

A Study on the Difficulties and Psychological Cognitive Mechanism of Chinese Tone Second Language Acquisition Based on Phonetic Contrastive Analysis

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Abstract: This study focuses on the second language acquisition of Chinese tones, and comprehensively uses the methods of comparative analysis, difficulty analysis and psychological cognitive mechanism research. By comparing the tone systems of Chinese and different mother tongues, this paper reveals the interference of mother tongues on Chinese tone acquisition, and the comparison of acoustic characteristics provides scientific reference for teaching. In the aspect of second language acquisition difficulties, the specific problems and causes of learners' tone perception, pronunciation, combined use and different learning stages are clarified. From the perspective of psychological cognition, this paper explains the effects of attention and memory theory, psychological representation, learning strategies and emotional factors on tone acquisition. Based on the above research, this paper puts forward some teaching principles, such as pertinence and interest, using imitation training, tone games and other methods, rationally developing and utilizing teaching materials, multimedia and other resources, and designing personalized teaching programs, aiming at improving the teaching effect of Chinese tones, helping learners overcome acquisition difficulties and improving their ability to use Chinese tones.

Keywords: Chinese tone; Second language acquisition; Psychological cognitive mechanism; Teaching strategy

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Introduction

At the moment of globalization, Chinese is one of the most widely used languages in the world, and its international influence is increasing day by day, and the number of non-native speakers learning Chinese continues to increase. Chinese tone is an important feature that distinguishes Chinese from other languages. It carries rich semantic information, and the correct use of tone plays a key role in Chinese learners' accurate expression and understanding of semantics. However, for second language learners, the acquisition of Chinese tones is a big difficulty. Learners with different mother tongue backgrounds face many challenges in perceiving, pronouncing and using Chinese tones due to the interference of mother tongue phonetic system. At present,

although there have been many studies on the second language acquisition of Chinese tones, most of them focus on the description of phenomena and the discussion of teaching methods, lacking in-depth research from the aspects of phonetic comparative analysis and psychological cognitive mechanism. Therefore, it is of great theoretical and practical significance to systematically study the difficulties and the psychological cognitive mechanism behind the acquisition of Chinese tones by using the method of phonetic contrast analysis, so as to reveal the rules of Chinese tone acquisition, optimize the teaching methods of Chinese tones as a foreign language, and improve the teaching quality and learners' Chinese level.

1 literature review

1.1 Characteristics and functions of Chinese tones

Chinese tones have unique features and important functions. According to the basic features, there are four main tones in Chinese, namely, level tone, rising tone, rising tone and falling tone, and their tone types are rich and varied. The level tone is Gao Pingtiao, rising tone is rising tone, rising tone is falling tone, falling tone is falling tone, and each tone has a relatively stable tone value. This tone system makes Chinese pronunciation full of cadence. Tone plays an important role in semantic expression^[1]. The same syllable has different meanings due to different tones, such as "Ma (mā), Ma (má), Ma (mǐ) and Ma (mà)", which reflects the function of tone in distinguishing semantics. At the same time, tone is also indispensable in the construction of Chinese rhythm. It cooperates with rhythm and intonation to make Chinese expression more musical and rhythmic, and it can show unique language charm whether it is poetry reading or daily communication^[2].

1.2 An overview of second language acquisition theory

There are many important theories in the field of second language acquisition, which have some enlightenment to the study of second language acquisition of Chinese tones. The contrastive analysis hypothesis holds that the differences between learners' mother tongue and target language will affect second language acquisition, and the greater the differences between mother tongue and target language, the more difficult it is to acquire. In the acquisition of Chinese tones, learners with different mother tongue backgrounds will face different degrees of difficulties due to the differences between mother tongue tones or intonation systems and Chinese tones. Interlanguage theory points out that learners will construct a transitional language system between mother tongue and target language in the process

of second language acquisition, that is, interlanguage. This means that the acquisition of Chinese tones is a dynamic development process, and learners are constantly adjusting and perfecting their tone pronunciation and gradually moving closer to the target language^[3]. These theories provide a theoretical framework and research perspective for the study of Chinese tone second language acquisition.

