CHAPTER 12

Language and Communication in Autism

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Knowledge about human communication is central to theory and clinical practice in the field of autism. Milestones in language and communication play major roles at almost every point in development in understanding autism. Most parents of autistic children first begin to be concerned that something is not quite right in their child's development because of early delays or regressions in the development of speech (Short & Schopler, 1988). Functional language use by school age has been shown to be related to better long-term outcomes in autism (DeMyer et al., 1973; Paul & Cohen, 1984a). Fluency and flexibility of expressive language are underlying dimensions beneath the distinction between "high-functioning" and "low functioning" autism in school age or adolescence. A history of language delay can be particularly crucial in differentiating autism from other psychiatric disorders in high-functioning adults (Lord & Venter, 1992).

Even though autism is often first recognized because of slow or unusual patterns of speech development, many early aspects of the language deficit associated with it overlap with other disorders (Beitchman & Inglis, 1991; Bishop & Adams, 1989). Thus, though skill in language is important to the functioning of people with autism, delays in expressive language in the early preschool years are not specific to autism (Cantwell, Baker, & Mattison, 1980). When there is a good description of a child's early social history and use of objects, the diagnosis of autism can often be made without reference to language delay at all (Cohen, Sudhalter, Landon-Jimenez, & Keogh, 1993; Lord, Storoschuk, Rutter, & Pickles, 1993; Siegel, Vukicevic, Elliott, & Kraemer, 1989). Although expressive language level at age 5 was an important discriminator of higher versus lower functioning older children and adults with autism (Rutter, 1970), simple characterization of language history did not add predictive power for outcome within a high-functioning group of adults (Howlin, Goode, Hutton, & Rutter, 2004). Asperger syndrome (AS) is an autism spectrum disorder (ASD) characterized by lack of general delays in language and cognition but by marked social deficits. Its existence suggests that, even though abnormalities in communication are a core feature of pervasive developmental disorders, slower language acquisition is not necessary or sufficient for a diagnosis within the spectrum of disorders associated with autism.

In addition, evidence from numerous sources suggests that the social and linguistic environments of autistic children, most of whom have active, loving, and determined parents and teachers, can be quite different from those of other children. Thus, initial deficits in language acquisition and in social or cognitive factors affecting language may be compounded by experiential differences (Konstantareas, Zajdemann, Homatidis, & McCabe, 1988; Siller & Sigman, 2002). The root of this difference is thought to be the limited nature of the social and linguistic opportunities that these youngsters provide

to others (Doussard-Roosevelt, Joe, Bazhenova, & Porges, 2003; Lord, Merrin, Vest, & Kelly, 1983).

The history of autism has included waxing and waning of interest in language and communication, from interpreting language abnormalities as secondary to deficits in social-emotional functioning (Kanner, 1943), to the view that autism impairments are the result of primary linguistic disorder (Rutter, 1970), to an exclusive focus on pragmatic impairments (Baltaxe, 1977), to interest in using language to study other behaviors, particularly higher order cognitive abilities, such as theory of mind (Baron-Cohen, 1993). It is now recognized that language in autism is extremely variable and that there are likely to be subgroups of individuals within the autism spectrum that have distinct language profiles, some of which are similar to those found in other developmental language disorders.

Tager-Flusberg and Joseph (2003) identified two language phenotypes among verbal children with autism: children with normal linguistic abilities (phonological skills, vocabulary, syntax, and morphology) and children with autism and impaired language that is similar to the phenotype found in specific language impairment. There may also be other subgroups on the autism spectrum that reflect different kinds of language disorder. For example, a significant number of children with autism never acquire speech. It is unlikely that all these children remain mute for the same reason, especially since recent reports suggest that the proportion of nonspeakers within the autistic population is decreasing as early intervention becomes more prevalent (Goldstein, 2002). One potential subgroup within nonspeakers, for instance, may experience *verbal apraxia* or *apraxia of speech,* a neuromotor deficit that affects the ability to produce speech sounds, sound sequences, and prosodic features (Darley, Aronson, & Brown, 1975). If this subgroup exists, however, it is likely to account for a small minority of nonspeakers with ASD (Rogers, 2004). Since little is known about language capacities in nonspeaking children with autism, due to a dearth of communication research on these children without functional language, the causes of failure to acquire speech are primarily speculation at this time. Nonetheless, it is likely that subgroups exist within both the speaking and nonspeaking autistic populations.

THE STUDY OF LANGUAGE DEVELOPMENT IN TYPICAL POPULATIONS

In order to provide a context in which we can evaluate the impairments in language and communication that characterize autism spectrum disorders, we begin with a brief overview of language acquisition in typically developing children.

Early Communicative Intent

Often parents recognize the absence of early communication in their young children with autism sometime during the second year, when the majority of children the same age begin to have established vocabularies of numerous words (Short & Schopler, 1988). However, nonhandicapped infants show communicative behaviors even from the first weeks and months of life, including recognizing their mothers' voice, synchronizing their patterns of eye gaze, movements, facial expressions of affect, as well as vocal turn taking (Fernald, 1992).

Infants typically exhibit a variety of communicative behaviors by the end of their first year that, to a knowing observer, are not usually seen in autism. These nonverbal communication patterns have been found to express the same intentions for which words will be used in the coming months, such as requesting objects, rejecting offered actions, calling attention to objects or events, and commenting on their appearance (Bates, 1976; Carpenter, Nagell, & Tomasello, 1998). These intents are expressed first with simple gestures, such as reaching to indicate a request or pushing away to indicate rejection, then by more complex gestures, such as pointing to request or shaking the head to mean "no," and then gradually accompanied by and, in some cases, replaced by vocalization and speech (Acredolo & Goodwyn, 1988; Adamson & Bakeman, 1991; Bloom, 1993).

Another achievement that normally occurs toward the end of the first year is the beginning of the understanding of words. At first, a few words associated with games such as

pat-a-cake or so big will be recognized. Infants gradually become more active responders to these routines (Bruner, 1975). By 12 months, merely saying the words ("Let's play pat-a-cake!" or "Show me your nose") in a familiar context will often elicit a spontaneous action, such as clapping or touching the nose, from the child.

First Words

Conventional use of language begins around 12 months (see Table 12.1), when toddlers usually say their first recognizable words. At this age, children also show clear evidence of understanding some words or even simple phrases, responding appropriately to specific words outside the context of routine games (Huttenlocher, 1974; Tomasello & Kruger, 1992). During the 12- to 18-month period, there is a gradual increase in both receptive and expressive vocabulary. The words children learn in this period name objects and people, usually those on which the child acts (e.g., daddy, mommy, cookie, ball) and describe relationships among objects (e.g., "all gone," "more"; Fenson et al., 1994). Children also learn social words to be used in rituals such as greetings. Much like early gestures, first words are often used to express ideas, such as appearance ("Uh-oh"), disappearance ("All gone"), and recurrence ("More"), related to the child's developing notions of object permanence (Bloom & Lahey, 1978; Gopnik & Meltzoff, 1987).

By the age of 18 months, expressive vocabulary size reaches an average of about 50 to 100 words (Fenson et al., 1994; Nelson, 1973), and the "word explosion" begins. This period may be punctuated by many requests from children for adults to label things in the world around them, and words are now learned very quickly, often after only a single exposure without any explicit instruction. This stage marks an important turning point as children are no longer learning via association; instead, they understand the referential nature of words (Nazzi & Bertoninci, 2003) and are able now to use words to get new information about the world (Halliday, 1975). By 16 to 19 months, infants are able to use nonverbal cues, such as an adult's eye gaze, to make fine distinctions between an object that an adult is naming and another object that happens to be present (Baldwin, 1991), suggesting that they can now understand the intentions of others within language contexts. Similar findings for learning words to describe actions have been reported for 2-year-olds (Tomasello & Kruger, 1992).

Prior to age 2, most children begin combining words to form two-word "telegraphic" sentences (Brown, 1973), encoding a small set of meanings. Children talk about objects by naming them and by discussing their locations or attributes, who owns them, and who is doing things to them. They also talk about other people, their actions, their locations, their own actions on objects, and so forth. Objects, people, actions, and their interrelationships preoccupy the young typically developing child. Thus, early language development, from gestures to single words to beginning sentences, is in many ways a remarkably organized process that reflects both how young children think about the world (e.g., recognition of the coming and going of things and people) and what is important to them (e.g., things that they can act on, interesting events such as going outside or wiping up a spill). Individual differences exist among typically developing children, but language acquisition is not a random process. There are generally clear links between forms (i.e., gesture, words, syntax) and functions (e.g., why the child is trying to communicate) over time.

