

The Effects of Hand Gestures and Traditional Methods of Teaching Mandarin Chinese
Tones

Sarah Gillette

Milligan College

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Abstract

The purpose of this study was to examine the effects of teaching Mandarin Chinese lexical tones with accompanying hand gestures versus traditional methods of teaching Mandarin Chinese tones. The sample for this single-subject research consisted of one student drawn from an introductory Mandarin Chinese class. The student was a 12-year-old Caucasian female from an upper-middle class family living in rural Northeast Tennessee. The student had no background in learning Mandarin Chinese.

Data were collected using A-B-A-B design. After baseline was established for the subject by a native Chinese speaker, interventions began. The student was taught using Chinese lexical tone hand gestures. During this time, lexical tone production was assessed. Following intervention was the withdrawal phase (B) and the subject was assessed on lexical tone production. The following phase, (A) was reintroduced and the student was assessed. The final phase (B) was the withdrawal phase and the student was also assessed.

The results indicated significant improvements on interventions compared with withdrawal phases. These results suggest that use of hand gestures while teaching Mandarin Chinese tones significantly improves Mandarin Chinese lexical tone production accuracy, including pitch range and pitch contour as opposed to traditional methods of teaching Mandarin Chinese tones.

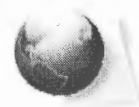
Keywords: Chinese, Mandarin, hand gestures, tonal languages, pitch contour, CFL



Institutional Review Board Decision Tree

Based on your responses, you do not need approval from the IRB.

It looks like your study is exempt because it does not meet the definition of a research activity. Therefore, it does not require approval by the IRB. However, you should follow ethical practices even when just practicing or demonstrating research.



[Refer to 45 CFR 46.102\(d\)](#)

Student researchers may benefit from going through the IRB process even if they are only collecting data to learn techniques.

[Return to Beginning](#)

Table of Contents

Contents	
Abstract	2
Chapter 1	4
Introduction.....	4
Statement of the Problem.....	6
The Purpose of the Study.....	6
Significance of the Study.....	6
Limitations.....	8
Definition of Terms.....	8
Overview of the Study.....	8
Chapter 2	10
Review of Literature.....	10
Chapter 3	25
Methodology and Procedures.....	25
Population.....	25
Sample.....	25
Data Collection Instruments.....	25
Procedures.....	26
Research Question and Related Hypothesis.....	27
Chapter 4	28
Data Analysis.....	28
Research Question and Related Hypothesis.....	28
Collection of Data.....	28
Chapter 5	36
Summary of Findings.....	36
Conclusions.....	38
Recommendations.....	39
Implications.....	39
References	40
Appendix	45

Chapter 1

Introduction

Standard Mandarin Chinese, like all varieties of Chinese, is a tonal language (Hyman, 2012). This means that in addition to the pictographic components of the characters and the vowels and consonants of their Romanization (known as pinyin), the pitch contour of each syllable is also used to distinguish each word from another. Each and every Mandarin word (in pinyin) consists of three basic parts: one initial (usually a consonant), one final (usually a vowel), and the tone (Weiner, 2016).

These pitches or tones are especially important for the Chinese language, as each word in Chinese consists of only one syllable, and there are a limited number of syllables in Mandarin. Mandarin only allows syllables to end with a vowel sound or one of the nasal consonants *n* or *ng*. Also, there are no consonant clusters, such as in English. For example, the word ‘snitch’; (Although this English word is only one syllable, it includes five consonants). Therefore, the number of syllables available to use is quite small. This means that there are only about 400 valid syllables in Mandarin if you’ve only got vowels and consonants. The number of homophones in the Chinese is hard to estimate; however, there are about 12,000 prefix words in the "Modern Chinese Dictionary", but only 316 kinds of pronunciation (Zhu, 2015). As a result, there are a huge number of homonyms.

Because of this linguistic restraint, many of these homonyms (words that consist of the same spelling and pronunciation), only have two differences among them, one is context and the other, most important difference is their tonal qualities. For example, the word *ma* can have a number of different meanings depending on how it is said: *mā*, *má*,

word *ma* can have a number of different meanings depending on how it is said: *mā*, *má*, *mǎ*, *mà*, or *ma*. As can be seen with the *ma* example, there are five different versions of the word. The first word, (and tone), adds a horizontal line above the vowel, the second a rising line, the third a falling and then rising line, the fourth has a falling line, and the final version (the fifth tone) has no tone markings at all. These are the five tones in their respective order. The fifth tone was considered a neutral tone with no pitch and was considered irrelevant for the purposes of this study. Each *ma* example has a different translation depending on its tone. *Mā* written in the first tone means mother in English. The second tone *má* means to bother. The third tone *mǎ* means horse. The fourth tone *mà* means to scold. The fifth tone *ma* is an interrogative particle used to signify a question (Weiner, 2016).

In addition to the difference in meanings, the four basic tones are produced differently. Imagine a scale from 1-5 in terms of comfortable pitch in speech. The 1 representing the lowest comfortable pitch and the 5 representing the highest comfortable pitch in speech. The first tone in Mandarin would stretch horizontally across the top of the fifth line, making it the highest tone in terms of pitch. In fact, this tone is often referred to as a “singing tone,” as its pitch is much higher than most native English speakers are comfortable with. The second tone would stretch in a rising line from the 3-5 on the pitch scale; therefore, this tone would rise from a mid-level pitch to the so-called “singing pitch.” It is also known as the rising tone. The third tone is more complicated in that it is multi-directional and begins at level two on this scale of pitches, falls to level one, and then rises again to the fourth level in pitch. This is also known as the rising-falling tone. The fourth and final tone begins from the highest point (the fifth line) and

abruptly drops to the first line. This tone is quite abrupt, short, and falling. It is also known as the “falling tone” (Taft, 2001).

These four tones are usually taught using two methods. The first method includes a graphic representation of the four tones as arrows stretched across a grid of varying pitch. The other method consists of using your hands, fingers, or arms to demonstrate the movement that these tones make across the five levels of pitch (Lin, 1985).

Statement of the Problem

While using hand gestures has been a widely-accepted and almost intrinsic method of teaching the four Mandarin Chinese tones, very little definitive research on its effectiveness has been conducted as compared to that of traditional methods. Therefore, the problem of this study was to investigate the effects of utilizing hand gestures as a method versus traditional strategies in teaching Chinese as a foreign language (CFL)

The Purpose of the Study

The purpose of this study was to examine the effects of hand gestures versus traditional methods on learning of the four basic Mandarin Chinese tones in the Chinese classroom.

