

L2 English Learners' Perception of English Diphthong /uə/ and Chinese Pinyin (wo) /uo/ (nest) in Phonetic Contexts

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Abstract: In English phonetics instruction, vowels often present challenges for second language learners. The articulation of vowel is complex and can be difficult for learners to be accurately grasped, making it hard for them to perceive the precise where English vowels are produced. Additionally, the vowel systems of English and Chinese differ significantly. Native Chinese speakers have internalized the Chinese vowel system, leading to pronunciation patterns that do not easily align with those of English. This paper examines the differences between the vowel systems of the two languages and the extent to which second language learners perceive specific vowels through a literature review. The findings suggest that the collected research on English and Chinese vowel system differences will serve as a valuable foundation for the upcoming experiment on the comparison and perception of the diphthongs /uə/ and /uo/. Furthermore, the review finds that conducting experiments on the perception of diphthongs with native Chinese speakers can provide valuable insights for further development in bilingual classrooms of second language learning.

Keywords: L2 English learning, vowel systems, diphthongs, phonetic perception.

1. Introduction

Vowels are a difficult part of English phonics teaching. Comparing and analyzing the differences between the English and Chinese vowel systems can help reduce students' difficulties in learning English vowels. By separating the Chinese vowels from the syllables, the vowel types that correspond to English can be identified. This paper intends to make a brief comparison of the differences between the English and Chinese vowel systems in the hope that it will be helpful to the phonological teaching of English vowels. In this paper, English refers to Standard British English and Chinese refers to Mandarin Chinese.

For diphthongs in the vowel system, the two vowel phonemes in a diphthong are usually unequal in length and intensity, with one sounding clearer, louder, and lasting a little longer than the other. English vowels can be categorized into two groups based on the direction and distance the tongue moves during pronunciation, one is called centering diphthong and the other is closing diphthong. However, there are no real sense of centering diphthongs in Chinese. Therefore, the English centering diphthongs /iə/, /eə/ and /uə/ often cause difficulties for native Chinese speakers. /e/ is located between /e/ and /æ/ and has a wider range of pronunciation, so /eə/ causes relatively little difficulty. /iə/ and /uə/, on the other hand, are often replaced by Chinese Pinyin “ie” and “uo”. The first vowel phonemes of /iə/ and /uə/ are /i/ and /u/, respectively, whereas the first phonemes of

Chinese Pinyin “ie” and “uo” are approximately equivalent to the English long vowels /i:/ and /u:/, with a more closed mouth and higher tongue position. The second phoneme is more retracted than English /ə/. This shows that the two diphthongs are different in pronunciation actually, with one existing in the English vowel system and the other in the Chinese vowel system. In this situation, when most Chinese second language learner cannot find the corresponding vowel in their system, they may choose to perceive it as a similar but different vowel. Thus, research in this field can significant implications for future second language (L2) teaching. Fortunately, many scholars have made comparative analyses as well as experimental research on the comparison of Chinese and English vowel systems.

According to Wang, participants experience substantial /ei/-/i:/ category confusion in the /f/ and /w/ contexts, where Mandarin listeners repair perceptually by modifying the vowel quality in illicit (unattested) consonant–vowel sequences, i.e., */fi:/, /fei/ and */wi:/, /wei/ [1]. Meanwhile, Mi’s study also aimed at a similar purpose of examining the relationship between English vowel identification and English vowel formant discrimination for native Mandarin Chinese- and native English-speaking listeners [2]. Yang had found that the first language (L1) features were maintained and transferred to the new phonetic system, which indicated that bi-high children produced L2 vowels in a near-native manner [3]. What’s more, they tended to transfer some L2 features to their L1 and moved the L1 vowels closer to L2 vowels. All of the aforementioned studies had demonstrated that L2 learners of all ages are likely to exhibit ambiguity in the perception and recognition of a different vowel system, providing a sound theoretical basis for our upcoming experiments.

Therefore, this paper firstly carries out the categorization and analysis of the relevant literature in this field and uses it as a basis for more effectively proposing an experimental research conception of L2 English learners' perception of English diphthong /uə/ and Chinese pinyin (wo) /uo/ (nest). This study provides a reference for the comparative analysis of the Chinese and English vowel systems, as well as a suggestion for teaching of English diphthongs in a bilingual L2 classroom.

