

# The use of slow and fast temporal envelope cues in phonetic discrimination at 3 months of age

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## 1. Introduction

Speech perception requires efficient auditory mechanisms to track differences in the spectro-temporal cues differentiating phonetic contrasts. In adults, slow (<16Hz) temporal envelope cues (or amplitude modulation, AM) play the most important role in speech identification in quiet. The fast AM cues and the temporal fine structure (or frequency modulation, FM) play a more important role in noise. The present study aims to explore the role of AM cues on two different time scales (below and above 8 Hz) in phonetic discrimination in 3-month-old infants. Previous studies showed that the detection of AM may be mature around 3 months of age. Thus, 3-month-old infants may be able to discriminate phonetic contrasts on the basis of slow and fast AM cues. However, it is not clear whether infants are able to switch between slow and fast AM cues in different listening conditions.

## 2. Method

English syllables with different stop consonants are processed by two tone-excited vocoders. These vocoders selectively replace the original FM cues with pure tones in 32 frequency bands. The AM cues are extracted in each frequency band with two different cut-off frequencies: 256 Hz or 8 Hz. Participants are 3-month-olds (N=54) and 18-30-year-old adults (N=24) with no risk factors for hearing loss. An observer-based testing method is used. Each participant has to detect a change in a repeating syllable from a non-target phonetic category to a target category: voiced, unvoiced, labial, coronal or velar. Discrimination is tested in quiet or in a speech-shaped noise (SNR= -5dB). When participants reach 80%-correct criterion in the AM-256Hz condition, discrimination is assessed in the AM-8Hz condition.

## 3. Results and Conclusions

The findings suggest that 3-month-old infants are able to use slow and fast AM cues to discriminate phonetic contrasts in quiet and in noise. However, results also suggest that phonetic discrimination is easier when fast AM cues are available in both noise and in quiet. It is thus unlikely that infants' performance is limited by immature temporal resolution. Nevertheless, more experience with the native language—and thus, with the acoustic cues related to syllabic rate—may improve the use of the slow AM cues for phonetic perception.