Language and Communication In Early Childhood

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Language is the single most important intellectual accomplishment of childhood before the age of 5, and it is the skill on which most later achievements depend. Because language is the only public form of cognition in the early years, it provides a window into the developing mind. Perhaps for that reason, language remains the best early predictor of cognition. Most children develop language with little or no direct help, yet delayed onset of language is a common problem in the preschool years, especially among high risk populations (eg, premature infants). Delayed language development is often the first clear sign of risk for intellectual impairment in young children with focal brain damage.1,2 Some children appear to be delayed in language but normal in other areas of cognitive development; and yet there are reasons to believe that so-called “specific language delay” co-occurs with at least some forms of non-linguistic retardation.3,4 Regardless of etiology, preschool language delay may persist well into the school years and is a strong predictor of later learning problems.5-10 As a result, early childhood specialists are becoming increasingly aware of the seriousness of delayed language in preschool children.10-12

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In view of these risks, pediatricians must be aware of the earliest signs of language delay. As the primary professional involved with children before they enter school, the pediatrician has the best opportunity to alert the parent and other appropriate professionals to early problems. Unfortunately, many assume that children under 4 who are delayed in language development will automatically catch up, and parents are advised accordingly. Evidence now demonstrates that this is a dangerous oversimplification.13-15 Language delay can be identified at least as early as age 2,14,16-19 and although many of these children do indeed catch up, a significant proportion continue to display language problems for many years. To help pediatricians make appropriate referral decisions for children this young, this article will review a range of prelanguage and early language milestones. First, however, the concepts of speech, language, and communication need to be distinguished.

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BASIC TERMINOLOGY

Speech and language are both used to exchange ideas or information, a process known as communication. Communication is a general term, as ideas and intentions can be exchanged in many ways. For example, an infant may signal discomfort by crying, whereas an adult may signal displeasure by frowning or by saying "I don't like that." Speech and language are more specific terms.

Speech is the overt, observable motor behavior through which most humans communicate using language. But it is only one of many possible vehicles for communicating with language. People who communicate using American Sign Language (ASL) are also using language. Similarly, written communication is linguistic. Speech is dependent on physiologic and neuromuscular development and can be impaired independently of language. To produce normal speech, a child must be able to precisely coordinate respiration, production of sound by the larynx and vocal folds (phonation), the shape of the oral and pharyngeal cavities that control the quality of the sound wave (resonance), and the fine-tuned movements of the lips, tongue, teeth, and hard and soft palates (articulation). Any problem that interferes with normal development of the structure or function of the nerves and muscles that move the face and thorax may independently disrupt the development of speech, leaving language intact in many cases. Speech can be impaired while knowledge of the language code is normal. Similarly, it is possible to have impaired knowledge of the language code but an unimpaired speech mechanism. This distinction between delayed speech and delayed language is important, but difficult to make without assistance from a professional who is skilled at speech and language assessment.

Language may be defined as "knowledge of a code for representing ideas about the world through a conventional system of arbitrary signals." In normal children the sounds of speech, described above, comprise the system of arbitrary signals. As an abstract code used by humans for communication, language contains lexical rules that map meaning onto symbolic units (eg, speech sounds or ASL), pragmatic rules that govern how those units can be used in real conversational settings, and grammatical rules that govern the ways in which linguistic units can be sequenced. These "rules" are known by all language users, but they are "known" only in the sense that they are followed by all native speakers of the language. Although there is evidence that children know many of these rules at a very early age, even highly educated adults are not likely to be able to state what many of the rules are. Although this makes language difficult to assess, especially in young children, psycholinguists have developed some ingenious techniques for determining whether children know the rules of their language. In many cases, creative language use and rote imitation can be distinguished, which is important if we want to chart the true course of normal language development.

