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REVIEW

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ZHU HUA, *Phonological development in specific contexts*. Clevedon: Multilingual Matters Ltd, 2002. Pp. 218.

This book, arising from the author's doctoral dissertation, is an important contribution to the field of child phonology and phonological disorders. It is the first book-length description of phonological development and disorders in Putonghua-speaking children. Although readers may have seen several chapters previously, published as journal articles co-authored with Barbara Dodd, this book is a valuable collation of the study of the nature of development and disorders in developmental Putonghua (Modern Standard Chinese).

Chapter 1 leaps immediately into a review of the universalist approach to phonological development. In section 1.1 Zhu tackles diverse uses of the term 'universals' in language development. Very brief coverage of 'typological universals' (1.1.1) 'universal grammar' (1.1.2) and 'developmental universals' (1.1.3) comprise this section. At the beginning of 1.1.3, the author states that it is generally accepted that innate and environmental factors impinge on language development, but their relative influence remains controversial. The way forward is to compare language development across children speaking the same language, or to compare language development crosslinguistically. Zhu lays out the rationale for her book by claiming that one must first establish patterns of development within languages before conducting crosslinguistic investigations, neatly identifying the need to closely investigate the acquisition of Putonghua. She does this by studying development in several different groups of children: typically developing children and children with patterns of development that diverge from typical development. Studies are conducted using cross-sectional and longitudinal designs and include children in typical and atypical circumstances (twin status, hearing impairment and functional speech disorders). Zhu specifically states in this section that it is not her intention to explore a particular theoretical account of language development, but rather to 'contribute to the knowledge of developmental universals' (p. 5), through a range of developmental studies.

The remainder of the first chapter outlines, briefly, what is known about typical phonological development in several languages (section 1.2) and about phonological development in atypical populations (functional speech disorders, twins and hearing impairment) (section 1.3), and it closes with the aims and objectives of the book (section 1.4).

Section 1.2, using a summary table and short paragraphs, summarizes how segmental development in several languages (Arabic, Cantonese, German,

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Italian, Maltese, Portuguese, Quiche, Spanish, Swedish, Turkish and Xhosa) compares with development in English. There follows a very brief review of theoretical possibilities for accounting for different patterns of segmental acquisition across languages, including Jakobson's (1968) 'laws of irreversible solidarity', Dinnsen's (1992) implication feature hierarchy, based on the featural system of Chomsky & Halle (1968), Locke's (1983) biological constraints on phonological development; and Pye, Ingram & List's (1987) model of functional load. This section closes with Zhu's comment that none of the theories adequately explains crosslinguistic differences in phonological development, specifically because the approaches fail to take into account the interaction of vowels, tones, syllable structure and consonants in phonological development. The need for further work on the interaction of universal tendencies and language specific influences is identified. This section of the book is the least satisfying for this reader. Greater in-depth discussion of the various theories and shortcomings would have laid a firmer foundation for Zhu's subsequent discussion of her own model of the factors that impinge on phonological learning, specifically 'phonological salience'.

Section 1.3 reviews phonological development in atypical populations: children with speech disorders, children in twinships and children with hearing impairment. The descriptive framework within which Putonghua phonological disorders will be outlined in a subsequent chapter is introduced: this is Dodd's (1995) four subgroups of phonological error patterns (phonetic disorder, delayed development, consistent disorder and inconsistent disorder). More detailed explanation of the nature of the deficit believed to underlie these subgroups would have been useful. To differentiate the sources of difficulty for the children categorized into the four disorder types, Zhu uses descriptions such as an inability to 'derive the constraints of the phonological system', a 'phonological assembly problem' and a 'peripheral problem in which the child has learned the wrong articulatory motor programme for the production of specific speech sounds' (p. 20). But there is very little discussion of what these phrases mean.

Sections 1.4 and 1.5 provide succinct, well-focused reviews of the nature of phonological development in twins and in children with hearing impairment. Finally the chapter closes with a statement of aims and objectives for the book. These are numerous. Zhu's 'factual' questions include (1) a description of Putonghua phonology, precisely the order and age of acquisition of vowels, syllable-initial and syllable-final consonants, tones, tone sandhi and stress, (2) the chronology of error patterns, (3) spontaneous change in disordered systems, (4) the effects of gender and second language exposure and (5) development in twins, children with functional phonological disorders and children with hearing impairment.

