

Neural categorization of hands from infancy to adulthood.

Thursday, September 11, 2025 2:10 PM (20 minutes)

Introduction. Early socio-cognitive development relies on the ability to discriminate and categorize social stimuli. Infants' preference for faces is well-known, engaging brain regions within occipito-temporal cortex and right-lateralized responses by 4 months (de Heering & Rossion, 2015). Hands also play a crucial role in social communication and are salient from the first months of life. By 8 months, the right temporal cortex differentiates human from mechanical hands (Biondi et al., 2016). Yet, the developmental trajectory of the neural categorization of hands is unexplored.

Methods. We investigated this using a Fast Periodic Visual Stimulation oddball paradigm coupled with EEG recording in a group of adults (N=33), 4- (N=45) and 9-month-olds (N=34). Participants viewed naturalistic object images at a rapid rate (6 Hz), with hand images presented every fifth stimulus (1.2 Hz), generating a categorical change.

Results. All three age groups showed strong visual processing at 6Hz (SNR>1.7, z-scores >7.42, ps<0.001). Importantly, the categorization response (1.2Hz) followed a developmental pattern. Adults showed robust occipital and parieto-occipital responses (1st-4th harmonics, SNR>1.97, z-scores >25, ps<.001), 9-month-olds right-occipital response (1st-3rd harmonics, SNR>1.8, z-scores >16, ps<.001), while no categorization was observed in 4-month-olds (all ps>.05).

Discussion. These findings pave the way for future investigations into the precise mechanisms and developmental factors that shape the neural representation of hands. They suggest that hand categorization becomes increasingly specialized and distributed with age. While 9-month-olds show emerging perceptual categorization, 4-month-olds may require further sensorimotor experience. Ongoing analyses will assess the role of grasping skills in shaping this developmental trajectory.

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