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Beyond the Laughable: How Appraisal Shapes Infant Laughter

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Abstract

Laughter is one of the earliest social signals in human development, yet how cognitive processes from infants shape its acoustic and temporal form remains poorly understood. We propose the Dynamic Infant Appraisal Model, a computational framework grounded in appraisal theory that simulates the infant's continuous cognitive evaluation during naturalistic caregiver-infant interaction. Using longitudinal data from the SAYCam corpus, we investigate how appraisal variables relate to four laughter features: Reaction Time, Overlap Ratio, Intensity, and Pitch. Our results reveal a functional dissociation: temporal features, particularly Overlap Ratio, are shaped by Familiarity, Coping Potential, and Pleasantness, and follow an Inverted-U trajectory relative to schematic discrepancy. Acoustic Intensity correlates with all appraisal variables but shows only a monotonic pattern. These findings suggest that infant laughter is a graded, multidimensional signal in which temporal dynamics encode predictive mastery and acoustic form encodes the reward value of cognitive challenge.