1.3 Research Status of Second Language Acquisition of Chinese Tones

The research on the second language acquisition of Chinese tones at home and abroad has achieved certain results. In terms of acquisition difficulties, it is found that learners generally have problems such as inaccurate tone perception, pronunciation mode and tone deviation. The study of influencing factors involves mother tongue interference, learning environment, learning strategies and many other aspects^[4]. Teaching methods, such as tone imitation training, contrast exercises and other strategies are also put forward. However, there are some shortcomings in the existing research. Some research samples are limited to learners with specific mother tongue background and lack of broader representation; In terms of research methods, questionnaires and subjective evaluation are the main methods, lacking objective phonetic analysis; Moreover, there is relatively little research on learners' psychological cognitive mechanism, which fails to reveal the inherent law of Chinese tone acquisition. Therefore, it is necessary to further study the difficulties and psychological cognitive mechanism of second language acquisition of Chinese tones^[5].

2 Contrastive Phonetic Analysis of Chinese Tone and Native Tone

In order to ensure the scientificity and reliability of the comparative analysis of Chinese tones and mother tongue tones, we carefully designed the experiment. Participants in the experiment selected Chinese learners

from different mother tongue backgrounds, including those whose mother tongue is not tonal language, such as English, Japanese and Korean, and those whose mother tongue is tonal language, such as Thai. Their ages ranged from 18 to 35, and they were all in the primary to intermediate stage of Chinese learning.

The experimental materials include monosyllabic words, disyllabic words and simple sentences, which contain four basic tones of Chinese. During the experiment, participants were asked to read aloud the experimental materials, and at the same time, professional recording equipment was used to collect audio. In order to ensure the accuracy and naturalness of pronunciation, participants will be asked to read each material three times, and the clearest one will be selected as valid data. The collected audio data will be stored in a special database for subsequent speech analysis. The data acquisition process strictly follows the standardized process to ensure the quality and consistency of data.

2. 1 Tone contrast of learners with different mother tongue backgrounds

Take English, Japanese, Korean and other learners with different mother tongue backgrounds as an example, there are significant differences between their mother tongue tones or intonation systems and Chinese tones. English is an intonation language, which mainly expresses emotion and semantics through intonation, and there is no tone with the function of distinguishing semantics like Chinese. Although Japanese has pitch stress, it is completely different from Chinese tone patterns and values. Korean also has no tone system like Chinese, and its phonetic changes are mainly used to express mood.

These differences have influenced the acquisition of Chinese tones in many ways. For native English learners, they are used to the change of intonation, and it is difficult to perceive the subtle differences of Chinese intonation, and it is easy to ignore the accuracy of

intonation when pronouncing, which leads to semantic expression errors. Japanese native speakers may mistakenly apply the concept of pitch stress to Chinese tones, confusing tone patterns. Korean native language learners face great difficulties in the perception and pronunciation of tones due to the lack of the concept of tones, and need to spend more time and energy to master Chinese tones.

2. 2 Comparison of speech acoustic characteristics

Using professional voice analysis software, this paper compares the acoustic characteristics of Chinese tones with those of mother tongue, such as pitch, length and intensity. In terms of pitch, Chinese tones have obvious pitch change patterns, such as Gao Pingtiao in level tone and rising tone in middle tone. English, Japanese and Korean, on the other hand, have relatively gentle pitch changes, which are not as complicated as Chinese. In terms of sound length, different tones in Chinese also have certain rules in pronunciation duration, for example, the pronunciation of the upper tone is relatively long. However, in English and other languages, the sound length is mainly used to distinguish the length of syllables, which has little connection with semantics. In terms of sound intensity, the sound intensity of Chinese tones does not change obviously, and the tones are mainly distinguished by pitch; And some languages may emphasize certain syllables through sound intensity.

