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Commentary

Neural Event Segmentation in Infants

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COMMENTRY

Although sensory input is continuous, we perceive and remember discrete events. Event segmentation has been studied extensively in adults, but little is understood about how the youngest minds experience the planet. The most impediments to studying event segmentation in infants have been a reliance on explicit parsing tasks that aren't possible at this age. Magnetic Resonance Imaging (MRI) has recently proven successful at measuring adult event segmentation during task-free, naturalistic perception. Applied to infants, this might reveal the character of their event segmentation, from low-level sensory transients to high-level cognitive boundaries. We collected MRI data from 25 adults and 25 infants but one year aged watching an equivalent short movie. Neural events were defined by the steadiness of voxel activity patterns. In adults, we replicated a hierarchical gradient of event timescales, from shorter events in early visual regions to longer events in later visual and narrative regions. In infants, however, longer events were found throughout the brain, including during a second dataset. Infant event structure fit adult data and the other way around, but adult behavioural boundaries were differently expressed in adult and infant brains. These findings have implications for the character of infant experience and cognition.

From the instant we are born, our sensory systems are bombarded with information. We overcome this perceptual challenge as adults by segmenting continuous experience into discrete events experience are often carved up at multiple timescales allowing us to perceive the passage of long events and to differentiate or integrate shorter events that comprise them. The multiple timescales of event perception are often flexibly modulated by attentional states successively, event structure helps with forming and organizing episodic memories, making adaptive decisions, and predicting the longer term. The hierarchy of event processing found in adults may either be present at birth or built up over development. In adults, coarser event segmentation is related to conceptual understanding and should be important for the development of abstract knowledge structures like event schemas and narratives. The protracted development of narrative understanding suggests that coarser event segmentation might not be developed in infancy. Thus, infants may segment experience at its most sensory level, in reaction to transient changes in low-level properties At an equivalent time, infants are sensitive to complex event types like act sequences In one set of studies, infants recognized the similarity between target action segments and longer sequences that contained them, showing greater sensitivity to discrete actions. Thus, there's some reason to believe that infant experience is structured into longer events. This fits with other work showing that infants and toddlers have longer temporal processing windows for vision Behavioural measures like looking time have expanded our understanding of infant event processing, yet can only provide circumstantial evidence and are overdetermined This makes it difficult to spot representations of events at multiple timescales. Neural measures provide a possible solution. Functional resonance imaging, for instance, has proven excellent at capturing parallel representations relevant to event segmentation in adults. In one approach, behavioural boundaries from an overt parsing task are used as event markers to model MRI activity during passive movie watching. Regions like the superior temporal sulcus and middle temporal area answer events at different timescales.

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