Toddlers often appear to understand everything they hear; however, studies of early language comprehension in highly structured settings have suggested that young children do not understand many more words than they are able to say (Bloom, 1974). When parents are asked to report the kinds of words and instructions that their young children are able to understand, they typically give much higher estimates than is observed during formal testing. Using a standard questionnaire (Fenson et al., 1994), parents estimated that their 8-month-olds understood an average of 6 phrases and about 20 words, increasing to an average of 23 phrases and 169 words by 16 months. Comprehension in ordinary situations may be achieved by a variety of nonlinguistic strategies that allow children to respond to what their parents say, when in fact they are responding to what their parents do or what they know about the way things usually happen

TABLE 12.1 A Summary of Milestones in Typical Language Development

	12 to 15 months	18 months	24 to 36 months	3 to 4 years	4 to 7 years
Semantics	Average expressive vocabulary size at 15 months: 10 words Average receptive vocabulary size at 15 months: 50 words Comprehension strategies include attending to objects named, and doing what is usually done	Average expressive vocabulary size at 18 months: 100 words (±105) Average receptive vocabulary size at 18 months: 300 words Comprehension strategies include acting on objects in the way mentioned, interpreting sentences as requests for child action	Average expressive vocabulary size at 24 months: 300 words (±75) Average receptive vocabulary size at 24 months: 900 words Comprehension strategies include interpreting sentences according to knowledge of probable events	Average expressive vocabulary size at 3 years: 900 words Comprehension strategies include supplying most probable missing information in answer to difficult questions	Average expressive vocabulary size at 6 years: 2,500 words Average receptive vocabulary size at 6 years: 8,000 words Comprehension strategies include overreliance on word order to process sentences that use unusual word order, such as passives
Syntax	First productions are single-word *holophrases;* one word carries the force of a whole sentence	Average age of first word combinations: 18 months (normal range: 14 to 24 months) First word combinations express basic semantic relations with consistent word order	Average MLU at 24 months: 1.92 (±0.5) Average MLU at 30 months: 2.54 (±0.6) Average MLU at 36 months: 3.16 (±0.7)	Average MLU at 4 years: 4.4 (±0.9) Grammatical morphemes become more consistent Mature forms of negatives and questions develop	Average MLU at 5 years: 5.6 (±1.2) Use of complex sentences increases from less than 10% to more than 20% of all utterances
Phonology	Most productions have CV or CVCV (consonant vowel/consonant vowel consonant vowel combinations, e.g., “ba” or “mama”) form Front stops and nasals are most frequent consonants	Back stops, fricatives, and glides are added to the consonant inventory CVC syllable shapes begin to be used 50% of consonants are produced correctly	9 to 10 different consonants are used in initial position; 5 to 6 in final; stops at all places of articulation are used; liquids appear Two-syllable words and initial consonant clusters are used by a majority of children 70% of consonants are correct; speech is 50% intelligible	Most sounds are produced correctly Consonant blends are used Some phonological simplification processes may persist Speech is nearly 100% intelligible	Almost all sounds are produced correctly Phonological processes are no longer used; a few distortions on difficult sounds (/s/, /l/, /r/) may persist Phonological analysis skills are learned for reading and spelling

Pragmatics	Average rate of communications: 1 per minute Requests and comments are used; communication is accomplished by combining gestures with speechlike vocalizations	Average rate of communications: 2 per minute Requests and comments are used; words predominate; gestural/vocal communication decreases	Average rate of communications: 5 per minute Requests and comments are used; children begin to ask questions and convey new information; word combinations predominate	Talk about past and future events increases More options for politeness are acquired New communicative functions (projecting, narrating, imagining, etc.) are expressed	Language is used to predict, reason, negotiate
Play	Conventional, functional play	Symbolic play using self as actor	Pretend play involving others and using multiple schemes	Sequences of events are played out (preparing food, setting table, eating) Child engages in dialogues, talking for all characters	Fantasy themes are played out Child or doll can take multiple roles Elaboration of planning and narrative story lines included in play

MLU = mean length of utterance
CV = consonant vowel
CVCV = consonant vowel consonant vowel

(Chapman, 1978). Such strategies include a child looking at whatever his or her parent is looking at ("See the balloon!"), doing whatever is usually done in this situation ("Brush your hair"), and interpreting sentences as a request for the child to do something. Few parents truly test their children's language comprehension by asking them to do things completely out of context (e.g., asking a child to go get Mommy's keys from the bedroom during a family meal).

The period of 18 to 24 months is also a time of important developments in conversational ability. Children now begin to understand the "conversational obligation" to answer speech with speech (Chapman, 1981). They reliably ask *and* answer routine questions ("Where's the doggy?" "What's this?" "What's the cow say?") and can now genuinely take their own part in a back-and-forth linguistic exchange.

The Acquisition of Linguistic Structures

The preschool period (from 2 to 5 years) is the time during which the child's language evolves from simple telegraphic utterances to fully grammatical forms. In addition to rapidly acquiring new vocabulary, the child goes through a process of approximating more and more closely the grammar of the language spoken in the home. There is evidence of the child's active role as a hypothesis-generator in the frequent occurrence of overgeneralized forms, such as "goed," "comed," and "mouses" (Cazden, 1968; Pinker, 1999). These errors are taken as evidence that the child is indeed acquiring a rule-governed system, rather than learning these inflections by imitation or on a word-by-word basis.

As the child's grammar becomes more complex, sentence length increases (Brown, 1973; Loban, 1976; Miller & Chapman, 1981), and children begin to use a variety of sentence forms including statements, negation, and questions. As structures in simple sentences approach the adult model, complex sentences using embedded clauses ("Whoever wins can go first") and conjoined clauses ("Then it broke and we didn't have it any more") emerge (Paul, Chapman, & Wanska, 1980). The abilities to encode ideas grammatically ("Daddy's shoe" versus "Daddy shoe") and to relate ideas within one utterance ("I'll go get it if you give me a bite of your candy") free the child's language from dependence on nonlinguistic contexts for interpretation. Whereas an adult had to use knowledge of the child and the situation to interpret "Daddy shoe" (The shoe that belongs to Daddy? Daddy put on the shoe?), the morphologically marked "Daddy's shoe" is unambiguous and interpretable by anyone.

In addition to changing their use of grammatical form, children between 3 and 5 years of age also change the ideas that they express in their sentences. Earlier utterances generally described actions and objects that were immediately present. During later preschool years, sentence content expands to allow for reference to events that are remote in time and space. Children begin to use their language in more diverse ways (Dore, 1978) to include imaginative, nonliteral, interpretive, and logical functions.

At this time, a variety of more advanced conversational and other discourse skills also emerge and become refined. Children increase their ability to maintain and add new information to the conversational topic, to clarify and request clarification of misunderstood utterances, to make their requests or comments using polite or indirect forms, and to choose the appropriate speech style on the basis of the speaker's role and the listener's status (Bates, 1976). Children also begin to engage in different types of discourse including storytelling, recounting events, and personal narratives, all of which follow cultural conventions for these diverse genres of linguistic reporting.

The Elaboration of Language

Although children have acquired most of the sentence structure of their language by age 5, syntactic development continues into the school years as children learn devices for elaborating their utterances, expressing coreference relations using pronouns (e.g., "When Mom wakes up, she'll help me dress"), and condensing more information into each sentence by increasing the proportion of dependent clauses (Loban, 1976). Children also gradually learn to use and to comprehend the more complex, optional sentence types in their language, such as passives

("The boy was hit by the car"; Lempert, 1978). They learn to use syntactic cues not only to decode semantic relations within sentences but also to identify the connections between sentence elements and those given previously in the discourse (Paul, 1985). Semantic and conversational abilities continue to develop during the school years. Vocabulary size is still increasing, and new words are now being learned from reading as well as from conversation. School-age children gradually acquire the ability to communicate with precision, to take the listener's viewpoint into account in formulating an utterance (Asher, 1978), and to tell more complex, well-structured narratives.

Issues from the Study of Language Development in Typical Children

Several issues arise in determining how to fit the different patterns of language development seen in autism into models of normal language acquisition. One source of confusion to parents and professionals is the question of consistency. Both children with autism and, on occasion, typically developing children may use a new word for a few days but then fail to continue to use this word in appropriate contexts. Are these "real" words? Does the child have them stored somewhere in the brain to be used if sufficiently motivated? Two questions arise: (1) How do we set standards for what is a reasonable level of consistency? (2) How broad do the contexts have to be in which we can reliably expect a behavior? For example, we might expect a 10-month-old to understand "bubbles" only in the bathtub, but by 18 months, the child should be able to say and understand the same word in a variety of different situations. The development of these sorts of standards may be particularly helpful for parents and primary care professionals trying to evaluate the seriousness of a possible communication delay in a very young child.

