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Locke has performed a service for researchers interested in the phonetic dispositions of talkers. He has brought together data on infant, child, and adult vocalizations from hundreds of sources; has organized them around the themes of discontinuity and drift in phonetic repertoires; and has performed valuable segmental frequency counts of a formidable volume of material. Across six chapters of widely varying organization, depth, and direction, L marshals evidence (a) that infants and children display strong predilections for gestures that result eventually in phonologically relevant behavior, and (b) that they are aided in their apparent early linguistic success by the phonetic character of adult languages, which bears strong resemblance to the output of their own immature speech production systems.

The word 'phonological' in the book's title should not mislead linguists into expecting a discussion of phonology, its scope, or its principles (cf. Anderson 1981). L does not always preserve the distinctions between phonological segments, features, and rules, on the one hand, and phonetic units, on the other. Further, he does not enter the debates on the units of acquisition and change (cf. Menn 1980.) He also leaves undiscussed the central question of the applicability of phonetic terms to infant vocalization (cf. Kent 1981). Nor, finally, does he offer alternative phonological analyses of particular cases in the literature. L's contribution is to call attention to a pattern of consonantal fre-

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quencies of occurrence that demand an explanation missing from R. Jakobson's and R. Brown's accounts of babbling and early speech. (He deals only with consonants, leaving the corresponding data on vowels and suprasegmental characteristics for others to document.) However, it is not L's discussion of theoretical issues, but rather his round-up of observations, his inclusion of neglected sources of material, and his list of topics for future research that make his book useful.

For L, 'the child's phonological system begins when an elaborate pattern of phonetic preference and capabilities is first evident, as in variegated babbling' (94); but 'acquisition of phonology begins' only when children demonstrate that their phonetic patterns have been influenced by the adult phonetic environment. L believes that communicative competence without language-specific phonetic patterns in production is an insufficient basis for declaring that children have acquired a phonology. But this restriction may be too severe, since (a) children's knowledge about sound patterns can be exhibited in non-verbal behavior (cf. Barton 1978); and (b) L fails to consider the possibility of phonological restructuring by the child which would produce no difference in segmental frequencies, yet would count as an approach to the adult phonology, e.g. recognizing that [p<sup>h</sup>] and [p] are functionally the same in English.

L begins in Chap. 1 by showing that the consonantal characteristics of babbling data from 15 languages bear a striking resemblance not only to each other, but to data from deaf, hearing-impaired, and Down's syndrome infants. Because the phonetic repertoires of these different populations are so similar, L concludes that factors within the maturing child, not environmental factors, are implicated. Perhaps because of this, he does not review studies of the auditory perceptual capacities of infants to discriminate or categorize speech segments. Rather, he proceeds to ask whether this segmental pattern can be explained by physiological factors; but his attention to neuro-anatomy and articulatory physiology under-represents these areas. He is, however, appropriately cautious about the implications to be drawn from knowing their details.

In Chap. 2, L asks whether there is 'any sense in which early speech is the CONTINUATION of anything, whether that thing lies in a linguistic, psychological, social, or sensorimotor domain' (52). This is a misleading question, because L wishes only to establish that, whatever else is going on, the consonantal patterns of late babbling and early speech plausibly deserve the same explanation. He does not discuss the social, cognitive, and sensorimotor aspects of development in any depth. In the final three pages of this 48-page chapter, L proposes three stages of phonological development: pragmatic, cognitive, and systemic. In the pragmatic stage, the child discovers the efficacy of vocalizing. (Here L might have cited, e.g., Delack & Fowlow 1978 to show that infants use vocalizations differentially with respect to social circumstances.) The cognitive stage is distinguished by the operation of hypothetical processes such as 'attention, storage, retrieval, and pattern matching' (97). The systemic stage 'is marked by changes, not of intentionality or in the nature of the lexicon, but rather in the phonetic characteristics of the child's phonological system' (97-8). L does not explain how changes in the phonetic characteristics of the child's phonological system could be manifested without changes in the lexicon; nor does he specify a model of a lexicon, or the underlying representations he has in mind (not obviously those of Kiparsky 1981).