Through comparison, it is found that the uniqueness of Chinese tone in acoustic characteristics lies in its complex tone type and tone value change. The acoustic features that learners easily confuse mainly focus on the starting point, changing trend and accuracy of pitch adjustment. For example, rising tone and falling tone are similar in the starting point and trend of pitch change, which is easy for learners to confuse them. Understanding the differences and confusing points of these acoustic features will help us to better guide the teaching and learning of Chinese tones.

3 An analysis of the difficulties in second language acquisition of Chinese tones

3.1 Tone perception difficulty

In the second language acquisition of Chinese tones, learners have many difficulties in tone perception. First of all, it is difficult for them to distinguish similar tones, such as the second sound and the third sound. Their pitch changes are similar to some extent, and learners often confuse them, which leads to the deviation of semantic understanding. In addition, some learners are insensitive to tone changes and cannot accurately capture the subtle differences between tones.

There are many factors that affect tone perception. Mother tongue interference is one of the important factors. Learners who don't have a tone system in their mother tongue, such as English and Japanese native speakers, find it difficult to establish a keen perception of Chinese tones because of their lack of experience in perceiving tones. Insufficient listening training will also affect tone perception. If learners lack sufficient Chinese phonetic input and targeted listening training, it will be difficult to improve their sensitivity to tones.

3.2 Tone pronunciation difficulty

The common mistakes made by learners in tone pronunciation include inaccurate tone type and deviation of tone value. For example, when the first sound is made, the Gao Pingtiao cannot be maintained, but the pitch fluctuates; When the fourth tone is issued, the falling tone is not crisp enough, and the pitch drop is not enough.

There are two main reasons for the difficulty of tone pronunciation. First, the control ability of the pronunciation organs is insufficient, and the accurate pronunciation of Chinese tones requires accurate control of the movements of the pronunciation organs such as the tightness of vocal cords and the opening and closing of the mouth. Non-native language learners may be unable to flexibly control the pronunciation organs due to the

lack of corresponding training, thus affecting the accurate pronunciation of tones. The second is the influence of pronunciation habits. Learners' long-term native language pronunciation habits will interfere with the pronunciation of Chinese tones, and they will unconsciously transfer their native language pronunciation methods to Chinese, resulting in tone pronunciation errors.

3.3 Tone combination and acquisition difficulties in language flow

Learners also face many difficulties in tone combination and language flow. It is a big challenge to master tone sandhi, such as the tone sandhi rules when two third tones are connected, which are often difficult for learners to use correctly and easy to pronounce according to the tone of a single word. In addition, there are also problems in the coordination of tone and intonation. Learners may put too much emphasis on tone and ignore the natural change of intonation, which makes the expression appear stiff.

In order to improve learners' ability to use tones correctly in language flow, various methods can be adopted. On the one hand, we should increase tone practice in language flow, so that learners can read sentences and short articles with different tone combinations, and be familiar with tone sandhi rules and the coordination of tone and intonation in practice. On the other hand, through comparative practice, learners can feel the difference between correct pronunciation and wrong pronunciation, and enhance their perception of the use of tones in language flow.

3.4 Changes of acquisition difficulties in different learning stages

Primary learners mainly face the difficulties of tone perception and basic pronunciation, and they need to spend a lot of energy to distinguish different tones and master the basic tone type and tone value of each tone. Intermediate learners have improved the accuracy of tone

pronunciation, but there are still problems in tone combination and tone sandhi, and they are not skilled in the use of tones in the stream. Although advanced learners have made great progress in mastering the tone as a whole, in some complex contexts, such as oral expression and fast language flow, there may be subtle deviations in tone.

With the advancement of learning stage, the difficulty of tone acquisition for learners gradually shifts from basic perception and pronunciation to more complex tone combination and language flow application. The primary stage is mainly to establish the basic concept and pronunciation basis of tone, the intermediate stage pays attention to the application of tone rules, and the advanced stage pursues the perfect integration of tone in the natural context.