Another source of confusion is that if a person does not have a reasonable level of knowledge about the breadth and depth of typical language development, it is fairly easy to fail to notice its absence in autism. For example, a child who occasionally says five words but does so without clear communicative intent is very different from another child who also has only five different words but uses them to express a range of different meanings (as described earlier) marked in a number of different ways (gesture, words, simple syntax, intonation) throughout each day. There is variability within the normal range in the development of expressive language (Rutter & Lord, 1987) though, on close inspection, individual differences within the normal range do not resemble the kinds of patterns of communication delay seen in autism. It is important that recognition of individual differences does not lead to underestimating communication delays usually seen in autism.

COMMUNICATION AND DEVELOPMENT IN AUTISM

In this section, we explore the unique characteristics of the development of language in children with autism, in comparison to typical development, and the corresponding implications for language research.

Course and Developmental Change

As noted earlier, there is enormous variation in the timing and patterns of acquisition of language among children with autism. A minority of children, usually diagnosed with AS, do not show any significant delays in the onset of language milestones. In contrast, most individuals with autism begin to speak late and develop speech at a significantly slower rate than others (Le Couteur, Bailey, Rutter, & Gottesman, 1989). Because autism is not usually diagnosed until age 3 or 4, there is relatively little information about language in very young children with autism. Various retrospective studies using parent report and videotapes collected during infancy and the toddler years suggest that by the second year of life, the communication of most children with autism is different from other children (Dahlgren & Gillberg, 1989). Several studies have found that, as early as 1 year of age, very young children with autism are less responsive to their names or to someone speaking compared to other children (Lord, 1995; Osterling & Dawson, 1994), and they are less responsive to the sound of their mother's voice (Klin, 1991). In one study

(Lord, Pickles, DiLavore, & Shulman, 1996), 2-year-old children judged very likely to have autism had mean expressive and receptive language ages of less than 9 months, in contrast to other skills falling between 16 and 21 months. Not only was their language severely delayed at 2, but also their expressive skills continued to develop at a slower rate through age 5 compared to nonautistic children with developmental delays at similar nonverbal levels.

About 25% of children with autism are described by their parents as having some words at 12 or 18 months and then losing them (Kurita, 1985). A recent large-scale systematic longitudinal study of toddlers by Lord, Shulman, and DiLavore (2004) found that this kind of "language regression" after a pattern of normal language onset was unique to autism and not found among children with other developmental delays. Generally, the regression is a gradual process in which the children do not learn new words and fail to engage in communicative routines in which they may have participated before. Language loss occurred in these children when they still had relatively small expressive vocabularies and before the word explosion. Lord and her colleagues found that children who experienced loss of words also lost some social skills, supporting the findings from Goldberg and her colleagues (Goldberg et al., 2003), and that similar losses of social skills occurred in a smaller group of children with autism who had not yet used words at the time of loss (Luyster et al., in press). This phenomenon is quite different from the regression that is associated with disintegrative disorder (see Chapter 4, this volume), which typically occurs at a later time and involves loss of advanced linguistic skills and communication to no speech. Though the skills children with autism may have had before the regression are often minimal, it is still confusing and heartbreaking for parents to watch their children lose any component of communicative skill, fleeting though it may have been. Studies have demonstrated only a minimal relationship between language regression in autism and later prognosis or outcome, with children who had regressions having, on average, slightly lower verbal IQ scores at school age than children with no history of loss (Richler et al., in press).

To gauge the developmental timing of language milestones for children with autism, we are generally dependent on parental report. Most diagnostic interviews, such as the Autism Diagnostic Interview-Revised (ADI-R; Rutter, Le Couteur, & Lord, 2003), include questions about the age of first words and phrases. (See Lord et al., 2004, for examples of regression questions from a modified ADI for toddlers.) Lord and her colleagues have found that repeated administrations of the ADI-R revealed that the ages that parents reported these language milestones increased with the age of the child at the time of the interview (Lord, Risi, & Pickles, 2004; Taylor, 2004). This systematic "telescoping" means that parents of older children with autism are more likely to recall their children's language as being even more delayed than they did when their children were younger.

Both within and across categories of children with ASDs, there is significant variability in the rate at which language progresses among those children who do acquire some functional language (Lord et al., 2004). In the preschool period and beyond, certain nonverbal skills, especially the frequency of initiating joint attention, and imitation, are strong predictors of language acquisition for children with autism (Charman et al., 2003; Rogers, Hepburn, Stackhouse, & Wehner, 2003; Sigman & Ruskin, 1999). There is also often a significant correlation between IQ and language outcomes although higher levels of nonverbal IQ are not always associated with higher level language skills (Howlin, Goode, Hutton, & Rutter, 2004; Kjelgaard & Tager-Flusberg, 2001). Although few longitudinal studies of language acquisition among verbal children with autism have been conducted, the research suggests that during the preschool years, progress within each domain of language (e.g., vocabulary, syntax) follows similar pathways as has been found for typically developing children (e.g., Tager-Flusberg & Calkins, 1990). Individuals with autism continue to make progress in language and related developmental domains well beyond the preschool years. Paul, Cohen, and Caparulo (1983), in a longitudinal study of children with aphasic and autistic disorders, showed that comprehension ability at early ages was related to degree of improvement in social relations in

late adolescence and early adulthood. Paul and Cohen (1984a) suggested that both comprehension and expressive abilities continue to improve in these populations through adolescence and adulthood, although expressive skills show greater rates of improvement. This pattern may occur because speech is more accessible than comprehension and more often a direct target of remedial efforts. In another series of follow-up studies in Britain, almost all of the participants with autism or developmental language disorders showed substantial improvements in formal aspects of language into adulthood (Cantwell & Baker, 1989). However, the group with autism, who had serious receptive language deficits in early childhood, remained more severely language delayed as a whole (Rutter, Mawhood, & Howlin, 1992). They had more severe behavioral limitations compared to the nonautistic language-disordered group, who had a much broader range of outcome, from total independence and good language skill to severe psychiatric disorder and continued expressive language problems.

Some children with autism never acquire functional language; many of these children have very low nonverbal IQ scores. Epidemiological studies indicate that about half the population remains nonverbal by middle childhood (Bryson, Clark, & Smith, 1988); however, recent longitudinal studies of children referred for possible autism at early ages have suggested that the proportion of children with ASD who do not use words to speak is less than 20% (Lord et al., 2004). Such a statistic is clearly affected by variation in who is studied: What age are the participants with autism? Are they recruited from special education services or clinics or from broader populations? What about the effect of education and treatment? The statistic is also affected by how useful speech is defined: Are single words enough? Simple sentences? How spontaneous do they have to be? How often do they have to be used? How intelligible must they be?

There is some optimism that with more children receiving earlier diagnoses and thus better access to early intensive interventions, especially for language and communication skills, the proportion of children with autism who fail to acquire functional language is diminishing. Nevertheless, as the prevalence rates for ASDs increase, it is not easy to disentangle improvements in language skills across the autism spectrum from an increase in the diagnosis among higher functioning, more verbal individuals.

Articulation

Among children with autism who speak, articulation is often normal or even precocious (Kjelgaard & Tager-Flusberg, 2001; Pierce & Bartolucci, 1977). However, Bartak and colleagues (Bartak, Rutter, & Cox, 1975) found articulation development to be somewhat slower than normal. These delays were more transient in a group of high-functioning boys with autism than in language-level-matched nonautistic boys with severe receptive-expressive delays in middle childhood (Rutter et al., 1992) and may be the result of later onset of language milestones. Still, Shriberg et al. (2001) reported that one-third of speakers with high-functioning autism (HFA) and with AS retained residual speech distortion errors on sounds such as /r/, /l/, and /s/ into adulthood, whereas the rate of these errors in the general population is 1%.

Bartolucci, Pierce, Streiner, and Tolkin-Eppel (1976) showed that phoneme frequency distribution and the distribution of phonological error types in a small group of children with autism was similar to that of mentally handicapped and typical children matched for nonverbal mental age. The less frequent the phoneme's use in the language, the greater was the number of errors. Phonological perception among the groups also was similar. These findings indicate that the developmental trajectory for phonological development in autism follows the same path as in other groups of children, although a higher rate of distortion errors is seen in adult speakers.

Two caveats should be noted. First, difficulties in articulation are relatively common in nonautistic children with intellectual handicaps. Thus, the fact that there is no difference between autistic and IQ-matched children with mental handicaps does not mean that no children with autism have articulation difficulties. Second, there are a relatively small number of autistic children who are identified as high functioning on the basis of nonverbal tests during preschool but who have extraordinary

difficulties in producing intelligible speech. These children are not likely to be included in many studies of language because they are relatively rare. By the time they are 10 or 12 years old, fluent language often becomes an implicit criteria for the category of "high functioning." Little is known about either the existence or phenomenology of this pattern of development.

