 1987).

Another seven years passed, and language development recurred in the diagnostic criteria (“delay in, or total lack of, the development of spoken language”), but again as only one of numerous criteria, for which only a subset needed to be met (APA, 1994; 2000). Thus, abnormal language development at one time defined autism, then became an optional means for making a diagnosis, but now no longer figures into contemporary diagnostic criteria.

In this chapter, we review recent empirical research on language development in autism. To paint a contemporary picture, we restrict our review to studies published in the 21st century. We conclude that language development in autism is often delayed, but not deviant; that a delay in language development is not unique to autism; and that language development in autism is remarkably heterogeneous and variable.

70.1 Delay in autistic language development

Many studies, which have measured language abilities at one discrete point in time, have suggested that autistic language development is delayed compared with typical language development. The most consistently reported delays are in producing and expressing language, what is often referred to as productive or expressive language. For example, autistic children have been reported to be delayed in speaking their first words (Charman et al., 2003; Matson et al., 2010); speaking their first phrases (e.g., *blue car*, Grandgeorge et al., 2009; Kenworthy et al., 2012; Pry et al., 2011); and speaking their first grammatical utterances (e.g., *go bye-bye*) or sentences (Anderson et al., 2007; Wodka et al., 2013).

Therefore, studies, which have measured the size of young, autistic children's expressive vocabularies at specific points during development, have often reported that young, autistic children have smaller expressive vocabularies than same-age typically developing children (Charman et al., 2003; Fulton & D'Entremont, 2013; Kover et al., 2013; Luyster et al., 2007; Luyster et al., 2008; Miniscalco et al., 2012; Sandercock, 2013; Stone & Yoder, 2001).

Other studies, which have examined other expressive language skills, for instance, expressing relations such as big and little, correctly producing grammatical morphemes for plurals and verb tenses, and using rising intonation when asking questions, have also reported that autistic children are less skilled than typically developing children (Fulton & D'Entremont, 2013; Hudry et al., 2010; Sigman & McGovern, 2005; Sutera et al., 2007; Vanvuchelen et al., 2011; Walton & Ingersoll, 2013).

That young, autistic children are often characterized by smaller expressive vocabularies should be of little surprise given that delays in the number of words and phrases children are saying are some of the most notable 'red flags' for autism (Baird et al., 2003; Filipek et al., 1999). Delays in early expressive language are also the primary concern that motivates parents to seek diagnostic evaluation of their children (Agin, 2004).

As for receptive language (the ability to understand language rather than produce it), reliable measurements are more difficult to make, particularly for very young children. Consequently, valid conclusions are more difficult to draw. One problem is that measuring receptive language in young children often relies heavily on parent report measures, such as the MacArthur-Bates Communicative Development Inventory (Fenson et al., 1993; 2007), which asks parents to tick off which of a list of words or phrases the parents believe their children to understand.

There are multiple reasons why parents might misestimate the number of words that their children understand (Feldman et al., 2000); for children who respond atypically, such misestimates are more likely (Akhtar & Gernsbacher, 2007; 2008; Bruckner et al., 2007). Nonetheless, many studies using the MacArthur-Bates Communicative Development Inventory have reported that young, autistic children are delayed in their receptive language development (e.g., Charman et al., 2003; Fulton & D'Entremont, 2013; Luyster et al., 2007; Luyster et al., 2008; Maljaars et al., 2012; Miniscalco et al., 2012; Paul et al., 2007, 2008; Vanvuchelen et al., 2011).

Using more objective measures, other studies have also reported that autistic children are delayed in their receptive language development. These studies have used standardized assessments, such as the Reynell Language Development scale (RLDS: Reynell & Gruber, 1990; Miniscalco et al., 2012; Vanvuchelen et al., 2011); the Peabody Picture Vocabulary Test or British Picture Vocabulary Scale (PPVT: Dunn & Dunn, 1997; BPVS: Dunn et al., 1997; Grigorenko et al., 2002; Howlin, 2003; Kover et al., 2013); the Clinical Evaluations of Language Fundamentals (CELF: Semel, Wiig, & Secord, 1992; 1995; 2000; 2006; Aman et al., 2004; Sigman & McGovern, 2005; Wisdom et al., 2007); the Mullen Scale of Early Learning (MSEL: Mullen, 1995; Luyster et al., 2008;

Sutera et al., 2007; Swensen et al., 2007); the Preschool Language Scale (PLS: Zimmerman et al., 1992; 2002; Hudry et al., 2010; Jasmin et al., 2009; Walton & Ingersoll, 2013), or the Psychoeducational Profile-3 (PEP-3: Schopler et al., 2005; Fulton & D'Entremont 2013).

However, other studies, which have also measured language abilities at one discrete point in time, have not shown that autistic language development differed from typical language development. For example, autistic toddlers were not reported to differ from typically developing toddlers in the number of words that they produced (Goodwin et al., 2012); autistic teenagers did not differ from typically developing teenagers in the number of words that they understood (Åsberg, 2010; Henderson et al., 2011; Paul et al., 2005); and autistic children, teens, and adults did not differ from typically developing participants in the quality or quantity of their written language production, be it number of words, length of words, length of sentences, or complexity of sentences (Troyb, 2011).