2. Literature review

2.1. Differences between English and Chinese vowel system

For L2 English learners in China, it is extremely vital to understand the differences between the vowel systems of the two languages. Zhang’s article emphasized that the differences between English and Chinese vowel systems can be revealed through a comparison of the two vowel systems in terms of basic vowel configuration, distinctive features and allophones [4]. Basically, his comparison was made in three parts: monophthong, diphthong, and triphthong. Chen’s results of a comparative acoustic analysis indicated that male and female Mandarin speakers differed significantly from American English speakers in their production of several English vowels [5]. The general pattern in his research shown across the Mandarin subjects was one in which vowels are produced with less acoustic diversity compared to native speakers of American English. Many studies of this kind can lead us to a further understanding of the differences between the Chinese and English vowel systems in various ways.

2.2. Perceptual bias

In previous research, much of the perceptual and spelling study on the English vowel system has focused primarily on single vowels. Therefore, the study conducted by Ruth Altmiller on how learners of English mark the distinction between short and long first-syllable vowels using vowel digraphs and double consonant digraphs was a very crucial step in the study of diphthongs [6].

In the study of diphthongs, it is essential to discuss bilingual learners' perceptions of two different vowel systems. Fortunately, Wang's study examined how adult L2 listeners' L1 phonotactics interfere with L2 vowel perception in different consonantal contexts [1]. However, participants in Wang's experiments experienced substantial /ei/-/i:/ category confusion in the /f/ and /w/ contexts, where Mandarin listeners repaired perceptually by modifying the vowel quality in illicit (unattested) consonant–vowel sequences. Meanwhile, Chikako's results also showed clear L1 perceptual drift in a subgroup of L2-learner participants who were not nativelike in L2 English /i-ɪ/ categorization but were L2 dominant [7]. This result supported the claim that L2 input plays an important role in reorganizing the L1 phonetic system. Besides, Georgios' study aimed to investigate how the already-formed Greek phonological system is modified after the perception of the English vowels in a non-naturalistic environment and to what extent Greek speakers are able to discriminate challenging English vowel contrasts [8]. As shown by the results of these studies, the bilingual learners' native vowel system does cause interference with English vowel perception.

Although most bilingual learners in deed experience perceptual bias, the degree of bias varies from person to person. From this point, Mi's study revealed individual variability in using multiple acoustic cues to identify English vowels for both native and non-native listeners [2]. Interestingly, Hutchinson found that exposure to foreign films can also impact the perception and production of non-native languages [9].

2.3. Experiments subjects of different age groups

While learning English, second language learners of different age groups generally present different perceptual and learning characteristics. Therefore, it is very necessary to set up control trials for different age groups when designing experiments. Certainly, a specific targeted study on the characteristics of one particular age group can also be one of the feasible approaches. Yang's study examined the influence of L1 (Mandarin)–L2 (English) interactions on the organization of vowel systems and fine-grained spectral features of vowel productions in young bilingual Mandarin-English children [3]. While most of the research has been conducted on adults, this study on children has provided a new perspective to emphasize that it is important to have a comprehensive understanding of children as a target group for second language teaching.

In addition, Wendy's study evaluated whether age effects on second language (L2) speech learning derive from changes in how the native language (L1) and L2 sound systems interact [10]. The results showed that Korean children were less likely than the Korean adults to perceive L2 vowels as instances of a single L1 vowel category.

2.4. Summary

To summarize, the literature review in this paper discusses three main aspects, including differences between English and Chinese vowel system, perceptual bias and experiments subjects of different age groups, which draws the conclusion that there are certain differences between the vowel systems of Chinese and English, and meanwhile, such differences are prone to make L2 learners develop a perceptual bias in vowel recognition, which is an impediment to second language learning. Moreover, there are differences in the categorization and perceptual effects of the vowel system in different age groups such as children and adults. Therefore, in order to make L2 English learners who are native Chinese speakers better able to learn L2 vowels, this paper makes a specific proposal for an experimental study of the diphthongs in the Chinese and English vowels that tend to cause perceptual biases in learners.

To sum up, this study wants to address the following two research questions:

- (1) What is the significance of distinguishing English diphthong /uə/ and Chinese pinyin (wo) /uo/ (nest) in phonetic contexts for Chinese college students majoring in English?
- (2) For Chinese college students majoring in English, can they distinguish between the English diphthong /uə/ and Chinese pinyin (wo) /uo/ (nest) in phonetic contexts?