Word Use

Word use in autism can be observed by asking two rather different questions: (1) Do children with autism use and understand words as belonging to the same categories as other people? and (2) Is there anything unusual about how individuals with autism use words? The answer to both questions is *yes*. In the first case, studies have shown that verbal children with autism use semantic groupings (e.g., bird, boat, food) in very similar ways to categorize and to retrieve words (Boucher, 1988; Minshew & Goldstein, 1993; Tager-Flusberg, 1985). High-functioning children and adolescents with autism can score well on standardized vocabulary tests, indicating an unusually rich knowledge of words (Fein & Waterhouse, 1979; Jarrold, Boucher, & Russell, 1997; Kjelgaard & Tager-Flusberg, 2001) and an area of relative strength for some individuals with autism. At the same time, Tager-Flusberg (1991) found that children with autism often fail to use their knowledge of words in a normal way to facilitate performance on retrieval or organizational tasks.

At the same time, it appears that certain classes of words may be underrepresented in the vocabularies of children with autism. For example, Tager-Flusberg (1992) found that the children participating in a longitudinal language study used hardly any mental state terms, particularly terms for cognitive states (e.g., *know, think, remember, pretend*). These findings were replicated in research including older children with autism (Storoschuk, Lord, & Jaedicke, 1995; Tager-Flusberg & Sullivan, 1994). Other studies suggest that children with autism have particular difficulties understanding social-emotional terms as measured on vocabulary tests such as the Peabody Picture Vocabulary Test (Eskes, Bryson, & McCormick, 1990; Hobson & Lee, 1989; Van Lancker, Cornelius, & Needleman, 1991). Thus, while overall lexical knowledge may be a relative strength in autism, the acquisition of words that map onto mental state concepts may be specifically impaired in this disorder.

Abnormal use of words and phrases has been described in autism for many years (Rutter, 1970). In samples of high-functioning adolescents and adults, a significant minority has been shown to use words with special meanings (Rumsey, Rapoport, & Sceery, 1985; Volden & Lord, 1991) or "metaphorical language" use, as Kanner (1946) described this unusual phenomenon. In most cases, these words or phrases were modifications of ordinary word roots or phrases that produced slightly odd sounding, but comprehensible, terms such as "commendment" for praise or "cuts and bluesers" for cuts and bruises. These terms were not radically different from those used occasionally by mentally handicapped or younger, nonhandicapped children matched on expressive language level, except that they were more frequent in the autistic population. Only subjects with autism produced neologisms or odd phrases for which the root was not fairly obvious, though these, too, were relatively rare (Volden & Lord, 1991). Increased language ability was associated with increased (proportions as well as absolute numbers) peculiarities and perseveration in individuals with autism. In a nonautistic mentally handicapped group, oddities decreased steadily as expressive language ability improved (Volden & Lord, 1991). Rutter (1987) suggests that these abnormal uses of words may be functionally similar to the kinds of early word meaning errors made by young typically developing children. It is their persistence in autism that defines them as abnormal, and they may reflect the fact that children with autism are not sensitive to the corrective feedback provided by their parents because of their social impairments.

Pedantic speech and being overly precise in a rather concrete way are also descriptors frequently used with individuals with HFA or AS (Ghaziuddin, Tsai, & Ghaziuddin, 1992), though these qualities can be very difficult to quantify. Wing (1981) commented on the language of people with AS as having a "bookish" quality exemplified by the use of obscure

words. She considered pedantic speech to be one of the main clinical features of this disorder (Burgoine & Wing, 1983). Mayes, Volkmar, Hooks, and Cicchetti (1993) found that the presence of peculiar language patterns was one of the best discriminators of pervasive developmental disorder from language disability.

Syntax and Morphology

Relatively few studies have systematically investigated grammatical aspects of language acquisition in autism. The longitudinal study of six autistic boys conducted by Tager-Flusberg and her colleagues found that these children followed the same developmental path as an age-matched comparison group of children with Down syndrome who were part of the study and to normally developing children drawn from the extant literature (Tager-Flusberg et al., 1990). The children with autism and Down syndrome showed similar growth curves in their Mean Length of Utterance (MLU), which is usually taken as a hallmark measure of grammatical development. At the same time, in a follow-up study using the same language samples, Scarborough, Rescorla, Tager-Flusberg, Fowler, and Sudhalter (1991) compared the relationship between MLU and scores on a different index of grammatical development, which charts the emergence of a wide range of grammatical constructions: the Index of Productive Syntax (IPSyn). The main findings were that at higher MLU levels, MLU tended to significantly overestimate IPSyn scores for the subjects with autism, suggesting that for the children with autism, the relatively limited growth in IPSyn reflects the tendency to make use of a narrower range of constructions and to ask fewer questions, which accounts for a significant portion of the IPSyn score.

Several studies of English-speaking children with autism investigated the acquisition of grammatical morphology, based on data from spontaneous speech samples. Some of these studies must be interpreted with caution as they included very small numbers of children, who varied widely in age, mental age, and language ability. Two cross-sectional studies found differences between children with autism and a comparison group of typical children or children with mental retardation in the mastery of certain grammatical morphemes (Bartolucci, Pierce, & Streiner, 1980; Howlin, 1984). Bartolucci et al. (1980) found that children with autism were more likely to omit certain morphemes, particularly articles (a, the), auxiliary and copula verbs, past tense, third-person present tense, and present progressive. Tager-Flusberg (1989) also found that children with autism were significantly less likely to mark past tense than were matched controls with Down syndrome. Bartolucci and Albers (1974) compared children with autism to controls in performance on a task designed to elicit production of present progressive *-ing* and past tense *-ed* for different verbs. The children with autism performed well on the present progressive form, as did the controls. They were, however, significantly impaired on the past tense elicitation trials. This finding was replicated in a recent study of over 60 children with autism who were given tasks to elicit both the past tense and the third-person present tense (Roberts, Rice, & Tager-Flusberg, 2004). The sample was divided into those who had scores within the normal range on standardized language tests and those who were significantly below the mean. Only those with impaired language scores performed poorly on the tense tasks. Across these studies, then, marking tense was impaired among children with autism. Roberts et al. (2004) interpret their findings as evidence that a subgroup of children with autism have grammatical deficits that are similar to those reported among children with specific language impairment (cf. Rice, 2004).

Studies of other sentence forms in spontaneous language have generally indicated that children with autism are similar to mental-age-matched youngsters in terms of the acquisition of rule-governed syntactic systems (Bartak et al., 1975; Pierce & Bartolucci, 1977). Children with autism, mental handicap, or developmental language disorders lag in language development relative to nonverbal mental age. It seems very likely that syntactic development in children with autism is more similar than dissimilar to normal development. It often proceeds at a slower pace and is related to developmental level more than to chronological age, although it may not keep

pace with other areas of development (Tager-Flusberg, 1981a).

Studies of adults with autism (Paul & Cohen, 1984a) suggest that this development eventually reaches a plateau in at least some individuals with autism. Adults with autism did significantly more poorly on measures of syntactic production in free speech than adults with mental handicap matched for nonverbal IQ. The lags shown by children and adolescents with autism are often more severe than those of other children with comparable delays earlier in childhood. In research, these delays are often less obvious because children with autism who are not delayed on nonverbal tests are generally grouped with children with autism who are more severely delayed. Moreover, it is now clear that among children with autism, there are different subgroups, some of whom have impaired language while others have normal language, as measured on standardized tests (Tager-Flusberg, 2003). The entire autism group is erroneously compared to a more homogeneous control group of nonautistic children with mental handicap (Lord & Pickles, 1996). These concerns highlight the need for more studies that are longitudinal in design, providing follow-up into late adolescence or adulthood, with a focus on individual variation among participants with ASDs.

Echolalia

One of the most salient aspects of deviant speech in autism is the occurrence of echolalia. Echolalia is the repetition, with similar intonation, of words or phrases that someone else has said. It can be immediate; for example, a child repeats back her teacher's greeting, "Hi, Susie," exactly as it was said to her. It can be delayed, as in the case of a child who approaches his father and says, "It's time to tickle you!" as a signal that he wants to be tickled, repeating a phrase he has heard his parents say in the past.

Echolalia was once viewed as an undesirable, nonfunctional behavior (Lovaas, 1977). However, other clinicians, beginning with Fay (1969) and elaborated by Prizant and colleagues (see Chapter 36, this *Handbook,* Volume 2), have emphasized that often echolalia serves the child-specific functions. Prizant and Duchan (1981) highlighted six communicative functions that they found were served by immediate echolalia: turn taking, assertions, affirmative answers, requests, rehearsal to aid processing, and self-regulation. Delayed echoes can be used communicatively to request re-creations of the scenes with which the remarks were originally associated, such as a child saying, "You're okay" in a sympathetic tone of voice if he falls down. They can serve other functions as well. Baltaxe and Simmons (1977) showed that the bedtime soliloquies of an 8-year-old autistic child contained frequent examples of delayed echolalia, which they suggested the child used as a base for analyzing linguistic forms that she was in the process of acquiring, as found among some nonautistic children (Weir, 1962).

