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The Effect of Proficiency on the Pronunciation Accuracy of Chinese Learners of French—A Case Study of /ã/

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Abstract: Chinese learners experience various pronunciation challenges when learning French, such as the nasal vowel /ã/, due to the negative transfer of their mother tongue. However, it has been noticed that there is an improvement in pronunciation as proficiency improves. This paper, therefore, explores whether there is a stable relationship between proficiency and pronunciation accuracy by acoustically analysing the pronunciation of /ã/ in four participants with different levels of French proficiency. The author uses PRAAT software to extract the values of the first and second formants for comparison with native speakers. The experimental results show that, in general, participants in the high proficiency group pronounce the words closer to native speakers and with greater accuracy. However, the degree to which proficiency affects pronunciation accuracy varies depending on the environment in which /ã/ is found.

Keywords: Pronunciation accuracy, Nasal vowel, Formant frequency, Acoustic analysis, Target language acquisition.

1. Introduction

As cultural exchanges between France and China increase, a growing number of Chinese are becoming interested in the French language. However, due to variations in sound systems, there are several pronunciations in French that are difficult for Chinese learners to master. For instance, /ã/, a nasal vowel in French, is not present in the vowel system of Mandarin Chinese. Influenced by the negative transfer from the mother tongue (L1) [1], Chinese learners of French are prone to substitute a similar sound [aŋ] for phoneme /ã/, resulting in incorrect pronunciation. An acquisition challenge thus appears.

This paper presents a comparative acoustic analysis of the pronunciation of /ã/ by four native Chinese learners of French, concentrating on the frequency of the first (F1) and second formant (F2). The results of the experiment, while investigating whether proficiency influences pronunciation accuracy, also aim to predict for Chinese learners some of the pronunciation errors they are likely to encounter when speaking French, thereby making the learning process more efficient and effortless.

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2. Experimental Methods

2.1. Participants

To study whether a reliable relationship exists between proficiency and pronunciation accuracy, four Chinese learners of the French language between the ages of 18-23 (two males and two females) engaged in this experiment. Based on their language proficiency in French, participants were divided into two groups. Two participants in the high proficiency group attained the C1 level, which corresponds to the proficient user on the Common European Framework of Reference for Languages (CEFR), while the other two participants in the low proficiency group achieved the A1 level, i.e. the basic user [2].

To decrease the impact of extraneous factors on the experiment's outcomes, all the participants have comparable foreign language learning capacities and similar French learning environments: their English is all at the C1 level, and they learn French at Beijing Foreign Studies University without any prior experience living or studying in a French-speaking country. In addition, each group consists of one male and one female.

2.2. Stimuli

Table 1: The experimental word list.

Nasal word	IPA	Gloss	Nasal word	IPA	Gloss
argent	[arʒɑ̃]	money	penser	[pɑ̃se]	think
changer	[ʃɑ̃ʒe]	change	rentrer	[rɑ̃tre]	return
encore	[ɑ̃kɔr]	still	sembler	[sɑ̃ble]	seem
enfant	[ɑ̃fɑ̃]	child	silence	[silɑ̃s]	silence
moment	[mɔmɑ̃]	moment	souvent	[suvɑ̃]	often

To allow participants to produce the most natural pronunciation during the experiment, in addition to the 10 experimental words with the nasal vowel /ɑ̃/, 20 control words are gathered: 10 containing other nasal vowels and 10 without nasal vowels, to the effect that participants cannot tell which phoneme is being tested. Moreover, each of the 30 words is a disyllable of 6-7 letters.

To avoid the effect of familiarity, the stimuli are selected from the list of the most common French words (19th and 20th centuries) [3] published on the Eduscol (the website of the Directorate-general for Schools of the French Ministry for National Education), and rank in the top 1000. Furthermore, another 3 Chinese learners of French of different levels (A1, B1, and C1, respectively) are invited to validate the high familiarity of selected words by scoring them on a scale from 1 to 5, with 5 indicating strong familiarity and 1 indicating no familiarity. Words with an average score of less than 4 are replaced until all words meet the criteria, ensuring that participants know the meaning and pronunciation of the words, thus preventing mispronunciations due to the unfamiliarity of the word.

2.3. Experimental Design

Before the experiment, a PowerPoint of the stimuli was prepared with one word per page. 30 words were randomly distributed, and the words containing the phoneme /ɑ̃/ were specifically controlled not to appear 2 times consecutively to avoid participants detecting the phoneme being tested and thus producing a non-natural pronunciation.

The experiment was conducted in a pre-selected quiet setting. After informing the participants of the rules of the experiment, their pronunciations were recorded using the PRAAT software. Participants began reading the words twice each, and were given the option to replay the recording if

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they thought they had mispronounced the word and chose to re-record it. The duration of the experiment was 40-50 minutes per participant.