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The theoretical issues that Zhu sets out to address include an evaluation of the success of existing theories of phonological development in accounting for universal and language specific developmental patterns. She focuses on '(i) Jakobson's law of irreversible solidarity … (ii) the notion of markedness … (iii) (the) biological model … and (iv) functional load' (p. 28).

Finally, Zhu aims to inform the study of phonological disorders by 'evaluating the differential diagnosis system for phonologically disordered children; contributing to the understanding of the natural history … of phonological disorders; contributing to the understanding of causal factors for impaired phonology …; contributing to the understanding of the nature of phonology of children with hearing impairment …' (p. 28).

Chapter 2 provides a very useful overview of the nature of Putonghua phonology. However, use of standard IPA symbols would have been helpful, or the use of IPA numbers rather than symbols, since the vowel [A] does not appear in the IPA guide (The International Phonetics Association, 1999). The direct comparison of the phonologies of English and Putonghua in Table 2.4 provides a basis for the reader to understand Zhu's treatment of her results.

Chapters 3 to 8 address Zhu's 'factual' aims and objectives. These cover the phonological development of typically developing children in cross-sectional and longitudinal designs; a description of both the phonological systems of children with speech disorders and how these change over time; a case study of a set of twins and a longitudinal case study of a child with a hearing impairment. Chapter 9 returns to theoretical issues.

Chapter 3 outlines phonological development in 129 typically developing children aged between 1;6 and 4;6 in a cross-sectional design. Consonants, vowels, diphthongs, triphthongs, tones and syllable shapes are described. Zhu claims that Jakobson's laws of irreversible solidarity are not upheld, but inspection of her data suggests that data collection did not start at a young enough age to confirm her claim, given that at the first data point, the children were already using nine of the word-initial consonants at the 90% criterion level (90% of children in a given age group had to be using the sound before the sound was credited as present for that age group). Note too that Jakobson (1968) was describing the emergence of contrastiveness, not individual segments. The section on feature acquisition (3.6.2) describes the presence of features as being linked to the presence of consonants (e.g. the presence of an affricate implies the presence of the feature [delayed release]). It is a pity that the discussion does not include feature contrasts, rather than just feature presence, given that Zhu, based on her data reduction, rejects notions of articulatory complexity and markedness as plausible accounts of phonological development. Error patterns, by way of phonological processes, are compared with those for English, Italian and Cantonese. A highlight of Zhu's work is her coverage of the development

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of vowels, diphthongs and triphthongs, an aspect of development not usually covered in such detail.

The notion of functional load as an account of the route of segment development is dismissed on the basis of the error patterns of syllable-final /n/ and /ŋ/; however, it is not known if these errors might be due to context effects (e.g. /n/→[ŋ] in the presence of certain vowels). On rejecting functional load, markedness, and biological constraints as possible influences on phonological development, Zhu presents a model of phonological saliency (p. 71). Phonological saliency is 'determined and affected by' three factors: the optionality of each component of phonology within the language (e.g. initial consonants), the number of choices within each component (e.g. four tones but 21 initial consonants), and the value of each component in distinguishing lexical meaning. This last concept is based on the notion of the cost of loss of a contrast within a language. This in fact is the conventional view of the meaning of the term 'functional load' (Surendran & Nigoyi, 2003). Zhu states that the most important aspect of a language's phonology is the aspect that conveys the most meaning, and therefore, tone has the highest phonological salience in Putonghua, followed by vowels. However, the notion of phonological salience is also rooted in the number of 'choices' that exist in a language. Because the choice of syllable-final consonants is low (there are only two nasals, the other codas being vowels), then, according to Zhu, these segments have a higher phonological salience than syllable-initial consonants, because there are 21 from which to choose. However this argument has little to do with how phonological features function contrastively in a language. In a recent report (after the publication of Zhu's book) Surendran & Nigoyi (2003) reported that tone has the highest functional load of all phonological features in Mandarin (Putonghua), with a functional load value of 0·1075, followed by the features of place (0·065), manner (0·0337), aspiration (0·0167) and nasality (0·008). With regard to the functional load of vowels, these appear to be less salient than consonants (FL = 0·091 vs. 0·2347). Zhu's remaining criterion for defining relative phonological saliency is the optionality of the unit within the language. For example, while tones are compulsory syllable components, initial consonants are not. This may be the vital part of Zhu's model, since optionality is a little explored concept in developmental phonology. Given the importance of Zhu's model of phonological saliency, it would have been useful to have a fuller description of the evidence to support it. Hopefully Zhu will expound on the model in further work. Finally, gender and exposure to a second language were not significant variables.

