

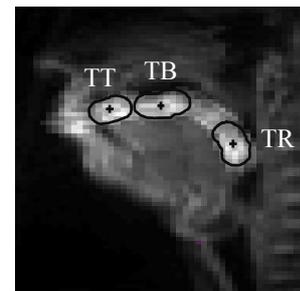
Articulatory characteristics of Korean liquid production: Position-sensitive realization

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Korean purportedly exhibits a single liquid phoneme that shows multiple allophones alternating between lateral and rhotic articulations. Traditionally, this liquid allophony has been described as a single phoneme with an underspecified feature at a phonological level, which becomes a flap [ɾ] syllable initially, but a lateral [l] syllable finally (Iverson & Sohn, 1994). To date, there has been only one articulatory study on the Korean liquid (Oh & Gick, 2002), and it still remains unclear what articulatory characteristics drive the lateral vs. flap percepts of this single liquid phoneme. To shed light on articulatory representations of the Korean liquid in terms of different phonological contexts, this study sets out a real-time MRI experiment.

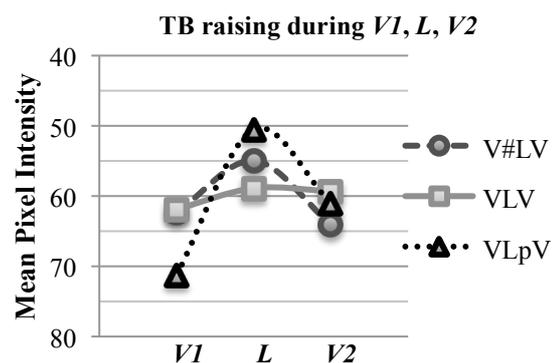
MRI experiment: Two Seoul Korean speakers participated in this study. Disyllabic pseudo-words were designed to elicit a range of liquid articulation in different syllable positions (onset [V#LV], inter-vocalic [VLV], coda [VLpV], where L indicates a liquid) and placed in the middle of the carrier sentence [tea, ___ hepoa] (Let's ___ say-imperative; presented visually in Korean).

MRI data analysis: Tongue movements were estimated using changes in the average pixel intensity in speaker-specific regions-of-interest of the vocal tract (ROIs: tongue tip [TT], tongue body [TB], tongue root [TR]), located along an automatically derived midline of the airspace. TT measurements included movement duration (time between movement onset and constriction offset), and movement displacement (mean pixel intensity difference between the points of movement onset and constriction maximum). To test whether there is any tongue body raising or tongue root fronting during the liquid in the various contexts, the TB and TR intensity values were measured at the points in time corresponding to $V1$ (at TT movement onset), L (at TT constriction maximum), and $V2$ (at TT movement offset).



ROIs for TT, TB, TR movement

Results & Conclusion: Inter-vocalic liquids (flap percept) were produced with shorter TT movement duration and smaller displacement compared to onset or coda liquids (lateral percept) (all at $p < .05$), suggesting gestural reduction in inter-vocalic position. TR intensity values at the three measurement points (during $V1$, L , $V2$) indicated that some tongue root fronting motions were always present during the liquid (coda < onset < inter-vocalic; all at $p < .05$). In



terms of TB raising intensity values, in the onset ($V\#LV$) or coda ($VLpV$) contexts, TB raising intensity values significantly differed at the three measurement points (all at $p < .05$). However, inter-vocalically (VLV), there was no effect of different measurement points on TB raising intensity values, suggesting that there is no TB raising associated with the flap articulation. Thus, our study suggests the allophony between lateral (onset, coda) and flap (inter-vocalic) is not only attributable to the overall TT, TB, TR gestural reduction, but also to a categorical distinction in gestural composition, in which there is no TB raising gesture at all

in the flap contexts. This compositional difference challenges phonetic/phonological models that view position-sensitive allophony as resulting exclusively from dynamic variation of the abstract component gestures. (e.g., Browman & Goldstein, 1995).

References || Browman & Goldstein 1995. Gestural syllable position effects in American English. *AIP*. || Iverson & Sohn 1994. Liquid representation in Korean. *Theoretical issues in Korean linguistics*. || Oh & Gick 2002. An ultrasound study of articulatory gestures of Korean /l/. *ICSS*.

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