In the review that follows, the sequence of development described after first words appear applies to English only. The grammar of every language contains syntactic rules for combining words into sentences (eg, "the man drives the car" is correct in English, "drives the man the car" is not), and morphological rules for building words from their roots with, for example, prefixes (eg, "un-" in unbucket), suffixes (eg, "-ment" in government), and inflectional endings (eg, "-ed" suffix used to indicate past tense of a verb). Human languages differ in grammatical structure, and our knowledge of basic milestones in language development is limited by this fact. For example, the English language is one in which word order plays a very important role; inflectional morphology is somewhat less important for language comprehension and children may take their time in learning this part of the grammar. A language such as Greenlandic Eskimo, in which whole sentences typically consist of one word with many different inflections, poses a very different problem to young learners; one that may result in a different picture of development. For better or for worse, the field of developmental psycholinguistics has focused primarily on English. We now know a great deal about normal and abnormal development in that language; but practitioners must be cautious in applying any of the results reported below to children who are learning a different native language (eg, Spanish or Thai). This review will begin with observable behaviors relevant to the immediate onset and use of language, the earliest stages of sound perception (eg, the auditory alerting response) and production (eg, reflexive crying, cooing, and vocal play) will not be addressed.

LANGUAGE MILESTONES

Between 6 and 10 months normal children begin to produce canonical babble (ie, meaningless consonant-vowel strings like "baba" or "nana"). Although the time of onset is variable, the consonants heard in early babbling are usually those the child will employ in his or her first words. (Table 1).

At or shortly after the emergence of babbling, the first reliable signs of word comprehension begin to appear. Clear evidence of comprehension can usually continue on page 302.
Table 1

<table>
<thead>
<tr>
<th>Average Age (months)</th>
<th>Observed Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-10</td>
<td>Canonical babble (CCV combinations such as “baba,” “nana,” and “dada”)</td>
</tr>
<tr>
<td>9-10</td>
<td>Word comprehension</td>
</tr>
<tr>
<td>12-13</td>
<td>Intentional, conventional signaling (e.g., pointing, making facial expressions)</td>
</tr>
<tr>
<td>18</td>
<td>Vocabulary burst</td>
</tr>
<tr>
<td>20</td>
<td>Word combinations (“car go,” “daddy bye-bye,” “want juice”)</td>
</tr>
<tr>
<td>24-36</td>
<td>Grammaticalization (3-word utterances, inflections such as “-ing” in running, “-ed” in played, “-s” in toys and “-s” in mommy)</td>
</tr>
</tbody>
</table>

Note: The table continues on the next page.

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**continued from page 300**

The rate at which receptive vocabulary expands beyond this point is quite variable. At 12 months the average number of words understood (as reported by parents) is approximately 85, with a range from 9 to 299. By 16 months the mean has reached 165, with a range from 27 to 295. Variability in early language development has been the major factor in preventing early referral, yet early identification of language disorders is extremely important. Although variability exists, we now know enough about early language development to describe patterns of development that correlate with catch-up or delay. Thus, early identification—such as at 18 to 24 months—of children at risk for language and learning disorders can be made with greater confidence than in the past. There is substantial variability in the numbers of words understood by individual children, but development is continuous.

First words appear around 13 months and gradually increase in number until the child uses approximately 50 words (for most children). They usually consist of...
vowel-consonant (eg. “ap” for apple), consonant-vowel (eg. “da” for dog), repeating consonant-vowel pairs (eg. “baba” for bottle), and nonrepeating consonant-vowel pairs (eg. “numi” for pacifier). Consonant-vowel-consonant forms (eg. “cat”) are rarely seen at this early stage. The consonants used are usually front consonants (ie, p, b, d, t, m, or n); consonant clusters (eg. “pl” as in play) are rare. As with comprehension, the onset and development of first words are variable. In a recent study of middle class children, 194 parents reported that their 12-month-old children used an average of 13 words, with a range from 0 to 83. At 16 months, an average of 62.5 words was reported, with a range from 2 to 231. A similar group of 191 parents who were asked about their 24-month-olds reported an average of 332 words, with a range from 28 to 628. These results are similar to those reported by Rescorla and Nelson.