Significance of the Study

Chinese language education and teaching are at an attention-grabbing stage. Since the mid-90s, Chinese has begun to shift from being a language learned mostly by non-native speakers for purposes of academic scholarship to, now, a language being learned for

tourism, casual conversation, business, marketing, commercialization, and other purposes. Even as this study is being conducted, Chinese is being learned by students representing a wider range of nationalities, linguistic and ethnic backgrounds than ever before. Especially in North America, there is a new need for well-trained Mandarin Chinese teachers. Historically, Western European languages have enjoyed a more advantaged position in North American education. However, today's globalizing world demands a dramatic restructuring of what languages should be considered integral to an educated person's success. In fact, it is likely that in the future, competence in Chinese as a second language will be just as important as, if not more so, than other Western European languages. As a result, Chinese educators must spend more time in researching the acquisition of Chinese a Foreign Language (CFL)

Chinese educators should learn how Chinese is acquired on the native level, learned as a non-native, and taught to western students. This is especially important for the teaching of the four basic tones. Besides the system of Romanization known as pinyin, the four tones are the basic building blocks for learning Chinese that every Chinese teacher will undoubtedly need to clarify during the first class meeting in any Chinese learning classroom. Therefore, the significance of this study was to awaken educators and policy makers to the importance of Chinese teaching methods. Another goal of the study was to show that the difficult aspects of Chinese learning, such as the four tones can be visualized and kinesthetically represented in ways that western learners can easily grasp.

Limitations

The following limitations were encountered during this study:

1. The instruments used to collect data were designed by the researcher and were not tested for validity and reliability.

Definition of Terms

1. **Chinese:** refers to the Mandarin dialect of the Chinese language
2. **T1-T5:** refers to the four Mandarin Chinese tones
3. **L1:** refers to the student's first language
4. **L2:** refers to the student's target language
5. **Hand gestures:** refers to the movements used by the Chinese instructor to teach the four Mandarin Chinese tones.
6. **Traditional Strategy:** refers to the graphic presentation method of teaching the four Mandarin Chinese tones.
7. **Tone Accuracy:** refers to the score given on a 1-10 scale as evaluated by a native speaker.
8. **TPR:** Total Physical Response

Overview of the Study

The study consists of five chapters that evaluate the effects of hand gestures versus traditional methods on Chinese tone acquisition. Chapter 1 includes the introduction, statement of the problem, the purpose of the study, the significance of the study, limitations, definition of terms, and an overview of the study. Chapter 2 contains a review

of the literature, and chapter 3 contains methodology, procedures, research questions and related hypotheses. Chapter four includes data analysis. Chapter 5, the final chapter, contains findings, conclusions, recommendations, and implications of the study.

Chapter 2

Review of Literature

As human beings communicate with each other, they use gestures. It's a practically unavoidable aspect of human communication. Gestures are so universal, in fact, that people even use them on cell phones, or in circumstances in which others cannot even see them. Indeed, even those who are blind from birth, and have never seen others gesture, motion with their hands when they communicate (Iverson and Goldin-Meadow 1998; Iverson, 2001).

Gestures, in general, contribute to spoken language by contributing a spatial or physical aspect to language or a graphic type of imagery. These “images” are not constrained by the rule-based system of spoken or written language. For example, a shrug of the shoulder or of the shaking of a fist is not subjugated to the constraints of proper grammar or spelling. It is simply understood. As a result, gestures have the freedom to convey thoughts that would otherwise be impossible to convey through written or spoken language alone (Novack, M., & Goldin-Meadow, S. 2015).

The use of gestures is most commonly found in communicative contexts, and therefore, it can be assumed that its main purpose is to aid communication. It is obvious that humans use gestures to aid the impact of their own speech. The relationship between gestures and speech are self-evident. However, it is important to understand some of the more specific aspects of the relationship between gestures and speech, thoughts, and cognitive learning for the purposes of this study.

Types of Gestures

According to Isabella Poggi, co-speech gestures facilitate the understanding of spoken language. In contrast with emblem gestures, co-speech gestures are not meant to be produced in the absence of speech. There are four main types. The first of these is called iconic gestures. They represent object attributes, spatial relationships, and actions. For example, one might open their arms wide to describe a wide canyon or close them towards their body to describe a narrow hallway.

The second type is called deictic or pointing gestures. These gestures are pretty plain, connecting speech to the location of an object. For instance, pointing out a person in question.

The third type is called metaphoric gesture. Metaphoric gestures put an abstract idea into a more literal, concrete form. Making your hands into a heart shape and placing them on your chest, for example, might indicate affection for a loved one.

The last type is called beat gestures. Basically, this type of gesture just keeps the rhythm of speech, and they convey no semantic content whatsoever. However, they may emphasize some phonological aspect of a word or emphasize some particular words in a sentence. Many politicians use this type of gesture in public speeches.

Gestures and Speech

The relationship between gestures and speech, in general, has already been heavily researched over the years. There is a body of research which already exists concerning how gestures and speech are correlated, and some of these theories assert claims about how verbal skills and gestures are related, (e.g., Kita, 2000; Krauss, Chen, & Chawla,

1996). Krauss, Chen, and Chawla found that speakers are more likely to use gestures when the content of their speech concerns some sort of spatial aspect. For example, describing the complex imagery from a painting would be difficult for a speaker to describe without the use of some hand gestures. In fact, when participants were constrained from using gestures, they have more difficulty producing speech.

The results of restricting gestures were significant. As gestures were restricted, lexical access became more difficult. In other words, recall and access to their stored vocabulary became more challenging. The speech of these participants contained more dysfluencies and a greater percentage of speech time was filled with pauses. As a result, the researchers concluded that their data implicated conversational hand gestures were an integral part of the speech production process, specifically helping with lexical access.

Another essential component of these theories is that gestures can assist speakers in verbalizing their thoughts, and as a result, are usually used when speakers are having issues in producing good speech. For example, a tourist in a foreign country might rely on gestures to aid their speech for fear that they are not being understood. These specific theories would say that verbal skills, or how skilled speakers are at expressing their ideas linguistically, are related to the number of gestures the speakers produces. Therefore, those who have poor verbal skills may need to use more gestures than individuals with strong verbal skills (Kita, 2000; Krauss, Chen, & Chawla, 1996).

Gestures and Thought

Firstly, it is important to understand how gestures and thoughts are related, so that it might be extrapolated into the teaching arena. Understanding how gestures affect individuals singularly and cognitively is a prerequisite to understanding how gestures

might affect others in second language learning. Several theories have been supposed to explain the correlation between gestures and thought during speech, (e.g. Frick–Horbury & Guttentag, 1998; Kita & Ozyurek, 2003; Rauscher, Krauss, & Chen, 1996).