To summarize, several contemporary studies have suggested that autistic language development is delayed compared with typical language development. These studies have suggested delays in both expressive (producing) language and receptive (understanding) language. However, other studies have not shown that autistic language development is delayed compared with typical language development. Thus, delayed language development is a common but not a universal characteristic of autism. In fact, there is good evidence that language develops independently from autistic traits. For example, in a recent large-scale study involving 3000 pairs of twins, amount of language development was both phenotypically and genetically unrelated to degree of autistic traits (so called, severity; Taylor, Charman, Robinson, Hayiou-Thomas, Happé, Dale, & Ronald, 2014). The empirically demonstrated independence between language and autism underlies not only the variability in research findings, as reviewed above, but also the variability in autistic language development.

70.2 Heterogeneity and variability in autistic language development

Several studies have reported observing language delays in some subgroups of autistic participants but not others (e.g., Kjølgaard & Tager-Flusberg, 2001). For example, the majority of a sample of autistic children achieved normative size expressive vocabularies, but 15% of that sample were delayed between one and two standard deviations below normal (Jones & Schwartz, 2009). Most of a sample of autistic teenagers did not differ from a sample of typically developing teenagers in their ability to read,

but a third of the sample did (Åsberg & Dahlgren Sandberg 2012). Half of a sample of autistic children and teenagers produced scores on the British Picture Vocabulary Scale in the average range, but a quarter of the sample performed one to two standard deviations below average, and another quarter of the sample performed more than two standard deviations above average (McCann et al., 2005).

Autistic language development often demonstrates extreme variability. For example, in a large sample of autistic toddlers, with a wide range of reported IQ scores, more than three fourths of the sample had spoken their first words before 18 months, which is within the range of typical development. However, a bit more than 5% of the sample had still not spoken their first words at six years of age (Wilson et al., 2003), which is far beyond the range of typical development. In two large samples of autistic preschool-age children, some children scored two years below age level on measures of expressive and receptive language, whereas other children scored nearly two years above age level (Fulton & D'Entremont, 2013; Hudry et al., 2010).

In a sample of autistic children and teenagers whose receptive vocabulary was, on average, in the normal range, some autistic children scored as low as four standard deviations below normal, whereas other autistic children scored as high as two standard deviations above normal (Nation et al., 2006). Similarly, in a sample of autistic preschool-age children, their receptive vocabulary ranged from four standard deviations below normal to two standard deviations above normal (Jasmine et al., 2009). In a sample of autistic school-age children, their expressive vocabulary also ranged from four standard deviations below normal to two standard deviations above normal (Joseph et al., 2005), and in a sample of autistic teens, their reading vocabulary ranged from three standard deviations below normal to one standard deviation above normal (Ricketts et al., 2013).

To summarize, several studies have reported observing language delays in some subgroups of autistic participants but not others; autistic language development often demonstrates extreme variability. In large samples of autistic participants, it is not unusual to find scores on various language measures that range from as low as two standard deviations below the norm to as high as two standard deviations above the norm.

70.3 Trajectories of Language Development

Within the first few years of life, autistic children's language development trajectories have been reported to be flatter than that of typically developing children (or children with other developmental disabilities; Landa &

Garrett-Mayer, 2006). However, examining development over a longer period of time sometimes shows that autistic language development trajectories can subsequently become steeper. After an initial delay, there was accelerated growth.

For example, autistic grade-school-age boys began with lower receptive, expressive, and overall language skills than typically developing boys. But over a nine-year period, the autistic boys' language skills improved, on average, by 10% per annum, whereas the typically developing boys' language skills improved only 1.6% per annum (Cariello et al., 2011). Autistic children's language development continued on an upward trajectory at age nine, whereas non-autistic children, who were characterized by other types of atypical development, began to plateau (Anderson et al., 2007).

Vocabulary development continued to improve through adulthood for a sample of autistic adults, first studied during grade school and followed up in their early twenties; however, for a comparable sample of adults with language impairment, vocabulary development stagnated (Mawhood et al., 2000). A steeper trajectory of language development is of course expected, if the starting point is low – but only if the final measurement point also indicates improvement.

Figure 1 (modified with permission from data reported by Dockrell et al., 2010) illustrates the growth of expressive language (Figure 1a) and receptive language (Figure 1b) during a four-year period for a sample of over 100 autistic grade-school-age children. Illustrated alongside the autistic grade-school children is a matched sample of over 200 grade-school children who were not autistic but had language disabilities. The data presented are the two groups' performance on expressive and receptive measures from the Clinical Evaluation of Language Fundamentals (Semel et al., 2006), presented in z-scores, based on a norms-based mean of zero and a norms-based standard deviation of one.

Figure 1a.

