

# L2 VOWEL PERCEPTION: PERCEPTUAL ASSIMILATION TO WHAT?

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## 1. INTRODUCTION

One of the most influential models of second language speech perception is Flege's (1995) Speech Learning Model (SLM). He argues that during initial stages of second language acquisition, second language (L2) phonological categories that share the same acoustic space as pre-existing first language (L1) categories will map onto those categories. In addition, Flege and Hillenbrand (1987) claim that acquiring a phonetic category that is similar to an L1 category can result in averaging the distance between the L1 and L2 categorical centres.

In addition, a distinction is made in the degree of difficulty learners face in acquiring specific L2 categories (Flege, 1995). Those L2 categories that share perceptual space with an existing L1 category are easiest to learn; those that are distinct from L1 categories or ambiguous are more difficult to learn. While comparisons of L2 productions with native-speaker means have been made (Chen, Robb, Gilbert & Lerman, 2001) few studies have compared L2 productions with productions of similar L1 categories.

This study examines the productions of English /u/ and /U/ categories by Mandarin L1 learners of English. Maddieson (1984) describes the Mandarin vowel inventory as including /u/ but not /U/. SLM would predict that English /u/ will map to an existing Mandarin /u/ category, while /U/, because it does not exist in Mandarin, will require the formation of a new category.

## 2. METHOD

The data used in this study were collected as part of a larger longitudinal study of the development of English language proficiency by recent immigrants to Canada.

### 2.1 Participants

Eight female and two male Mandarin L1 learners of English were selected on the basis of being newcomers to Canada with low English language proficiency. All participants were enrolled in a full-time ESL program at a local college. They ranged in age from 26-39 years.

### 2.2 Data Collection

Recordings of each participant's English productions were made six times over the course of one year, using a minidisc recorder with a sampling rate of 44,100 Hz.

Participants were asked to listen to a native speaker's recorded rendition of the target vowels in a /pVt/ frame presented in the carrier phrase "The next word is \_\_\_\_." They had to respond by saying, "Now I say \_\_\_\_." In total, 60 renditions of each vowel stimulus were obtained. To obtain productions of /u/ in a Mandarin context, participants read from a list of ten disyllabic Mandarin words containing the target vowel preceded by an initial voiceless bilabial.

### 2.3 Data Analysis

The author selected the 30 responses to English stimuli that were judged to be closest to the target L2 category for analysis. The Mandarin productions were also checked to insure errors were not made in reading the target words. Using the program Praat, 50 ms sections from the centre of the steady state portion of each English and Mandarin vowel production were selected. Measures of F1 and F2 frequencies were calculated.

All values of F1 and F2 were normalized to the average female values. These were then compared to published female native English speaker productions taken from Hillenbrand, Getty, Clark and Wheeler (1995).

## 3. RESULTS

Mean F1 and F2 values across speakers and their range are provided in Table 1. Production of English /u/ was not significantly different across native speakers (NS) and Mandarin L1 non-native speakers (NNS). There is a significant difference on the F2 values for the English /U/ category.

Table 1. F1/F2 values of English /u/ and /U/ and Mandarin /u/ and /u/ categories by Mandarin learners of English.

Target vowel	Speaker L1	F1	Range	F2	Range
English /u/	Mandarin	431	371-	1085	957-
	English	459	518 n/a	1105	1213 n/a
English /U/	Mandarin	531	466-	1061	948-
	English	519	607 n/a	1225	1279 n/a
Mandarin /u/		354	295- 416	885	712- 1086

As predicted, Mandarin L1 learners of English

the English /u/, which is perceptually similar to a Mandarin category. Of greatest interest is that the mean and range of the F1/F2 values for the Mandarin /u/ category is clearly different from the same speakers' productions of English /u/.

Figure 1 below plots the Mandarin speaker productions in a two dimensional space.

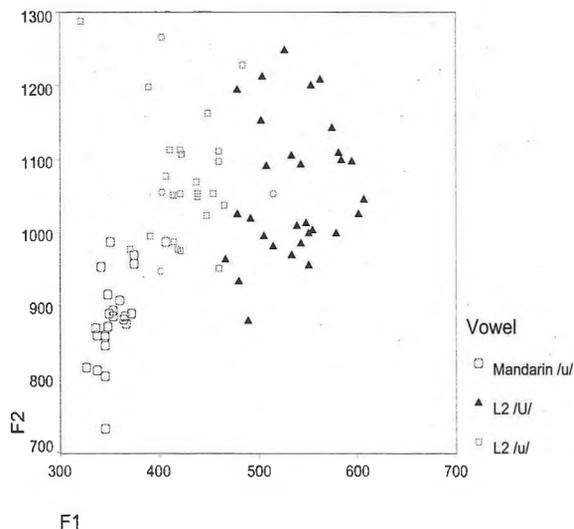


Fig. 1. F1/F2 values of English /u/ and /ʊ/ and Mandarin /u/

Figure 2 illustrates the difference in category centres between NS and NNS productions, comparing these with the centre of the Mandarin /u/ category.

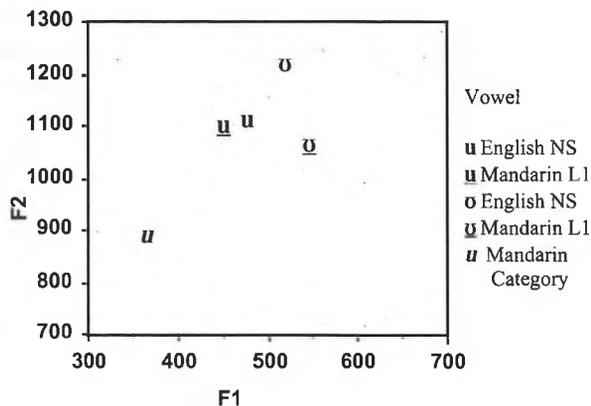


Fig. 2. Mean F1/F2 values of NS and Mandarin L1 production of English /u/ and /ʊ/ and mean of Mandarin /u/.

#### 4. DISCUSSION

What is most striking about these results is the difference between the acoustic properties of Mandarin /u/ following a bilabial compared to those produced by the same speakers in response to English /u/ stimuli. Since the means and ranges are different, it is clear that in producing an English /u/, Mandarin speakers do not simply map to an

exact replica of the prototypical Mandarin category, as might have been predicted. Rather, it seems they are sensitive to crosslinguistic differences and are developing an English-specific representation.

The small overlap between the upper edges of the Mandarin /u/ productions and the same speakers' English L2 productions suggests that if any categorical mapping is taking place, it is to non-prototypical exemplars of the L1 category; that is, to allophones of the Mandarin category that are closest to the English equivalent. This may explain why acquiring an L2 phonetic category that is similar to an L1 category often results in averaging the distance between the L1 and L2 categorical centres. As the learner is exposed to L2 vowels that are non-prototypical members of the L1 category, he/she still recognizes them as belonging to the L1 category. The frequency of the rare allophones at the L1 category's edge is strengthened by this L2 input. To truly acquire a native-like representation of the English /u/ vowel, however, Mandarin L1 learners need to develop greater sensitivity to differences between similar L1 and L2 categories by noticing L2 exemplars that are less similar to their L1 counterparts. In the case of the English learners in this study, a sensitivity to English /u/ seems evident. The greater difficulty associated with acquiring English /u/ may then be a result of its similarity to English /ʊ/ as much as its closeness to the Mandarin /u/ category.

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