UNIVERSITÄT SALZBURG
Psychologie

Talk on Tuesday, 03. Nov 2026
Start: 10:15 till 11.30 Uhr
in HS 424
The talk will be presented in English

Psy-Talks: Pupil dilation as a prediction measure of language development

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Pupil dilation provides a promising measure of auditory and cognitive processing, offering a window into the mechanisms underlying early language development. In this talk, we present three studies examining the reliability of pupillary responses, their sensitivity to speech processing, and their potential to reveal how language experience shapes perceptual representations.

First, we examine the reliability of pupil dilation as a measure of auditory orienting in infants and children with and without hearing loss. We find that attentional responses to simple auditory stimuli are individually detectable in only 20% of children, with between-session reliability reaching 0.5 at 70 dB. In contrast, tonic pupil size from the same recordings shows substantially higher reliability (ICC = 0.8), reflecting the fact that between-child variability in evoked responses is nearly eight times smaller than trial-level noise. We discuss the implications of these findings for using pupillary responses to measure individual differences.

Second, we investigate whether individual differences in pupillary entrainment to speech reveal how 9-month-old infants weigh prosodic and statistical cues during speech segmentation. Alt-

hough infants show no consistent preference for either cue at the group level, individual differences in the temporal alignment of their pupillary responses reveal distinct segmentation strategies. Importantly, these differences are associated with language abilities at 40 months, suggesting that pupillary responses can capture meaningful individual variability in early language processing that predicts later development.

Third, we use temporal response function (TRF) modeling to demonstrate that pupillary responses also encode the phonological features of speech sounds. Using these feature-specific responses, we reconstruct the phonological repertoire of six-month-old infants and the perceptual relationships among its constituent sounds. We show that this phonological space is already warped by native-language experience, with perceptual distances expanding or contracting according to the statistical properties of the language infants hear. Crucially, the resulting phonological organization already closely resembles that observed in adult speakers of the infants' native language.

Together, these studies highlight both the methodological challenges and the potential of pupillometry as a measure of early language processing, showing how pupillary responses can reveal individual differences in language development as well as the emergence of language-specific perceptual representations.