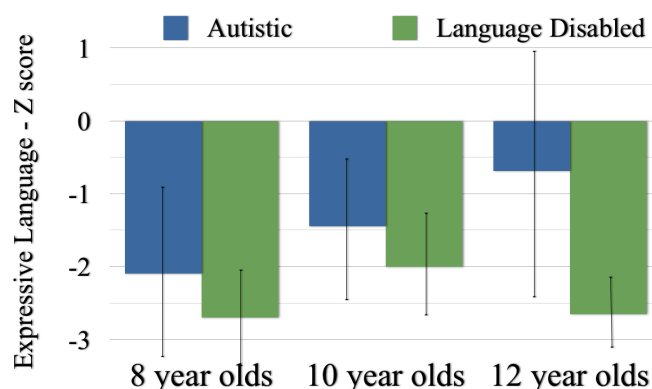
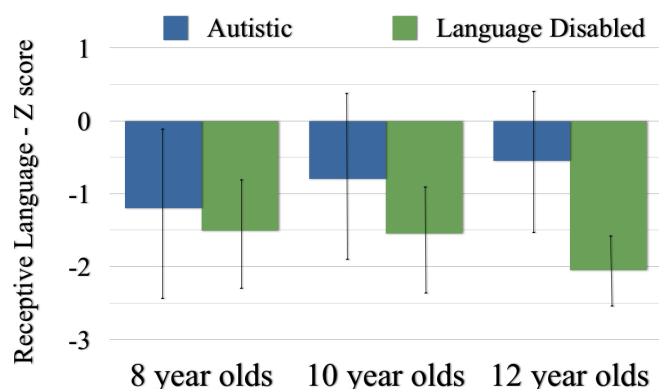


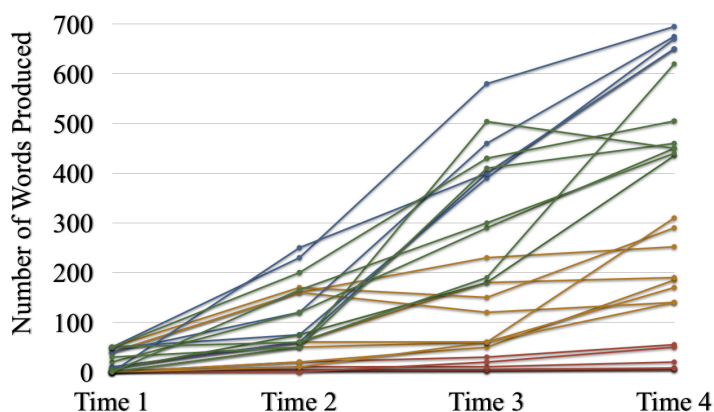
Figure 1b.



As Figure 1 illustrates, the older the autistic grade-school children, the better their expressive and receptive language skills. In contrast, for the language disabled children who were not autistic, neither their expressive nor their receptive language skills improved with age. Although these data are cross-sectional, they represent a steep trajectory of increasing language development for the autistic children, such that by the end point of measurement, the autistic children's language skills did not differ from normal.

However, trajectories of language development in autism, similar to static measures of language ability in autism, show great individual variability. Figure 2 (modified from data reported by Smith, Miranda, & Zaidman-Zait, 2007) illustrates individual trajectories in expressive vocabulary development for 35 autistic preschool-age children. Each child was assessed (by the MacArthur-Bates Communicative Development Inventory, Fenson et al., 1993) at four time points over a 24-month period. Although children were enrolled into the study only if their expressive vocabulary was smaller than 60 words, the children showed a wide range of vocabulary growth over the subsequent two-year period, as Figure 2 demonstrates.

Figure 2.



Some children, indicated by blue lines in Figure 2, showed a steep rate of expressive vocabulary develop-

ment, with expressive vocabularies of nearly 700 words at the last time point. Other children, indicated by green lines in Figure 2, showed a steady increase in vocabulary development, with expressive vocabularies of 400 to a bit over 600 words at the last time point. Still other children, indicated by gold lines in Figure 2, showed a slow increase in vocabulary development. The remaining children, indicated by red lines, showed a flat rate of vocabulary development, with little change in the number of words they produced over the two-year period.

The four color-coded clusters illustrated in Figure 2 were produced via statistical cluster analysis (Smith et al., 2007), based on the trajectory of the individual children's vocabulary development. However, the average age of the children within each of the four clusters did not differ; neither did their level of cognitive development nor their degree of autistic traits. Most markedly, all children were undergoing the same therapy. Therefore, these data show just how variable the course of language development can be for autistic children, even when the children are all receiving 15 to 20 hours a week of early behavioral intervention, including speech-language therapy.

Very few studies of autistic language development have followed participants through adulthood; indeed, very few studies have followed autistic participants into adulthood at all, studying any type of development (Dawson, Motttron, & Gernsbacher, 2008). However, one of the few longitudinal studies that have extended through adulthood followed 29 autistic adults who had marked language delays in childhood and 35 autistic adults who did not. In adulthood, the two groups did not differ in either their expressive or receptive vocabulary (Howlin, 2003).

To summarize, within the first few years of life, autistic children's language development trajectories have been reported to be flatter than that of typically developing children (or children with other developmental disabilities); however examining development over a longer period of time sometimes shows that autistic language development trajectories can also be steeper. After an initial delay, there is accelerated growth. However, trajectories of language development in autism, similar to static measures of language ability in autism, show great individual variability.

70.4 Language Delay versus Language Deviance

Evidence suggests that language development can be delayed in autism, but is it deviant? Does it proceed in the same general sequence? Are there qualitative differences? Most studies that have investigated specific nuances of language development, rather than gross measures on standardized tests, have suggested that autistic children's language development proceeds in the same order and is

qualitatively similar in its developmental course to the language development of non-autistic children at the same stages of development.

For example, although autistic toddlers and preschool-age children might understand fewer words than age-matched typically developing children, when compared to younger, typically developing children with the same size vocabulary, autistic children's receptive vocabularies contain the same relative proportion of words from different grammatical categories (e.g., nouns, verbs, pronouns, and the like) and the same relative proportion of words from various semantic categories (e.g., people, games and routines, body parts, sound effects, and the like, [Charman et al., 2003](#)).

Similarly, although autistic toddlers and preschool-age children might produce fewer words than age-matched typically developing children, when compared to younger, typically developing children with the same vocabulary size, there is substantial overlap in autistic and typically developing children's most frequently spoken words ([Wicklund, 2012](#)). Indeed, when autistic toddlers are compared with non-autistic toddlers who are also delayed in their language development ('late talkers'), the two groups are just as likely to produce words from a range of grammatical and semantic categories, including emotion terms, and the autistic toddlers did not differ from the non-autistic late talkers in the complexity of their grammatical utterances ([Ellis Weismer et al., 2011](#)).

When autistic preschool-age children are compared with non-autistic preschool-age children who have other developmental disabilities, the autistic children do not differ from the non-autistic children in their correct production of noun phrases, sentence structures, plurals, singulars, or past-tense inflections ([Park et al., 2012](#)).

Norbury and colleagues have demonstrated in several studies that when compared to non-autistic grade-school-age children, autistic children do not differ from non-autistic children in their sequential achievement of a variety of language comprehension processes. For instance, autistic grade-school-age children acquire the understanding of idioms (e.g., "it's raining cats and dogs") at the same time as language-ability matched non-autistic children do ([Norbury, 2004](#); see also [Gernsbacher & Pripas-Kapit, 2012](#)).

Autistic children acquire the understanding of metaphors (e.g., "[Because] John spent too long in the swimming pool, he was a prune") at the same time as language-ability matched non-autistic children ([Norbury, 2005b](#)). Autistic children acquire the ability to draw inferences from stories ([Norbury & Bishop, 2002](#); see also [Young et al., 2005](#)); negotiate ambiguities in language ([Norbury, 2005a](#)), and structure the stories that they tell ([Norbury &](#)

[Bishop, 2003](#)) at the same time as language-ability matched non-autistic children.

Norbury's studies also illustrate the independence between language development and autistic traits. In these studies, Norbury and colleagues typically assemble four participant groups: autistic children with language impairment and autistic children without language impairment; non-autistic children with language impairment and non-autistic children without language impairment. By definition, the autistic participants differ from the non-autistic participants in their degree of autistic traits. For instance, in Norbury's ([2005a](#)) study, the difference in degree of autistic traits between the autistic and non-autistic participants is over two standard deviations (which is beyond the effect size of the difference between average men vs. women's height). Thus, the autistic children in these studies clearly have more autistic traits than the non-autistic children and most likely are 'autistic enough.'

However, in each of Norbury and colleagues' studies, it is the participants' degree of language impairment, not their degree of autistic traits, that predicts their ability to understand idioms ([Norbury, 2004](#)); understand metaphors ([Norbury, 2005b](#)); draw inferences from stories ([Norbury & Bishop, 2002](#)); negotiate ambiguities in language ([Norbury, 2005a](#)), and structure stories that they tell ([Norbury & Bishop, 2003](#)). Thus, autistic children do not differ from language-matched non-autistic children in their sequential achievement of important language comprehension processes.

Historically it was assumed that unusual, perhaps aberrant, features of language development characterized autism, such as echolalia (repeating words and expressions verbatim) and pronoun reversal (using *you* when *I* is intended). More recently, some researchers have suggested another aberrant feature might characterize autistic language development: Expressive language might proceed abnormally ahead of receptive language (i.e., autistic children say more than they understand). However, none of these putatively aberrant characteristics are empirically reliable or universal among autistic children, as Gernsbacher, Morson, and Grace ([in press](#)) recently argued.

Another characteristic of autistic language development that is sometimes assumed to be specific to autism is regression, or loss, of language skills. Unfortunately, codifying language loss is complicated (is it a consistent loss or a fluctuating loss?), and measuring language loss is difficult, particularly if measurements are not taken prospectively ([Lord, Shulman, & DiLavore, 2004](#)). Despite classification and measurement difficulties, two patterns appear to be consistent in the data on autistic language loss.

First, autistic children who seemed to lose language are those whose early language was developing on time or with little delay ([Baird et al., 2008](#); [Pickles et al., 2009](#)).

For example, autistic toddlers who were coded as having lost language had produced their first words around one year of age, whereas autistic toddlers who were not coded as having lost language hadn't produced their first words until two years of age (Pickles et al., 2009).

Second, autistic children who seemed to lose language do not progress as quickly in subsequent language development as autistic children who do not seem to lose language. For example, at age six, many of the autistic children who seemed to lose language earlier, were still using single words, whereas other autistic children had advanced to producing sentences (Bernabei et al., 2007).

To summarize, most studies that have investigated specific nuances of language development, rather than gross measures on standardized tests, have suggested that autistic children's language development proceeds in the same order and is qualitatively similar in its developmental course to the language development of non-autistic children at the same stages of development. Although it has been assumed that aberrant features of language development characterize autism, such as echolalia and pronoun reversal, neither these features nor language loss is unique to autism.

References

- Agin, M. C. (2004). The 'late talker' -- When silence isn't golden. *Contemporary Pediatrics*, 21, 22-32.
- Akhtar, N., & Gernsbacher, M. A. (2007). Joint attention and vocabulary learning: A critical look. *Linguistics and Language Compass*, 1/3, 195-207.
- Akhtar, N., & Gernsbacher, M. A. (2008). On privileging the role of gaze in infant social cognition. *Child Development Perspectives*, 2, 60-66.
- Aman, M. G., Novotny, S., Samango-Sprouse, C., Lecavalier, L., Leonard, E., Gadow, K. D., King, B. H., Pearson, D. A., Gernsbacher, M. A., & Chez, M. (2004). Outcome measures for clinical drug trials in autism. *CNS Spectrums*, 9, 36-47.
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., Revised). Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., Text Revision ed.). Washington, DC: American Psychiatric Association.
- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Anderson, K., Lord, C., Risi, S., DiLavore, P. S., Shulman, C., Thurm, A., Welch, K., & Pickles, A. (2007). Patterns of growth in verbal abilities among children with Autism Spectrum Disorder. *Journal of Counseling and Clinical Psychology*, 75, 594-604.
- Åsberg, J. (2010). Patterns of language and discourse comprehension skills in school-aged children with autism spectrum disorders. *Scandinavian Journal of Psychology*, 51, 534-539.
- Åsberg, J., & Dahlgren Sandberg, A. (2012). Dyslexic, delayed, precocious, or just normal? Word reading skills of children with autism spectrum disorders. *Journal of Research in Reading*, 35, 20-31.
- Baird, G., Cass, H., & Slonims, V. (2003). Clinical review: Diagnosis of autism. *British Medical Journal*, 327, 488-493.
- Baird, G., Charman, T., Pickles, A., Chandler, S., Loucas, T., Meldrum, D., Carcani-Rathwell, I., Serkana, D., & Simonoff, E. (2008). Regression, developmental trajectory and associated problems in disorders in the autism spectrum: the SNAP study. *Journal of Autism and Developmental Disorders*, 38, 1827-1836.
- Bernabei, P., Cerquiglini, A., Cortesi, F., & D'Ardia, C. (2007). Regression versus no regression in the autistic disorder: Developmental trajectories. *Journal of Autism and Developmental Disorders*, 37, 580-588.
- Bruckner, C., Yoder, P., Stone, W., & Saylor, M. (2007). Construct validity of the MCDI-I receptive vocabulary scale can be improved: differential item functioning between toddlers with autism spectrum disorders and typically developing infants. *Journal of Speech, Language, and Hearing Research*, 50, 1631-1638.
- Cariello, A., Bigler, E. D., Tolley, S.E., Prigge, M.D., Neeley, E.S., Lange, N., Alexander, A. L., Froehlich, A.L., DuBray, M. B., Cooperrider, J. R., Bigler, E.D., & Lainhart, J. E. (2011, May). *A longitudinal look at expressive, receptive, and total language development in individuals with Autism Spectrum Disorders*. Paper presented at the International Meeting for Autism Research, San Sebastian, Spain.
- Charman, T., Drew, A., Baird, C., & Baird, G. (2003). Measuring early language development in preschool children with autism spectrum disorder using the MacArthur Communicative Development Inventory (Infant Form). *Journal of Child Language*, 30, 213-236.
- Dawson, M., Mottron, L., & Gernsbacher, M. A. (2008). Learning in autism. In H. L. Roediger, III (Ed.), *Cognitive psychology of memory* (pp. 759-772, Vol. 2, Learning and memory: A comprehensive reference, J. Byrne Editor). Oxford: Elsevier.
- Dockrell, J., Ricketts, J., Palikara, O., Charman, T., & Lindsay, G. (2010). *Profiles of need and provision for children with language impairments and autism spectrum disorders in mainstream schools: A prospective study* (Department for Education No. DFE-RR247-BCRP9). London: HMSO.
- Dunn, L. M., & Dunn, L. M. (1997). *Peabody Picture Vocabulary Test*. (3rd ed.). Circle Pines, MN: American Guidance Service.
- Dunn, L. M., Dunn, L. M., Whetton, C., & Burley, J. (1997). *The British Picture Vocabulary Scale-II*. Windsor, UK: NFER-Nelson.
- Ellis Weismer, S., Gernsbacher, M. A., Stronach, S., Karasinski, K., Eernisse, E. R., Venker, C. E., & Sindberg, H. (2011). Lexical and grammatical skills in toddlers on the autism spectrum compared to late talking toddlers. *Journal of Autism and Developmental Disorders*, 41, 1065-1075.
- Feldman, H. M., Dollaghan, C. A., Campbell, T. F., Kurs-Lasky, M., Janosky, J. E., & Paradise, J. L. (2000). Measurement properties of the MacArthur Communicative Development Inventories at ages one and two years. *Child Development*, 71, 310-322.
- Fenson, L., Dale, P. S., Reznick, J. S., Thal, D., Bates, E., Hartung, J. P., Pethick, S. & Reilly, J. S. (1993). *The MacArthur Communicative Development Inventories: User's Guide and Technical Manual*. Baltimore: Paul H. Brookes.
- Fenson, L., Marchman, V. A., Thal, D. J., Dale, P.S., Reznick, J. S., & Bates, E. (2007). *The MacArthur-Bates Communicative Development Inventories: User's guide and technical manual* (2nd ed.). Baltimore: Paul Brookes Publishing.
- Filipek, P. A., Accardo, P. J., Baranek, G. T., Cook, Jr. E. H., Dawson, G., Gordon, B., Gravel, J. S., Johnson, C. P., Kellen, R. J., Levy, S. E., Minshew, N. J., Prizant, B. M., Rapin, L. Rogers, S. J., Stone, V. L., Teplin, S., Tuchman, R. F., & Volkmar, F. R. (1999). The screening and diagnosis of autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 29, 439-484.
- Fulton, M. L., & D'Entremont, B. (2013). Utility of the Psychoeducational Profile-3 for assessing cognitive and language skills of children with

- Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, 43, 2460-2471.
- Gernsbacher, M. A., Dawson, M., & Goldsmith, H. H. (2005a). Three reasons not to believe in an autism epidemic. *Current Directions in Psychological Science*, 14, 55-58.
- Gernsbacher, M. A., Geye, H. M., & Ellis Weismer, S. (2005b). The role of language and communication impairments within autism. In P. Fletcher & J. C. Miller (Eds.), *Language disorders and developmental theory* (pp. 73-93). Philadelphia, PA: John Benjamins.
- Gernsbacher, M. A., Morson, E. M., & Grace, E. J. (in press). Speech and language on the autism spectrum. *Annual Review of Linguistics*.
- Gernsbacher, M. A., & Pripas-Kapit, S. (2012). Who's missing the point? A commentary on claims that autistic persons have a specific deficit in figurative language comprehension. *Metaphor & Symbol*, 27, 93-105.
- Goodwin, A., Fein, D., & Naigles, L. R. (2012). Comprehension of wh-questions precedes their production in typical development and autism spectrum disorders. *Autism Research*, 5, 109-123.
- Grandgeorge, M., Hausberger, M., Tordjman, S., Deleau, M., Lazartigues, A., & Lemonnier, E. (2009). Environmental factors influence language development in children with autism spectrum disorders. *PLoS ONE*, 4.
- Grigorenko, E. L., Klin, A., Pauls, D. L., Senft, R., Hooper, C., & Volkmar, F. (2002). A descriptive study of hyperlexia in a clinically referred sample of children with developmental delays. *Journal of Autism and Developmental Disorders*, 32, 3-12.
- Henderson, L. M., Clarke, P. J., & Snowling, M. J. (2011). Accessing and selecting word meaning in autism spectrum disorder. *Journal of Child Psychology and Psychiatry*, 52, 964-973.
- Howlin, P. (2003). Outcome in high-functioning adults with autism with and without early language delays: Implications for the differentiation between autism and Asperger Syndrome. *Journal of Autism and Developmental Disorders*, 33, 3-13.
- Hudry, K., Leadbitter, K., Temple, K., Slonims, V., McConachie, H., Aldred, C., Howlin, P., Charman, T., and the PACT Consortium (2010). Preschoolers with autism show greater impairment in receptive compared with expressive language abilities. *International Journal of Communication Disorders*, 45, 681-690.
- Jasmin, E., Couture, M., McKinley, P., Reid, G., Fombonne, E., & Gisell, E. (2009). Sensori-motor and daily living skills of preschool children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 39, 231-241.
- Jones, C. D., & Schwartz, I. S. (2009). When asking questions is not enough: An observational study of social communication differences in high functioning children with autism. *Journal of Autism and Developmental Disorders*, 39, 432-443.
- Joseph, R. M., McGrath, L. M., & Tager-Flusberg, H. (2005). Executive dysfunction and its relation to language ability in verbal school-age children with autism. *Developmental Neuropsychology*, 27, 361-378.
- Kenworthy, L., Wallace, G. L., Powell, K., Anselmo, C., Martin, A., & Black, D. O. (2012). Early language milestones predict later language, but not autism symptoms in higher functioning children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 6, 1194-1202.
- Kjelgaard, M. M., and Tager-Flusberg, H. (2001). An investigation of language impairment in autism: Implications for genetic subgroups. *Language and Cognitive Processes*, 16, 287-308.
- Kjellmer, L., Hedvall, A., Fernell, E., Gillberg, C., & Norrelgen, F. (2012). Language and communication skills in preschool children with autism spectrum disorders: Contribution of cognition, severity of autism symptoms, and adaptive functioning to the variability. *Research in Developmental Disabilities*, 33, 172-180.
- Kover, S. T., McDuffie, A. S., Hagerman, R. J., & Abbeduto, L. (2013). Receptive vocabulary in boys with autism spectrum disorder: Cross-sectional developmental trajectories. *Journal of Autism and Developmental Disorders*, 43, 2696-2709.
