

Syllabic perception of vowels: evidence from interlanguage

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Existing models of L2 vowel perception (*e.g.* Flege & Bohn, 2021) predict the accuracy of interlanguage sounds by classifying “identical”, “similar” or “different” phonemes. Many predictions assume that identical phonemes are the easiest to learn and similar phonemes are the most difficult to acquire. However, Li (2021) observes that even there exist identical phonemes in the vocalic inventory of the learners’ L1 compared to the target language, it is difficult for them to acquire some of those vowels.

In a cognitive point of view, we suggest that the basic unit of vowel perception and recognition may not be segmental sounds, but syllables, *i.e.* words, for Chinese learners of L2, as there is a strict “syllable-morpheme” correspondence in Chinese languages (Chen *et al.*, 2002). The cognitive factor of syllables in vowel perception and recognition is the subject to some previous studies from the perspective of phoneme and allophone: whether there is an "Allophone-to-Phoneme" process followed by association with lexicon in the vowel perception and recognition process? McClelland & Elman (1986), Norris (1994), Luce, Goldinger, Auer, & Vitevitch (2000) support setting up the process, while Marslen-Wilson & Warren (1994), and Klatt (1989) take the opposite view. We argue that phoneme, allophone remains an abstract unit/concept, or a mode of analysis. In the process of vowel perception and recognition, there exists the possibility of studying vowel perception and recognition through higher unit than phoneme and allophone. Some recent studies placed greater importance on syllables (Yasufuku & Doyle, 2021), but the scope of the material and the experimental approach have focused more on drawing scenario-specific conclusions than on theoretical exploration, *i.e.*, on uncovering the theoretical value of syllables in vowel recognition.

Thus, we propose the hypothesis that phonological system is based on the lexical system. Language is a sound-meaning integrated system. As a result, the phonological system is never established independently, but along with the building of the meaning system, in the process of distinguishing or expressing meaning, of constructing morphemes or words. The segment (phone or phoneme)-morpheme-word-phrase-clause-sentence represents a hierarchical system of linguistic units from bottom to top. Syllable plays an important role as a link between segments and morphemes: segments distinguish or express meaning and construct morphemes through syllables, and morphemes are realized as segments through syllable distinctions or expressions of meaning. Therefore, compared to phoneme and allophone alone, the syllable in the cognitive process of meaning recognition may be more salient than segmental sound.

To verify this hypothesis, we first tested the perception of three marked vowels ([y], [ø] and [ɯ]) in L1 Chinese (Mandarin, Cantonese and Xi’an dialect) and in L2 (French, German and Japanese) by Chinese learners in isolated form and in syllabic forms respectively (See Tableau 1). Then we conducted acoustic analysis of the production of the these L2 vowels by L1 Chinese learners. Our results reveal that:

- 1) the subjects cannot fully perceive the marked vowels of L2, even they exist in their L1;
- 2) it is difficult for the subjects to perceive the marked vowels in isolated form than in syllabic forms, in L2 and also in L1;

3) we observe more accurate production of the L2 vowels in the syllabic forms that correspond to their native language than in the syllabic forms that do not.

Our conclusion is that vowel perception and recognition are based on syllables. The basic level of cognitive categorization of vowels is syllabic. Phonotactic structure plays a more important role than the equivalence of vocalic inventories both in perception and in production. Cognitively speaking, it is difficult for Chinese learners to manipulate sounds at a level lower than syllabic level.

Tableau 1: Recognition rate of three marked vowels in L1 and L2.

| | Context | Sound | Recognition rate | Significance |
|------------------|---------------------------|---------------------|------------------|--------------|
| L1 Mandarin | isolated | [y] | 67.27% |]* |
| | syllabic (word) | [ly] <i>lü</i> | 96.58% | |
| L2 French | isolated | [y] | 43.93% |]* |
| | syllabic (word in L1) | [ly] <i>lu</i> | 82.38% | |
| | syllabic (not word in L1) | [ty] <i>tu</i> | 59.82% |]* |
| L1 Cantonese | isolated | [ø] | 45.25% |]* |
| | syllabic (word) | [ʃøn] <i>shoen</i> | 84.94% | |
| L2 German | isolated | [ø:] | 35.63% |]* |
| | syllabic (word in L1) | [ʃø:n] <i>schön</i> | 71.79% | |
| | syllabic (not word in L1) | [ø:l] <i>öl</i> | 55.52% |]* |
| L1 Xi'an Dialect | isolated | [w] | 51.65% |]* |
| | syllabic (word) | [kw] <i>ku</i> | 90.82% | |
| L2 Japanese | isolated | [w] | 38.26% |]* |
| | syllabic (word in L1) | [kw] <i>ku</i> | 77.19% | |
| | syllabic (not word in L1) | [nw] <i>nu</i> | 63.38% |]* |

*: $p > 0.05$

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