There is also a large range of variation in the extent to which comprehension and production “hang together” or “come apart.” Although these two aspects of vocabulary typically develop together (with children who are high, medium, or low on both), a significant subgroup has appeared in every study to date comprised of children who understand far more than they produce. Indeed, we have seen children who produce virtually no speech despite comprehension vocabularies of 200 to 300 words. There are also marked developmental differences in the content of vocabulary in these two domains. For example, verbs are rarely produced by children with vocabularies under 50 words, but the same children may display an ability to understand quite a few verbs (as demonstrated by their response to commands like “come here” or “spit that out.”) Studies of children between 12 and 20 months of age consistently report a large increase in the proportion of verbs produced (from 0% to 10% to 12%) as expressive vocabulary increases, although nouns continue to comprise the major proportion of words used (50% to 60%). In contrast, comprehension of verbs remains constant, at about 20% of all words understood (as reported by parents).

This comprehension-production disparity starts to disappear as children approach 2 years of age, but production still lags behind comprehension for most children. Interestingly, children who show a sharp comprehension-production dissociation in their first words tend to display the same dissociation in early grammar. Although this dissociation is not very well understood, it may play very important in determining the long range prognosis for children who are markedly delayed in language production.

Many children display a “burst” in rate of word acquisition at about the point that their productive vocabulary has reached 50 words. The sharp increase in rate of word acquisition is usually accompanied or quickly followed by two word combinations and by a shift in vocabulary content (with a particularly sharp increase in verbs and adjectives). The average age for this is about 20 months, but again the range of normal variation is wide. First word combinations in normal children have been reported as early as 14 months. On the other hand, many normal children do not begin to produce word combinations before 24 months. Three word combinations appear when approximately half of the child’s utterances contain two words. The greater length is usually achieved by recombining and expanding earlier two word utterances.

After two word productions appear, language development begins to be elaborated through the development of morphology and grammar as well as length. Since they develop in tandem during this early period, utterance length has been used to estimate morphologic and grammatical sophistication. The most common measure of grammatical development in this age range is mean length of utterance in morphemes (MLU). MLU is derived by taking a sample of the utterances produced by a child in a naturalistic context, summing the number of utterances and the number of morphemes (words, prefixes, suffixes, and inflections) used, and dividing the morpheme sum by the sum of the utterances. MLU is a good predictor of language complexity up to an MLU of 4.0. Between the values of 1.5 and 5, MLU increases by approximately 1.2 morphemes per year. However, MLU is only a gross index; it provides no information about the actual morphologic forms or syntactic rules mastered by the child. In fact, children with the same MLU may have different grammatical or morphologic competence. To obtain a finer picture of normal development, Brown outlined a set of five stages defined by MLU, and described the developments that can be expected in each. Table 2 presents those stages and the approximate ages at which they occur.

Within each stage, characteristic linguistic changes occur. In stage 1 children move from production of single words to simple two word combinations and then three word utterances, which are correctly organized according to word order rules (eg. “daddy,” “daddy car,” “daddy go car”). In stage 2 the first morphologic inflections occur (eg. “mommy running,”

<table>
<thead>
<tr>
<th>Stage</th>
<th>Brown’s Stages</th>
<th>Age (months)</th>
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<tbody>
<tr>
<td>1.</td>
<td>MLU 1.0-2.0</td>
<td>12-26</td>
</tr>
<tr>
<td>2.</td>
<td>2.0-2.5</td>
<td>27-30</td>
</tr>
<tr>
<td>3.</td>
<td>2.5-3.0</td>
<td>31-34</td>
</tr>
<tr>
<td>4.</td>
<td>3.0-3.75</td>
<td>35-40</td>
</tr>
<tr>
<td>5.</td>
<td>3.75-4.5</td>
<td>41-46</td>
</tr>
</tbody>
</table>
Certain kinds of nonspeech and nonlanguage communication are also closely tied to language and may help to identify children at risk of developmental delays in language.

