# Early and asymmetric sensitivity to phonological boundaries and within-category variation across hemispheres

Speech processing requires mapping continuously variant acoustic signals to discrete phonological categories. Previous studies suggest that this is achieved through the identification of phonetic features and neutralisation of within-category variance by ~100ms after phoneme onset. What happens, however, when a sound is consistent with more than one category?

22 native English speakers performed forced-choice consonant identification on consonant-vowel syllables during magnetoencephalography data acquisition. Stimuli were natural speech pairs, digitally morphed to span an 11-step continuum of voice onset times (VOT; p-b, t-d, k-g) and places of articulation (PoA; p-t, t-k).

The behavioural results replicated previous findings: Consonant selection was sharply categorical, and reaction-times increased at the boundary between phonological categories.

Activity in left (but not right) Heschl's gyrus increased with proximity to the phoneme boundary ~50ms post-onset, mirroring reaction-time data and suggesting that phonological categories are relevant to speech processing earlier than previously considered. Amplitude of the left M100 increased as VOT decreased, and was modulated by categorical PoA: bilabial stops (/b/, /p/) elicited more activity than alveolar and velar stops. Peak latency of the right M100 corresponded to participants' binary classification of the VOT continuum: latency was shorter for stimuli identified as voiceless (~110ms) than voiced (~125ms), and displayed no sensitivity to PoA or within-category variation.

The data suggest that (1) neural sensitivity to categorical ambiguity in left Heschl's gyrus can be observed before the proposed time-window of phonetic feature identification; (2) phonological discretisation evokes bilateral responses, but with differential sensitivity across hemispheres.