Infants learn to look and look to learn

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New research from the University of Iowa explains through modeling how infants learn by looking and how that learning is vital to forming memories. Credit: Tim Schoon

(Medical Xpress)—Researchers at the University of Iowa have documented an activity by infants that begins nearly from birth: They learn by taking inventory of the things they see.

In a new paper, the psychologists contend that infants create knowledge by looking at and learning about their surroundings. The activities should be viewed as intertwined, rather than considered separately, to fully appreciate how infants gain knowledge and how that knowledge is seared into memory.

"The link between looking and learning is much more intricate than what people have assumed," says John Spencer, a psychology professor at the UI and a co-author on the paper published in the journal Cognitive Science.

The researchers created a mathematical model that mimics, in real time and through months of child development, how infants use looking to understand their environment. Such a model is important because it validates the importance of looking to learning and to forming memories. It also can be adapted by child development specialists to help special-needs children and infants born prematurely to combine looking and learning more effectively.

"The model can look, like infants, at a world that includes dynamic, stimulating events that influence where it looks. We contend (the model) provides a critical link to studying how social partners influence how infants distribute their looks, learn, and develop," the authors write.

The model examines the looking-learning behavior of infants as young as 6 weeks through one year of age, through 4,800 simulations at various points in development involving multiple stimuli and tasks. As would be expected, most infants introduced to new objects tend to look at them to gather information about them; once they do, they are "biased" to look away from them in search of something new. In other words, an infant will linger on something that's being shown to it for the first time as it learns about it, and that the "total looking time" will decrease as the infant becomes more familiar with it.

But the researchers found that infants who don't spend a sufficient amount of time studying a new object—in effect, failing to learn about it and to catalog that knowledge into memory—don't catch on as well, which can affect their learning later on.

"Infants need to dwell on things for a while to learn about them," says Sammy Perone, a post-doctoral researcher in psychology at the UI and corresponding author on the paper.

To examine why infants need to dwell on objects to learn about them, the researchers created two different models. One model learned in a "responsive" world: Every time the model looked away from a new object, the object was jiggled to get the model to look at it again. The other model learned in a "nonresponsive" world: when this model looked at a new object, objects elsewhere were jiggled to distract it. The results showed that the responsive models"learned about new objects more robustly, more quickly, and are better learners in the end," says Perone, who earned his doctorate at the UI in 2010.

The model captures infant looking and learning as young as 6 weeks. Even at that age, the UI researchers were able to document that infants can familiarize themselves with new objects, and store them into memory well enough that when shown them again, they quickly recognized them.

"To our knowledge, these are the first quantitative simulations of looking data from infants this young," the authors write.

The results underscore the notion that looking is a critical entry point into the cognitive processes in the brain that begin in children nearly from birth. And, "if that's the case, we can manipulate and change what the brain is doing" to aid infants born prematurely or who have special needs, Perone adds.

"The promise of a model that implements looking as an active behavior is that it might explain and predict how specific manipulations of looking over time will impact subsequent learning," the researchers write.

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