- Landa, R., & Garrett-Mayer, E. (2006). Development in infants with autism spectrum disorders: A prospective study. *Journal of Child Psychology and Psychiatry*, 47, 629-638.
- Lord, C., Shulman, C., & DiLavore, P. (2004). Regression and word loss in autistic spectrum disorders. *Journal of Child Psychology and Psychiatry*, 45, 936-955.
- Luyster, R. J., Kadlec, M. B., Carter, A., & Tager-Flusberg, H. (2008). Language assessment and development in toddlers with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 38, 1426-1438.
- Luyster, R., Lopez, K., & Lord, C. (2007). Characterizing communicative development in children referred for Autism Spectrum Disorder using the MacArthur Bates Communicative Development Inventory (CDI). *Journal of Child Language*, 34, 623-654.
- Maljaars, J., Noens, I., Scholte, E., & Van Berckelaer-Onnes, I. (2012). Language in low-functioning children with autistic disorder: Differences between receptive and expressive skills and concurrent predictors of language. *Journal of Autism and Developmental Disorders*, 42, 2181-2191.
- Matson, J. L., Mahan, S., Kozlowski, A. M., & Shoemaker, M. (2010). Developmental milestones in toddlers with autistic disorder, pervasive developmental disorder-not otherwise specified, and atypical development. *Developmental Neurorehabilitation*, 13, 239-247.
- Mawhood, L., Howlin, P., & Rutter, M. (2000). Autism and developmental receptive language disorder -- a comparative follow-up in early adult life. I: Cognitive and language outcomes. *Journal of Child Psychology and Psychiatry*, 41, 547-559.
- McCann, J., Peppé, S., Gibbon, F. E., O'Hare, A., & Rutherford, M. (2005). Prosody and its relationship to language in school-aged children with high-functioning autism. *Queen Margaret University College Speech Science Research Center*, Working Paper WP-3.
- Miniscalco, C., Fränberg, J., Schachinger-Lorentzon, U., & Gillberg, C. (2012). Meaning what you say? Comprehension and word production in young children with autism. *Research in Autism Spectrum Disorders*, 6, 204-211.
- Mullen, E. (1995). *Mullen Scales of Early Learning*. Circle Pines, MN: American Guidance Service, Inc.
- Nation, K., Clarke, P., Wright, B., & Williams, C. (2006). Patterns of reading ability in children with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, 36, 911-919.
- Norbury, C. F. (2004). Factors supporting idiom comprehension in children with communication disorders. *Journal of Speech, Language, and Hearing Research*, 47, 1179-1193.
- Norbury, C. F. (2005a). Barking up the wrong tree? Lexical ambiguity resolution in children with language impairments and autistic spectrum disorders. *Journal of Experimental Child Psychology*, 90, 142-171.
- Norbury, C. F. (2005b). The relationship between theory of mind and metaphor: Evidence from children with language impairment and autistic spectrum disorder. *British Journal of Developmental Psychology*, 23, 383-399.
- Norbury, C. F., & Bishop, D. V. M. (2002). Inferential processing and story recall in children with communication problems: A comparison of specific language impairment, pragmatic language impairment and high-functioning autism. *International Journal of Language Communication Disorders*, 37, 227-251.
- Norbury, C. F., & Bishop, D. V. M. (2003). Narrative skills of children with communication impairments. *International Journal of Language Communication Disorders*, 38, 287-313.
- Park, C. J., Yelland, G. W., Taffe, J. R., & Gray, K. M. (2012). Morphological and syntactic skills in language samples of preschool aged children with autism: Atypical development? *International Journal of Speech-Language Pathology*, 14, 95-108.
- Paul, R., Augustyn, A., Klin, A., & Volkmar, F. R. (2005). Perception and production of prosody by speakers with autism spectrum disorders. *Journal of Autism and Developmental Disabilities*, 35, 205-220.