3. Methodology

Fifty L1 Mandarin listeners who did not report speech or hearing impairments (25 females and 25 males) will participate in this study and complete the perceptual task. Participants are undergraduate students majoring in English at a Chinese university. All participants spoke Standard Mandarin as their first language and have been learning English as their second language. They studied English as a compulsory subject in primary, middle, and high school. English is also a required course during their studies at universities, and participants receive approximately two hours of English instruction per week from native Chinese-speaking teachers as part of their study program.

This experiment will be set up an E-prime program in the experiment to explore students' ability to recognize different vowels. E-Prime is an experiment generation system for computerized behavioral research. Its easy-to-use graphical interface makes it convenient to set up experiments, including simple designing, easy data collection and analysis, which shortens the researcher's pre- and post-experiment time. This program collects responses with milliseconds of accuracy, which is helpful for our research. During this procedure, all the recordings used were checked and prepared with the software Praat. Praat is a speech analysis tool used for doing phonetics by computer. It can analyse, synthesize, and manipulate speech, and create high-quality pictures, which is really suitable for our phonetic research and experiments to better observe the pronunciation in a visual approach. To improve the ability to hear and distinguish the recordings, participants will also be instructed to use a pair of headphones to complete the experiment.

The intended experiment on English diphthong /uə/ and Chinese pinyin (wo) /uo/ (nest) studied in this paper will be conducted with reference to Wang's experiment for the following main reasons. Firstly, it was published in 2023, which is relatively close to the present time, therefore the validity of the results may be very high. Secondly, this article has sufficient literature review as well as theoretical support, so it shows that the feasibility of the experiment is relatively strong. Besides, Wang's experimental steps are scientifically sound, with the three types of experiments confirming and supplementing each other, the rationality, accuracy and comprehensiveness of the conclusions are guaranteed.

The expected experiment, based on Wang's study will be conducted in three parts [1].

Experiment 1: Vowel categorization

The first task will be a cross-language categorization task, which examines the mapping relations between L2 and L1 phonological categories. On each trial, the participants will be instructed that they will hear a recording of a nonsense word that contains one of the following diphthongs /uə/, /uo/, /ua/ (A new diphthong is added in as the control group to ensure that participants are able to perform properly in the experiment as well as to better test the accuracy of the final results.). Then, the participants will be required to classify the stimulus by pressing the corresponding button on their computer.

Experiment 2: Vowel identification

Experiment 2 will be a vowel identification task adopting a "Yes/No" paradigm, testing whether the participants are able to perceive vowels accurately in all kinds of phonotactic contexts. On each trial, the participants will hear one of the three stimuluses, and they will need to decide whether the target vowel is correct or not by hitting either the F key ("The vowel is correct.") or the J key ("The vowel is not heard.") on their keyboard.

Experiment 3: Vowel discrimination

A discrimination task will test how well the participants can auditorily differentiate the vowel contrasts at the perceptual level in different phonological contexts. In this experiment, participants will hear a sequence of the three stimuli (A, X, B), and they will be required to classify that whether the middle vowel is more phonologically similar as either the vowel in A (by pressing the F key means A=X) or B (by pressing the J key meaning X=B).

4. Expected results

If the experiment can actually be carried out according to the set-up steps above, then a set of real experimental result data will be produced. The author here refers to Wang's results and his analysis as well as discussion to predict the following expected results. Analyzing the expected experimental results in advance will enable the researchers to better understand the significance of the steps and better perform the operation smoothly in the real experiments in the future.

Experiment 1:

In the vowel categorization experiment, the results will be presented as specific percentage data (the percentage of the participants who choose the correct vowel). Since a control group is set up in Experiment 1, the author predicts that the control group will result in a significantly higher percentage since it is more distinguishable than the other two experimental groups, it is expected to reach up to nearly ninety percent. According to the prediction, if the other two vowel groups present lower correct response rates than the control group at no more than fifty percent (a centered figure, the probability that any one of the two vowels will be correct), then Experiment 1 will be able to show that L2 learners indeed have difficulty in perceiving the English diphthong /uə/ and Chinese pinyin (wo) /uo/ (nest). However, if the probability of correctness for both vowels is 70% (a more reasonable number) or above, then it may indicate that the participants do not have difficulty in perceiving these two vowels.

