

On the role of theta-driven syllabic parsing in decoding speech: intelligibility of speech with a manipulated modulation spectrum

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Recent hypotheses on the potential role of neuronal oscillations in speech perception propose that speech is processed on a hierarchy of temporal scales formed by a cascade of neuronal oscillators locked to the input pseudo-rhythm. In particular, Ghitza (2011) proposed that the oscillators are in the theta, beta and gamma frequency bands with the theta oscillator the master, tracking the input syllabic rhythm and setting a dynamic temporal scale synchronized with the input. In the study described here the hypothesized role of theta was examined by measuring the intelligibility of speech with a manipulated modulation spectrum. Each critical-band signal was manipulated by controlling the degree of temporal-envelope flatness. Intelligibility of speech with critical-band envelopes that are flat is poor; plugging extra information, restricted to the input syllabic rhythm, markedly improves intelligibility. It is concluded that flattening the critical-band envelopes prevents the theta oscillator from tracking the input rhythm, hence the disruption of the hierarchical temporal scale that controls the decoding process. Plugging the input-rhythm information revives the tracking capability, hence the synchronization between the temporal scale and the input, resulting in the extraction of additional information from the flat modulation spectrum.

Ghitza O (2011) Linking speech perception and neurophysiology: speech decoding guided by cascaded oscillators locked to the input rhythm. *Front. Psychology* 2:130.