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# Simulating Infants' Attachment: Behavioral Patterns of Caregiver Proximity Seeking and Environment Exploration Using Reinforcement Learning Models.

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## Abstract

Attachment is crucial for infants' cognitive development and social relationships. Traditional attachment research has been qualitative, lacking a model to explain how infants' attachment styles develop from experience and how these are influenced by personal traits and environmental factors. We propose such a model, predicting how infants balance interaction with caregivers against exploring their surroundings. Our study is based in a grid-world environment containing an infant and caregiver agent. We vary the infant's temperamental factors (e.g., ability to regulate emotions and preferences for social vs. environmental reward), and caregiver behavior (whether positive or negative interactions are more likely). We find that different equilibria result that qualitatively correspond to different attachment styles. Our findings suggest that the characteristic exploratory behavior of each attachment style in real infants may arise from interactions of infant temperament and caregiver behaviors.