These theories predict that gestures only enhance communication *in* the target language, not while learning it. For example, participants were asked to recall the imagery in a painting that they had been shown earlier. The majority of participants used gestures to help with recall and, indeed, the gestures helped increase participants' speech rate. However, while gestures may help students while they are speaking the target language, it may not assist them during the learning process of the target language, (i.e. learning tones, memorizing vocabulary). As a result, gestures should have a minimal effect on the students' learning. Despite this, there are other studies which point to opposite conclusions, stating that visual, spatial hand gestures can improve learning, and support learners in second language acquisition (e.g. Cook, Mitchell, & Goldin-Meadow, 2008; McNeill, 1992).

Growth Point Theory

One study which actually does support the idea of gestures aiding second language acquisition comes from David McNeill's *Hand and mind: What gestures reveal about thought*. The most noteworthy of his ideas is a theory called the growth point theory. This theory, unlike the others, makes the claim that gesticulations come from "growth points" that surface randomly during speech (McNeill, 1992, 2005). This theory basically suggests that while speakers are in the process of speaking, they are also experiencing new verbal ideas while they are in the midst of speaking. Also, for the purposes of this

study, growth point theory assumes that gestures should aid second language communication, encoding, and recall. If this is true, both producing and observing gestures can aid students in the comprehension and reproduction of concepts taught in school. This has been shown in other research. For example, the research article entitled “Gesturing makes learning last” demonstrates that gestures have been proven to help young children learn difficult concepts in mathematics (Cook, Mitchell, & Goldin-Meadow, 2008).

While other theories claim that gestures have no effect on student’s learning, these few studies may point to the benefits of gestural learning in a second language. Otherwise, most studies agree that gesticulations can aid communication *within* a language, but do not point to any benefits regarding gestures and acquisition of a new language. This research, of course, only answers why we as humans rely on gestures in our native languages naturally. It does not, however, concern how gestures are used as a teaching tool in second language acquisition.

Gestures and Second Language Acquisition

Second language acquisition and the use of hand gestures is multi-faceted. Both in the classroom and in conversation, language learners and their teachers use hand gestures, or meaningful hand movements along with the target language in an attempt to convey information (Adams, 1998; McCafferty, 2002; Sueyoshi & Hardison, 2005).

In the past, research has shown that hand motions and gestures most definitely benefit second language acquisition, especially word recall. In one study, researchers explored whether gestures also play a role in language learning in adults. In the first

Experiment, they gave adults a brief training session presenting novel Japanese verbs with and without hand gestures. Over the course of three sets of memory tests (at five minutes, two days and one week). The results showed that the most learning occurred when gestures conveyed redundant imagistic information to speech. The second experiment was a preliminary investigation into possible neural correlates for such learning. The researchers exposed participants to similar training sessions over three days and then measured words learned with and without co-speech gestures. The main finding was that words learned with gesture produced a larger percentage of recollection than words learned without gesture (Gullberg et al., 2010; Kelly, McDevitt, & Esch, 2009; Lazaraton, 2004; Tellier, 2008). However, even those who are not familiar with second language acquisition research employ its hand gestures and techniques on a daily basis inside the classroom.

Of all the research that has ever been done in the second language acquisition arena, little has had more of a far-reaching effect than the work of James J. Asher. Even if foreign language teachers don't know him by name, they most certainly use his work every day in their classrooms, especially if those classrooms are immersion classrooms. James J. Asher's work introduced the Total Physical Response (TPR) technique in a foreign language class in 1969. The results of the study and the corresponding technique were so convincing that, indeed to this day, TPR is a regular, daily activity in most foreign language classrooms.

Total Physical Response (TPR)

James J. Asher's Total Physical Response (TPR) research technique is based on the premise that the human brain contains an inherent biological "ability" to acquire any

natural language one the planet, including sign language. This process is observable in watching how infants internalize their mother tongue.

According to Asher, there is a unique “conversation” between mother and child. For example, the first dialogue between mother and child might be, “Where’s mommy? Where’s mommy?” The infant’s head then turns in the direction of the voice and mommy shouts, “He’s looking at me! He’s looking at me!” As stated by Dr. Asher, this “conversation” is called “a language-body conversation” because the mother speaks and the infant answers with a physical response such as looking, smiling, laughing, turning, reaching, pointing, holding, and so on (Asher,1969).

It is important to remember that these types of “conversations” are held and continued for many months before a child says anything more intelligible than “mama” or “dada.” Despite the fact that the child is not yet speaking, the child is imprinting a map of what language is and how it works. Before speaking, the child is listening to the patterns, the cadence, and all of the sounds of the target language. Once the child has decoded enough of the target language, speaking appears spontaneously. At first, the infant’s speech will not be perfect, but over time, the child’s speech will adjust to more or less that of a native speaker.

Asher’s original work consisted of the results of 21 different experiments designed to find the best method for teaching second language acquisition to non-native speakers. The Total physical response (TPR) strategy used in Dr. Asher’s experiments involved having students listen to a command in a foreign language and immediately obey with a physical action. For example, as in Asher’s study, students sit with the instructor in Japanese language class. The teacher may introduce a new Japanese vocabulary word and

then immediately follow it with an action. The students, along with the teacher, would perform the action. For example, the instructor said “aruke” and all of the students would walk forward. Other commands were *maware* (turn), *kagame* (squat), and *hashire* (run), and *lobe* (jump). This technique began with a short utterance, but with a matter of minutes, the syntactical complexity of the commands increased. By the end of the training, students could perform actions from listening to Japanese that included many complex steps and many different grammatical structures. For example,

Isu kara taste, kokuban no anata no namae o kese.

“Stand up and erase your name from the blackboard.”

Kare no namae o enpitsu de konokami ni kake.

“Take the pencil and write his name on this paper.”

Sono hana o tsukue kara tori, kanojo ni watase.

“Take that flower from the desk and give it to her.” (Asher, 1969, pg.4)

This groundbreaking research demonstrated that the subjects who were required to follow each command with a total physical response not only had the ability to comprehend long and complex commands in Japanese but could also retain the information for longer. The results of these pilot studies were almost perfect retention in listening to Japanese from two weeks to a year where the subjects ranged from school children to adults (Asher, 1969).

