French and Russian students' production of Mandarin tones

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Abstract

This paper discusses the tone acquisition of Chinese by students in the context of Indo-European languages. This paper conducted two experiments: (1) Using Zhang (2006)'s 'Somatically-Enhanced Approach'(SEA) to conduct small-scale teaching experiments to the effectiveness of SEA on error correction of intermediate French and Russian students. "Somatically-Enhanced Approach" is centered on the body, teaching through humming, clapping, rhythm and movement to increase learners' sensitivity to tone and rhythm through language rhythm. The data in this thesis comes from the output of a Chinese class oral test of six French and Russian exchange students in a private university in Taiwan. (2) In the second experiment, all the spoken language corpus of French and Russian students were provided to ten native speaking Chinese teachers for analysis. After a one-semester study of the "Somatically-Enhanced Approach" in this research, Russian students and French students demonstrated that they could correctly pronounce the correct tones when speaking Chinese, with enhanced fluency in natural speech. The results of this study will be presented through quantitative (statistical data) and visualization and Praat was used to analyze the collected classroom spoken data and explore the sources of the errors.

Keywords: tone analysis, French and Russian students, interlanguage, Somatically-Enhanced-Approach.

1. Introduction

Tone is an important feature for distinguishing meaning in Chinese, and it is also one of the evaluation criteria for the accuracy of Chinese pronunciation. Chao (1930) also pointed out that Chinese tones have a distinguishing function, and the accurate mastery of Chinese tones can eliminate ambiguity and communicate effectively. Tones are supra-segmental components attached to syllables which are realized in pitch. To depict tones graphically to facilitate understanding, in Chinese language teaching the "Tone letter system" designed by Chao (1930) is usually adopted.
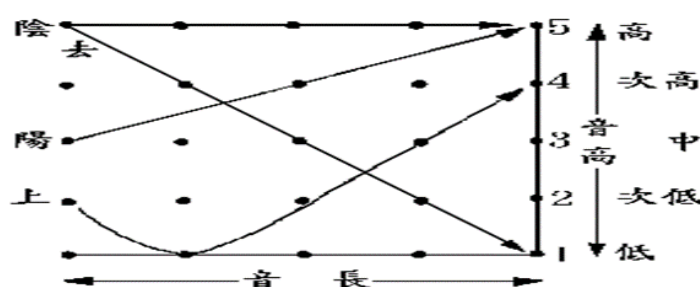
Figure 1: A system of tone letters

In Figure 1, the vertical axis represents a person's voice range which can be divided into five equal levels represented by 1, 2, 3, 4, and 5. Among them, 1 means the lowest, 2 means the second lowest, 3 means the 3rd highest, 4 means the second highest, and 5 means the highest level of pitch. 葉德明 (2005) pointed out that tones are realized by the pitch of speech which is determined by the frequency of the sound wave. Therefore, the higher the number for frequency, the higher the pitch for the sound, and vice versa. It is related to the number of vocal cord vibrations. The pitch ranges of a person also vary by gender. For instance, for males, it is roughly between 100 and 200 Hz, while for females, it is roughly between 150 and 300 Hz. There are four tones in Mandarin Chinese, five if neutral tone is included.

Using Figure 1 as an illustration, Tone 1is represented as 55, which means a word with a 55 tone tends to be high and flat like 'ma1: mother'. Tone 2 is represented as 35 which means that it starts at level 3 and increases in pitch until the voice reaches level 5 (ma2: hemp). Tone 2 is not of a vertical upward shape. Its shape goes from level 3 to level 5 across the entire horizontal axis. Tone 3 has a zigzag shape which goes from level 2 down to level 1 and then back up to level 4 like ma3: horse. Finally, Tone 4 is represented by 51 which means it starts at level five and then go straight down to 1 across the horizontal axis.

These tonal representations represent tones of citation form of characters consisted of single syllables. However, in real running speech, tones are affected by words surrounding that tone. This is most evident in the realization of tone 3. Even for native speakers, Tone 3 is often mixed up with Tone 2 and is the last tone to be acquired (Guo, 1991). For foreigners learning Chinese as a second language (TCSL), the mastery of Tone 3 is notoriously difficult with Tone 2 and Tone 3 equally unstable and error prone (葉德明, 2005).

