Speech Assessment in Children: Descriptive Linguistic Methods

Descriptive linguistic methods have long been used in the analysis of fully developed primary languages. These same methods are also well-suited to the study of language development, particularly the analysis of children’s speech sound systems. Descriptive methods are a preferred analytic tool because they are designed to gather evidence that reveals the hallmark and defining characteristics of a sound system, independent of theoretical orientation, age, or population of study. The defining properties of descriptive linguistic analyses of children’s sound systems are discussed in this article.

The Phonetic Inventory. A phonetic inventory comprises all sounds produced or used by a child, regardless of whether those sounds are correct relative to the intended (adult) target. In the acquisition literature, the conventional criterion for determining the phonetic status of sounds is a two-time occurrence independent of the target or context; that is, any sound produced twice is included in a child’s phonetic repertoire (Stoel-Gammon, 1985). Children’s phonetic inventories reflect the range of individual variability expected in development. As such, complementary methods have been designed to further depict developmental variation, including the phone tree methodology (Ferguson and Farwell, 1975) and the typology of phonetic complexity (Dinnser, 1992). For children with speech sound disorders, the phonetic inventory may be quite large despite errors of production, and may consist of sounds that do not occur in the ambient language.

The Phonemic Inventory. Phonemes are used to signal meaning differences in a language. Phonemes are conventionally determined by the occurrence of minimal pairs. A minimal pair is defined as two words identical except for one sound, for example “pat” and “bat” or “cap” and “cab.” Here, the consonants /p/ and /b/ are the only point of difference in each pair of words; therefore, these would be said to function as phonemes in the differentiation of meaning. For children, the phonemic inventory is generally smaller than the phonetic inventory (Gierut, Zimmerman, and Neumann, 1994). Gaps in the phonemic repertoire often affect the sound classes of fricatives, affricates, and liquids. From a linguistic perspective, the nonoccurrence of these sound classes in children’s speech parallels markedness. Markedness defines lawful relationships among sound categories that have been found to hold universally across languages of the world. One type of markedness is implicational in nature, such that the occurrence of property X in a language implies property Y, but not vice versa. The implicating property X is taken to be marked, and is presumably more difficult to acquire, whereas the implied property Y is unmarked and predictably easier to learn. In development, then, phonemic gaps in the inventory correspond to more marked (difficult) structures of language. In linguistic terminology, these gaps would be characterized as a type of phonotactic constraint (Dinnser, 1984).

The Distribution of Sounds. Distribution refers to where sounds (phones or phonemes) occur in words and is determined by examining context. For children, sounds may be used in all word positions, initial, intervocalic, and final, or they may be limited to certain contexts. In development, overt stops commonly occur word-initially but not postvocically; whereas fricatives and liquids commonly occur postvocically but not word-initially (Smith, 1973). As with the phonemic inventory, restrictions on the distribution of sounds correspond to markedness, with children having a tendency toward unmarked as opposed to marked structure.

Rule-Governed Alternations. Asymmetries in the distribution of sounds may be further indicative of systematic rule-governed alternations in sound production (Kestowicz, 1994). Rule-governed alternations occur when morphologically related words are produced in different ways, for example, “electric” but “electricity.” Alternations are typically sampled by adding either a prefix or suffix to a base word in order to change the context in which a sound occurs. There are two general types of rule-governed change: allophonic variation and neutralization. Allophonic variation occurs when a single phoneme has multiple corresponding phonetic outputs that vary by context. An example is /t/ produced as aspirated in word-initial position “tap,” as flap in intervocalic position “bitter,” and as unreleased in word-final position “it.” In each case, the target sound is /t/, but the phonetic characteristics of the output differ predictably by word position. Thus, there is a one-to-many mapping between phoneme and phones in allophonic variation. Neutralization occurs when two or more phonemes are merged into one phonetic output in a well-defined context. An example is /t/ and /d/ both produced as flap in intervocalic position “writer” and “rider.” In neutralization, the contrast between phonemes is no longer apparent at the phonetic (surface) level. Consequently, there is a many-to-one mapping between phonemes and phone. In children, the emergence of target-appropriate morphophonemics occurs later in language development. For children with speech sound disorders, nontarget allophonic variation and neutralization have been observed and parallel the rules of fully developed languages of the world (Camarata and Gandour, 1984).

Together, these four properties define the most basic elements of a sound system at a segmental level of structure. In addition to examining these properties, descriptive linguistic methods may evaluate prosodic levels of structure by examining units larger than the sound, such as permissible syllable types and combinations and the overlay of primary and secondary stress on these in the formation of words and phrases (Lló and Prinz, 1996; Kehoe and Stoel-Gammon, 1997). As with segmental structure, children typically use unmarked pro-
Sodic structure, with preferences for open syllables and trochaic (strong-weak) stress assignment.

For children with speech sound disorders, there are other methods of analysis that may be relevant to a comprehensive characterization of the sound system (Fey, 1992; see SPEECH SOUND DISORDERS IN CHILDREN: DESCRIPTION AND CLASSIFICATION). Relational analyses establish a one-to-one correspondence between a child's errored outputs and intended target sounds. These analyses are intended to capture the patterns of a child's errors, and to descriptively label these patterns as phonological processes. Four main categories of phonological processes characterize children's commonly occurring developmental errors (Ingram, 1989). These categories are substitution processes, involving different manners or places of production than the target; syllable shape processes, involving different canonical (consonant-vowel) shapes than the target; assimilatory processes, involving sounds produced more alike in a word than in the target; and other processes, such as reversals in the sequencing of sounds or articulatory differences in sound production such as lisping. Children with speech sound errors are likely to use other unusual phonological processes and to persist in their use of these processes for longer durations than are typical (Leonard, 1992).

Supplemental clinical methods have also been designed to evaluate perceptual or metalinguistic skills, as these skills may affect a child's knowledge of the ambient sound system. The Speech Production-Perception Task is one clinical technique that establishes a child's ability to perceptually differentiate target sounds from their corresponding substitutes (Locke, 1980). Other metalinguistic procedures employ categorization tasks that evaluate a child's judgment of the similarity of target sounds and their substitutes (Klein, Lederer, and Cortese, 1991). Although these methods may have clinical utility in isolating the source of breakdown and in designing appropriate intervention for a child's speech disorder, they are considered external (not primary) evidence in conventional linguistic analyses of sound systems (Anderson, 1981), because these skills lie outside the domain of phonology in particular and language in general.

Finally, one of the most central aspects of a descriptive linguistic analysis of a sound system is the interpretation or theoretical account of the data. A number of theories have been advanced to account for the fundamental properties of sound systems. Each relies on a unique set of assumptions about the structure, function, and organization of sounds in a speaker's mental lexicon. Among the most recognized frameworks are linear phonology, including standard generative and natural frameworks; nonlinear phonology, including autosegmental, metrical, underspecification, and feature geometry frameworks (Goldsmith, 1995); and, most recently, optimality theory (Prince and Smolensky, 1997). Any formal theory of language must account for the facts of acquisition, including those pertinent to children with speech sound disorders. Acquisition data present unique challenges for linguistic theory because of the inherent variability within and across children's sound systems within and across points in time (Chomsky, 1999). These challenges have been handled in different ways by different linguistic theories, but at the core, they have served to outline a well-defined set of research issues about children's speech sound development that as of yet remain unresolved. Central questions bear on the nature of children's mental (internal) representation of sound, the relationship between perception and production in speech sound development, and the contribution of innateness and maturation to language acquisition.

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References


**Further Readings**


