



# To Mu is to Move, to Tau is to Understand: a Possible Functional Role for Lower Alpha Oscillations in Human Speech Perception.

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Contemporary research suggests that the alpha band (8-12Hz) of the human EEG signal can be divided into functionally discrete sub-bands. Within the alpha range, at least two additional functional rhythms are proposed; tau (6.5-9.5Hz) and mu (7.5-12.5Hz). These sub-bands are primarily distinguished based on oscillatory activity at specific cortical sites; thus mu is associated with activity in motor/sensorimotor areas and tau with activity in auditory areas; thus event-related synchronisation/desynchronisation (ERS/ERD) to auditory stimuli in the lower alpha range by sources within the temporal lobes would be classified as a tau rhythm. Although tau has previously been associated with lower order sound processing, any involvement in higher order processing is unknown. To explore this further, the current study collected continuous 64 channel EEG from 27 participants as they undertook two tasks: (i) passive listening to a variety of animal noises; and (ii) a grammatical decision task involving both real and nonsense English word stimuli. Following FFT, significantly higher ERD was observed in the lower alpha, or tau range for human words and primate vocalisations when compared to other animal vocalisation types. This difference was independent of acoustic differences. The ERD data was then analysed via eLoreta with desynchronization localised to both primary and secondary auditory processing areas suggesting that tau responds to both lower and higher order processing. Given that this response was common to both human speech and primate vocalisations, with primate vocalisations and nonsense words evoking the greatest ERD, this suggests that tau may also be suppressed when identifying whether a complex sound is meaningful, that is speech related, and deserving of further language processing.

**Keywords:** Speech Perception, EEG, tau, ERS/ERD, complex sound processing

**Conference:** XII International Conference on Cognitive Neuroscience (ICON-XII), Brisbane, Queensland, Australia, 27 Jul - 31 Jul, 2014. **Presentation Type:** Poster

**Topic:** Sensation and Perception

**Citation:** Cocks B, Jamieson G and Evans I (2015). To Mu is to Move, to Tau is to Understand: a Possible Functional Role for Lower Alpha Oscillations in Human Speech Perception.. *Conference Abstract: XII International Conference on Cognitive Neuroscience (ICON-XII)*. doi: 10.3389/conf.fnhum.2015.217.00133

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