Investigating new orthography-induced L2 phonological contrasts: Evidence from Korean- and Farsi-English L2 learners' production of English vowels and diphthongs

Giulia Cortiana – gcortian@uwo.ca – Western University
Natasha Swiderski – natashaswiderski@live.ca – Western University
Sarah Cornwell – scornwell@uwo.ca – Western University
Veronica Whitford – veronica.whitford@unb.ca – University of New Brunswick
Marc Joanisse – marcj@uwo.ca – Western University
Yasaman Rafat – yrafat@uwo.ca – Western Univesity

Recent studies have shown that exposure to orthographic input can promote first-language (L1) phonological transfer (Bassetti et al., 2015; Young-Scholten & Langer, 2015; Rafat 2016). However, little is known about how exposure to orthographic input may modulate second-language (L2) vowel and diphthong production in learners whose L1 has a different orthography (Rafat et al., 2017). Here, we investigated the effect of orthography on vowel and diphthong length production in English homophonic words (e.g., <meat>, [ˈmit] vs. <meet>, [ˈmit], plain [ˈpleɪn] vs. plane [ˈpleɪn]) in native Korean and Farsi learners of English living in Canada. Both Korean and Farsi orthographic systems differ from English. The Korean writing system, Hangeul, is an alphabetic syllabary with shallow orthography (Ahn & Iverson, 2003). The Farsi writing system is based on Arabic syllabary and, with vowels not considered marked, is orthographically deeper (Samareh, 2000). The English writing system is alphabetic and orthographically deep (Sousa, 2005). Based on prior research (Bassetti, 2017; Rafat et al., 2017), our predictions were threefold: (1) exposure to orthographic input would negatively affect vowel production, where (i) a digraph (i.e., <ee> as in <meet> [ˈmit]) would lead to a longer vowel vs. a sequence of two different graphemes (i.e., <ea> as in <meat> [ˈmit]); (2) a sequence of two graphemes (i.e., <ai> as in <plain>, [ˈpleɪn]) would lead to a longer diphthong vs. a VCV sequence (i.e., <aCe> as in <plane>, [ˈpleɪn]); and (3) that there would be language-specific effects: a more robust negative effect of orthography for native Korean than native Farsi speakers. We had three participant groups: (1) Farsi-English bilinguals (n = 24); (2) Korean-English bilinguals (n = 25); and (3) native speakers of English (n = 25). All participants completed the following tasks: (1) a word-reading task; (2) a word-naming task; (3) a close test language proficiency task; and (4) a language background questionnaire. The stimuli consisted of 20 monosyllabic English homophones. A total of 4,369 tokens were acoustically analyzed in PRAAT, where duration was measured. Vowel-to-word ratios were calculated to normalize duration. We analyzed the word-reading and word-naming data using two linear mixed-effects models in R: one for <ea> vs. <ee> and another for <aCe> vs. <ai>. For the word-reading task, we found a significant interaction between language group and grapheme condition (β = 0.01, SE = 0.00, t = 2.07, p = .04).Relative to English monolinguals, Farsi-English bilinguals had lower <ea> ratios (0.44 vs. 0.42), but comparable <ee> ratios (0.43 vs. 0.43). We found a similar interaction for the word-naming task, where relative to English monolinguals, Farsi-English bilinguals, again, had lower <ea> ratios (0.44 vs. 0.40), but comparable <ee> ratios (0.43 vs. 0.43). We also found a significant interaction between language group and grapheme condition (β = -0.03, SE = 0.00, t = -4.61, p < .001), where relative to English monolinguals, Korean-English bilinguals had higher <aCe> (0.44 vs. 0.47), but comparable <ai> (0.43 vs. 0.43) ratios. Our results suggest that different combinations of graphemes (i.e., <ee> vs. <ea>) may affect vowel and diphthong production in bilinguals, albeit there may be language-specific differences. Because length is not contrastive in English (Kaye, 2005), we attribute the longer L2 productions

to the fact that length is contrastive in both Farsi (Rafat, 2010; Rafat et al., 2017) and Korean (Ahn & Iverson, 2003), as well as to the effect of orthography. Taken together, this study elucidates how orthographic input may modulate L2 production and lead to the establishment of new phonological representations in L2 speech as a result of orthography-induced phonological transfer.

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