

A Summary of Researches on Mandarin Tone Acquisition

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Abstract: Tone acquisition has always been a difficulty and focus of second language acquisition. Many studies have used the way of tone production or perception to reveal the influence of mother tongue experience on tone acquisition. Based on the review, this article discusses some experiments on tone production and perception, reveals the significance of these studies and explores possible future research directions.

Keywords: Speech perception and production; Tone acquisition

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1. Introduction

The majority of prior investigations on the speech development of Mandarin-speaking children have focused on the phonological process ^[1], consonant and vowel acquisition ^[2, 3], and tone acquisition ^[4, 5]. However, as compared to research focused on Mainland China, there is a lack of study on Hong Kong Mandarin Chinese speech development and acquisition. As a result, the author of this study may investigate the learning of Mandarin Chinese tones by Hong Kong young children whose mother tongue is Cantonese as a second language.

2. Review

Compared to Indo-European language studies, research on Mandarin Chinese speech development and acquisition is limited in 2019, despite the fact that there are more than 918 million Mandarin native speakers, accounting for 11.922 percent of the world's population. The tone of Chinese, which is categorized into four tones, was initially discovered and discussed by several linguists throughout the Southern and Northern Dynasties. Modern Mandarin Chinese is a syllabic language with a basic syllable structure that requires each syllable to be connected to one of the four tones in order to express and identify distinct meanings (T1: high-level tone, T2: high-rising tone, T3: low-rising tone, T4: high-falling tone). The study of tones in Modern Chinese started from the early 1920s. Zhao Yuanren once proposed the use of experimental methods to explore Chinese tones ^[6] and he also compared the Chinese tones with the scales in music. Later, in 1924, Liu Fu ^[7] conducted empirical research on Chinese tones and used instruments to analyze the tones of 12 local dialects of Chinese, which was a milestone in the history of Chinese phonology. The introduction of foreign acoustic and experimental equipment, along with technological advancements, has benefited in the research and development of Chinese tones to a significant extent. Liang Zhian later added psych-phonology to the study of Chinese tones in the 1960s, and he began to investigate Chinese tonal perception.

Many linguists have been researching Chinese tones, such as tonal features, tonal patterns, the Chinese

tonal height system, and continuous tone sandhi, since the 1980s and 1990s. Speech acquisition theory has been advanced in recent decades as a result of the ongoing updating and growth of speech technology. Simultaneously, an increasing number of empirical studies on second language learning have appeared. There are also longitudinal experiments on the general speech and language development of Mandarin speaking children conducted by the linguists and educators from American and Taiwan. Later, some cross-sectional experiments mainly published in Chinese appeared, and other studies on children such as speech sound disorders (SSDs) and disability rehabilitation have been received more and more attention.

For more than 40 years, the Mandarin tone acquisition has been one of the most extensively researched topics. Newborn babies are talented at distinguishing phonetic contrasts of language. The previous literature on children tone production have presented that, children have mastered most of the Mandarin tones as early as 3 years old, additionally, the T1 and T4 have been mastered earlier than T2 and T3 to a large extent [8-10]. And the longitudinal study conducted by Tse in 1978 on tone acquisition in Cantonese stated that the children started to develop their perceptual discrimination of linguistic tones at their 10th month. Based on previous literature, it is reasonable to conclude that the many of Mandarin-speaking children could acquire four tones by the age of four. However, the tone acquisition development process in Hong Kong young children whose first language is Cantonese has been barely researched so far.

The Cantonese tone system is very different from the Mandarin tone system. Mandarin Chinese has four lexical tones: high (T1), rising (T2), low-dipping (T3), and falling (T4). In Chao's 5-level pitch notation [11] the four tones are 55, 35, 214, and 51. Among all the tonal contrasts in Mandarin, the T2-T3 contrast is widely considered to be the most similar pitch pattern [12]. Cantonese has a more complex tone system than Mandarin. There are three level tones [HL (T1), T3 (ML), LL (T6)], two rising tones [HR (T2), LR (T5)], and one falling tone (T4 LF), and these are contrasted by both pitch heights and pitch shapes. Barry and Blamey [13] preferred through experiments: children's error patterns included confusions among the three-level tones [HL (T1) vs. ML (T3) and ML (T3) vs. LL (T6)], between the two rising tones [HR (T2) vs. LR (T5)], and between the low-falling and low-level tones [LF (T4) vs. LL (T6)].

3. The influence of mother tongue experience

Many academics have looked at the reasons of lexical tone learning problems in Mandarin. First and foremost, mother tongue transmission is critical. When Cantonese tones T33 and T25 were played, Yeung et al. [14] examined the reactions of Cantonese-learning babies with Mandarin-learning infants. T25 was shown to be more recognizable to Mandarin-learning babies. The Cantonese tone T25 can be incorporated into a "local" tone for this reason. T25 is extremely comparable to the native rising tone for Mandarin learners. As a result, Mandarin-learning children may have preferred T25 to T33 due to the former's relative familiarity, but Cantonese newborns may not have demonstrated any distinct preferences because both languages were local to them. Secondly, perception preference is another essential reason.

