

## L2 speakers' perceptual compensation of the underlying phonemes

Recently perceptual and psycholinguistic research has found that L1 listeners activate speakers' intended underlying phonemes when they hear the assimilated phonemes (Pitt 2009, Gow 2002). Their restoration of underlying representation (e.g., 'cone' from [kom bent]) is attributed either to phonological inference or to phonetic inference via incomplete assimilation. The present study addresses an interesting question of whether/how even Korean L2 listeners recover nonnative speaker's underlying segments specifically in the environment of English devoicing and coronal regressive assimilation (e.g., *has to* [...s t...], *right berry* [...p b...]). Pitt (2009) suggests that listeners depend on both lexical process and phonological process to recognize speakers' intended words. However, our study focuses on the available power of phonological inference by using semantically novel word sequences (e.g., *cat pat* [...p p..]) and on the possibility of phonetic inference by using the gradiently assimilated segments.

As illustrated in (1)-(2), acoustic properties of C<sub>1</sub>C<sub>2</sub> cluster embedded in two-word sequences as listening input in the current study revealed that the acoustic properties of C<sub>1</sub> was intermediate between voiced and voiceless in terms of the length of preceding vowels and duration of C<sub>1</sub> closure/frication duration. Furthermore, the assimilated C<sub>1</sub>s in place context showed the intermediate values in F2 and F3 between coronals and noncoronals as seen in (3)-(4).

- (1) a. underlying voiced                      b. assimilated voiceless                      c. underlying voiceless  
*cause do*                                      *cause to*                                      *moss to*  
*cove do*                                      *cove to*                                      *cough to*  
*cab do*                                      *cab to*                                      *cap to*

(2)

	UR voiced	Assimil. voiceless	UR voiceless
Dur.of preceding (ms)	121	117	101
Fric./closure dur. (ms)	105	101	110

- (3) a. underlying alveolar                      b. assimilated alveolar                      c. underlying labial/velars  
*cat tat*                                      *cat pat*                                      *cap pat*  
*cad dad*                                      *cad bad*                                      *cab bad*  
*can tap*                                      *can bad*                                      *cam bad*

(4)

	UR Alveolars	Assimil. Alveolars	UR Lab/Velars
F2 (Hz)	1816	1807	1800
F3 (Hz)	2869	2874	2841

First, an identification test with 28 English-learning Korean speakers showed that assimilated voiced obstruents (e.g., *cau[s]e to*) were recovered by approximately 61%, while underlyingly voiced ones (e.g., *cause do*) were retrieved by 62% and words with underlyingly voiceless ones (e.g., *moss to*) were recovered by 86% ( $F[2,54]=12.24$ ,  $p=.000$ ) in (5). That is, L2 listeners recovered speakers' intended words with the underlying voiced obstruents above chance level even when they surface voiceless ones (i.e., recover *cause to* from [kɔ:s tu]). Furthermore, interestingly, reaction times when it took to recover the underlying voiced ones in assimilation context were not different from those for the underlying voiceless and voiced ones in nonassimilation contexts (1.6 sec. vs. 1.7 sec. vs. 1.6 sec.). This finding indicates that even L2 listeners had no additional difficulty in activating the underlying voiced ones from the devoicing assimilation context though it took a little long for both cases. It suggests that a certain phonetic property of the devoiced obstruents might be a perceptual cue, in part, to recover the underlying voiced ones and/or L2 listeners actively lean on phonological inference mechanism whereby the underlying voiced ones are backward inferred from the assimilation contexts.

(5) Recoverability of UR voicing

	UR voiced	Assimil. voiceless	UR voiceless
Reaction time (sec.)	1.6	1.7	1.6
Accuracy (%)	62	61	86