In Chap. 3, L cites studies of sociolinguistic phonetics to show, e.g., the tendencies of speakers of Indo-European languages to devoice or omit final stops. He notes the similarity between children's articulatory dispositions and selected rules in historical phonologies. L could have made his case stronger by following such scholars as Ohala 1974—who goes beyond the listing of particular examples of the coincidence of historical trends with children's phonetic tendencies, and provides an explicit interpretation of the patterns. L also surveys the Stanford Phonology Archive for eight types of context-sensitive rules that produce outputs similar to the errors in children's speech, e.g. final devoicing.

In a most interesting section (125–41), L reviews the consonantal tendencies of inebriated and cerebral-palsied adults, as well as the neologisms of adult aphasics, on the grounds that the preferred gestures of adult vocal tracts may be more evident in their speech. Here he brings together segmental frequency data from slips of the tongue, glossolalia, and the Stanford and UCLA data sets. (L fails to mention that the two data sets are not independent, since the 317 languages of the UCLA data set include 189 of the 197 languages in the Stanford Archive; Maddieson 1980.)

In Chap. 4, L suggests that the phonetic naturalness of final devoicing, assimilations, and other patterns are to be expected if adult and child are under similar physiological constraints. L adds his voice (194) to the chorus that advises developmentalists to attend 'more directly to the nature of systems children are expected to attain'—not because the properties of adult grammars will guide the understanding of the course of development (cf. Kiparsky 1972), but because adults' phonetic tendencies reveal what children need not learn (cf. Stampe 1973, Donegan & Stampe 1979.)

Chap. 5 is a nine-page acknowledgment that further thought is needed. L first reviews cases in which investigators have noticed that children's phonetic idiosyncrasies resemble those of adult cohorts. Next he reviews the variability associated with language death. Thus, after two hundred pages on the similarity of adult and child consonantal distributions—presumably based on physiology—L briefly turns to the role of linguistic environments. This chapter need not have been so thin; there are many relevant findings in the cited literature that L does not discuss (cf. Dressler 1972).

In his final Chap. 6, L treats such topics as the spelling errors of children, tonogenesis, vowel nasalization, and vowel lengthening in a final demonstration that patterns exist in children's speech that bear phonetic explanation. He raises a most important (and unanswered) question (210): 'How is a child to sort through the complex distribution of noises and come up with the IMPORTANT noises?' But perhaps the more basic question is: How does a child come to have a segmental analysis of speech? The tone of L's work will lead readers to expect that the organization of articulatory gestures of speech may provide an answer, but he offers no explicit hypotheses.

That phonetic effects should play an important role in phonological accounts of speech development is a theme shared by many researchers. Lindblom 1972 and others (e.g. Ohala 1974, Ladefoged 1980) have long argued for an approach which redefines the role of phonetics in phonology—which 'starts out from hypotheses about preconditions for speech communication and its development, and attempts to derive aspects of phonological structure as a consequence of these hypotheses' (Lindblom, 67). The phonetic transparency of underlying representations and the phonetic naturalness of phonological processes are variously discussed by, e.g., Donegan & Stampe 1979, Hooper 1976, Vennemann 1972, Michaels 1979, Kiparsky 1973, and Linell 1979. Again, the articulatory basis of phonetic segments has received greater attention recently in studies of adult production and perception (cf. Fowler et al. 1980).

L's major contribution is the collection of an enormous number of observations into tables which rank-order the frequency of occurrence of consonantal features and segments by age-of-speaker, language, syllable position, and phonetic environment. To these he has added statistical descriptions of the distributions—and, in many cases, comparisons with values expected on the basis of assumptions either previously held (e.g. by Jakobson) or newly made plausible. But readers should exercise caution in accepting some of the statements and arguments surrounding the statistical tests. Thus L states (p. 3), in reference to Jakobson's observation on infant phonetic versatility: 'it would seem that a large number of sounds must have an evenly low frequency of occurrence.' Yet, of course, they need not; the range of a distribution does not prescribe its shape. If we expect an 'evenly low frequency of occurrence', it is because we expect the sounds to be produced with equal ease. Another confusion emerges a few pages later (22), in L's discussion of babbling drift in a cross-linguistic context. He tabulates the repertoire of an 18-month-old Afrikaans

learner and compares it with an English repertoire; then he states that, if drift has occurred, 'we would expect more "Afrikaans only" than "English only" sounds.' This expectation, however, requires further assumptions that the language-specific segments of Afrikaans and English are of equal difficulty to the child, and that an equal or lesser number of English-only segments are among those most likely to develop in any child. We are not surprised that, in the absence of an Afrikaans voiced glottal fricative [ɦ], 5% of the child's repertoire of consonants consisted of the 'English-only' [h]. Without additional information, such asymmetries cannot be used to show the absence of drift.