Asher’s second field test studied college students for two semesters in an experimental 45-hour TPR class to compare their test results with those students who had already had 75 and 150 hours of formal training. Every student in the treatment group took a Modern Language Aptitude Test. Halfway through the year and at the end of the

instruction, the control group and the experimental groups listened to a series of stories and took listening and reading comprehension tests. In both instances, the TPR experimental group scored significantly higher in listening.

Asher also conducted two laboratory studies with children. In one study, the hypothesis was tested that sixth-grade children who responded to Russian command with actions would have better retention than children who passively observed the modeling of actions.

To control for the variables of ability levels, the children were matched in both groups according to teacher ratings on classroom performance and scores on the California Test of Mental Maturity and The California Achievement Test. None of the children were bilingual or had previous exposure to the Russian language.

The results demonstrated a significant difference (beyond the .01 level) of retention with the children who responded to Russian with actions compared to children who only observed. The experimental group demonstrated their knowledge through action when hearing a command in Russian, while the control group responded to the command by writing English translations of each word.

Price assumed that the difference in retention could be due to the difference in demonstrating knowledge through actions vs. writing translations.

Price then designed a new study where he tested students in second, fourth, and eighth grades (Asher & Price, p. 1219). He replicated Hamilton's study, but on a larger scale. The only difference being the summative exam. Both the experimental and control groups listened to each Russian command and then acted out the response physically. The researcher tested sixteen pairs of children in each grade level and once again

controlled for their ability levels by using scores from the California Test of Mental Maturity and The California Achievement Test and teacher assessments on in-class performance.

The results demonstrated an almost equal retention for the both the treatment and control groups for all grade levels. This study displayed that acting or observing during the learning process was not important. What was more important was the physical action used during retrieval. Greater retrieval occurred with acting out the command. After this, a follow-up study of the eighth graders was conducted two months after the initial study. This time, half of the students demonstrated what they remembered through actions. The other half demonstrated it through writing English translations. The results were that the students who acted out their responses had better recall than those who only wrote English translations.

James J. Asher's work is invaluable to teachers of foreign language around the world. However, his work focuses mainly on teaching listening comprehension and vocabulary on the semantic level. Some argue that Total Physical Response can be used to teach grammar, but it is still a controversial aspect of the technique which has drawn some critics. Up to this point, it is still unclear whether gestures affect the acquisition of tones, not word meaning, in language learning, specifically Asian languages.

Gestures and Asian Language Acquisition

Very little research has been conducted concerning hand gestures and Chinese tonal acquisition. However, in some closely related research, accounts from Yukari et al. 1996 showed that hand gestures did *not* help non-native speakers to produce beats of differing lengths to differentiate short and long vowels in Japanese. The study seems to

conclude that gestures do not seem to integrate with speech, specifically at the phonological level. While a huge amount of research has revealed the beneficial effects of hand gestures on semantic levels in second language learning, this study seems to point in the opposite direction (Macedonia et al., 2011; Quinn-Allen, 1995; Sueyoshi & Hardison, 2005). It seems that hand gestures actually constrained the correct usage of long and short vowels in Japanese.

One similar, but more recent study on the role of hand gestures in second language phonological learning is Hirata and Kelly (2010), in which native English speakers saw videos of speakers producing Japanese short and long vowels with and without short and long beat gestures. These hand movements were called beats because they conveyed sequential information about the accompanying syllables, although one could also describe those hand movements as metaphoric because the length of the visual gesture metaphorically mapped onto the length of the corresponding spoken vowel. The researchers found that participants did not learn to perceive the short/long vowel contrasts in the speech gesture condition any better than the speech alone condition. One way of viewing these results is assuming hand gestures might not play a role in the segmental processing of speech, suggesting a limit of the integration of gesture and speech in language comprehension.

Gestures and Tone Acquisition in Mandarin Chinese

In a study most similar to the one at hand, Morett and Li-Yun examined whether gesture could facilitate English speakers' discrimination between Mandarin words differing in tone. The researchers taught Chinese words using three different methods.

The words were learned with gestures conveying tone pitch contours (pitch gestures), gestures conveying word meanings (semantic gestures) or no gestures at all.

The results of the study established that pitch gestures improved English speakers' discernment between the meanings of Mandarin words differing in tone, while semantic gestures actually hindered their identification of tones in learned words. The findings of the study indicate that the spatial gestures used in teaching Chinese tones strengthen the relationship between English speakers' demonstrations of Mandarin lexical tones and word meanings (Morett, L. M., & Li-Yun, C. (2015). This, once again, supports earlier research which has suggested that hand gestures only aid in learning on a semantic level.

Morrett's Study

Because Morrett's study is the only research to date of this kind and most similar to the research at hand, it is important for the researcher to dispel the nature of Morrett's experiment and its results. The experiments had three phases: pre-test, learning, and post-test.

Subjects initially completed a pre-test in which they heard audio-recordings of the target vocabulary which would be used in the learning phase. Participants would then guess each word's lexical tone by pressing one of four buttons. The researcher explained to the subjects that each of the buttons had a symbol which indicated the pitch contour of a Mandarin tone. In order to emphasize differences in tone, the words from each pair were presented in consecutive trials.

Following this, the subjects completed the intervention phase. First, the subjects were shown a short video in which each of the four lexical tones was taught verbally and presented visually, using an image to depict pitch contour. After this, participants learned

the target vocabulary. During each trial, the subjects viewed a video clip corresponding to their assigned learning condition for the vocabulary (pitch gesture, semantic gesture, or no gesture). Then the subjects would repeat the word and its English translation aloud while re-enacting the action shown in the video. As in the pre-test words from each pair were presented in consecutive order.

Upon conclusion of the learning phase, subjects were given a five-minute break. Upon returning, subjects were required to take a post-test, which was divided into two equally balanced sections. The first was tone identification and the second was a word-meaning association. The post-test section of the tone identification items was structured identically to the pre-test. After this, subjects were given a five-minute break. Upon returning, the subjects were required to complete a novel section, where the Chinese words had not yet been learned. This post-test was divided into two equally balanced parts: tone identification and word-meaning association. In this novel section, participants listened to each of the novel Mandarin Chinese words and then pressed the button that corresponded to its tone. In the semantic portion of the novel post-test, subjects heard each learned Mandarin word while two English words, one of which was the meaning of the presented word and one of which was the meaning of the other word in that pair, were shown on both sides of the screen. Subjects then identified the semantic meaning of each word by pressing the correct corresponding button with its English translation. During this section, as well as all others, Mandarin words from each minimal pair were presented consecutively without any alteration to their sequence. No assistance or feedback was provided during any of the experimental tasks. Subjects simply heard each of the non-learned words and pressed the button which represented its corresponding tone.

