Infants' use of combined onset asynchrony and temporal envelope cues in concurrent sound segregation

*Monika-Maria Oster¹, Lynne Werner²

¹Technische Universität München, München, Deutschland
²University of Washington, Seattle, Vereinigte Staaten

Separating speech from competing sounds is a difficult task for infants, particularly those with hearing loss. However, the reasons for these difficulties are not well understood. The mature and healthy auditory system solves this problem by grouping and segregating frequency components from competing sound sources based on acoustic similarities and differences. One possible explanation for infants' increased difficulties is that these mechanisms are not fully developed. The current study investigated this possibility by comparing the ability of typically hearing 3- and 7-month-old infants and adults to segregate competing vowels based on differences in sound onset and temporal envelopes. Listeners were presented with trains of vowel pairs, consisting of 2 different vowels from a male and a female talker, and taught to respond to one specific target vowel (either male /i:/ or /u:/). Performance was compared between four conditions: 1) baseline, in which vowel pairs had simultaneous onset and similar temporal envelopes, 2) onset asynchrony, in which the male talker's vowels begin 100ms after those of the female talker, 3) envelope differences, in which the two vowels carried different temporal envelopes and 4) combined cues, which combined conditions 2 and 3. The results showed that 7-month-old infants and adults gain a similar benefit from the combination of combined onset and envelope cues. This benefit was no greater than that gained from isolated cues. In contrast, while 3-month-old infants' concurrent vowel segregation was supported by isolated onset asynchrony cues, it was not supported by isolated envelope or combined cues. These results suggest that while the use of onset asynchrony is developed early in infancy, the use of envelope and combined temporal cues develops through auditory experience within the first 6 months of life. These findings can be used as the basis for the evaluation of current and development of new interventions for infants with hearing loss.