PRAAT software [4] was used to analyse the experimental recordings, focusing on the formant frequency of the spectrum, specifically the first and second formant values. Formants are frequency peaks in the spectrum with a high level of energy, which are especially prominent in vowels [5]. The frequency of the first formant (F1) is mostly determined by the height of the tongue body, while the frequency of the second formant (F2) is mostly determined by the backness of the tongue body [6]. Height and backness are two features of vowel quality that are used to contrast one vowel with another in nearly every language [7]. French is not an exception. It has been confirmed by lots of scholars that /ã/ has a higher value for F1 and a lower value for F2 compared to its corresponding oral vowel /a/ [8]. Therefore, /ã/ is somewhat lower, also more posterior than /a/ [9]. According to the data collected by Montagu, F1 values for the native French articulators /ã/ are 545 Hz and the F2 values are 1004 Hz [10]. In this paper, the above data will be used as a criterion to analyse the recordings collected.

The mean F1/ã/ and F2/ã/ values of the two groups (high proficiency group and low proficiency group) will be compared to those of the native speakers respectively. The results will determine which group is closer to the native speakers and more accurate in pronunciation, thus concluding whether there is a relationship between proficiency and pronunciation accuracy.

3. Results and Discussion

Table 2: Mean values of F1/ã/ and F2/ã/ of the two groups.

	Mean F1/ã/	Mean F2/ã/
High proficiency group	662.44	1056.78
Low proficiency group	756.92	1089.96
Native speaker	545	1004

Table 3: Mean values of F1/ã/ and F2/ã/ of stimuli.

	High proficiency		Low proficiency		Native speaker	
	Mean F1	Mean F2	Mean F1	Mean F2	F1	F2
argent	650.54	1092.49	735.50	1167.60	545	1004
changer	560.55	1126.34	747.50	1112.54	545	1004
encore	599.50	948.58	736.06	1141.74	545	1004
enfant	702.64	993.64	813.06	1076.97	545	1004
moment	677.62	1090.76	746.65	1131.78	545	1004
penser	662.36	923.54	569.02	1047.62	545	1004
rentrer	567.79	1096.55	553.52	1054.96	545	1004
sembler	812.91	1072.21	744.75	1085.48	545	1004
silence	670.14	1004.77	744.50	1059.05	545	1004
souvent	720.38	1129.68	738.69	1021.89	545	1004

**All data are accurate to 2 decimal places.*

Firstly, based on the data in Table 2, it is clear that the pronunciation of the high proficiency group is more accurate, with the mean F1/ã/ and F2/ã/ values much closer to those of native speakers, thus validating that as proficiency in the language increases, so does the accuracy of pronunciation. However, it is undeniable that the mean F1/ã/ and F2/ã/ values of both groups are higher than those of the native speakers, indicating that all four learners have some problems with the accuracy of their

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pronunciation. The negative transfer of the native language leads to an inaccurate tongue position. According to the data for each stimulus in Table 3, it appears that for participants in both the high proficiency and low proficiency groups, the tongue body was positioned too high and too far back in the mouth in most cases.

Furthermore, it was unexpectedly found that the difference between mean F1/ã/ and F2/ã/ value for each stimulus in the high and low proficiency groups was not constant, implying that the magnitude of the influence of proficiency on accuracy varied across words because of the different environments in which /ã/ was found. Therefore, the author further explores exactly in which environments proficiency has the greatest effect on the accuracy of pronunciation of the phoneme /ã/, and in which cases it has the least effect.

Start with the F1 values. The degree of proficiency's effect on pronunciation accuracy can be estimated by comparing the magnitude of the difference between the two groups, given that the mean F1/ã/ values for all stimuli were greater for both groups than for native speakers. The comparison revealed that the stimulus "changer" produced the biggest difference between the two groups at 186.95 Hz, whereas the stimulus "rentrer" produced the smallest difference at 14.27 Hz.

In the pronunciation of "changer", the mean F1/ã/ value in the high proficiency group is 560.55 Hz, which is the closest to native speakers (545 Hz) of all the pronunciation in this group, while the value for the low proficiency group is 747.50 Hz, which is at the average level of this group. It is therefore inferred that as proficiency develops, the articulation of /ã/, especially the height of the tongue body in the mouth, in the environment between /ʃ/ and /ʒ/, i.e. between voiceless palatal fricatives and voiced palatal fricatives, becomes significantly more accurate. Then, as to the stimulus "rentrer", the values for the two groups are both fairly close to those of native speakers. In this word, /ã/ is preceded by /ʁ/ and followed by /t/. Since the phoneme /ʁ/ is a voiceless uvular fricative sound, produced by raising the back of the tongue toward the uvula [11], it is speculated that it may have been with the help of the uvular consonant that the participants produced the more accurate /ã/ sound. And in this environment, proficiency has little effect on the accuracy of the height position of the tongue body in the mouth.

The mean F2/ã/ values for both groups are actually very similar to those of native speakers, from which it is inferred that Chinese learners of French have a better grasp of the front-to-back position of the tongue than that of the height of the tongue in the mouth when pronouncing the phoneme /ã/. By comparing the mean F2/ã/ values, it was found that the stimulus that best demonstrates the effect of proficiency on the accuracy of front-to-back position of tongue in the mouth is "encore", and the words in which proficiency has the least effect are "sembler" and "changer".