There is also strong evidence that the beginnings and endings of sentences were a problem area for learners whose mother tongue was English and especially when Tone 4 occurs in the final positions of a sentence or a question (Zhang, 2006). This finding agrees with Wang's finding that large discrepancies exist between the tonal patterns of Tone 2, Tone 3 and Tone 4 before internal phrase boundaries and those at the end of the utterances exist (Wang, Jongman, & Sereno, 2001; Wang, Sereno, Jongman, & Hirsch, 2001). Such tonal problems also occur with students from other nationalities such as Russian and French learners of Mandarin (娜斯佳,

2014; 娜達莉婭, 2014; 林宥榛, 民 101; 隋偉靜, 2012). Regardless of which tone posed most difficulty for which students, the majority of the foreign students investigated in previous research demonstrated that especially students from non-tonal languages, i.e. those from alphabetic languages, their voice ranges for their native languages are consistently narrower than what is required to speak native level Mandarin Chinese. Zhang (2006) demonstrated that Mandarin native speakers' voice range is about 35% wider than those of the English speakers'. This suggests that the widening foreign learners' voice range is necessary in order for foreign learners to successfully acquire tones in Mandarin Chinese. This was also true with Russian, French, Italian and Polish students (周汪融, 2018; 娜斯佳, 2014; 娜達莉婭, 2014; 辛亞寧, 2007; 隋偉靜, 2012). Given this universality, Zhang (2006) used a movement oriented active approach known as the Somatically-enhanced Approach (SEA) in her study. The results of her study showed that using the body to enhance students' perception and production of Mandarin tones was largely successful except for Tone 3. The steps in SEA are intended as tools for implicit learning without help from pinyin, tone diacritics or English explanation. To solve the problems regarding Tone 3, this study employed an explicit learning paradigm in which the different realizations of Tone 3 are explained, with the aid of Pratt. to the student and then intensely practices immediately following the explanation.

2. Research methods

The research utilized a pre-posttest research design. The pre-test was held during the mid-semester test period and the post-test was conducted in the semester final period.

2.1 Setting and participants

Participants were 6 Russian and French exchange students who came to a private university in Taiwan to study Chinese. They usually only stay in Taiwan for about 6 months. Therefore, opportunities to collect oral data were limited which limits the effectiveness of this research. The participating students in the course had already acquired a certain level of Chinese with the Russian students having taken HSK level 3 exam in China. The teaching material was created by this researcher. The purpose of the course was to correct their language errors. Oral data analyzed came from mid-semester and final semester oral exams. Table 1 shows the basic information of the participating students.

Table 1: Basic information of the participating students

Student	age	gender	Length of studying Chinese	Certification
1	20	Female	2 years	HSK level 3
2	19	Female	2 years	HSK level 3
3	19	Female	3 years	HSK level 3
4	19	male	2 years	None
5	21	Male	2 years	None
6	20	Male	2years	None

2.2 Data collection instrument

Data was collected through mid-semester and end of semester oral tests in a 36-hour Mandarin course. The mid-semester test consisted of three parts. The first task was to read a passage, which only consisted of characters. The second task was for students to use natural speech to describe a house and the third task was a prepared monologue narrating ten things one must not do in French or Russian cultures. In the end of semester test, only two tasks were chosen. Task 1, the same passaged used in Task 1 of mid semester test was used. With the content of the passage under control, it was possible to more accurately compare tonal errors between the two tasks. The second task was a pre-prepared monologue on taboos in French and Russian cultures. The rationale for the design of the controlled and natural tasks was to see whether errors made under controlled environment were transferred to free natural speech tasks

2.2.3 Auditory analysis

In order to explore in more detail, the nature of L2 learner errors in Mandarin, an auditory analysis was also conducted. This analysis was done by two native speakers of Mandarin who are also experienced teacher of Mandarin. Markers marked according to her judgment, the deviant tonal production of each syllable using Chao's tone letter system (Chao, 1930). They were allowed to listen to each utterance as often as she wanted. From the detailed auditory analysis, it was possible to observe the patterns of errors made by the student. An inter-rater coefficient is calculated to ensure the consistency between the markings of the two markers. ICC was used to calculate the interrater correlation coefficient for the two markers.

2.2.4 The perceptual experiment

In the perceptual experiment, speech productions produced by the student were given to 10 native speakers of Mandarin in Taiwan in random order. The researcher was not one of the ten judges. The native speaking judges were TCSL trainee teachers of Mandarin from Taiwan who were asked to listen to the speech production with no script and mark the "naturalness" of the speech from each recording according to a scale of 1 to 9. They were not specifically asked to mark tones or intonation or prosody as any judgment of these aspects of the language required specialized knowledge of the Mandarin phonological system. "Naturalness" is defined as how close the utterances are to native speaker speech in terms of rhythm, tones, intonation, stress and discourse features. The results obtained from the perceptual experiment represent subjective judgment of TCSL student's performances from native speakers of Mandarin. The judges did not know which oral performances were produced at which time.

2.2.5 Teaching procedure

The course consisted of two-hour per week for 18 weeks, a total of 36 hours of Chinese language instruction. In the first few weeks, the teacher found that the 6 students had some problems with tones, especially in Tone 3 of Chinese through oral recording assignments.