The Morrett study examined whether metaphorical gestures conveying pitch or iconic gestures conveying meaning could enhance English speakers' spoken word recognition and lexical tone discrimination in Mandarin. The results of this study demonstrated that pitch gestures enhanced differentiation between the meanings of Mandarin words varying only in tone, whereas semantic gestures hindered tone identification in learned Mandarin words. These findings indicate that information conveyed via gesture can affect the acquisition of L2 lexical phonology and semantics positively or negatively and that its impact depends on the level of processing accessed at retrieval. Notably, this is the first study to demonstrate that gestures illustrating the acoustic attributes of non-native phonemes can enhance word learning.

The results of the Morrett study suggest that, relative to semantic gestures or no gestures at all, pitch contour gestures enable English speakers' to associate Chinese vocabulary with different accompanying lexical tones with their corresponding semantic meaning. However, they fail to help with lexical tone identification. Moreover, they demonstrate that semantic gestures actually hinder English speakers' identification of lexical tones in learned Mandarin Chinese words. Because of this, the results indicate that metaphorical gestures which show the pitches or acoustical attributes of unfamiliar words and phonological contrasts can help with their perception, but only when the association between the gesture and the word meanings are clear.

Morret's research, although most similar to the present research still leaves questions for the researcher. If semantic gestures improve student's abilities to recall information, and pitch contour gestures also help students recall the semantic meaning of words, then why does semantic gesture actually hinder tone identification? This would

be an interesting question for future research in CFL. In addition to this point, Morrett's study points out that semantic and pitch-contour gestures hinder tone identification, but does not mention anything about tone production. The present study wishes to address this gap. Of course, tone identification and tone production are two different processes. The first is a simply mental or abstract process. In Morrett's study, the participants were not required to speak, but only identify and then press a corresponding button. The present research will require subjects to identify tones and then create a physical response using pitch with and without pitch-contour gestures.

Overall, the research is conflicting. While some preceding research supports the benefits of hand gestures at the semantic level, other, later research concludes that hand gestures have aided in tonal production and discrimination as well.

Now that the Chinese language is entering the limelight, it is critical that more Chinese-specific research is conducted. Thanks to China's fast-growing economic development and the increasing exchange in foreign trade, technology, education and culture, the world has shown greater and greater interest in learning the Chinese language, and China's significant rising influence in the world's political, economic and cultural arenas has most definitely made Chinese language learning a global trend. However, the field of Teaching Chinese as a Foreign/Second Language (TCF/SL), both in terms of theory and practice, seems to be lagging behind a generation or more of developments in the teaching and learning of other world languages, such as English (Li,2008). Much of this is a direct result of a lack of research in the field of Teaching Chinese as a Foreign Language (TCFL).

Chapter 3

Methodology and Procedures

The purpose of this study was to examine the effects of teaching Mandarin Chinese lexical tones with hand gestures versus traditional methods of teaching Mandarin Chinese tones. After a baseline was determined for the student by a native Chinese speaker, instruction accompanied by Chinese lexical tone hand gestures was then carried out. After the completion of the instruction, rankings on lexical tone production were assessed. These treatment results were then compared to the student's initial baseline.

Population

This research study took place in a rural, private after-school Mandarin Chinese program in Northeast Tennessee. The school serves 10 students. Five students are Caucasian and 5 are of African-American descent. Four students are female and 6 students are male.

Sample

The sample for this single-subject research consists of one student drawn from an introductory Mandarin Chinese class. The student was a 12-year-old Caucasian female from an upper-middle class family living in rural Northeast Tennessee. The student had no background in learning Mandarin Chinese.

Data Collection Instruments

The data for this study were collected using a video camera. The video was taken with a Meitu m6 cellphone. The student was aware that the video was being taken in each evaluation. The materials used were taken from Cheng and Tsui's *Integrated Chinese Level 1, Part 1*. The exercise used to test the subjects pronunciation and lexical tone

production was a comprehensive list of 50 Chinese words written in pinyin, Romanization, with corresponding tone demarcations. The main tool of the evaluation was observation. The subject's tone production was then assessed by a ranking score of precision from one to ten given by a native Chinese speaker.

Procedures

Before the study began, permission was sought from the Milligan College IRB (Institutional Review Board). A permission form was then sent home with the student. Upon receiving appropriate permission from the student's parent, the study was carried out during weekly Mandarin Chinese lessons over the course of six months (24 one hour lessons). The design of the study was single-subject research with an ABAB design-model.

Before any instruction using gestural techniques occurred, the student was given a comprehensive list of novel pinyin Romanization and asked to read the words aloud. The instructor then videotaped the student's responses over the course of five weeks.

After this initial baseline was determined, the instructor then spent two weeks teaching the lexical tones using the hand gesture method. After instruction was finished, the instructor withdrew and, once again, videotaped the responses. After a baseline was determined for the student by a native Chinese speaker, instruction accompanied by Chinese lexical tone hand gestures was then carried out. After the completion of the instruction, rankings on lexical tone production were assessed.

After the withdraw phase concluded, the student was again instructed in lexical tones using the pitch-contour gestures to assist in the production of Chinese tones. After two

weeks of instruction, the student's pronunciation was then, again videotaped and assessed. During the final withdrawal phase, one more recording was made and assessed. These treatment and withdrawal results were then compared to the student's initial baseline. This process was repeated on three separate occasions over the course of six months. Once all data had been collected, it was then analyzed and graphically represented. Tallying of correct responses out of a total of 50 from each phase were then compared.

Research Question and Related Hypothesis

Research Question 1: Do hand gestures improve lexical tone production compared to traditional methods of learning the four basic Mandarin Chinese tones?

Research Hypothesis 1: Hand gestures improve lexical tone production compared to traditional methods of learning the four basic Mandarin Chinese tones.

Null Hypothesis 1: Hand gestures do not improve lexical tone production compared to traditional methods of learning the four basic Mandarin Chinese tones.

Chapter 4

Data Analysis

This case study was conducted to determine if Mandarin tone hand gestures affected tonal reproduction and to examine the effects of hand gestures versus traditional methods of learning the four basic Mandarin Chinese tones in the Chinese classroom. The data for this study were collected using a video camera and were assessed using a native Chinese speaker's ranking on a scale of one to ten for each Chinese word's pronunciation of pinyin, pitch, and pitch contour.

Research Question and Related Hypothesis

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Null Hypothesis 1: Hand gestures do not improve lexical tone production compared to traditional methods of learning the four basic Mandarin Chinese tones.