Experiment 2:

In the vowel identification experiment, the results will also be presented as specific percentage data (the percentage of participants who correct judged). It is predicted that if participants' probability of correctly identifying the vowels in the recordings is not higher than fifty percent, then Experiment 2 will show that L2 learners do have difficulties in recognizing and discriminating between English diphthong /uə/ and Chinese pinyin (wo) /uo/ (nest). However, if both vowels can be recognized with the percentage of seventy percent or even more, then the results would indicate no difficulty in perception.

Experiment 3:

In the vowel discrimination experiment, the results will be presented as specific percentage data (the percentage of participants who made correct judgments about vowel groupings out of the total number of participants). It is predicted that if the percentage of participants who made correct judgments is no higher than fifty percent, then Experiment 3 can reveal that L2 learners do have difficulty distinguishing between English diphthong /uə/ and Chinese pinyin (wo) /uo/ (nest). However, if that result is not met, the experimenter should analyze the results differently in the future research.

The above expected results derived from Wang's results may provide some reference value and pre-determined directionality, but the final outcome and conclusion still needs to be made based on the actual experimental data. In short, if the experimental results show that students tend to classify /uə/ and (wo) /uo/ (nest) as the same vowel and have a low accuracy in distinguishing them, it will prove that second language learners have difficulty perceiving the correct pronunciation of this pair of vowels. The results of this expected experiment are informative for future practical instructional approaches with teaching vowels in second language learning.

5. Conclusion

In conclusion, this paper focuses on the perception of English diphthong /uə/ and Chinese pinyin (wo) /uo/ (nest) by second language learners of English who are native speakers of Chinese as an example to specifically compare different vowel systems in the two languages. In this paper, the author collected a lot of related literature on language learners' recognition of vowel systems in different contexts to keep abreast of the latest research directions and findings in this field. Meanwhile, the author set up three perception experiments on a specific set of contrastive vowels by referring to Wang's study, and analyzed the expected experimental results. It is hoped that the author will invite adequate and suitable research participants, set up the required programs for the experiments, and conduct the actual experimental tests in further research. Afterwards, the actual experimental results will be compared with the expected results, and the reasons for any differences will be concluded. Moreover, the researcher will further analyze the information in the actual results.

It is urgent to pay extra attention to second language teaching on this pair of pronunciations, which is also a typical representative of other pairs of vowels and even the entire vowel system. There are still many pairs of pronunciation worth studying and it is better to make students realize this kind of differences by using various learning methods, so that they can learn and perceive different languages better. Although this paper discusses various aspects of the vowel system in bilingual learning, it does not consider the possible effects of the consonant system on vowel perception. At the same time, the experimental suggestions made in this paper are only limited to a single set of diphthong comparisons. Hopefully, future research will focus more on the whole phonological system, exploring more comprehensive and scientific experimental methods, and strive to make a greater contribution to second language teaching and learning.

References

- [1] Wang, Y. (2023). Same vowels but different contrasts: Mandarin listeners' perception of English /ei/-i:/ in unfamiliar phonotactic contexts. *Journal of Phonetics*. Volume 97, 101221.
- [2] Mi, L. (2016). English vowel identification and vowel formant discrimination by native Mandarin Chinese- and native English-speaking listeners: The effect of vowel duration dependence. *Hearing Research*. 333: 58-65.
- [3] Yang, J. (2017). L1-L2 interactions of vowel systems in young bilingual Mandarin-English children. *Journal of Phonetics*. Volume 65: p60-76.
- [4] Zhang, J. (2002). Comparison of English-Chinese vowel system and the teaching of English Phonetics. *Journal of PLA University of Foreign Language*. Vol.25.
- [5] Chen, Y. (2001). Vowel production by Mandarin speakers of English. *Clinical Linguistics and Phonetics*. 15: 427-440.
- [6] Altmiller, R. (2023). Double trouble: Using spellings of different lengths to represent vowel length in English. *Journal of Experimental Child Psychology*. 231, 105649.
- [7] Takahashi, C. (2023). L1 vowel perceptual boundary shift as a result of L2 vowel learning. *Journal of Phonetics*. 100, 101265.
- [8] Georgios, G. P. (2019). Bit and beat are heard as the same: Mapping the vowel perceptual patterns of Greek-English bilingual children. *Language Sciences*. 72: 1-12.
- [9] Hutchinson, A. (2022). Exposure to speech via foreign film and its effects on non-native vowel production and perception. *Journal of Phonetics*. 95, 101189.
- [10] Baker, W. (2008). Child-adult differences in second-language phonological learning: the role of cross-language similarity. *Language and Speech*. 51, 317-342.