L's work would have benefited from more careful editing—which might have eliminated his tendency to increase by simple division the number of significant digits, and therefore the apparent precision of the data (e.g. Tables 1.15, 3.1, 4.1). L should have been encouraged to standardize the types of comparisons made, so that more of the tables would be directly comparable. For example, the percentage of speakers who produce certain segments (e.g. Table 3.10) could have been converted to the percentage of occurrence of the segments (e.g. Table 3.11) when such information was available.

An editor might also have caught some of the errors and omissions in this work, such as 'year' for 'month' in '5–6-year olds' (p. 34, in reference to data in Table 1.9), or  $X$  for  $\bar{X}$ , the mean, in Table 4.1. The absence of relevant dimensions in the captions of many tables is more serious because it reduces the usefulness of L's work. Thus Table 2.10 presumably gives the frequency of occurrence of items in the first four columns, and acoustic frequencies in Hertz in the fifth. L does not identify the units of description in Table 1.15, concerning the relative frequency of [d] and [g]. Moreover, the units must be different in different parts of the table: some values (e.g. 106) cannot be percentages; they must be raw numbers of occurrences of the segment. Others (e.g. 2.79) cannot be numbers of occurrences, and presumably are percentages of an unspecified set.

There is a different problem with Table 3.10. The data come from Platt, Andrews & Howie 1980, not from the source which L cites; and the table misrepresents their data. These authors provide word-initial data on 48 speakers, and word-final data on 46—not the 50 which L reports, and uses to calculate the percentages in the table. These errors have no qualitative effect on the rankings, but L's values are incorrect. The comparison of data of Platt, Andrews, Young & Quinn 1980 with those of Bryne 1959 is not original with L, although he provides more detail than the former authors in his Table 3.11. Platt and colleagues made their own comparison with Bryne's data, and reached the conclusions which L did. However, unlike L, they noted a disparity between their results with adults and Bryne's with children; they called for further studies to replicate the finding that cerebral-palsied adults achieve relatively greater accuracy than cerebral-palsied children with voiceless velars.

In some instances, the detail of a study provided by L in the text does not match that in his accompanying table. Thus, in Tables 3.12 and 3.13, he omits without comment 25 of the 1251 consonants which he reports analysing. Such errors jeopardize L's credibility as a source of quantitative information. Readers are advised to check the original sources if actual numerical information is crucial. L might consider issuing a new edition with corrections.

Few works offer such a wealth of detail as to demand re-reading; fewer still have such poor indexing as to require it. The indices are a serious limitation in this work. There is no author index, and the language index is just adequate. L collapses languages discussed separately in the text into undifferentiated classes such as Arabic, Chinese, and Spanish; this makes recovery of specific data needlessly difficult. Moreover, several references to languages in the text have been omitted. The subject index is very frustrating for anyone familiar with phonetic and phonological terms; e.g., 'bilabial', 'stops', and 'rule' are all missing, although 'rule' does appear in the C's, under 'context-sensitive'. 'Syllabic patterns' appears under 'babbling'; but no corresponding reference is made under 'adult', although the comparison of the two types is an explicit part of L's story. Locating segment frequencies, to which readers will want to refer, is impossible from the subject index. A guide to the tables and figures should have been provided. An age index would also have been appropriate for this work. Finally, editing could also have relieved us of L's many ambiguous or

opaque phrases (e.g., 'As child accuracy declines with lexical representation', 161; 'In general, small languages look like small children', 151.)

Most linguists will be puzzled by L's concluding remarks that 'many of the more interesting aspects of phonology may even be ineligible for [expression in 'alphabetic notation' and linguistic rules], bound instead to speakers' intentions to manipulate phonological categories and phonetic operations in order to achieve all the ends for which people talk' (235). Nothing that L has presented would convince us of this. Rather, if many consonantal frequency effects can be treated as phonetic consequences of natural vocal-tract activity, then phonology may become even more interesting.

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