"see dogs"). Stage 3 includes the addition of simple sentence forms (eg, "I want juice"), yes/no questions (eg, “daddy go work?”), what questions (eg, “what mommy doing?”), negatives (eg, "no want milk."), and imperatives (eg, "gimme juice!"). In stage 4, we find the beginning of phrase or clause embedding within another sentence (eg, "I gotta have a cookie"). In stage 5, the child begins to produce conjoined or compound sentences (eg, "I had potatoes and peas for supper"). It has been argued that the basic work of language acquisition is essentially complete at this point; more recently, however, psycholinguists have uncovered a number of subtle but important changes in the way that language is used from age 5 through puberty. These include an increase in syntactic fluency (ie, the ease with which children produce complex grammatical structures that they know but avoid in the 3 to 7 year age range) and increases in their ability to tie two or more sentences together into a coherent passage of discourse. There are also late changes in the child's control over the sound system of language. In particular, there are late developments in a skill called "coarticulation," which is (roughly) the tendency to anticipate sounds that are coming up later in speech by holding the speech apparatus in a configuration that will make the passage from one speech sound to another as easy as possible. In short, most of the building blocks of grammar and phonology are in place by 5 years of age, but the 5-year-old child is still not a fluent native speaker. There is still a lot to learn about how to use these structures in spoken and written speech, developments that may be related to success in school with implications for later success in life.

NONVERBAL PREDICTORS OF LANGUAGE

Certain kinds of nonspeech and nonlanguage communication are also closely tied to language and may help to identify children at risk of developmental delays in language. They are particularly useful because they are easily observed by parents. One such group includes the actions of giving, showing, and pointing, with pointing having the best predictive value. These gestures are the first signs of intentional communication and appear around 9 months (about the same time as word comprehension). In normal infants, Bates, et al have shown that giving, showing, and pointing correlate with language comprehension at 9 months, and with comprehension and production at 13 and 20 months, respectively. In other words, normal children who are early pointers are also early talkers, whereas late pointers are late talkers. In an ongoing study of infants with neonatal and perinatal focal brain damage, we have also found delay in these communicative gestures. The children who were not delayed in giving, showing, and pointing were also normal in acquisition of first words.

Around 13 months (at the same time that first words appear) children use gestures that have been called “enactive naming” or recognitory gestures. This is a kind of symbolic play in which a child acts on an object in a typical, adult-like manner although the appropriate conditions do not exist. For example, a child may make a drinking gesture with a toy cup or sniff an artificial flower. Since the child shows no expectation of getting a drink or perceiving a fragrance, these gestures are not simply the real actions misplaced. In a sense, the child appears to be using the gestural modality to "name" the objects, in essence showing the meaning of the object rather than saying it. Like pointing, enactive names make reference to things in the world, but unlike pointing they are systematically and conventionally associated with particular classes of objects or events. That is, they are symbolic in nature, probably as symbolic as the child's first words. Recognitory gestures correlate with language development at a number of important points in early language development, and their presence in the absence of words is a reasonable sign that words will soon be produced.

We add nonverbal indicators to our list because they may be useful to pediatricians who are trying to decide whether to refer a “late talker” for further evaluation. Preliminary evidence suggests that late talkers are more likely to catch up with their peers if they comprehend speech normally, and if they display a normal range of communicative and symbolic gestures. However, these indicators are only useful at the first stages of development (ie, before the point at which we ought to expect grammatical development, with an MLU of 1.5 or more).

CONCLUSION

By the time children enter the school system, their progress in language development will be tracked by a range of trained professionals. The physician's role in tracking language development is maximal in the period between 12 and 36 months of age; this is also the age range in which changes in language are most visible to both parent and physician. Although there is considerable variation in the early period of language development, developmental psycholinguists have identified certain patterns that predict continued language delay. These early signs of danger (Table 3) can
TABLE 3

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Early Signs of Impairment</th>
<th>Observed Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-12</td>
<td>No giving, showing, or pointing to objects for caretaker (^{14})</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Comprehends fewer than 60 words</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Produces fewer than 5 words (^{16,34})</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Produces fewer than 50 words</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Produces no two-word combinations (^{14})</td>
<td></td>
</tr>
</tbody>
</table>

be identified through a combination of careful observation and a judicious use of parent report. The latter can be particularly helpful in that parents are often the only ones who have the opportunity to observe how their toddlers communicate. There are a number of valid parental report instruments available now which, because they can be filled out in the waiting room and scored by an aide or a secretary, decrease the burden on the physician of attempting to sample a child's language behavior during the actual physical examination. \(^{14,43,44}\) Thus, it is possible for pediatricians to assist families with toddlers as young as 18 months in making decisions about the need for a further evaluation of hearing, speech, or language by professionals who now have techniques available to assess language as early as 18 to 24 months.

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REFERENCES