The adaptation of native clusters with non-native phonetic patterns is task-dependent

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It has been repeatedly shown that non-native consonant clusters are modified to conform with native language phonotactics both in perception and production (e.g., [1, 4, 5, 6]). This study asks (1) whether licit onset clusters with non-native phonetic patterns are also modified, or adapted, to match the native patterns, and (2) whether different tasks can induce a different degree of adaptation. We examine how native speakers of Georgian (a rich onset cluster system) spontaneously imitate word-initial clusters produced by a French talker in two conditions: Word-form Shadowing (**WS**) and Sentence Completion (**SC**). Georgian has different phonetic implementation of onset clusters from French: Georgian has longer inter-consonant timing lag [2, 7], which often results in a transitional schwa [3]. In addition, Georgian has an initial prominence for CVCV forms while French has a final prominence. Based on these differences, we predict that, if non-native phonetic patterns are adapted to native patterns, Georgian speakers will (1) produce transitional vowels when imitating French CCV, and (2) imitate French CV_1CV_2 sequences with "illusory clusters" especially when V_1 is similar to the transitional vowel produced in Georgian native clusters.

Participants were 25 native speakers of Georgian living in Tbilisi, Georgia. They were randomly assigned into two experimental conditions.

Stimuli: A French native talker produced 32 $C_1V_1C_2V_2$ pseudo-words with 8 different C_1C_2 combinations (ps, pt, sk, sp, bl, gl, pl, kl). V_1 alternated among /a/, /u/, /ø/, and no vowel, and V_2 was always /a/ (e.g., /pasá/, /pusá/, /pøsá/, and /psá/). The "no vowel" stimuli were essentially monosyllabic /$C_1C_2V_2$/. Acoustic analysis of the stimuli revealed that (1) French "no vowel" stimuli never had a transitional vowel, and (2) French /ø/ was acoustically similar to schwa in its formants (mean F1=413Hz, F2=1605Hz, F3=2584Hz).

Task: In the **WS** condition, 14 participants (1) saw CCV/CVCV sequences in Georgian script and read them aloud (baseline), and (2) heard and shadowed (immediately repeated what they heard without being told to "imitate") the French auditory stimuli. In the **SC** condition, 11 participants were asked to produce the target CCV/CVCV sequences embedded in a Georgian carrier phrase "ვეები ___ ფუჭია" /veeba ___ puʧ'ia/. The participants (1) saw the carrier phrase with the target sequences in Georgian script and read them aloud (baseline), and (2) heard the French stimuli while seeing the carrier phrase with an empty slot, and produced the carrier phrase completed with the heard target sequence (test).

Results: Preliminary results (22 speakers analyzed so far [**WS**=14, **SC** =8]) suggest that segmentally native onset clusters with non-native phonetic patterns were indeed adapted, but to different degrees in different tasks. As predicted, the participants' test productions reflected modifications of French stimuli towards their native (baseline) productions, such as transitional vowels that do not exist in the auditory target, or "illusory clusters" when imitating French CVCV sequences. Moreover, these modifications were more frequent in **SC** than in **WS**. The transitional vowels were less frequent in both test conditions than in their baselines, but this decrease was significantly smaller in **SC** than in **WS** (χ^2 =5.1, p = .02, **Fig.1**). "Illusory clusters" were also more frequent in **SC** than in **WS** (χ^2 =11.9, $p < .01$), occurring almost exclusively when V_1 was /ø/ (e.g., /pøta/ imitated as /pta/) in both conditions (**Fig.2**).
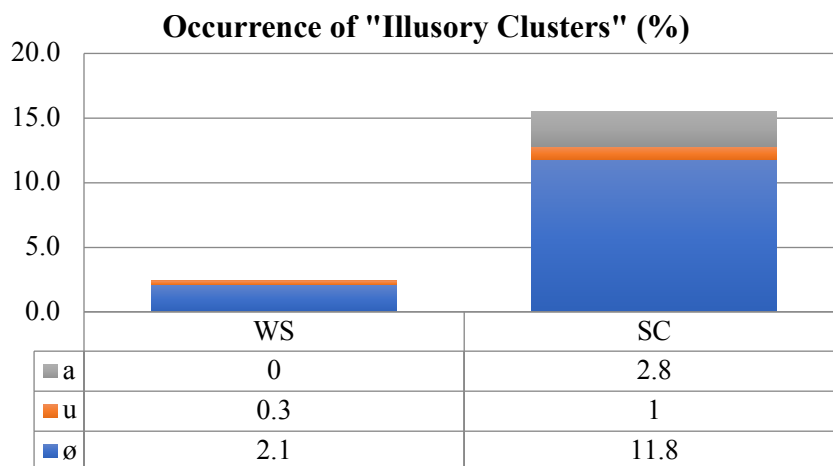
Taken together, we claim that the effects of native language on adaptation of word-initial consonant clusters are not limited to their segmental composition, but also involve their phonetic implementation, such as timing lag and the occurrence of transitional vowels. The current findings also suggest that producing sentences in one's native language induces more rigorous modifications from the auditory targets than producing words in isolation (c.f., [4]).

(1)

Occurrence of Transitional Vowels (%)

	Baseline	Test
Cond 1	33.9	18.1
Cond 2	36.2	25.5
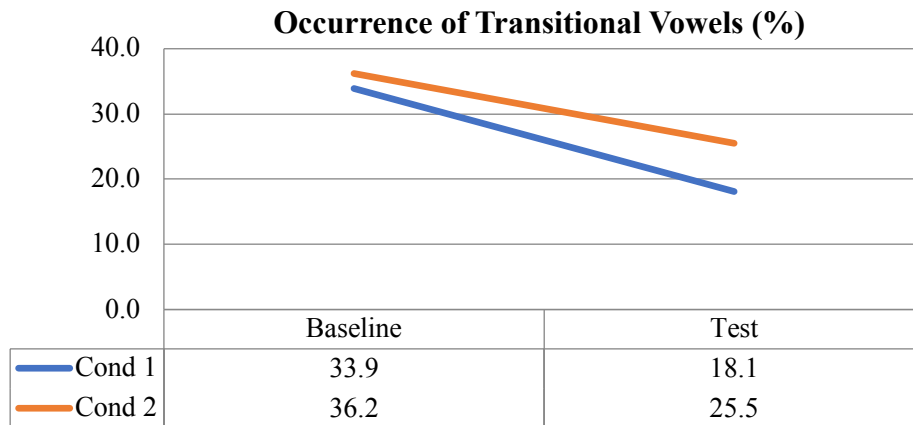
Figure 1. *Occurrence of transitional vowels produced within CCV sequences*

(2)

Occurrence of "Illusory Clusters" (%)

	WS	SC
a	0	2.8
u	0.3	1
ø	2.1	11.8

Figure 2. *V$_1$ in French stimuli when "illusory clusters" were produced*

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