Although echolalia is one of the most classic symptoms of autism (Kanner, 1946), not all children with autism echo, nor is echoing seen only in autism. Echoing particularly immediate repetition occurs in blind children, in children with other language impairments, in older people with dementia, and, perhaps most importantly, in some normally developing children as well (Yule & Rutter, 1987). McEvoy, Loveland, and Landry (1988) found that immediate echolalia was most frequent in children with autism who had minimal expressive language but was not closely associated with chronological or nonverbal mental age. Shapiro (1977) and Carr, Schreibman, and Lovaas (1975) found that children with autism were most likely to echo immediately questions and commands that they did not understand or for which they did not know the appropriate response.

A substantial minority, but not all, of verbal autistic adolescents and adults are described by their parents as having engaged in delayed echolalia at some point in their development (Le Couteur et al., 1989). Echolalia has been offered as evidence of "gestalt" processing in autism (Frith, 1989). Prizant (1983) proposed that children with autism are especially dependent on the gestalt approach to acquiring language (cf. Peters, 1983) and that this is evident in their reliance on echolalia. Tager-Flusberg and Calkins (1990) investigated whether variations in echolalia were tied to differences in the process by which grammar was acquired in autism, when compared to language-matched groups of typically developing children and young children with Down

syndrome. As predicted, the children with autism at the early stages of language development produced the most echolalic and formulaic speech. For all children, echolalia declined rapidly over the course of development. To investigate whether children with autism used echolalia as a means for acquiring new grammatical knowledge, Tager-Flusberg and Calkins compared echolalic and nonecholalic spontaneous speech drawn from the same language sample for length of utterances using MLU and for the complexity of grammatical constructions using IPSyn. If imitation is important in the acquisition of grammatical knowledge, then length and grammatical complexity should be more advanced in echolalic than in spontaneous speech produced at the same developmental point. This hypothesis was not confirmed for any of the children in this study. On the contrary, across all language samples, spontaneous utterances were significantly longer and included more advanced grammatical constructions. These findings suggest that echolalia is not an important process in facilitating grammatical development in autism, though it clearly reflects a different conversational style and plays an important role in children's communication with others, especially when they have very limited linguistic knowledge.

In summary, although immediate and delayed echolalia are salient features of autistic speech, they are neither synonymous with nor unique to this syndrome. Although some echolalia in autism may appear to be nonfunctional or self-stimulatory, both immediate and delayed echolalia can serve communicative purposes for the speaker.

Use of Deictic Terms

Confusion of personal pronouns (e.g., when a child asks for a drink by saying, "Do you want a drink of water?") is another frequently mentioned atypical language behavior associated with autism. As with other aspects of deviant language, pronoun reversal sometimes occurs in children with language disorders other than autism or in blind children (Fraiberg, 1977), and it may even be present briefly in the language of some normally developing children (Chiat, 1982). As with echolalia, pronoun reversal errors may not occur in all children with autism, but they are more common in individuals with autism than in any other population (Le Couteur et al., 1989; Lee, Hobson, & Chiat, 1994). It is interesting that Tager-Flusberg (1994) found that among small groups of young children with autism, all of them went through a stage of reversing pronouns, though as they got older, the more linguistically advanced children stopped making these errors. The majority of the time, children used pronouns correctly; reversal errors averaged only 13% of all pronouns produced.

Kanner (1943) originally attributed pronoun reversals to echolalia. Some examples, such as the child who says, "Carry you!" seem to reflect this relationship. Other accounts have considered the linguistic or information-processing demands in having to shift and mark reference (Rice et al., 1994). Within autism, difficulty using pronouns is generally viewed as part of a more general difficulty with deixis, the aspect of language that codes shifting reference between the speaker and the listener. For example, in labeling a person by name (e.g., "James"), the label remains the same without regard to who is speaking whereas, for pronouns, whether James is referred to as "I" or "you" depends on whether he is the speaker or the listener during a particular conversation. Deixis is marked not only by pronouns but also in various ways in different languages. In English, these include various determiners (e.g., whether a speaker uses "this" or "that" depending on previous reference or location of an object) or the selection of verbs (e.g., "come" and "go") and verb tense.

Most current interpretations of pronoun errors in autism view them as a reflection of the difficulties that children with autism have in conceptualizing notions of self and other as they are embedded in shifting discourse role between speaker and listener (Lee et al., 1994; Tager-Flusberg, 1993). Their difficulty understanding discourse roles is related to impaired social communicative functioning, specifically conceptual perspective-taking (Loveland, 1984), and may be related to their broader social deficits (see Chapter 12, this volume).

Suprasegmental Aspects of Language

Paralinguistic features such as vocal quality, intonation, and stress patterns are another

frequently noted speech characteristic of individuals with ASDs (Rutter et al., 1992). Odd intonation patterns associated with autism seem to be one of the most immediately recognizable clinical signs of the disorder. However, defining what constitutes autism-related paralinguistic abnormalities so that clinicians can make reliable judgments about them has been quite challenging (Lord, Rutter, & Le Couteur, 1994; Lord et al., 2000; Volkmar et al., 1994), in part, perhaps because of the number of different ways in which language can sound unusual.

There are several levels of prosodic function: grammatical, pragmatic, and affective (Merewether & Alpert, 1990). Grammatical prosody includes cues to the type of utterance (e.g., questions end with rising pitch) and different stress patterns used to distinguish different parts of speech (e.g., marking the word *present* with stress on the first syllable if used as a noun). Pragmatic stress may highlight new information or draw the listener's attention to the significance of the message expressed (e.g., "Are *you* the writer of this note?" versus "Are you the writer of this note?"). Affective prosody conveys the speaker's feelings or attitudes and may include variations in vocal tone and speech rate. Failure to use and appreciate intonational cues, then, will likely not only affect the emotional tone of a verbal exchange but also hamper its comprehensibility.

Intonational peculiarities frequently are associated with ASDs. The most frequently cited is monotony (see Fay & Schuler, 1980). These patterns were formerly attributed to emotional states thought to be present (or absent) in autistic individuals and were originally thought to reflect flat affect, the failure to express personality, or repressed anger (see Lord & Rutter, 1994). Fay and Schuler (1980) also describe a subset of autistic individuals who used a singsong rather than flat pattern. Goldfarb, Braunstein, and Lorge (1956) and Pronovost, Wakstein, and Wakstein (1966) found unusually high fundamental frequency levels in autistic speakers. Other voice disorders, such as hoarseness, harshness, and hypernasality, have been identified (Pronovost et al., 1966). Our own clinical observations detected hyponasality in some children with autism. Poor control of volume, with unexplained fluctuations, has also been reported (Pronovost et al., 1966). And Fay (1969) reported frequent whispering among children who echo.

Research on AS suggests that these abnormalities in intonation and prosody are even more prevalent for children and adults with AS than for individuals with autism. Eisenmajer and his colleagues (Eisenmajer et al., 1996) compared the clinical behaviors of children with autism and children with AS using in-depth interviews conducted with their parents. The children with AS were more likely to be described by their parents as having an unusual tone of voice such as flat or monotonous quality. The most systematic direct investigation of prosodic features in AS was conducted by Shriberg et al. (2001). They analyzed speech samples collected during a diagnostic interview, the Autism Diagnostic Observation Schedule (ADOS), which was conducted with the adolescent and adult participants with autism or AS. The main findings were that about one-third of the participants with AS had distorted speech and articulation problems, and two-thirds expressed prosodic abnormalities at grammatical, pragmatic, or affective levels. Like Asperger's case studies (Asperger, 1991), quite a number of the study participants had loud, high voices with a nasal tone. Koning and Magill-Evans (2001) investigated whether adolescents with AS were able to use nonverbal cues, including facial expression, body gestures, and prosody, to interpret the feelings of people acting in videotaped scenes. They found that the adolescents with AS were significantly worse than controls in interpreting the emotions and relied least on prosodic information. These findings suggest that people with AS not only are impaired in expressive prosody but also have difficulty comprehending prosodic information expressed by others. The reasons behind these deficits in suprasegmental features remain obscure. Frith (1969) showed that like typically developing children, children with autism recalled stressed words better than unstressed ones, especially when the stress was placed on content words. On the other hand, children with autism seemed less able than typical children to take advantage of stress cues for meaning (see also Baltaxe, 1984). Thurber and Tager-Flusberg (1993) found autistic children produced fewer nongrammatical

pauses than controls matched on verbal mental age when telling a story from a wordless picture book. There was no difference in grammatical pauses (i.e., those between phrases). Deviance in intonation seems unlikely to be due solely to simple perceptual or motor deficits. More fundamental aspects of the autistic syndrome reflected in higher level language and communicative behaviors, such as understanding of other persons, related social cognitive deficits, and/or ability to plan and execute a complex action, may contribute to how autistic children learn to use intonation and other paralinguistic features.