Chapter 4 describes a longitudinal study (over about 11 months) of four children, aged 0;10, 1;0, 1;1 and 1;2 at the beginning of the study. This study was conducted to extend the findings from the cross-sectional study

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to younger children. Longitudinal studies are extremely valuable in developmental research as they provide unique windows into the differences among children in the rate and route of development. A particularly interesting section of this chapter is the discussion of the relative emergence of tones. Zhu reported that high level tones developed first, followed by high falling tones. These were followed by rising and falling-rising tones. The earlier occurrence of high level tones was attributed to the fact that level tones are default tones and that high level tones are unmarked. It would be interesting to see further work on tone to focus again, in more detail, on the transition from single word to multi-word speech, since this period of development brings with it tone sandhi. It is possible that tone sandhi in child directed speech may also impact on early patterns of tone development. The finding that tones are stabilized before any other phonological component leads Zhu again to the concept of phonological salience. It is not clear though that articulatory complexity cannot account for the earlier emergence of tone over vowels and consonants. The discussion of why physiological constraints should not predict the earlier emergence of tones hinges on the point that non-native speakers trying to learn a tonal language have great difficulty with tone, but have no physiological constraints on the production of tone (adjustments of the vocal cords). The subsequent paragraph on cortical organization of tone is unclear to this reader, and I look forward to Zhu's further work on this issue.

The chapter is a valuable contribution to our understanding of developmental phonology, not least because longitudinal studies are still relatively rare. It is unfortunate that only in the closing paragraphs does Zhu mention the role of input in phonological learning, given the importance of this factor in other work (e.g. Stokes & Wong, 2002).

Chapter 5 describes the phonological systems of 33 children with functional speech disorders, aged 2;8 to 7;6. Zhu reports the distribution of disorder types (using Dodd's 1995 framework), the percentage of consonants in error (PCE), error patterns (phonological processes) and individual profiles. An attempt is made to highlight why the categorization of disordered phonology into consistent and inconsistent groups is important, via a discussion of the distribution of PCE, total number of error patterns and number of missing consonants across consistency scores. These data are presented in two figures (Figures 5.2 and 5.3), but the data are difficult to decipher. More discussion of this issue, in addition to later paragraphs (p. 125) that do address the issues, would have been useful for the reader.

Chapter 6 describes a longitudinal study of six children with phonological disorders. At the time of writing, China had very few services for children with speech and/or language disorders, and children with phonological disorders were seldom recognized as requiring help, and referrals for assessment or intervention were rare. Speech disorders remained untreated,

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and so at the time of Zhu's study it was possible to track the natural history of Putonghua phonological disorders, as has been done for Cantonese (Stokes, 2002). Zhu describes the changes in percentage of consonants in error (PCE), the number of error patterns, phonetic and phonemic inventories and error patterns. Zhu found evidence for the instability of categories of disorder across time. One child shifted from the 'normal' to the 'delayed' category, one had the reverse pattern, and three children remained in the categories in which they started. Zhu appears to allude to environmental (input) factors in the first two children, but 'internal underlying deficits' in the children who did not change categories. Children with delayed systems spontaneously resolve, as has been reported elsewhere (Dodd & Iacano, 1989; Stokes, 2002). Children with 'atypical' development do not resolve (also reported by Stokes, 2002). More discussion of the intransigent 'internal underlying deficits' would have been welcome.

The last two chapters on different populations (chapters 7 and 8) are relatively short descriptions of the phonologies of a set of twins and a boy with a hearing impairment. Both provide unique data on Putonghua phonological development.

The final chapter summarizes the research findings and returns to theoretical issues. Here Zhu reiterates the main findings across studies and the concept of phonological salience, without adding further to the discussions presented earlier. However, Zhu raises challenging questions for further study, such as a refinement of the notion of phonological salience. In closing, Zhu notes that her book is concerned with the description of typical and atypical Putonghua phonological development, which she admirably achieves. As she states, it was not her intention to formulate a full theoretical account of development: 'a full discussion of the current phonological theories and their implications … is not the aim of this book …' (p. 187). Further work, on more diverse languages, is required to confirm or refute Zhu's rejection of biological constraints, markedness and Jakobson's theories (pp. 177–78). In sum, Zhu achieved most of her aims and provided a model for publications of research on other languages. The book is recommended as a reference on developmental Putonghua.

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