Before launching into phonetic correction, the teacher decided to find out whether the large number of errors with Tone 3 was caused by students not being able to hear the different realizations of Tone 3 or from the fact they have been taught to annotate the Tone 3 always with the diacritic [ˇ].

First, the teacher verbally explained the different realization of tone 3 based on Miracle's research (Miracle, 1989) based on native speaker samples, i.e.：

- when in the word initial position, the NSs produced the low level contour (22);
- while in the word final position, the low falling contour (21) was more prevalent.
- A consistently falling contour was found preceding the neutral tone (21) and Tone 1 (21).
- In all other combination environments there was variation among the NSs between a falling and level contour.

Secondly, she illustrated these phenomena by using Pratt so that students can confirm with their eyes how these Tone 3 combinations are realized in reality. Then the teacher asked students to notate what they hear of the Tone 3 using [22] when tone 3 appears in the initial position; [21] when tone 3 in the final position; [21] before a neutral tone or tone 1. Of course, she also reminded them of the tone sandhi phenomena that when two or a series of third tones together, the preceding tone 3 change to a tone 2 with the last tone 3 preserving its 214 shape. Thus when two tone 3s are together such as in [ni3hao3], therefore its tones are represented as 35 for ni3 and 214 for hao3.

Thirdly, the teacher then read out 87 tone 3 combinations and asked them to note on the sheet what tone 3 combinations they hear and annotate them according to the new rules and notational system they established.
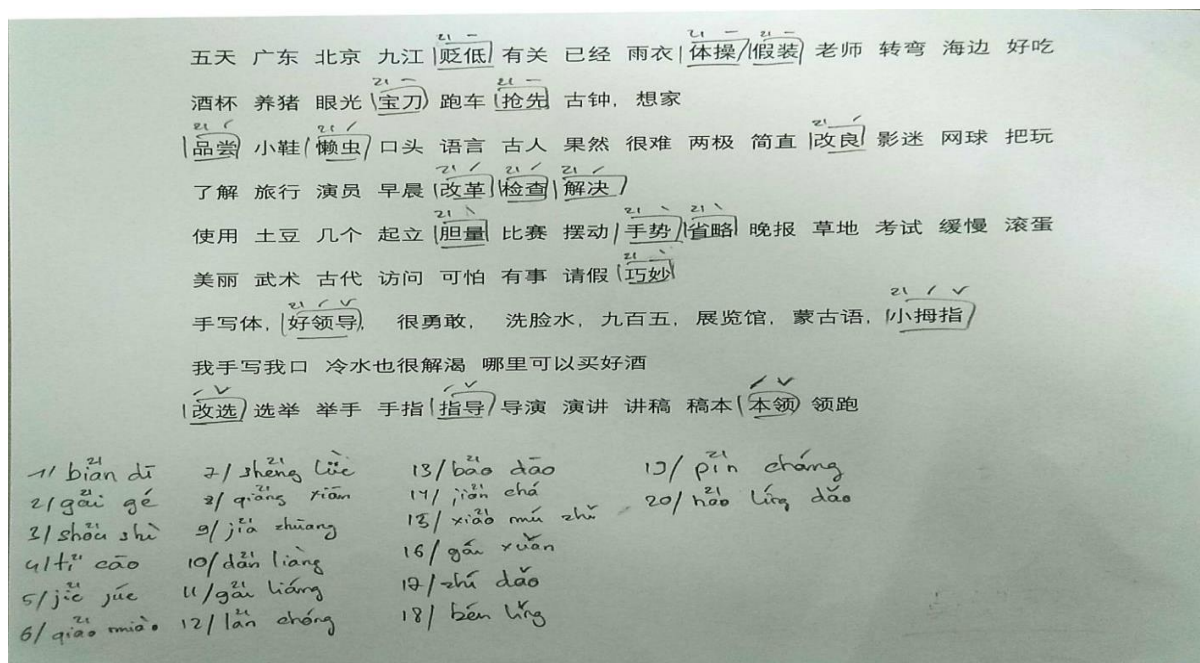

Figure 2: 87 tone 3 combinations used in the pre-testing stage. (曹文, 2002, p. 130)

This perception exercise established that most of the errors that these students made, with regards to Tone 3, came from the fact during their course of learning Chinese, the different realizations of Tone 3 were not explained to them adequately. This confusion with Tone 3 is further compounded by the convention of notating Tone 3, no matter what realization, with the tonal diacritic [˘].