There seems no doubt that there is something different about the way in which the stream of sound associated with speech is produced in many persons with autism. Ricks and Wing (1976) carried out one of the first studies in this area. They studied parents' identification of the meaning of the prelinguistic vocalizations of autistic children and found that parents of children with autism were unable to understand the preverbal vocalizations of other children with autism, even though they could understand their own child's messages. In contrast, parents of typically developing children could understand vocalizations of typical children who were not their own, as well as those of their own child. These findings were not replicated in a later study by Elliott (1993).

Historically, autistic children have been described as babbling less frequently than other children during early childhood. However, Elliott (1993) found no difference in the frequency with which preverbal, developmentally delayed 2-year-olds, preverbal typically developing 10- to 12-month-olds, and 2-year-olds with autism produced vocalizations in situations that were intended to engage the children socially (e.g., watching a balloon fly around the room); however, a smaller proportion of the children with autism vocalized than in the comparison groups. Moreover, the vocalizations the children with autism did produce were less likely to be paired with other nonverbal communication, such as shifts in gaze or gesture or changes in facial expression than they were for the other children (Hellreigel, Tao, DiLavore, & Lord, 1995). Sheinkopf and his colleagues conducted a detailed examination of the vocal behavior of young preverbal children with autism and a group of comparison children with developmental delays (Sheinkopf, Mundy, Oller, & Steffens, 2000). Although the children with autism did not have difficulty with the expression of well-formed syllables (i.e., canonical babbling), they did display significant impairments in vocal quality (i.e., atypical phonation). Specifically, autistic children produced a greater proportion of syllables with atypical phonation than did comparison children. The atypicalities in the vocal behavior of children with autism were, however, unrelated to individual differences in joint attention skill, suggesting that a multiple process model may be needed to describe early social-communication impairments in children with autism.

Taken together, these findings suggest that the source of the difference between the vocalizations of the young children with autism and those of other young, nonverbal children was not just in social intent, but also in a more basic aspect of the form of the vocalization beginning very early in development.

Language Comprehension in Autism

Most research on the language of individuals with autism centers on their productive capacities. In contrast, less attention has been focused on their comprehension skills. This is unfortunate because early response to language, a likely precursor to comprehension, is one of the strongest indicators of autism in very young children (Dahlgren & Gillberg, 1989; Lord, 1995). Charman and his colleagues collected data on early language development from a large group of preschool-age children with autism using a parent report measure: the MacArthur Communicative Development Inventory (Charman, Drew, Baird, & Baird, 2003). They found that comprehension of words was delayed relative to production, though, like typically developing children, in absolute terms the children with autism understood more words than they produced. The continuation of significant delays in comprehension is also one of the strongest differentiators of HFA from specific language disorders (Rutter et al., 1992).

Bartak et al. (1975) and Paul and Cohen (1984a) showed that individuals with autism performed more poorly on standardized

measures of language comprehension than participants with aphasic or mental handicap at similar nonverbal mental age levels. Studies of very young children (Paul, Chawarska, Klin, & Volkmar, 2004) suggest that comprehension skills are depressed relative to production in the second year of life, while the gap tends to narrow, with receptive skills moving closer to expressive levels, in the third to fourth year. Studies that have compared receptive and expressive language skills among somewhat older children with autism using standardized tests have found that receptive skills as measured by standard scores tend to be comparable to expressive on vocabulary tests as well as tests of higher order language processing (Jarrold et al., 1997; Kjelgaard & Tager-Flusberg, 2001). Yet, there is a clear clinical impression that among verbal children with autism, comprehension is more significantly impaired (Tager-Flusberg, 1981a).

More insight into the mechanisms that underlie the impression of impaired language comprehension in autism comes from experimental studies. Sigman and Ungerer (1981) looked at language comprehension and sensorimotor performance in children with autism with mental ages of about 2 years. They found sophisticated performance on object permanence tasks but poor performance on receptive language measures. They suggested that sensorimotor skills play a small role in the acquisition of language. Play skills, on the other hand, were highly related to receptive language level, particularly those forms of play that were directed outward toward dolls. Thus, the more social aspects of cognition, those involving the imaginary creation of a scene with dolls and interactions between people, appear to be more related to the understanding of language than are those involving knowledge about objects, which can be learned with very little social interaction. Tager-Flusberg (1981b) investigated sentence comprehension using experimental tasks that assessed the use of different strategies. Children with autism performed at the same level as typical controls in their use of a word order strategy for processing sentences (interpreting noun-verb-noun sequences as agent-action-object); however, they were less likely to use a semantically based probable event strategy, interpreting sentences based on their likelihood of occurring in the real world (e.g., knowing that a mother is more likely to pick up a baby than a baby pick up a mother). Tager-Flusberg (1981b) concluded that children with autism have difficulty applying their knowledge about the probabilities of occurrence of events in the world to the task of understanding sentences.

In a partial replication of this study, Gaddes (1984) showed that children with autism were much less consistent in identifying probable events that involved relationships between people (e.g., the mother feeds the baby) than were very young normally developing children with lower or equivalent expressive abilities. This occurred when the relationships were acted out by dolls, even when no comprehension of language was required. Thus, the difficulties may lie in comprehending the situation and what is probable in it, as well as comprehending the word order that depicts the situation. Paul, Fischer, and Cohen (1988) found that although children with autism used similar strategies in sentence comprehension as other children, they always performed less competently. Together, these findings suggest that children not only may have limited ability to integrate linguistic input with real-world knowledge, but also, in some cases, may lack knowledge about social events used by normally developing children to buttress emerging language skills and to acquire increasingly advanced linguistic structures (Lord, 1985).

Another source of difficulty in comprehending language in everyday situations rather than in standardized testing situations may be the ability to integrate nonverbal cues to help interpret linguistic input. Examples include noticing the smile on another's face, the way in which another person touches you, the tone of his or her voice, as well as the words, to determine whether someone is being affectionate, teasing, or being aggressive (Loveland, 1991; Ozonoff, Pennington, & Rogers, 1990; St. James & Tager-Flusberg, 1994).

Paul and Cohen (1985) looked at the ability of matched groups of participants with autism and mental handicap to understand indirect requests for action (e.g., "Can you color this circle blue?") of varying syntactic complexity. The two groups, with IQs in the mildly to moderately retarded range, performed similarly in

a context in which the request intent of the utterance was made explicit (e.g., "I'm going to tell you to do some things. Can you . . ."). However, the autism group performed significantly worse when the same requests were presented in an unstructured context with no prefacing cue as to the intention of the utterance. The authors concluded that the individuals with autism are impaired in the ability to determine the speaker's intention without explicit cuing over and above any syntactic comprehension deficit that might be present. This pattern may be an example of why, in their follow-up of HFA individuals, Rutter et al. (1992) found a strong relationship between language comprehension and social functioning in adulthood, with no similar finding for adults identified as having specific receptive and expressive language impairment as children.

For individuals with autism, understanding language in conversational and other discourse contexts remains a significant challenge because semantic and pragmatic aspects of language are so closely linked to nonverbal social communication and other aspects of social adaptation.

Language Use

Language use or the pragmatic aspects of language in autism has been studied from a variety of perspectives. This domain has been the focus of research for the past several decades because problems have been found across all individuals with ASDs. Studies on language use including specific, unusual aspects of language use such as delayed echolalia and neologisms, as well as language used to describe particular phenomena such as mental states or emotions, are discussed elsewhere in the chapter; this section focuses on research on speech acts, referential communication, discourse, and narration.

One of the most interesting characteristics of language use in autism is that it has aspects that are constant across development and aspects that change. As with the development of social behavior (Lord, 1995), some of the changes occur because children improve in their communicative abilities; other changes occur because situational demands for communication are different for children of different ages and for adults and vary with the contexts in which individuals find themselves. Thus, in considering deficits in language use, factors such as what individuals are expected to do, what they are given the opportunity to do, and what they usually do all must be considered. Stone and Caro-Martinez (1990), in an observational study of the spontaneous communication of children with autism of varying abilities placed in special classrooms, found differences in the functions about which the children communicated. These differences were related to chronological age, nonverbal IQ, and whether the children's primary mode of communication was through speech or motor acts. Children who did not talk engaged in more social routines than verbal children. Children with speech were more likely to use language to offer new information. They communicated to a greater number of different people (rather than just the teacher) and were more likely to address communications to peers as well as adults than children without speech. McHale, Simeonsson, Marcus, and Olley (1980) showed that autistic students communicated more in the presence of their teachers than in their absence and directed their communication only to adults, not to peers.

