

Discourse with few words: How infants form durable and expressible memories of objects and their names

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Learning depends on both the internal processes that do the learning and on the experiences that engage those mechanisms. We know infants learn common object names well before they speak those names because infants 12 months old and younger look reliably to referent upon hearing the name. I will propose a new solution and present new work (with Hadar Raz) including a formal model based on the alignment between the dynamics of early memory formation and the temporal structure of the parent-infant interactions. The talk has three parts. In Part 1 we consider the frequency and temporal structure of the multimodal stream of parent and infant behaviors that surround highly infrequent parent naming and do so at an extended temporal scale characteristic of interactions between parents and their 12-month-old infants. In Part 2, we note how the observed properties of parent-infant interactions in Part 1 align with recent evidence on how durable and expressible cortical memories can rapidly form without hippocampal involvement. We instantiate these ideas in a mathematical model and show how the dynamic properties of the entire stream of events, not just naming, can create an internal environment of persistent activations on which the formation of durable memory depends. In Part 3, the conclusion, we argue for a reconceptualization of the environment for learning object names, one that is less about name-referent co-occurrences and transparency and more about the dynamic structure of the extended social and multimodal experiences and the internal memory processes. Human development evolved to take place in active social contexts. The time scales, temporal properties and multimodal nature of human behavior likely shaped the dynamic properties of infant memory systems. Thus we should not be surprised that the statistical properties of everyday social experiences fit the learning mechanisms available in infancy. This line of reasoning suggests the general importance of studying the natural statistics of everyday human behavior and experience.