Having found the source of Tone 3, the teacher then introduced them to the famous poem by Li qing zhao (李清照)，sheng1sheng1 man4, xun2xun2mi4mi4 (聲聲慢，尋尋覓覓)(曹文, 2002, p. 132). Again, they were asked to listen and note the tones of the poem using the new system, then they used movements in the "Somatically-Enhanced Approach" to correct their tones. They were not allowed to read the text. In the 'walking in circle' procedure, they hummed, clapped and used movements to perceive tones. When the teacher finds that there is a problem

with the tone, the teacher will use the movements to correct errors. For example, after '下班 (xiàbān):

get off work', the Russian students are always unable to pronounce Tone 4 xia4 properly. So the teacher asked them to use the "stomping" method of physical teaching to correct it.

2.2.5.1 A brief sketch of the Somatically-enhanced Approach to Mandarin prosodic correction

This study was about how L2 learners learn to 'structure' L2 language input in the L2 learning process. Trubetzkoy defined the tasks of phonology as how the infinite variety of physical sounds fit in with the finite nature of language structures that govern a particular language (Trubetzkoy, 1939). As far as perception is concerned, structuring happens when a learner is called upon to select different acoustic stimuli through the senses in order to integrate the message. In other words, in terms of perception, the structuring activity implies re-ordering, usually in an unconscious way, by selective filtering out of redundant data that are usually perceived globally. For instance, in production, the learner must structure the non-linguistic experiences that he/she wants to talk about so that the available extra-linguistic and linguistic means can be applied to it.

Before we describe the structuring activity through SEA in detail, it is essential to understand what makes up a speech sound. Take the sound [i] in French. If it is recorded and listened to successively through octave filters: at different frequency ranges, different sounds can be heard. This is to illustrate how one's ears are trained to hear sounds at a particular frequency which makes sense to the person by his/her mother tongue.

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between    150 and    300 cps, we hear [u]
between    300 and    600 cps, we hear an intermediate sound
                                      between [u] and [o]
between    400 and    800 cps, we hear [o]
between    600 and  1,200 cps, we hear [ɔ]
between    800 and  1,600 cps, we hear [a]
between  1,200 and  2,400 cps, we hear [ɛ]
between  1,600 and  3,200 cps, we hear [e]
between  2,400 and  4,800 cps, we hear [i] lax
between  3,200 and  6,400 cps, we hear [i] tense — Cf. R. RENARD,
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Figure 3: "L'appareil Suvaglingua, instrument de recherché et de correction phonétique", R.P.A., 4, 1967, notes 13 and 14, pp. 62 and 63. Taken from(Renard, 1985)

According to the above figure, the French [i] is made up of all those sounds, each sound occupying a different frequency. Yet when French speakers were asked to identify these sounds, all the sounds were identified by French speakers as productions of the phoneme /i/. This manipulation of the French [i] sound showed very clearly the superabundance of the acoustic sound in reality. Through perception a distinction between what is necessary for [i] to be recognized ([i] is recognized between 3200 Hz to 6400 Hz, previously in cps: cycles per second) and French NSs would filter out the other superfluous frequencies.

However, when it comes to a L2 learner learning French, the learner would perceive a sound through hearing all the frequencies that are contained in a sound. When it comes to perceiving a sound in L2, he/she is likely ***not*** to recognize the sound /i/ at the frequency recognized by a French person but is likely to recognize the sound /i/ at a frequency dictated by his/her mother tongue such as between 300-600 Hz because his/her perception is likely to be mediated through his/her mother tongue, Thus, he/she is in danger of confusing /u/ (between 300-600 Hz) with /i/ (between 3200 and 6400 Hz), or with /o/ (between 400 and 800 Hz) as these sounds also occupies part of the spectrum that contains /i/ at different frequencies.

In order for L2 learners of French to perceive [i], the sounds at frequencies above 300 Hz could be eliminated and only leave frequencies between 3200 and 6400 Hz through a process of filtering so that L2 learners can be exposed to the French [i] at the correct frequency. This was a strategy similar to the strategy adopted by McCandliss et al in the perceptive training Japanese speakers to discriminate between the difference between [r] and [l] in English ((McCandliss, Fiez, Protopapas, Conway, & McClelland, 2002) in which exaggeration was used to highlight the difference. A filtering process was also used in the Verbo-tonal method (VTM) of phonetic correction, developed at the Institute of Phonetics of the University of Zagreb by the late Professor Petar Guberina. Filtering in VTM (Renard, 1975) is a load lightening measure through which only the "relevant frequencies" for a particular sound, in this case, that of /i/ in French, is allowed to remain. In the teaching of Mandarin Chinese, the researcher in this study

did not have the equipment to supply students with a filtering mechanism. However, within the sensitization process of SEA, steps have been taken to prioritize the tonal aspects of Mandarin Chinese perceptually through the employment of humming, clapping and gestures. With the specific aim of defeating the 'phonological sieve' postulated by Trubetzkoy (1939), the following procedure was employed so as to develop a 'feel' for Mandarin prosody in TCSL students. The following descriptions has been simplified from Zhang (2006).