Across different language levels, children with autism also share important similarities. Despite deficits in spontaneous speech, most children on the autism spectrum do attempt to use their language to communicate even if only in limited ways. Bernard-Opitz (1982) showed that communicative performance of one child with autism varied with different interlocutors and in different settings, indicating some social awareness in his use of language. However, rate of initiation of spontaneous communications in autism is often described as very low. In the study by Stone and Caro-Martinez (1990), the modal frequency in school was two or three spontaneous communicative acts per child per hour. Only half of the children ever directed a communication to a peer across multiple observations. Several other investigators have shown autistic children to have less frequent and less varied speech acts in free play or more open-ended situations, even when their responses to highly structured situations were similar to those of control groups (Landry & Loveland, 1989; Mermelstein, 1983; Wetherby & Prutting, 1984). General studies of younger children

with autism find that they rarely use language for comments, showing off, acknowledging the listener, initiating social interaction, or requesting information. Even among older higher functioning children, language is rarely used to explain or describe events in a conversational context (Ziatas, Durkin, & Pratt, 2003). The speech acts that are missing or rarely used in the conversations of children with autism all have in common an emphasis on social rather than regulatory uses of language (Wetherby, 1986). There are also similarities in abnormalities in language use across verbal individuals with autism who show a range of expressive language abilities. Difficulties in listening, talking to self, problems in following rules of politeness, and making irrelevant remarks occur for many children and adults with autism (Baltaxe, 1977; Rumsey, Rapoport, & Sceery, 1985).

Difficulties in social uses of language, especially in conversations and other discourse contexts, have also been widely noted for people with both HFA and AS by clinicians and researchers (e.g., Klin & Volkmar, 1997; see Landa, 2000, for review). Chuba, Paul, Miles, Klin, and Volkmar (2003) reported on conversational behaviors in 30 adolescents with either HFA or AS who were engaged in semistructured conversational interviews with clinicians. Findings revealed that for both diagnoses, conversational errors were *inconsistent,* rather than constant. Nonetheless, it was possible to distinguish teenagers with ASD from those with typical development (TD) in terms of the quantity of conversational errors. No TD subject made more than five errors within a 30-minute sample, whereas all subjects with HFA and AS made more than eight errors. The most robust differences observed were in the areas of gaze and intonation, while remaining differences centered on ability to share topics and infer others' informational state. Similarly, Paul and Feldman (1984) reported in a case series presentation that highly verbal adolescents and adults with autism showed difficulties in identifying the topic initiated by the conversational partner and in providing a relevant comment. They had difficulty judging, on the basis of cues in the conversation and on the basis of general knowledge about what listeners could reasonably be expected already to have in their knowledge store, how much information was the right amount to include in an utterance (Lord et al., 1989). For example, when asked the question, "Did you and your sister do anything besides rake leaves over the weekend?" a participant responded, "Yes." This answer, although correct in a strictly syntactic sense, fails to appreciate the listener's real purpose in asking the question. It fails to provide the socially appropriate amount of information in response. On the other hand, another adolescent with autism, when asked how his day had gone, began the account with a description of the exact time when he awakened, the bathroom where he washed his face, and the color of his toothbrush. Similar findings were reported by Surian and his colleagues using a structured experimental task (Surian, Baron-Cohen, & Van der Lely, 1996).

Few differences have been reported between subjects with HFA and AS, although Shriberg et al. (2001) found that young adults with AS were significantly more garrulous than those with HFA. Ghaziuddin and Gerstein (1996) included monologue speech as part of their definition of pedantic speech style, which suggests that people with AS do not engage much in turn taking during reciprocal conversations with other people and may also talk too much. Ramberg, Ehlers, Nyden, Johansson, and Gillberg (1996) found that children with AS were impaired in taking turns during dyadic conversations, providing some support for this view.

Adams, Green, Gilchrist, and Cox (2002) compared conversational samples collected from adolescents with AS and a group of age- and IQ-matched children with severe conduct disorder. Although there were no overall significant group differences in verbosity, the adolescents with AS tended to talk more during conversational contexts that focused on emotional topics. A few participants with AS were extremely verbose. The groups were similar in their ability to respond to questions and comments offered by their conversational partner, but a qualitative analysis of responses revealed that the participants with AS had more pragmatic problems such as providing an inadequate or tangential response especially when discussing an unusual event or personal narrative.

Children and adolescents with autism perform less well on tasks of referential communication (Loveland, Tunali, McEvoy, & Kelley, 1989), although many can identify another

person's visual perspective (Baron-Cohen, 1989; Hobson, 1984). More social and/or more complex aspects of referential communication, such as those that affect narration and discourse, are particularly affected (Hemphill, Picardi, & Tager-Flusberg, 1991). Children with autism often have difficulty dealing with new information (Tager-Flusberg & Anderson, 1991). They produce more noncontingent utterances, with patterns similar to those of language-impaired children but with proportionately more errors (Baltaxe & D'Angiola, 1992). Hurtig, Ensrud, and Tomblin (1980) reported that persistent and perseverative questioning generally did not serve the purpose of requesting information in autistic children but was communicative, often functioning as a means of initiating interaction or getting attention.

Bishop, Hartley, and Weir (1994) studied a group of children with semantic-pragmatic disorder who had some social and communicative behaviors that overlap with autism and pervasive developmental disorder. They found that, in these more verbally fluent children, there was a higher proportion of utterances that were initiations than responses. This finding seemed to account for how language-impaired children, including some with autism, could be considered talkative, even though the total amount of language they produce is not higher than that of other children.

Paul and Cohen (1984b) studied responses to requests for clarification in adults with autism or mental retardation matched for nonverbal IQ. They found that although the participants with autism were just as likely to respond to requests for clarification, their answers were less specific than those of the nonautistic participants. They were also less likely to add information that might be of help to the listener, suggesting that they had difficulty judging what piece of information was relevant.

Chuba et al. (2003) used conversational probes and role playing to examine the pragmatic abilities of adolescents with HFA and AS. In these more structured conversational situations, as in more naturalistic interviews discussed earlier, subjects with ASD had significantly more difficulty than controls with TD in responding to topics introduced by others and in making comments contingent on the interlocutor's remark. They also had difficulty gracefully terminating topics. In role-playing situations that required the subject to lead the conversation, teenagers with ASD generally were unable to take assertive conversational roles. Paradoxically, then, adolescents with ASD showed difficulty in responding contingently to others' conversational input *and* in appropriately guiding conversations to elicit remarks from an interlocutor. Taken together, these results suggest a basic difficulty in establishing and maintaining reciprocity in conversation—in the ability to engage in mutual, cooperative social dialogue.

Studies of the ability of individuals with autism to produce narrative discourse have also provided information about the ways in which persons with autism organize and convey their thoughts to others. In general, studies have found that, commensurate with their language ability, children and adults with autism are able to narrate stories and follow simple scripts for common social events, such as a birthday party. Particular difficulties in making causal statements were found in one study (Tager-Flusberg, 1995), but these findings were not replicated in a later study (Capps, Losh, & Thurber, 2000). Loveland and her colleagues asked individuals with autism or Down syndrome, matched on chronological and verbal mental age, to retell the story they were shown in the form of a puppet show or video sketch (Loveland, McEvoy, Tunali, & Kelley, 1990). Compared to the controls, the children with autism were more likely to exhibit pragmatic violations including bizarre or inappropriate utterances and were less able to take into consideration the listener's needs. Some of the participants with autism in this study even failed to understand the story as a representation of meaningful events, suggesting that they lacked a cultural perspective underlying narrative (Bruner & Feldman, 1993; Loveland & Tunali, 1993). Norbury and Bishop (2003), however, found few differences between narrative skills of children with ASD and those with specific language impairment, suggesting that difficulties with stories may be common to children with communication impairments.

Taken together, these studies of pragmatic skills in verbal autistic individuals echo the suggestions of studies of nonverbal communication

in young autistic children. Although basic intention to communicate often exists, the autistic person has impaired skill in participating in communicative activities involving joint reference or shared topics. This is particularly true in supplying new information relevant to a listener's purposes. The strategies used by an individual with autism to maintain conversation are less advanced than syntactic ability would predict, as is the ability to infer the interlocutor's implicit intentions.

One difference between individuals with autism and other populations with language impairments has been that, in most groups with language impairment, the more a child talks, the less likely it is that the language will have unusual characteristics. In contrast, two studies with autistic children and adolescents showed that subjects' unusual aspects of language and lack of cohesiveness increased with the amount of speech (Caplan, Guthrie, Shields, & Yudovin, 1994; Volden & Lord, 1991). In autism, difficulties in explaining and predicting behavior seem to be related both to general language deficits and to deficits in specific cognitive functions, such as metarepresentation and using the information at hand (Tager-Flusberg & Sullivan, 1994). Because most, though not all, individuals with autism have significant delays as well as deviance in language, they are doubly handicapped in communication.

