

## **Nonrelease in preconsonantal plosives as a phonetic universal: A case study of MRI, acoustic and aerodynamic data on Korean plosives**

This paper is concerned with nonrelease in preconsonantal plosives as a phonetic universal and, as a case study, we examine Korean preconsonantal plosives in articulatory, acoustic and aerodynamic aspects. A plosive followed by another plosive is usually unreleased in many languages. For example, in English (e.g., Ladefoged 2006), the plosives /p/ and /k/ are unreleased in *apt* [æp̚t] and *act* [æk̚t], respectively, within a word; the first /t/ in *white teeth* across a word boundary; and the /t/ in *cat* in the phrase *the cat pushed*. According to Ladefoged (1993: 56), the plosive /p/ in *apt* is unreleased, that is, “unexploded because the closure for the [t] occurs before the lips come apart.” The nonrelease in preconsonantal plosives also occurs in Korean as in /k/ and /p/ in *mak+ta* [mak̚t’a] ‘to eat’ and *kip+ta* [kip̚t’a] across a morpheme boundary (Kim-Renaud 1974) with the following plosives getting tense as a language-particular process.

In the present study, we examine the nonrelease of Korean preconsonantal plosives based on stroboscopic cine-MRI, acoustic and aerodynamic data. Our MRI data on the six test words /tak+pa, tak+ta, tap+ka, tap+ta, tat+ka, tat+pa/ were taken from two (a male and a female) subjects of Seoul Korean. The MRI midsagittal data showed that the gesture of a primary articulator (lips, tongue blade or dorsum) is completely or partially overlapped with that of another primary articulator throughout the oral closure of the sequences of plosives in most of the test words. In the case of /tat+ka/, however, our female subject had continuous tongue contact from the alveolar ridge to the velum during the oral closure of the plosives /t/ and /k/, whereas our male subject had only the velar contact throughout the oral closure as a result of the complete assimilation of /t/ in place to the following plosive /k/. The same test words were examined in our acoustic and aerodynamic data taken from the same two subjects. In order to measure airflow and pressure of the labial, coronal and dorsal plosives, we put a narrow tube through the nose of a subject under the guide of a medical doctor. The test words were put in a frame sentence and read by the two subjects three times at a normal speech rate. And both aerodynamic and acoustic data were taken simultaneously. It is found that there is no noise burst during oral closure of the plosive sequences and that air pressure builds up throughout the oral closure.

Based on the phonetic data, we propose that the nonrelease of Korean preconsonantal plosives is due to partial or complete gesture overlapping as a result of coarticulation or continuous tongue contact from one target to another along the mouth roof with no removal of oral closure in the sequences of the plosives. The gesture overlapping or continuous tongue contact leads to air pressure buildup throughout the oral closure. Given that the nonrelease of preconsonantal plosives is based on the speech mechanism with the least possible articulatory effort, we suggest that it is expected to phonetically occur across languages, as in Korean and English, unless a language-particular process is involved, for example, in Standard French and Tashlhiyt Berber (Dell and Elmedlaoui 2002). According to François Dell (personal communication), the first plosives in the sequences /kt/, /gd/ and /kd/ in *acteur*, *Bagdad* and *anecdote* would be either unreleased or released in Standard French. When they are released, “very short schwa-like vocoids are only noticed by trained linguists and they do not impinge on syllabification.”