

Acquisition of Linguistic Tonal Systems

Languages that have tone make use of manipulations in pitch height and pitch contours to change the meanings of words and sentences. Whereas in English rising and falling pitch contours over a single word are associated with focus, in lexical tone languages these changes can alter the meaning of the word. In languages with grammatical tone systems, such modifications could entail changing the tense of the sentence from present to past. Tone languages are spoken by a majority of the world's population, and include most of the languages in Asia and Africa. Chinese is one of the most well known lexical tone languages with the largest population of speakers. Despite the pervasiveness of tone languages, relatively little is known about the acquisition of tones compared to other phonological contrasts (i.e., vowels and consonants).

Most of what we know about the acquisition of tonal systems comes from studies of the Chinese family of languages. Mandarin, the official language in China, has a four tone system with one level and three contour tones; High Level (mā: *mother*), Rising (má: *hemp*), Dipping (mǎ: *horse*), and Falling (mà: *reprimand*). All four tones appear in the productions of Mandarin-speaking children by the 1-word stage of development. However, confusion between the Rising and Dipping tones continues into the 2/3-word stage, finally disappearing as longer sentences are produced (Li & Thompson, 1977). Mandarin also has processes of tone sandhi, where the underlying tones change when they occur in a certain context. When two Dipping tones occur in succession, the first one becomes a Rising tone, and when the Dipping tone is followed by any other tone it becomes a half-tone (does not rise after the initial drop in pitch). Tone sandhi begins to be acquired by the 2/3-words stage with few errors (Li & Thompson, 1977). Thus, tonal acquisition is acquired rapidly compared to the more protracted acquisition of Mandarin vowels and consonants, which are reported to be fully acquired by around 4;6 years (Hua & Dodd, 2000), when children begin to produce more complex sentences. The picture for Cantonese (spoken in southern China), is similar, with most children mastering the more complex six way tonal contrasts by the age of 2. This includes 3 level tones (High: level high pitch, Mid: level mid pitch & Low: level low pitch), two rising tones (High-Rising: begins at mid pitch rising to high, and Mid-Rising: begins at low pitch rising to mid-high), and one falling tone (begins at mid pitch falling to low). Cantonese-speaking children acquire the High and Mid level tones first, followed by the High-Rising and Low level tones, with Low-Rising and Falling tones acquired last (So & Dodd, 1995). Again, tone acquisition is completed early (around 2 years) compared to segments (around 4;6 years for consonants and vowels) (So & Dodd, 1995). The same early acquisition of tone is also observed in other Asian languages. The Thai tonal inventory contains 3 level tones (High, Mid, & Low), and a Rising and a Falling tone. In a case study of a Thai-speaking child all 5 tones were present by the 2-word stage (Tuaycharon, 1977). From the 1-word stage Mid and Low level tones emerged and were used to substitute for High level, Rising and Falling tones. This was followed by the emergence of the Rising tone, and then the High level and Falling tones.

Unlike Asian tone languages, African tone languages generally have a smaller tone inventory but have much more complex tone sandhi rules that often have a heavy syntactic and/or semantic function. For example, the Nigerian language Yoruba has only 3 tones, High Mid and Low, but has a rule that changes High and Low tones into Rising and Falling tones, and another rule that changes a Low tone verb to a Mid tone before an object. In Bantu languages such as Sesotho, where lexical tone interacts with syntax/semantics as well, lexical tones are again acquired early, but tone sandhi rules are acquired only by 3 years or later, as children learn more about the grammar of the language (Demuth, 1993).

While data on tone acquisition is still very limited, what emerges is that (1) simple tone contrasts are typically acquired early, (2) simple tone contrasts are acquired earlier than

more complex contour tones, and (3) tone sandhi rules are later acquired. The order in which tones are acquired may depend on the type and number of tonal contrasts and tone sandhi phenomena in a given language. For example, in both Cantonese and Thai the Falling tone is among the last to be acquired. On the other hand, the Falling tone is acquired early in Mandarin, and it is the Rising and Dipping tones that are acquired last. These different acquisition patterns may be due to differences in the sizes of the tone inventories and the tone sandhi rules. Much more research into the acquisition of different types of tonal systems, including studies of both perception and production, are needed to more fully understand how and when these tonal phenomena are learned, and what constitutes normative development.

Nan Xu Rattanasone & Katherine Demuth
Department of Linguistics, Macquarie University

Also see: Frequency effects in language development, Morphological development, Phonological awareness (development of), Phonological and prosodic bootstrapping, Phonological development, Phonological templates (development of)

Further Readings:

- Demuth, K. (1993). Issues in the acquisition of the Sesotho tonal system. *Journal of Child Language*, 20, 275-301.
- Hua, Z., & Dodd, B. (2000). The phonological acquisition of Putonghua (Modern Standard Chinese). *Journal of Child Language*, 27, 3-42.
- Li, C. N., & Thompson, S. A. (1977). The acquisition of tone in Mandarin-speaking children. *Journal of Child Language*, 4(02), 185-199.
- Ohala, J. J. (1978). Production of tone. *Tone: A linguistic survey* (pp. 5-39). New York: Academic.
- So, L. K. H., & Dodd, B. J. (1995). The acquisition of phonology by Cantonese-speaking children. *Journal of Child Language*, 22, 473-495.
- Tuaycharon, P (1977). *The phonetic and phonological development of a Thai baby: From early communicative interaction to speech*. Unpublished PhD Thesis, University of London.
- Yip, M. (2002). *Tone*. Cambridge, UK: Cambridge University Press.

(1031 words)