Reading

Many children with autism have an early interest in letters and numbers, and some learn to read words without any direct instruction (Loveland & Tunali-Kotoski, 1997). Decoding, or pronouncing written words, and spelling tend to be relative strengths for many individuals with ASD. These strengths are especially noteworthy when children with autism are compared to other individuals with histories of language delay, who tend to do especially poorly in reading and writing. Children with autism typically show literacy skills that are on par with their overall developmental level (Loveland & Tunali-Kotoski, 1997; Myles et al., 2002) and can understand simple reading passages at grade level (Ventner, Lord, & Schopler, 1992). Written material has been shown in a variety to studies to provide a helpful medium of intervention for these children. Written scripts, social stories, graphic organizers, reminder cards, and lists are useful in increasing social and communicative behavior for individuals with autism who read (e.g., Gray, 2000; Krantz & McClannahan, 1998). Nonetheless, these individuals can have relative deficits in comprehension, particularly when longer, more complex texts, such as narratives, are involved (Walhberg & Magliano, 2004).

While developmental level-appropriate literacy skills are the norm in autism, there is a subset of children with ASD who show remarkable decoding ability (Grigorenko, Klin, & Volkmar, 2003). These children are often referred to as *hyperlexic.* They usually begin reading words before they get to school and are obsessive in their interest in letters, writing, and reading (Nation, 1999). However, Grigorenko et al. (2003) point out that hyperlexia is not synonymous with autism. Their review reveals that only 5% to 10% of children with autism show hyperlexia, although this rate is much higher than that which occurs in otherwise normal development. Moreover, hyperlexia is not specific to autism; it is also seen in a variety of other disabilities including Turner syndrome, Tourette's syndrome, and mental retardation. Although hyperlexia is more prevalent in autism than in these disorders, it can occur in conjunction with nonautistic disabilities. The hallmarks of hyperlexia are advanced word recognition in children who otherwise have significant cognitive, linguistic, or social handicaps; a compulsive preoccupation with reading, letters, or writing; and a significant discrepancy between strong word recognition and weak comprehension of what has been read. Children with autism who show hyperlexia are often baffling to families, because their independent, early acquisition of word recognition contrasts so sharply with their severe handicaps in social communication and learning in other areas. Hyperlexia is, to some extent, a "savant" skill, like other special abilities occasionally seen in children with autism (e.g., drawing, calculation, music, calendar calculation), which fails to connect to general intellectual and functional abilities. Like other savant skills, hyperlexia can be used as a starting point for teaching other, more functional behaviors, but direct instruction and intensive practice will be necessary to move from the unprocessed

"word calling" that is characteristic of this syndrome to more purposeful and communicative uses of reading.

Theories of Origin

Recently, increasingly sophisticated neuroimaging and neurophysiological measures have offered a promise for autism of eventual documentation of anatomical and functional differences in the brain. Although a replicable, consistent, meaningful neuroanatomic or neurophysiological basis for autism has not yet been identified (Bailey, Phillips, & Rutter, 1996), there have been some small-scale studies that have investigated structural brain abnormalities related to language using magnetic resonance imaging (MRI).

In the normal population, left cortical regions especially in key language areas (perisylvian region, planum temporale, and Heschel's gyrus) are enlarged relative to the size of those regions in the right hemisphere. Herbert and her colleagues compared 16 boys with autism (all with normal nonverbal IQ scores) to 15 age-, sex-, and handedness-matched typically developing controls (Herbert et al., 2002). Their main findings were that the boys with autism had significant *reversal* of asymmetry in the inferior lateral frontal cortex, which was 27% larger in the right hemisphere compared to 17% larger in the left hemisphere for the normal controls. There were also significant differences between the autism and control groups in the asymmetry patterns in the planum temporale. While both groups showed a left hemisphere asymmetry, this was more extreme in the autistic boys (25% leftward asymmetry for autism compared to only 5% in the controls). These findings for the planum temporale were not replicated in a study comparing adults with autism and age-matched normal controls (Rojas, Bawn, Benkers, Reite, & Rogers, 2002). Rojas and his colleagues found that their adults with autism had significantly reduced left hemisphere planum temporale volumes and no hemispheric asymmetry in this important language region. Perhaps methodological differences can explain these conflicting findings. Rojas et al. studied adults rather than children, included women in their sample, and their groups were not matched for IQ.

Functional magnetic resonance imaging (fMRI) is beginning to be used, as well, to investigate online language processing in autism. Just, Cherkassky, Keller, and Minshew (2004) investigated brain activation during sentence comprehension. Reliable differences were found between subjects with HFA and TD in activation in the basic language areas of the cortex. Subjects with HFA showed higher activation in Wernicke's (left laterosuperior temporal) region, which is traditionally associated with language comprehension (particularly, understanding words), and lower activity in Broca's area (left inferior frontal gyrus), usually associated with production and grammar. Functional connectivity between cortical regions also appeared lower in the subjects with HFA.

New discoveries about brain structure and function are also being incorporated into thinking about origins of autistic language difficulties. For example, Rogers (2004) has noted research showing the presence of "mirror neurons" (Bekkering, 2002), which are activated both when a movement is seen and when it is made. This "resonance" may facilitate imitation of motor activities. Rogers speculates that specific mirror neurons for sights and sounds associated with speech may exist that could impact the ability to imitate and learn from language input. Children with ASDs, who are known to have special difficulties with vocal imitation (Stone, Lemanek, Fishel, Fernandez, & Altemeier, 1990), may be impacted by deficits in these mirror neuron systems, which might provide one element of etiology of speech delays and deviance in these syndromes. Further studies are clearly needed to explore the structural abnormalities in brain regions subserving language in both children and adults with autism. Although research exploring the neurobiology of language impairment in autism is still in the early stages, together with advances in molecular genetics, the likelihood is that, in the long term, neurobiological approaches will contribute significantly to our understanding and treatment of language and communication in autism.

Any robust theoretical model for communication abnormalities in autism must have several characteristics. It needs to describe a course that goes awry very early in development and that has a range of consequences,

from severe language disability involving no representational-communication system, to more circumscribed abnormalities primarily affecting the pragmatics of connected discourse. It needs to be related to other social and cognitive functions, but not completely accounted for by other factors. That is, there are children and adults without apparent syntactic and semantic difficulties who share the social difficulties seen in autism (as in AS), and there are children and adults with severe to profound mental handicap or with specific language disorders who make substantial improvements in social areas and/or nonverbal cognitive functioning but who remain significantly impaired in spoken language. Thus, it appears that, although outcome and severity of social and cognitive deficits in autism are related to language level, these factors are also independent to some degree.

A complete theoretical account of language impairment ultimately needs to delineate the underlying mechanisms that explain these very different patterns of language acquisition and impairment in autism. It is likely that across different children, different mechanisms may be impaired. For some, communicative deficits are related most closely to social impairments in decoding nonverbal cues and understanding other minds. For other children, these social-cognitive impairments may be more severe, leading to the inability to understand language as an intentional symbolic system, which may impede them from even entering the linguistic system as marked by the absence of rudimentary comprehension skills and severe joint attention deficits. Additional mechanisms that may be directly or indirectly linked to language acquisition in children with autism include oral motor skills, imitation, and auditory processing and attentional systems. We are still at the early stages of developing theoretical accounts to explain the individual variation in language outcomes in ASDs that encompass all levels of analysis from genetics to neuropathology to cognition and behavior.

CONCLUSION

Many questions remain to be answered about communication in autism. For example, how is odd intonation related to deficits in communication and social cognition? How do linguistic comprehension deficits relate to the various aspects of deviant language seen in the syndrome? What triggers the initial failure of social cognition and joint attention that seems to be associated with such pervasive communicative difficulties? Like so many other questions about autism, the answers to these are likely to be neither simple nor universally true. A wide and heterogeneous range of communicative behaviors and function is seen in the syndrome. Whatever the biological explanation, communication disorders in autism are most likely affected by deficits in the ability to process information about social situations and how people behave when interacting with each other at every point in development. This deficit must be addressed in any attempt to remediate autistic communicative disorders. In addition, although they are integrally tied to broader cognitive and social deficits, delays in the ability to understand and produce words and sentences may have an even greater effect on the lives of individuals with autism than they do on persons with other handicaps. The double handicap of delay and deviance in autism means that we cannot assume that either individuals with autism or those who provide their linguistic environments can naturally compensate for these deficits without carefully considered intervention. This intervention must include understanding of how these deficits are manifested in particular children or adults and the communicative contexts in which each individual needs to function.

Cross-References

Aspects of classification and diagnosis are discussed in Chapters 1 to 7; developmental changes in autism, in Chapters 8 through 15; and language intervention, in Chapters 30 through 32.

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