Perception of Tense/Lax Vowels by Native Speakers of a Language with Limited Tongue Root Contrasts: Evidence from Bengali

It is widely recognized (Flege et al., 1997, Best and Strange, 1992) that perception of contrasting sounds in an second language (L2) L2 is difficult when the native language (L1) does not contain such contrasts, e.g. discrimination of English /r/–/l/ by Japanese listeners (cf. Goto, 1971). This study investigates whether the ATR/RTR contrast in English vowels is perceptible to native speakers of a language which lacks tongue root contrasts: Bengali.

Vowels with the phonological feature [ATR] are produced by combining tongue-root advancement and lowering of the larynx; perception of this feature also involves discrimination of tense/lax contrasts. Kwon & Starr (2023) propose that, as proficiency of the second language learner grows, familiarity with novel vowel features also grows, allowing the learner to eventually establish L2 contrasts. However, these contrasts may be affected by perceptual similarity to existing L1 vowel segments and contrasts (Kwon & Starr 2023).

We present evidence from a behavioural experiment testing perception of ATR/RTR contrasts in two groups: native English speakers (N=40) and native Bengali speakers highly fluent in English. (N=40) The experiment consisted of a cross-modal fragment priming task with lexical decision. Participants performed lexical decisions on visual stimuli (e.g., PENNY) preceded by auditory prime fragments that were either matched (e.g. [pɛn]) or mismatched ([peɪn]) to the target for Tongue Root status (see Table 1). The experiment tested all directions for RTR and ATR primes and targets, (e.g. PENNY / PAINTING). Additionally, two vowel contrasts were investigated: /ɛ/–/eɪ/ and /ɔ/–/o/.

In the English group, matched conditions (e.g. [peɪn] > PAINTING and [pɛn] > PENNY) were faster than mismatched ([peɪn] > PENNY and [pɛn] > PAINTING), but RTR contrasts were not overall faster or slower than ATR contrasts. Conversely, for the native Bengali speakers, there was only a significant difference between match and mismatch for RTR primes (Figure 1). Further analysis of the two groups of contrasts (/ɛ/–/eɪ/ and /ɔ/–/o/) revealed that the /ɛ/–/eɪ/ group did indeed show a difference between match and mismatch for both ATR and RTR primes, but the /ɔ/–/o/ group did not when the prime was ATR: e.g. between [sol]- SOLID and [sol]- SOLAR (Table 2, Figure 2). These findings lend weight to the theory that L2 learners apply their L1 phonology to L2 input, but asymmetries arise for segments that are perceptually similar to existing L1 vowel segments- even when highly fluent in the L2.

Works Cited:

Best, C. T., & Strange, W. (1992). Effects of phonological and phonetic factors on cross-language perception of approximants. Journal of phonetics, 20(3), 305-330.

Flege, J. E., Bohn, O. S., & Jang, S. (1997). Effects of experience on non-native speakers' production and perception of English vowels. Journal of phonetics, 25(4), 437-470.

Goto, H. (1971). Auditory perception by normal Japanese adults of the sounds" L" and" R.". Neuropsychologia.

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Table 1:

Auditory prime	Prime Status	Visual Target	Target Status	Match Condition	L1 RT (ms)	L2 RT (ms)
[pɛn]	RTR	PENNY	RTR	match	504	578
[pɛn]	RTR	PAINTING	ATR	mismatch	549	616
[peɪn]	ATR	PAINTING	ATR	match	510	588
[peɪn]	ATR	PENNY	RTR	mismatch	531	598

Figure 1:

L1: L2:

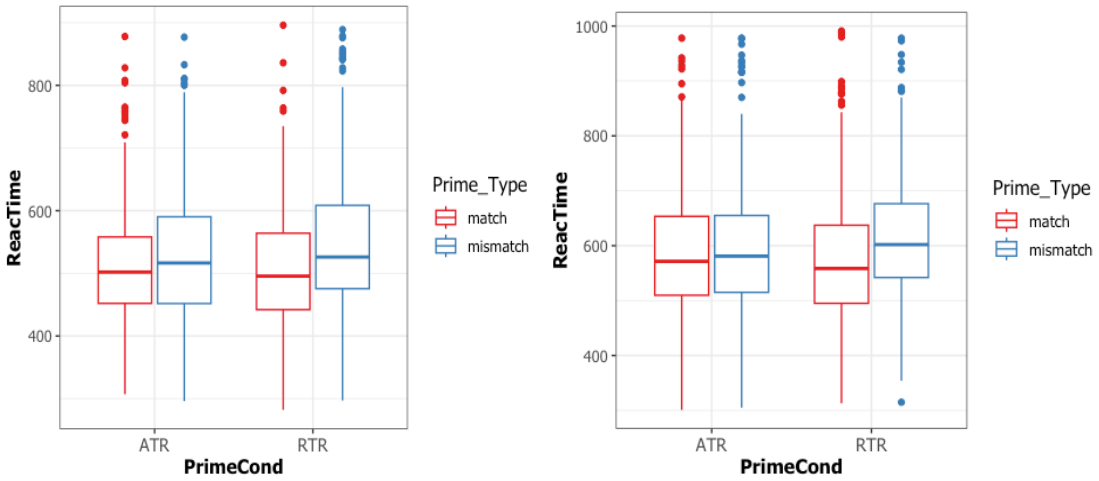

Table 2:

Group	prime fragment	Prime Cond	Target	Prime_Type	ms
ɛ/eɪ	[sɛk]	RTR	SECTOR	match	579
	[sɛk]	RTR	SACRED	*mismatch	605
	[seɪk]	ATR	SACRED	match	579
	[seɪk]	ATR	SECTOR	*mismatch	597
ɔ/o	[sɔl]	RTR	SOLID	match	583
	[sɔl]	RTR	SOLAR	*mismatch	632
	[sol]	ATR	SOLAR	match	604
	[sol]	ATR	SOLID	*mismatch	606

Figure 2: