Variation in intergestural timing of a glide with a preceding onset consonant in Korean

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Across languages, a glide /j/ may be analyzed differently: as part of a 'segment sequence', a 'complex segment', or a 'diphthong' (e.g., [1-5]). But characterizing its exact nature can be elusive due to different approaches employed by different researchers. The Korean glide /j/ presents such a case. Some findings concern its phonological behavior in forming an onset cluster (e.g., [6]), a complex segment (e.g., [7]), or a diphthong (e.g., [8]). Others analyze its acoustic characteristics: a brief F2 steady state, for example, is used to characterize /j/ as part of a complex segment [9]. But the same acoustic evidence might also support a diphthongal formation as the acoustic form often obscures the temporal relations of the actual articulatory gestures involved. We therefore directly examine temporal realizations of articulatory gestures. In Articulatory Phonology (e.g., [10, 11]), gestures can be hypothesized to be timed simultaneously for a complex segment, but sequentially for a segment sequence. [12, 13] showed that for a complex segment, C-/j/ gestures are indeed timed together, so that their onset-to-onset lag is much less influenced by variation in C duration (Fig.1a), compared to a segment sequence (Fig.1b) in which timing of /j/-onset relative to C-onset (onset-to-onset lag) is positively correlated with C duration: The longer the C, the later the /j/-onset occurs, showing a sequential coordination. We adopt this approach to examine /C/-/j/ gestural coordination in /mjV/, compared to the reference case of /mV/ gestures assumed to be timed simultaneously. The aim is to understand the temporal characteristics of the Korean /j/ in gestural terms, which will, in turn, inform whether /j/ forms a complex segment or a segment sequence.

EMA data from 12 Seoul speakers (M_{Age}=23.7; from the HIPCS database) were analyzed with /mj/ produced in nine words (e.g. /la**mj**ʌne/) and /mi/ in seven words (e.g. /ma**mi**ne/), all within a phrase. Each token was repeated twice and at different speaking rates (normal/fast), facilitating the analysis of intergestural timing within temporal variation, totaling 705 tokens for analysis. The tongue blade sensor and the Lip Aperture (of the upper and lower lips) were used to identify /j/-gesture (or /i/-gesture) and /m/-gesture, respectively. Temporal landmarks were detected using the *findgest* function in Mview [14]. The temporal intervals for analysis include **G_1-DUR**(G_1release-G_1onset), **G_1ONS-TO-G_2ONS LAG** (G_2onset-G_1onset), and **G_1REL-TO-G_2ONS LAG** (G_1release-G_2onset) (G_1=/m/, G_2=/j/ or /i/).

In the results, /m/+/j/ displays a significantly longer G_1ONS-TO-G_2ONS LAG, compared to the reference /mi/ (est.=20ms, t=-6.5, p<0.001). This suggests a leftward shift of /m/-gesture relative to /j/-gesture in /m/+/j/, indicating some sequentiality of the two gestures. However, G_1REL-TO-G_2ONS LAG for /mj/ does not differ from that for /mi/, indicating that /m/ and /j/ gestures are not clearly sequential, just like those of /mi/. The relationship between G_1-DUR and G_1ONS-TO-G_2ONS LAG (Fig.2) indeed shows nearly flat regression lines for both /mj/ and /mi/. This indicates that variations in G_1-DUR have a minimal impact on the onset-to-onset timing, akin to the complex segment account (Fig.1a) There is, however, interspeaker variation (Fig.3): Some (F11, M15) exhibit patterns akin to the segment sequent account (Fig.1b) for /mj/, and others (F06, M12) patterns resembling the complex segment account (Fig.1a) in both /mj/ and /mi/. Importantly, /m/+/j/ timing patterns showed more interspeaker variation than /mi/ timing.

In sum, /j/-gesture is timed later than /m/-gesture in Korean, showing some sequentiality, but not to the extent of full sequential coordination. The lagged onset of /j/ further indicates that it is not part of a diphthongal vowel, as its timing would otherwise be similar to that of the vowel /i/. The leftward shift, instead, is in line with the C-center effect observable with onset consonant clusters [15-18]. The results imply that the surface timing of the C+glide gestures is not as invariant as the phonologically specified gestural coordination (sequential/simultaneous) would predict. This variation seems to accommodate the phonotactics that imposes temporal constraints on the onset (typically a singleton C but two Cs only with a glide overlapping with C1), reflecting the range of coarticulation permissible in the phonetic grammar of the language.