Step 1: Relaxation

The first step in the learning process is a relaxation procedure adapted from the success of Suggestopaedia in the 1980s. This relaxation step also is designed to reduce the language shock experienced by many learners especially when they are required to speak in the target language. In this first step, students are asked to lie on their backs on the floor and if possible, with the classroom darkened, then carry out mind-calming exercises for some five to ten minutes. This constitutes the relaxation phase of the classroom procedure.

Step 2: Humming

"Now, get up and stand in a circle." The teacher joins the circle. The teacher says "I will hum to the sentence and please hum with me while walking slowly in a circle". This is done for 5 times. (Step 2)

Step 2 involves humming to the intonation of the sentences without the vowels and consonants (5 times). This is used to highlight the intonation and tones of Mandarin. At this stage, students take an explicitly active part in the proceedings through humming along to the model. They are asked to repeat by "humming along" to the intonation. This is a way for them to produce an uncluttered sound string free from interfering vowel and consonant sounds.

The removal of vowel sounds is particularly important for learners of Mandarin from alphabetic language backgrounds because it forces them to prioritize the tones and prosodic aspects of Mandarin. As the input and output of the language uttered mutually reinforce each other, the language structure to be hummed should be a maximum of 5 to 7 syllables.

Step 3: Clapping to the rhythm of the sentences

"Now, I will clap to the rhythm of the sentence and then you can clap after me while walking in a circle." (Step 3) This is done for 5 times again. The intonation of the sentence is again hummed in this fashion while the clapping is taking place.

The students, while listening to and "feeling" the intonation patterns, begin to move in harmony with the rhythm and intonation of the sentences modelled by the teacher. The teacher provides the beat and the rhythm of the sentences according to the stress and discourse features of the sentences. For instance, in teaching the sentence "nǐ jiào shénme míngzi? What is your name?" in spoken speech "shénme:what" always go together. If a learner only learns this through reading then it is highly likely that he/she will always introduce a pause in between "shén" and "me" and another pause between "míng" and "zi". However, in prioritising the spoken over the written language in this course, the teacher demonstrated the beat of this sentence by providing

a beat for that group of words in the following manner:

[nǐ]   [jiào]   [shénme] [míngzi]?

1beat   1 beat   2 beats   2 beats

The clapping to the intonation patterns create a rhythm that students could follow while walking in a circle. This also allow students to observe and experience how stress, realized by length and loudness in Mandarin, is tied to meaning. This also allow them to observe the key words in a sentence and realize that not all words were of equal value and that in making oneself understood, some words are more important than others. This training was also essential in equipping them with the strategies of prediction and advanced planning in listening comprehension.

Step 4: Incorporation of movement and gesture

"Self-synchrony" refers to a process whereby the body of a speaker moves closely in time with speech (Condon & Ogston, 1966). For instance, spoken English is produced in groups of words, typically averaging about five in length, where there is only one primary vocal stress, conveyed principally through changes in pitch, also through changes in loudness or rhythm (Bull & Connelly, 1985). English, French and Russian are stress timed languages (Nespor, Shukla, & Mehler, 2011) To learn Mandarin Chinese successfully, they need to change their vocal and bodily behavior from speaking a life time of a stress-timed language to that of a syllable time language. Russian and French both are perceived as stress-timed languages and Mandarin a syllable time language.

Zhao (1987) described the four tones of Mandarin in terms of varying degree of tenseness of the vocal cords. For instance, in order to produce Tone 1, the vocal cords should be kept tense; to produce Tone 2, the vocal cords at first neither tense nor lax, then tense rapidly; to produce Tone 3, the vocal cords become lax immediately after being tensed, and then tense again; to produce Tone 4, the vocal cords suddenly tense, and then lax gradually.

Thus the corresponding gestures have been developed to produce the various tensions of the four tones in a sentence environment are as follows:

Tone 1: requires the vocal cords to be tensed and to be kept tensed. In order for students to experience the tensing of the body tension when pronouncing the Tone 1, students and the teacher need to tense up their hands, with the fingers spread out and the palms facing upwards. The elbows should be vertical and held close to the body. Students then push upward as though trying to touch the ceiling and keep to this posture, when pronouncing Tone 1.

Furthermore, as Tone 1 starts at a higher frequency with the tensing of the body greater than what most foreign speakers are used to, extra physical efforts need to be made to remind one that one must start high. To stretch one's muscular system to express these Mandarin tones, one must not slouch in seats. By asking students to stand up straight and walk in a circle with various gestures would enable them to experience the coordination and synchronization of various muscles with the sounds uttered.