In the word "encore", the nasal vowel /ã/ is at the beginning of the word, followed by the voiceless velar plosive /k/. Combining the data from another stimulus - "enfant", the difference between two groups is also relatively large. It is therefore hypothesized that since /ã/ occurs at the beginning of the word without any consonant assistance, it is a big challenge for beginners, and as such, the accuracy of pronunciation will improve through proficiency. In contrast, the relationship between proficiency and accuracy of front-back tongue position was not well represented by the stimulus "sembler", as the mean F2/ã/ values for both groups were particularly close to those of native speakers. It is inferred that Chinese learners of French have commonalities in the pronunciation of /ã/ and better mastery of the standard anterior-posterior position of the tongue in the "s_b" environment.

4. Conclusion

The research questions of this paper were addressed through experimentation. Although all four participants had problems with their pronunciation, the data showed that there was indeed a link between language proficiency and pronunciation accuracy. By comparing the mean F1/ã/ and F2/ã/ values of the two groups, it was shown that there was a positive relationship between the proficiency

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and pronunciation accuracy. The higher the proficiency, the more accurate the pronunciation and the closer it was to that of the native speaker. By increasing proficiency, the effect of negative transfer from the native language is gradually reduced and tongue position errors are improved.

However, the degree of effect of proficiency on pronunciation accuracy varies with the different stimuli, and the environment in which /ã/ occurs. Experimental findings indicate that, in terms of tongue height accuracy, the influence of proficiency is stronger when /ã/ is in a "ʃ_ʒ" environment and less when it is in a "ʁ_t" environment. In terms of the front-to-back position of the tongue in the mouth, the data suggest that learners with higher proficiency will pronounce /ã/ more accurately than beginners when they are in the "#_f" environment, whereas participants' pronunciations of /ã/ in the "s_b" environment do not differ significantly by proficiency.

Nonetheless, there are still areas in which this paper could be enhanced. Firstly, the small number of participants in the experiment makes no doubt that the results are vulnerable to chance and that only a sufficient amount of data will yield more convincing conclusions, because individual differences, such as the structure and quality of the articulatory organs, gender, and the environment in which the articulation takes place, can all contribute to different results. Secondly, the environment in which the phoneme /ã/ was placed was rather heterogeneous, with only one word for each phonological environment. If focusing on only one phonological environment, the resulting data will be more precise. If a comparison of multiple phonological environments needs to be studied, more words are needed as material support. Finally, there are many values other than the F1 and F2, such as nasal formant, which are also criteria for the accuracy of nasal vowels. Using F1 and F2 value is feasible to determine whether a pronunciation is accurate, but not comprehensive. An acoustic analysis in terms of other features of nasal vowels is also possible.

Despite these shortcomings, this paper still provides evidence to support the relationship between proficiency and pronunciation accuracy. The findings of this experiment also lead to the question of whether, if proficiency increases indefinitely, a foreign language learner's pronunciation can approach or even reach the level of a native speaker's pronunciation indefinitely, or whether it can only reach a certain threshold and no longer approach the level of the native speaker. This is a question that deserves further exploration.

References

[1] *Odlin, T. (1989). Language Transfer. Cambridge: Cambridge University Press.*

[2] *Using the CEFR: Principles of Good Practice. (2011). Cambridge: University of Cambridge ESOL Examinations.*

[3] *Liste de fréquence lexicale (2022). Retrieved May 5, 2022, from https://eduscol.education.fr/186/liste-de-frequence-lexicale.*

[4] *Boersma, P., & Weenink, D. (2005). Praat: doing phonetics by computer (Version 4.5.16) [Computer program]. Retrieved May 2, 2022, from http://www.praat.org/.*

[5] *Priyanka A. A., Bharti W. G., & Suresh C. M. (2016). Introduction to EEG – and Speech-Based Emotion Recognition. Cambridge : Academic Press.*

[6] *Haase, C., & Orlova, N. (Eds.). (2019). English Language Teaching through the Lens of Experience. Cambridge : Cambridge Scholars Publishing.*

[7] *Ladefoged, P., & Johnson, K. (2010). A Course in Phonetics (Sixth Edition). Wadsworth Publishing Company.*

[8] *Azra, J. L. (2019). Les voyelles nasales du français de l'origine à nos jours: revoir la question des changements de timbre. Available from Seinan Gakuin University Institutional Repository Web site, http://repository.seinan-gu.ac.jp/.*

[9] *Delvaux, V., Metens, T. & Soquet, A. (2002). Propriétés acoustiques et articulatoires des voyelles nasales du français. XXIVe Journées d'étude sur la parole, Nancy, 348-352.*

[10] *Montagu, J. (2004). Les sons sous-jacents aux voyelles nasales en français parisien : indices perceptifs des changements. JEP, Fès, Maroc.*

[11] *Ladefoged, P., & Johnson, K. (2010). A Course in Phonetics (Sixth Edition). Wadsworth Publishing Company.*