Collection of Data

Before data were collected, permission to administer the scale and use the results was obtained from the subject's mother. Permission was also obtained from the Milligan College Institutional Review Board (see appendix A). Then the data were collected using a video camera and were assessed by a native Chinese speaker on a scale from 1-10. The rating scales were administered in an A-B-A-B format. The scale was used to assess

Mandarin Chinese tones before intervention (A), during intervention (B), during withdrawal of the intervention (A), during the second intervention (B), and during the final withdrawal (A).

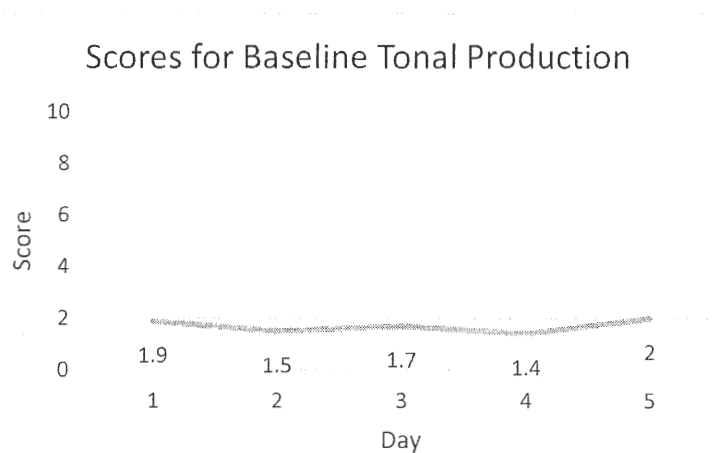
The scale used was created by the instructor and used consistently throughout each phase of the study. The tonal rating scale uses numbers from 1-10, which correspond to the quality of tonal reproduction. In this scale, 10 represents flawless tonal reproduction, including pronunciation of pinyin, pitch, and pitch contour. This scale was defined using the following descriptors:

1. Far below average (speaker pronounces a completely different word from what was asked)
2. Well below average (may contain a few phonemic aspects of the word, but fails in producing the correct word)
3. Below Average (may contain some phonemic aspects of the word, but fails in producing the correct word)
4. Slightly below average (contains most phonemic aspects of the word, but fails in producing the correct word)
5. Average (contains all phonemic aspects of the word, but fails significantly in pitch level and pitch contour)
6. Slightly above average (contains all phonemic aspects of the word, but fails slightly in both pitch and pitch contour)
7. Well above average (contains all phonemic aspects of the word, but fails significantly in only one aspect of pitch or pitch contour)

8. Far above average (contains all phonemic aspects of the word, but fails slightly in only one aspect of pitch or pitch contour)
9. Excellent (contains all phonemic aspects of the word, but fails only in not producing the second half of pitch contour)
10. Flawless (contains all phonemic aspects of the word and produces perfect pitch and pitch contour)

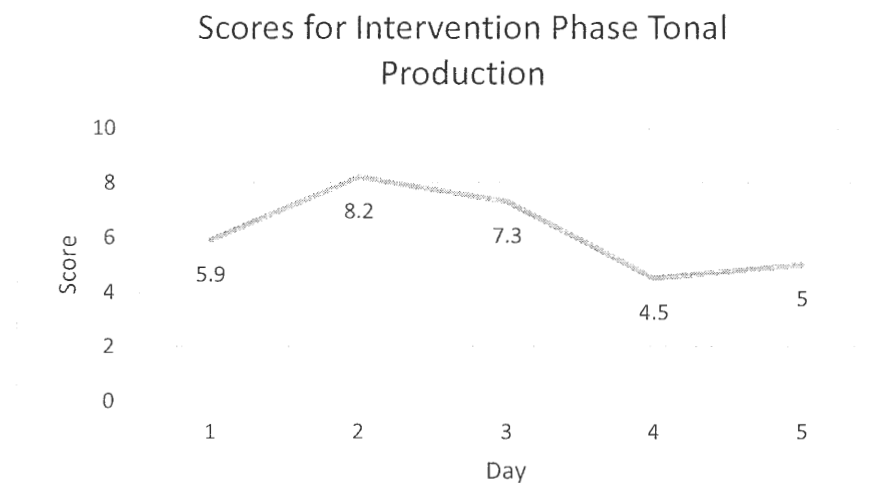
To answer the research question, data were analyzed for the five phases of initial baseline, initial intervention, initial withdrawal, second intervention, and final withdrawal. Each phase was divided into five days. The scores across the first five days of baseline tonal production proved to be quite steady, although the overall score for these days was very low, (all scores were assessed at 2 or under), and the mean for these first five days was 1.7, categorized as far below average. The results of these first five days of the initial baseline as assessed by a native Chinese speaker are displayed in Figure 1.

Figure 1 Ranking of Baseline Tonal Production



After the initial baseline was determined, the instructor began introducing Mandarin Chinese tone hand gestures. The intervention stage lasted five weeks with one class meeting per week. The same scale was used by a native speaker to assess each of the five days recorded. The results of the five-week period showed that during the intervention, scores increased dramatically from a baseline mean of 1.7 to an initial intervention mean of 6.18, which would be categorized as slightly above average. The results for the initial intervention phase as observed by a native Chinese speaker are displayed in Figure 2.

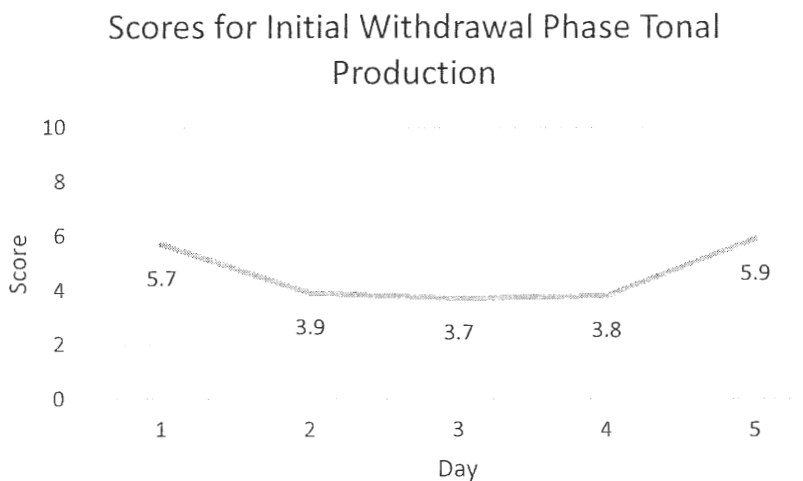
Figure 2 **Ranking of Tonal Production During Intervention Phase**