Tone 2: the vocal cords are at first neither tense nor lax, then become tense rapidly.

In order for students to experience the gradual tensing of the vocal cords, students are advised to adopt a forward slumping of the shoulders or a forward motion of the head initially, using very tense hands with the fingers spread out and the palms facing downwards, then tense up their arms and the whole of the upper body with the elbows held close to their body, then gradually push their hands up directly over their heads while pronouncing the Tone 2. This movement was used a great deal when practicing counting from one to ten in Mandarin because ten is pronounced in Tone 2 as "shí". The movement thus reproduces the tonal contour of this tone. The key is to start the movement from the waist level and go up gradually until tenseness in the muscles are experienced.

Tone 3: the vocal cords become lax immediately after tense, and then tense up again. However, this description is only accurate on a lexical level. In running speech, Tone 3 is either realized as a lower level tone before a Tone 1, Tone 2, Tone 4 or a neutral tone or a Tone 2 before another Tone 3 according to the tone sandhi rules. Therefore, it is more accurate to describe Tone 3 before Tone 1, Tone 2, Tone 4 or a neutral tone as a lower level tone which requires the body to relax; and as a Tone 2 before another Tone 3 thus requiring the same movement as those described for Tone 2.

In instructing students to produce the low level Tone 3, students were advised to adopt a Relaxed posture with the shoulders accompanied by a forward motion of the head while producing the sound. In instructing students to produce the Tone 3 before another Tone 3, the movement adopted in producing Tone 2 was recommended with the first Tone 3 syllable.

Tone 4: the vocal cords suddenly tense, and then lax gradually. When it is necessary to go from tense muscle to lax muscle very quickly such as producing Tone 4, they were instructed to first raise their hands up high like what they were doing in Tone 1, then stamp their foot and if this movement fails for students to pronounce the Tone 4, throwing their arms downwards quickly while stamping their foot proved to be effective.

Step 5: Mouthing the words

In this step, the teacher instructs students by saying "Continuing with the movements, now mouth the sentences while I say them out loud." (Step 5)

For the first time in the learning sequence, so far, students were hearing an intelligible sentence. They were asked not to say anything but merely to mouth the words.

Mouthing the words gives students the opportunity to practice the articulation of the sounds of the words without, in fact, placing them on an intonational background actually produced themselves.

Step 2-5 isolates each element of articulation e.g. filtered intonation, humming and mouthing before restoring them to a normal context has the further advantage of eliminating as many difficulties as possible in terms of comprehension of the sentence. Consequently, by the time students are actually asked to repeat a full sentence, they will have practiced each of its

constituent elements many times. They will look forward to achieving success in the next step of the process which will follow naturally and which should present little additional difficulty.

Step 6-7: Adding words to the intonation patterns

The teacher then says "Now repeat after me, and then add words to the intonation." This again is done for five times. (Step 6)

The teacher then instructs each individual to repeat the sentence by themselves; checking that each student is reproducing the sentence correctly (Step 7).

The prosodic patterns are hummed again by the teacher for a further 5 times, and students are asked to say the sentences at the same time as they hear the prosodic patterns. This provides a transition between the kinds of exercises performed so far and the production of normal speech.

3.Results

Due to lack of space in this paper, the results of this research will provide most of the results in a simplified form but will comment in detail on the following two issues: (1) What are the causes of tonal errors in Russian and French students? (2) Are their errors a result of first language interference?

3.1 Result of perceptual experiment by ten native speakers of Mandarin Chinese:

Did the ten native speakers of Mandarin Chinese also perceive the students' improvement as a result of conducting experiment two?

Table 2 Assessment of 6 students' Mandarin Chinese production by 10 native speaking Chinese teachers

	No. of students	Average	Standard deviation
Pretest	6	6.1	1.02
Posttest	6	7.3	1.01

The T-test shows that there was a significant difference between the pre-test and the post-test, and there was a significant growth in the post-test of students' production. The scoring criteria was to score on "naturalness" ranging from 1=totally unnatural and 9=natural like a native speaker. The mean value of the difference in the perceptual rating scores given by the teachers has a significant level ($p = 0.011$) where $p < 0.05$, which proves that the use of the "Somatically-enhanced approach can successfully improve foreign students' Mandarin tone acquisition.

3.2 Causes of tonal errors:

To answer the question concerning the causes of student errors, the analysis of the production of the sentence

「在美国每天早上九点上班，下午五点下班」(zàiměiguóměitiānzǎoshangjiǔdiǎ xiàwǔwǔdiǎnxiàbān) was used. According to the mid-semester oral data (pre-test), all students made errors with the word 美國. All pronounced 'mei3' with 35 rather than the 21.