Mandarin speakers more heavily weigh F0 direction (or pitch contour) when identifying tones (i.e., whether, and in which direction F0 is changing) compared to F0 height (i.e., the part of the F0 range where a particular tone is instantiated). Adult Cantonese speakers, on the other hand, must weigh both dimensions to identify native categories [15]. Finally, Mandarin tone sandhi is also a reason that cannot be ignored. There are two contexts for the tone sandhi process in Mandarin. The full sandhi context occurs when two-tone 3 syllables occur in succession (tones 3-3), and the first becomes a rising tone. The half sandhi context occurs when tone 3 is followed by any other tone (tones 1, 2, or 4), and is realized with a falling pitch. Nan et al. proposed by experiment that children produced half sandhi with flatter f0 slopes and reduced f0 range compared to adults. These results suggest that children are not yet adult-like in their tone sandhi productions for f0 range, slope, and contour, even for the oldest age group.

Many studies have shown that mother tongue experience can affect the acquisition of second language

tones. If the mother tongue is a tonal language, then learning other tonal languages will have certain advantages. Peng et al ^[16] employed Mandarin, Cantonese, and German-speaking university students as experimental subjects to assess their perception of Mandarin tone 1 and tone 2. The results show that in the identification experiment, tonal language native speakers have a narrower identification boundary width and a steeper recognition curve; in the discrimination experiment, tonal native speakers have a more obvious categorization, whereas non-tonal native speakers only show the mental category.

As a result, despite the fact that Cantonese's tone structure is substantially different from that of Mandarin, the same tonal language, its native speakers are more sensitive to tones. Choi ^[17] also pointed out through experiments that Cantonese-English bilinguals can perceive vocabulary stress in English better than native English speakers. This is because, like tone, the pitch level determines the word stress in English. As a result, tonal experience can change not just the effect of another tonal language, but also the perception of suprasegmental speech. These researches are quite important. Because they demonstrate that, while the mother tongue has a detrimental transfer effect on other languages, tonal experience can help with suprasegmental language learning.

4. Improvement of experimental method

Most of the research will adopt the method of perception and generation, and some research will use the research method of ERP. In the early days, most of the research focused on the perception of the tone 1 and tone 4 in Mandarin. That is, taking a two-tone single syllable uttered by a native Mandarin speaker as the original sample, using Praat or other speech software, a series of voice stimuli can be obtained by gradually adjusting the starting pitch of the sample. In some subsequent experiments, the same adjustment method was used to obtain the phonetic continuum of the tone 1 and tone 4 of Mandarin. Wang ^[18] obtained the phonetic continuum of the tone 2 and tone 3 of Mandarin by inserting different inflection points and changing the pitch of the end point. This is due to the fact that when native Mandarin speakers produce second tones, the acoustical pitch level does not show an upward trend from the beginning, but a short period of decline and then a substantial increase. Therefore, by inserting different inflection points and changing the pitch of the end point, the slope of the second voice pitch can be changed, resulting in a tone 2 and tone 3 continuum.

5. Innovation and limitations

These studies are unique in that, in addition to focusing on the speech development of Mandarin-speaking Hong Kong students, as many other researchers and educators have done previously with regard to Modern Chinese acquisition and teaching issues, they also venture into the fields of psycholinguistics, sociolinguistics, neurolinguistics, phonetics and phonology, semantics, second language acquisition, interlanguage, language planning and policy, language attitudes, bilingual education, and language behaviors and code-switching. In addition, this study has practical and academic implications for the development of learners' speech in Hong Kong. There are, however, certain restrictions, which only touch on other areas including Hong Kong accents, cognition, mental process, and word formation.

6. Research significance

The speech acquisition development analysis on Hong Kong Mandarin speaking learners will theoretically extend previous literature on second language acquisition studies, interlanguage theories, and Chinese linguistic studies, as well as provide sufficient empirical data and valuable examples for future comparative studies at home and abroad. Practically, by examining the characteristics, acquisition level, and acquisition sequence of Mandarin Chinese tone development in the Hong Kong context, reviews of the possible causes and effective pedagogical measures for improving Mandarin teaching quality for both teachers and parents

will be conducted. Furthermore, by focusing on Mandarin Chinese tone acquisition issues, the research thesis provides sufficient empirical pronunciation data for children with impaired speech development studies, as well as being of great use and assistance to clinicians in Hong Kong, particularly in the tone acquisition area.

Disclosure statement

The author declares no conflict of interest.

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