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Amplitude modulation of noise cues voicing distinction in fricatives

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The aperiodic noise source in fricatives is characteristically amplitude modulated by voicing. Previous psychoacoustic studies have established that observed levels of AM in voiced fricatives are detectable, and its inclusion in synthesis has improved speech quality. Phonological voicing in fricatives can be cued by a number of factors: the voicing fundamental, duration of any devoicing, duration of frication, and formant transitions. However, the possible contribution of AM has not been investigated. In a cue trading experiment, subjects distinguished between the nonsense words 'ahser' and 'ahzer'. The voicing boundary was measured along a formant-transition duration continuum, as a function of AM depth, voicing amplitude and masking of the voicing component by low-frequency noise. The presence of AM increased voiced responses by approximately 30%. The ability of AM to cue voicing was strongest at greater modulation depths and when voicing was unavailable as a cue, as might occur in telecommunication systems or noisy environments. Further work would examine other fricatives and phonetic contexts, as well as interaction with other cues.