Table 3 Frequency of tonal errors in the sentence 「在美国每天早上九点上班，下午五点下班」(pretest)

	Errors: French students（n3）（time）	Errors: Russian students（n3）（time）
美（21）國（35）	1（s3）	1（s4）
每（21）天（55）	1（s3）	0
早（214）上（51）	2（s1、s2）	2（s4、s6）
九（35）點（214）	1（s3）	1（s4）
上（51）班（55）	1（s3）	3（s4、s5、s6）
下（51）午（214）	0	2（s4、s5）
五（35）點（35）	2（s1、s3）	0
下（51）班（55）	0	0
total	8	9

key：s1, s2, s3=French students；s4, s5, s6=Russian students

Examples of errors made are as follow:

(1) Comparison of [美國] between a male native speaker teacher and student 3.
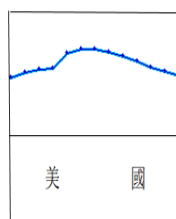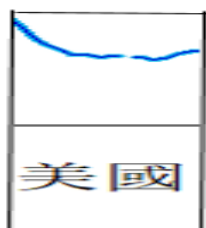
Figure 4; Male native speaker   Figure 5: student 3（pretest）

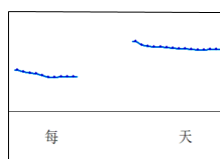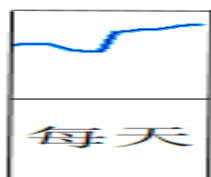(2) Comparison of 「每天」 between a male native speaker teacher and student 3.

Figure 6 Male native speaker Figure 7: student 3（pretest）

(3) Comparison of 「上班」between a male native speaker teacher and Russian students
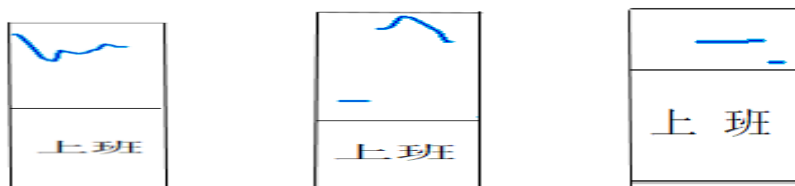
4 and 5.

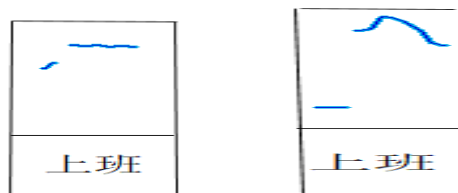Figure8: NS female teacher   Figure 9: student 4 (pretest)   Figure 10:student4 (posttest)

Figure 11: Student 5 (pretest)   Figure 12:student 6 (posttest)

The above results clearly demonstrate that errors with 上班(shang4ban1) persisted. In order to investigate what might be the cause of this persistent error, the researcher asked a native speaker Russian to say 「在美国每天早上九点上班，下午五点下班」in Russian.
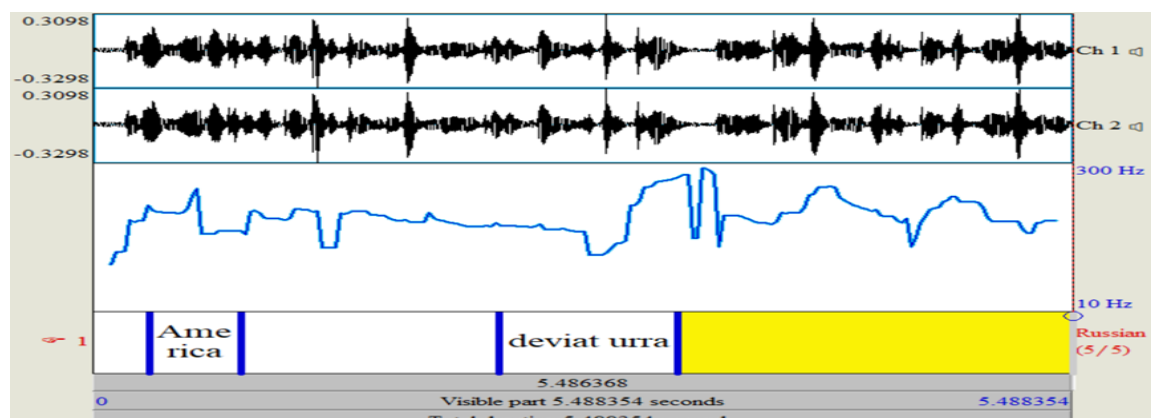
Russian：V Amerike rabochi den nachinaetsa v deviat urrà， a zakanchivaetsa v piat vecher à。