4 Psychological cognitive mechanism of Chinese tone second language acquisition

4.1 Cognitive Psychology Theory and Second Language Tone Acquisition

The theories of attention, memory and perception in cognitive psychology play an important role in the second language acquisition of Chinese tones. Attention theory points out that learners need to focus on the characteristics of Chinese tones in order to accurately perceive and learn. For example, in the classroom, learners can only learn effectively if they focus on the tone type and tone value of the teacher's pronunciation. Memory theory is also very important for tone acquisition, and learners need to master tone patterns and rules through repeated memory. For example, words and sentences with different tones are repeatedly read, and tone information is stored in long-term memory. Perception theory helps learners to identify the uniqueness of Chinese tones. Due to the influence of mother tongue, learners may not be able to accurately perceive the differences of Chinese tones at first. Through perceptual training, they can gradually distinguish

different tones.

In the process of tone acquisition, learners' cognitive processing includes the input, coding, storage and extraction of tone information. First, learners input Chinese tones through hearing, and then encode them into a form that the brain can understand and store them in memory. When you need to use it, you can extract relevant information from your memory for pronunciation.

4.2 Psychological Representation and Tone Acquisition

Learners have specific psychological representations of Chinese tones in their brains. Pitch mode is a common one, and learners will form a pitch curve of each tone in their minds to guide their pronunciation. Tone image is also a psychological representation, and learners may associate a tone with a specific image or feeling to help them remember and understand.

The formation and development of psychological representation has an important influence on tone acquisition. Accurate psychological representation can help learners pronounce more quickly and accurately. For example, when learners establish a clear tone pitch pattern in their brains, they can better control the movements of vocal cords and mouth when pronouncing, and make the pronunciation closer to the standard. With the deepening of learning, psychological representation will be constantly improved and refined, thus promoting the progress of tone acquisition.

4.3 Learning Strategies and Psychological Cognitive Mechanism

Learners will adopt a variety of learning strategies in the process of acquiring Chinese tones. Imitation is one of the most commonly used strategies. Learners learn tones by imitating the pronunciation of teachers or native speakers. Memory strategies include reciting tone rules and vocabulary and sentences with specific tones. The

contrast strategy is to compare Chinese tones with tones or intonations in the mother tongue to find out the differences and similarities.

Different learning strategies are closely related to psychological cognitive mechanism. Imitation strategy depends on learners' perception and memory ability, and imitates by perceiving other people's pronunciation and memorizing it. Memory strategies directly act on the memory mechanism, helping learners to store tone information in their brains. Contrastive strategies involve the process of cognitive comparison and analysis, which helps learners to understand the characteristics of Chinese tones more clearly. Appropriate learning strategies can improve the efficiency of psychological cognitive mechanism, thus improving the effect of tone acquisition.

4. 4 The Influence of Emotional Factors on Psychological Cognitive Mechanism

Emotional factors such as motivation, anxiety and self-confidence have a significant impact on learners' psychological cognitive mechanism and tone acquisition. Learners with strong learning motivation will be more actively involved in tone learning, and their attention will be more focused and their memory effect will be better. Excessive anxiety will interfere with learners' cognitive process, making it difficult for them to concentrate on learning tones and even affecting the accuracy of pronunciation. Self-confidence can enhance learners' learning motivation and make them dare to try and correct their pronunciation.

In order to promote the acquisition of Chinese tones, we can improve the learning effect by adjusting emotional factors. Teachers can stimulate learners' interest and motivation, such as using interesting teaching methods and activities, so that learners can feel the fun of learning Chinese tones. At the same time, help learners to relieve anxiety, give positive feedback and encouragement, and enhance their self-confidence. For example, the correct pronunciation of learners should be

affirmed in time, and the wrong pronunciation should be corrected patiently, so that learners can learn tones in a relaxed and pleasant atmosphere.

5 Teaching Strategies of Chinese Tone Based on Psychological Cognitive Mechanism

5. 1 Teaching principle

Based on the difficulties and psychological cognitive mechanism of second language acquisition of Chinese tones, the following teaching principles can be established. The principle of pertinence requires teachers to fully understand learners' mother tongue background, learning stages and existing specific problems, and implement targeted teaching. For example, for learners whose mother tongue is not tonal language, focus on tone perception and basic tone training; For learners who have mastered the basic tones but have difficulties in tone combination, the teaching of tone sandhi should be strengthened.

The principle of interest can stimulate learners' interest and enthusiasm in learning. Introducing interesting elements in teaching, such as presenting Chinese tones through nursery rhymes and stories, makes the learning process no longer boring. The principle of practicality emphasizes that learners should learn and consolidate tones in practical language use. Organize dialogue exercises, scenario simulations and other activities to enable learners to use tones in real contexts and improve their ability to use tones.

5. 2 Teaching methods and skills

There are various methods and skills suitable for Chinese tone teaching. Tone imitation training is the basic method. Teachers can pronounce accurately, so that learners can imitate repeatedly. By comparing teachers' and their own pronunciations, they can constantly adjust and improve the accuracy of tone pronunciation. Tone contrast exercises compare similar tones or confusing tones together, such as the second and third tones, so that

learners can perceive their differences more clearly. Tone games increase the interest of learning, such as "Tone Guess", in which the teacher reads a word, so that learners can guess the tone and stimulate their enthusiasm for participation.

Using these methods and techniques can effectively improve learners' tone ability. Imitation training can directly improve pronunciation ability; Contrast exercises help to enhance tone perception; Tone games can help learners consolidate what they have learned in a relaxed and pleasant atmosphere, and better grasp the tone accurately in practical application.

5. 3 Development and utilization of teaching resources

There are many suitable teaching resources in Chinese tone teaching. In terms of teaching materials, Chinese Course and Boya Chinese contain systematic tone teaching contents to guide learners to master tones step by step. Multimedia resources, such as Chinese learning APP, are rich in phonetic materials and interactive exercises, which are convenient for learners to learn anytime and anywhere. Network resources, such as online Chinese courses and Chinese learning websites, provide a large number of learning materials and communication platforms.

The development and utilization of these resources can enrich the teaching content and form. Teachers can choose the appropriate textbook chapters to explain according to the teaching needs, use the voice and animation in multimedia resources to show the pronunciation process of tones, and organize online discussion and exchange activities through network resources to improve the teaching effect.

5. 4 Personalized teaching scheme design

There are individual differences among different learners. In terms of learning style, some learners are visual, and they can better understand the tone through

pictures and charts. Some are auditory, and listening to more phonetic materials is more helpful for learning. With different language levels, beginners need more basic training, while advanced learners can carry out more complex tone combinations and language flow training. Cultural background will also affect learning, and learners from different cultures have different ways to accept and understand tones.

According to these individual differences, design personalized teaching programs. For visual learners, teachers can make charts of pitch changes of tones; For auditory learners, provide more high-quality phonetic materials. For learners with different language levels, the objectives and contents of hierarchical teaching are formulated. Considering the cultural background factors and combining the cultural characteristics of learners' mother tongue, teaching can help them better understand and master Chinese tones by analogy with similar cultural phenomena.

6 conclusion

This study focuses on the second language acquisition of Chinese tones and draws the following important conclusions.

In the comparative analysis of Chinese tone and mother tongue tone, it is clear that learners with different mother tongue backgrounds are significantly influenced by the differences of mother tongue system in tone perception and pronunciation, and the comparison of acoustic characteristics also provides scientific basis for teaching. The analysis of difficulties in second language acquisition reveals that there are difficulties in perception, pronunciation, tone combination and different learning stages, which are closely related to mother tongue interference, pronunciation habits and other factors. The study of psychological cognitive mechanism shows that cognitive theory, psychological representation, learning strategies and emotional factors all play a key role in tone acquisition.

Based on this, this paper puts forward teaching strategies including teaching principles, methods and skills, resource utilization and personalized programs. In actual teaching, teachers should fully consider the individual differences of learners, combine effective teaching resources and use diversified teaching methods

to stimulate learners' interest in learning, help them overcome difficulties in acquisition, and improve their ability to perceive, pronounce and use Chinese tones, thus promoting the improvement of Chinese tone teaching quality and the optimization of learners' second language acquisition effect.

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