- Paul, R., Chawarska, K., Cicchetti, D., & Volkmar, F. (2008). Language outcomes of toddlers with autism spectrum disorders: A two year follow-up. *Autism Research, 1*, 97-107.
- Paul, R., Chawarska, K., Fowler, C., Cicchetti, D., & Volkmar, F. (2007). "Listen my children and you shall hear": Auditory preferences in toddlers with autism spectrum disorders. *Journal of Speech, Language, and Hearing Research, 50*, 1350-1364.
- Pickles, A., Simonoff, E., Conti-Ramsden, G., Falcaro, M., Simkin, Z., Charman, T., Chandler, S., Loucas, T., & Baird, G. (2009). Loss of language in early development of autism and specific language impairment. *Journal of Child Psychology and Psychiatry, 50*, 843-852.
- Pry, R., Peterson, A. F., & Baghdadli, A. M. (2011). On general and specific markers of lexical development in children with autism from 5 to 8 years of age. *Research in Autism Spectrum Disorders, 5*, 1243-1252.
- Reynell, J. K. & Gruber, C. P. (1990). *Reynell Developmental Language Scales (U.S. edition)*. Los Angeles: Western Psychological Services.
- Ricketts, J., Jones, C. R. G., Happé, F., & Charman, T. (2013). Reading comprehension in autism spectrum disorders: The role of oral language and social functioning. *Journal of Autism and Developmental Disorders, 43*, 807-816.
- Sandercock, R. K. (2013). *Gesture as a predictor of language development in infants at high risk for autism spectrum disorders* (Unpublished doctoral dissertation). University of Pittsburgh, Pennsylvania.
- Schopler, E., Lansing, M. D., Reichler, R. J., & Marcus, L. M. (2005). *Examiner's Manual of the Psychoeducational Profile*. (Vol. 3). Austin, TX: Pro-Ed Inc.
- Semel, E. M., Wiig, E. H., & Secord, W. (1992). *Clinical Evaluation of Language Fundamentals – Preschool*. San Antonio, TX: The Psychological Corporation.
- Semel, E., Wiig, E. H., & Secord, W. (2000). *Clinical Evaluation of Language Fundamentals (3rd ed. UK [CELF-3UK])*. London: Psychological Corporation.
- Semel, E., Wiig, E. H., & Secord, W. (2006). *Clinical Evaluation of Language Fundamentals—Fourth UK Edition (CELF-4 UK)*. London: Pearson Assessment.
- Semel, E., Wiig, E. H., & Secord, W. A. (1995). *Clinical Evaluation of Language Fundamentals, Third Edition (CELF-3)*. San Antonio, TX: Psychological Corporation.
- Sigman, M., & McGovern, C. W. (2005). Improvement in cognitive and language skills from preschool to adolescence in autism. *Journal of Autism and Developmental Disorders, 35*, 15-23.
- Smith, V., Mirenda, P., & Zaidman-Zait, A. (2007). Predictors of expressive vocabulary growth in children with autism. *Journal of Speech, Language, and Hearing Research, 50*, 149-160.
- Stone, W. L., & Yoder, P. J. (2001). Predicting spoken language level in children with autism spectrum disorders. *Autism, 5*, 341-361.
- Sutera, S., Pandey, J., Esser, E. L., Rosenthal, M. A., Wilson, L. B., Barton, M., Green, J., Hodgson, S., Robins, D. L., Dumont-Mathieu, T., & Fein, D. (2007). Predictors of optimal outcome in toddlers diagnosed with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 37*, 98-107.
- Swensen, L. D., Kelley, E., Fein, D., & Naigles, L. R. (2007). Processes of language acquisition in children with autism: Evidence from preferential looking. *Child Development, 78*, 542-557.
- Taylor, M. J., Charman, T., Robinson, E. B., Hayiou-Thomas, M. E., Happé, F., Dale, P. S., & Ronald, A. (2014). Language and traits of autism spectrum conditions: Evidence of limited phenotypic and etiological overlap. *American Journal of Medical Genetics, Part B: Neuropsychiatric Genetics, 165*, 587-595.
- Troyb, E. (2011). *Academic abilities in children and adolescents with a history of autism spectrum disorders who have achieved optimal outcomes* (Unpublished master's thesis). University of Connecticut, Connecticut. Master's Theses, Paper 189.
- Vanvuchelen, M., Roeyers, R., & DeWeerd, W. (2011). Imitation assessment and its utility to the diagnosis of autism: Evidence from consecutive clinical preschool referrals for suspected autism. *Journal of Autism and Developmental Disorders, 41*, 484-496.
- Walton, K. M., & Ingersoll, B. R. (2013). Expressive and receptive fast-mapping in children with autism spectrum disorders and typical development: The influence of orienting cues. *Research in Autism Spectrum Disorders, 7*, 687-698.
- Wicklund, M. D. (2012). *Use of referring expressions by autistic children in spontaneous conversations: Does impaired metarepresentational ability affect reference production?* (Unpublished doctoral dissertation). University of Minnesota, Minnesota.
- Wilson, S., Djukic, A., Shinnar, S., Dharmani, C. & Rapid, I. (2003). Clinical characteristics of language regression in children. *Developmental Medicine and Child Neurology, 45*, 508-514.
- Wisdom, S. N., Dyck, M. J., Piek, J. P., Hay, D., & Hallmayer, J. (2007). Can autism, language, and coordination disorders be differentiated based on ability profiles? *European Child and Adolescent Psychiatry, 16*, 178-186.
- Wodka, E. L., Mathy, P., & Kalb, L. (2013). Predictors of phrase and fluent speech in children with autism and severe language delay. *Pediatrics, 131*, e1128-e1134.
- Young, E. C., Diehl, J. J., Morris, D., Hyman, S. L., & 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.
- Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (2002). *Preschool language scale*. (4th ed.). San Antonio, TX: The Psychological Corporation.
- Zimmerman, I., Steiner, V., & Pond, R. (1992). *PLS-3: Preschool Language Scale-3*. San Antonio, TX: The Psychological Corporation.