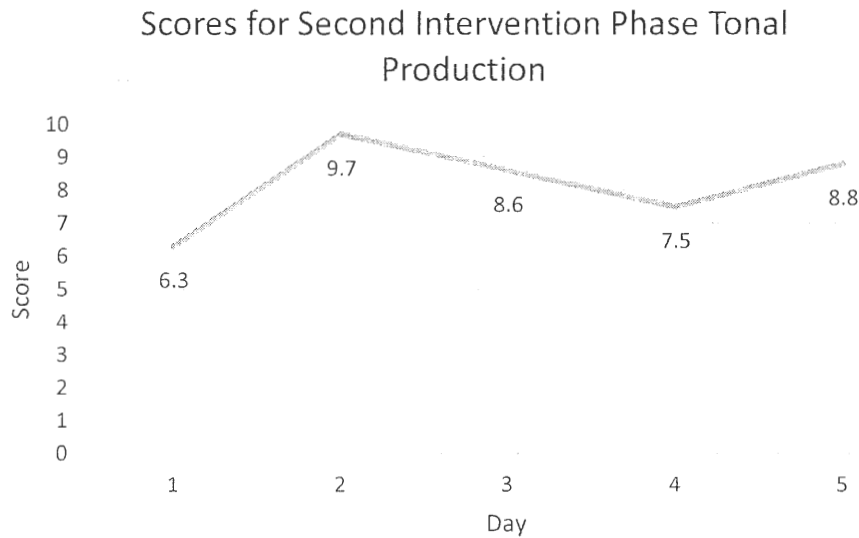
The pattern between the baseline and intervention phase demonstrated a significant increase in scores, which signifies an increase in accuracy in producing each Chinese word's pinyin, pitch, and pitch contour.

Following a four-week withdrawal from the instruction of Mandarin Chinese tones using hand gestures, the scale was again used to rate the tonal production of the subject. The results obtained from the initial withdrawal phase showed a mean of 4.6, which categorizes as slightly below average on the scale. The results for the initial withdrawal phase which depict mean scores for each of the five days recorded as observed by a native Chinese speaker are displayed in Figure 3.

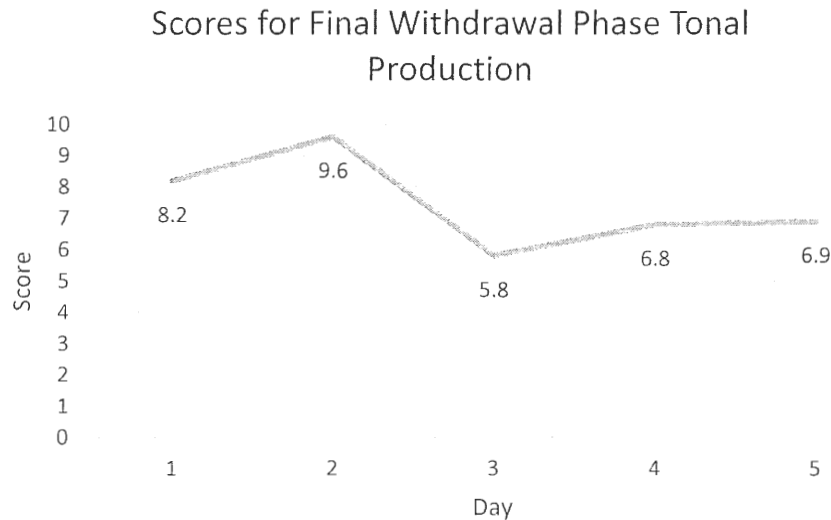
Figure 3 Ranking of Tonal Production During Initial Withdrawal Phase



Following a four-week reintroduction of instruction of Mandarin Chinese tones using hand gestures, the scale was again used to rate the tonal production of the subject. The results obtained from the second intervention phase showed a mean of 8.18, which categorizes as far above average on the scale. The results for the second intervention phase which depict mean scores for each of the five days recorded as observed by a native Chinese speaker are displayed in Figure 4.

Figure 4 **Ranking of Tonal Production during Second Intervention Phase**

Following a second four-week withdrawal of instruction of Mandarin Chinese tones using hand gestures, the scale was again used to rate the tonal production of the subject. The results obtained from the second intervention phase showed a mean of 7.46, which categorizes as well above average on the scale. The results for the final withdrawal phase, which depict mean scores for each of the five days recorded as observed by a native Chinese speaker are displayed in Figure 5.

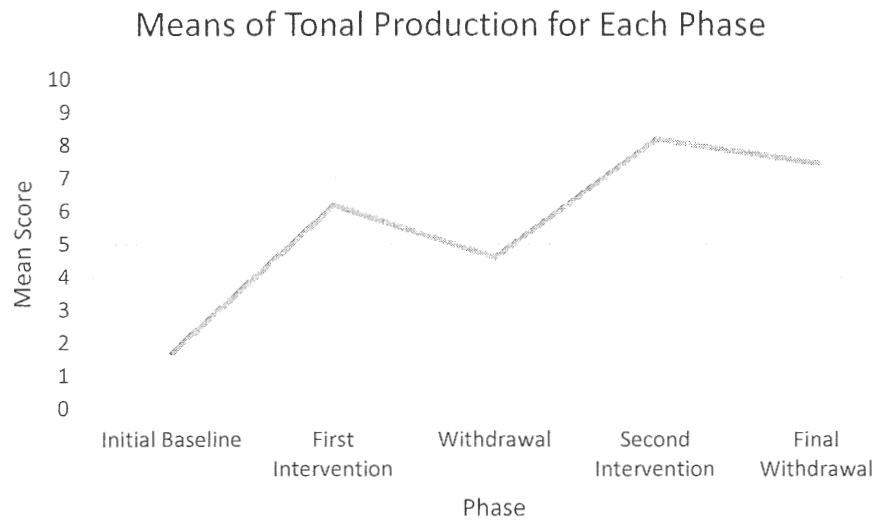
Figure 5 **Ranking of Tonal Production during Final Withdrawal Phase**

Overall, figures 1-5 depicted an obvious pattern. The subject's tonal production did increase and decrease in an A-B-A-B pattern over the course of the study, starting from an initial baseline mean score of 1.7 and ending with a final withdrawal mean score of 7.46. Over the course of six months, the subject progressed from being unable to pronounce phonetically virtually any of the 50 Chinese words used to being able to pronounce them with only some slight errors in pitch and pitch contour. The subject's mean scores increased a total of 5.76 points on the scale. During the baseline, the subject's scores were as low as possible on the scale. During the initial intervention subject's score means increased 4.48 points on the scale. During the initial withdrawal, the subject's score means decreased 1.58 points on the scale. During the final intervention, the subject's score means again increased 3.58 points on the scale. During

the final withdrawal, the subject's score means once again, although not as significantly, by 0.72 points on the scale.