Figure 13：俄國人用俄文說「在美國每天早上九點上班，下午五點下班。」

The Praat figure 13 clearly shows that for the word 'America', the pitch goes up and similarly for the words 'deviat urra' the pitch goes up as well.
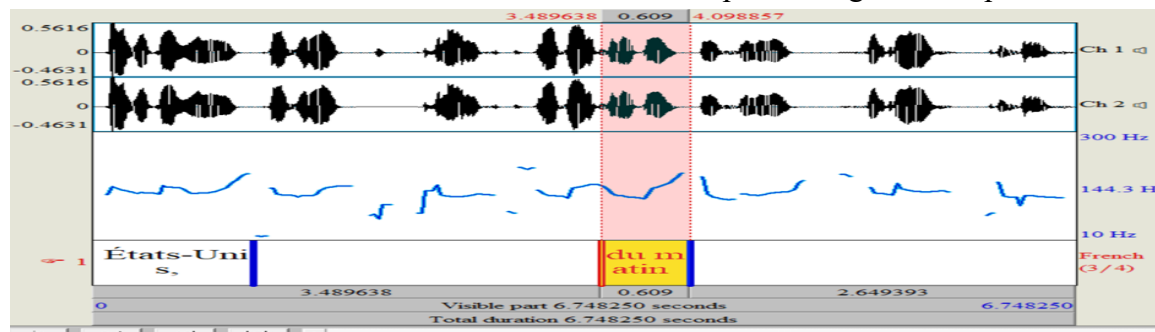
French：Aux États-Unis, le boulot commence à 9 heures du matin et finit à 5 heures du soir.

Figure 14：法國人用法文說「在美國每天早上九點上班，下午五點下班。」

Similarly, when the same sentence is spoken in French, figure 14 "Aux États-Unis" means

America, the intonation also goes up. For "du matin" it also goes up. In French '9 'clock' goes before 'in the morning".

5. Conclusions

Tone 3 errors produced by the French and Russians may be due to poor or none existent explanation of Tone 3 realizations in real running speech. However, the Russians' fourth tone errors is most likely affected by their mother tongue's intonation. Like the Russian, when French people want to change sentences, their intonation usually goes up, which causes tonal problems in Chinese. Zhang (2006) pointed out that when students are saying a series of things, the end of each phrase, regardless of the tone present, always rises, while the trend of the last syllable at the end of the same phrase of native speakers is downward. In this study, the fourth-tone errors of Russian students confirmed the conclusion of Zhang (2006). To further confirm this conclusion, it will be advisable to conduct a comprehensive experiment involving a larger number of students be recording them both in Chinese and Russian.

This study also proves that the same problem occurs in the language of Russian-speaking Chinese students. When saying a series of things or to pick up the next sentence, they would raise the tone of the ending sound, just like the phrase "下班". The French students in this study are also affected in the same way. Therefore, it may be said that if a student's mother tongue is an alphabetic language, most of the tonal errors that occur when they speak Chinese may be related to the intonation of their mother tongue. Since intonation and stress are more important than tones in their mother tongues, these features of their mother tongues are a likely to persist even in advanced speakers of Chinese's Mandarin speech. The job facing teachers and phoneticians is still how to suppress the 'phonological sieve' (Trubetzkoy, 1939) of the first language in the second language process of Mandarin. In terms of research method, this study has demonstrated that the use of running speech to analyze students' oral production is the way to allow first language interference errors at phrase junctures to appear.

6. Suggestions for teaching

The data contained in this paper suggests that Tone 3 is teachable and information about the realization of Tone 3 in sentences has always been available from Miracle's research (Miracle, 1989). To avoid confusing students during the instructional process, the researcher suggests that the following strategies to be included in teaching practice:

(1) Given that it is likely that many topics related to one's family and friends will be the content of a zero beginner's course, the different realizations of Tone 3 need to be explicitly shown to students and discussed with them through Praat. At the initial stage, avoid reliance on pinyin and tone diacritics in the printed textbook or the use of a language laboratory.

(2) In the teaching process, it might be advisable to introduce Chao's system of tones after the common 20 questions about oneself have been introduced. Once the tone letter system is introduced, use '21' to represent the lower third tone; '24/14 as the change to a second tone

when the next character is another third tone. Then conduct perception exercises with third tone words or phrases to sensitize students' perception of third tone realizations. Then always ask students to look for rules about what third tone combinations cause changes in the realization of third tones. Always correct using gestures in student production.

These measures serve to expand the support system to include body, movement, gesture and other forms of technical support for students. More importantly, through the use of these support systems, learners will learn new strategies for learning Chinese on their own.

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