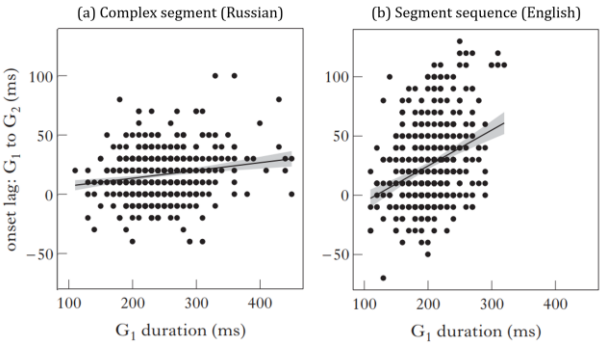

Fig. 1. A scatter plot of G1 duration (x-axis) against G1onset-to-G2onset lag (y-axis) in Russian (a), and English (b) (adapted from Shaw et al., 2021, p. 464).

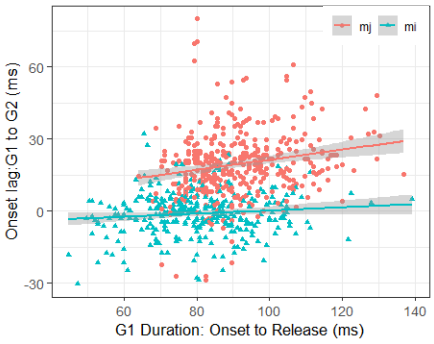

Fig. 2. A scatter plot of G1 duration [G1onset to G1release] (x-axis) against G1onset-to-G2onset lag (y-axis) for Korean /mj/ (in red) and /mi/ (in blue). (G1=/m/, G2=/j/ or /i/)

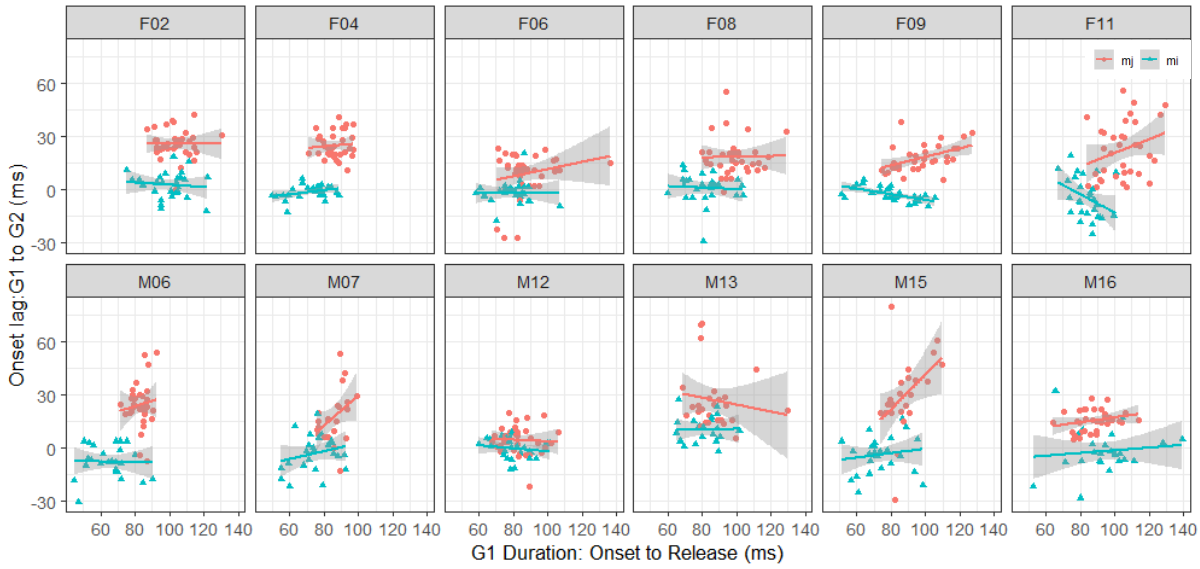

Fig. 3. A scatter plot of the effect of G1 duration [G1onset to G1release] (x-axis) on G1onset-to-G2onset lag (y-axis) for Korean /mj/ (red) and /mi/ (blue) for each speaker (G1=/m/, G2=/j/ or /i/, G1release= the release of /m/).

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