The results of the case study comparing the means for each phase throughout the study as observed by a native Chinese speaker are displayed in Figure 6.

Figure 6 Collective Rankings and Comparison of the Means of Tonal Production for Each Phase



Chapter 5

This chapter includes a summary of findings for a case study examining the effectiveness of hand gestures versus traditional methods of teaching Mandarin Chinese lexical tones.

Summary of Findings

When the research question, “Do hand gestures improve lexical tone production compared to traditional methods of learning the four basic Mandarin Chinese tones” was examined, the results suggested that there was, in fact, a measurable difference in lexical tone production after the intervention. Therefore, the null hypothesis was rejected.

According to data obtained from the subject and teacher-created rating scale completed by a native Chinese speaker, the lexical tone output increased markedly after each and every intervention. Subsequent withdrawals from intervention also caused significant drops in rating, causing the subject’s scores to revert towards the baseline each time.

During the first intervention (A), the subject’s lexical tone production improved drastically. Initially, during baseline, the subject’s pinyin pronunciation was, for the most part, completely incorrect. This caused her responses to be virtually incomprehensible to both native and non-native speakers alike. Pitch and pitch contour rules were also completely ignored by the subject. A baseline mean score of 1.7 out of 10 was achieved.

The subject reacted most dramatically during the first intervention (A). The instructor introduced the hand gestures to the subject, one for each of the four tones. As each Chinese word was read aloud, the instructor would gesture with its corresponding hand gesture. This process was repeated for five days. The subject was also required to

demonstrate the hand gestures for each word while being recorded. After this intervention, the mean scores increased to 6.18 out of 10. The data shows that the initial intervention provided the greatest increases in scores. Once the subject understood the conceptual “rules” of pitch and pitch contour, the subject was a great deal more scrupulous in her tone production. The subject would pause for some moments in order to prepare. The accompanying hand gesture helped the subject to prepare responses before actually speaking. This allowed the subject some amount of time to adjust from her normal pitch ranges to reach those pitches that are outside of the normal English range.

During the withdrawal phases of the study, the subject had a tendency to revert back to an English range in pitch and pitch contour, although not to the extent of the original baseline. The subject’s scores dropped 1.58 points during the initial withdrawal, and 0.72 points during the final withdrawal. This suggests that as the subject acquired the conceptual knowledge needed to produce the four tones, she managed to do so with less and less explicit instruction. By the end of the study, the subject could produce the Chinese words from the comprehensive list with an average of 82% correctness and 75% correctness during the final withdrawal.

It is also notable that the subject’s scores continued to increase also during subsequent withdrawal phases, although not as high as preceding interventions. The subject’s rapid increase in scores may also be attributed to her certain personal characteristics and the one-on-one classroom environment, where the subject felt more relaxed. In addition, after being recorded multiple times, the subject felt more at ease with her responses and

instructor. As a result, throughout the course of the study, the subject's affective filter was continually decreasing.

The findings of this research also have interesting implications for the previous study mentioned earlier in the literature review. Although there has been very little previous research done on the effectiveness of hand gestures in teaching Mandarin Chinese tones, these results seem to contradict results found by accounts from Yukari et al. 1996, which stated that hand gestures did *not* help non-native speakers to produce beats of differing lengths to differentiate short and long vowels in Japanese. Differentiating between short and long vowels in Japanese, therefore, may not be a comparable task to producing different tones and pitches for Chinese words.

These findings could also accentuate results from Morrett's study on hand gestures and tone identification. As it was found, tonal or semantic gestures did not help non-native speakers *identify* tones (Morett, L. M., & Li-Yun, C. (2015). However, present findings suggest that tonal gestures may actually aid in tonal *production*.

Conclusions

In conclusion, the data confirmed that Mandarin Chinese lexical tone production improved greatly with accompanying hand gestures as opposed to traditional methods of teaching Mandarin Chinese tones. There was a more significant improvement during the first intervention phase of the case study where hand gestures were introduced for the first time than the second intervention phase when the subject already possessed a working knowledge of the hand gestures. Scores tended to revert to the baseline during each withdrawal. Therefore, the inference can be made that hand gestures provide significant aid in tonal perception, production, and accuracy.

Recommendations

The recommendations of this research project are as follows:

1. Additional double-blind research studies should be conducted to determine the effectiveness of hand gestures in teaching Mandarin Chinese tones.
2. A long-term study using larger populations should be conducted in order to determine the benefits of instructing Mandarin Chinese tones with accompanying hand gestures.
3. Based on the positive findings of this study using a teacher-created scale, future research should be expanded to include ACTFL Oral test scores, which are the most accurate indicator of oral Chinese proficiency currently available.

Implications

The implications of this research project are as follows:

1. This study helps to inform Teaching Chinese as a Foreign Language (TCFL) community about the possible benefits of including tonal hand gestures in their Chinese instruction.
2. This study helps to inform non-native Chinese language learners of the importance of utilizing tonal hand gestures in their self-study in order to perceive and reach the pitch range of a native Chinese speaker.
3. This study helps to augment an earlier study which concerned hand gestures and the tonal qualities of Chinese but did not include the aspect of non-native tonal production.

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Appendix

Parental Consent Form

Dear Mrs. Farley,

Parental Consent Form

Over the next six months, Sarah Gillette will be conducting a case-study research project using your child as the subject. This letter is intended to provide you an opportunity to provide formal consent. The research plan is outlined in this consent document. Your child's initial baseline in producing lexical tones in Mandarin Chinese will be assessed by the instructor. After the initial baseline is determined, the instructor will introduce hand gestures to accompany each Chinese word. Afterward, your child's responses will be recorded a second time. Thereafter, the instructor will withdraw from instructing using hand gestures. A third recording will be taken. Following this step, the instructor will then, again, instruct the student to use hand gestures and record another response. Following this, there will be one more withdrawal phase where responses are recorded.

After this study is completed, the rating scales and the information they contain will be destroyed. I will use the data collected to complete a supervised Graduate Thesis.

By signing below, you give consent for your child to participate in the research project conducted by Sarah Gillette. You understand that your child may withdraw from the study at any time. Your child's grades will not be impacted by participation or non-participation in the research.

Date

Parent/Guardian Name

Subject's Name

Parent/Guardian Signature