

Cognitive scientists ID new mechanism at heart of early childhood learning and social behavior

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Wearing head-mounted eye-tracking technology, a child and his mother engage in free play. Credit: Indiana University

Shifting the emphasis from gaze to hand, a study by Indiana University cognitive scientists provides compelling evidence for a new and possibly dominant way for social partners—in this case, 1-year-olds and their parents—to coordinate the process of joint attention, a key component

of parent-child communication and early language learning.

Previous research involving joint [visual attention](#) between parents and toddlers has focused exclusively on the ability of each partner to follow the gaze of the other. In "Joint Attention Without Gaze Following: Human Infants and Their Parents Coordinate Visual Attention to Objects Through Eye-Hand Coordination," published in the online journal *PLOS ONE*, the researchers demonstrate how hand-eye coordination is much more common, and the parent and toddler interact as equals, rather than one or the other taking the lead.

The findings open up new questions about language learning and the teaching of language. They could also have major implications for the treatment of children with early social-communication impairment, such as autism, where joint caregiver-child attention with respect to objects and events is a key issue.

"Currently, interventions consist of training children to look at the other's face and gaze," said Chen Yu, associate professor in the Department of Psychological and Brain Sciences at IU Bloomington. "Now we know that typically developing children achieve joint attention with caregivers less through gaze following and more often through following the other's hands. The daily lives of toddlers are filled with social contexts in which objects are handled, such as mealtime, toy play and getting dressed. In those contexts, it appears we need to look more at another's hands to follow the other's lead, not just gaze."

The new explanation solves some of the problems and inadequacies of the gaze-following theory. Gaze-following can be imprecise in the natural, cluttered environment outside the laboratory. It can be hard to tell precisely what someone is looking at when there are several objects together. It is easier and more precise to follow someone's hands. In other situations, it may be more useful to follow the other's gaze.

"Each of these pathways can be useful," Yu said. "A multi-pathway solution creates more options and gives us more robust solutions."

Like Google Glass, which records the views of those wearing it, researchers used innovative head-mounted eye-tracking technology that has never been used before with [young children](#), the researchers recorded moment-to-moment high-density data of what both parent and child visually attend to as they play together in the lab. The researchers applied advanced data-mining techniques to discover fine-grained eye, head and hand movement patterns from the rich dataset they derived from multimodal digital data. The results reported are based on 17 parent-infant pairs. However, over the course of a few years, Yu and Smith have looked at more than 100 kids, and their data confirm their results.

"This really offers a new way to understand and teach joint attention skills," said co-author Linda Smith, Distinguished Professor in the Department of Psychological and Brain Sciences. Smith is well known for her pioneering research and theoretical work in the development of human cognition, particularly as it relates to children ages 1 to 3 acquiring their first language. "We know that although young children can follow [eye gaze](#), it is not precise, cueing attention only generally to the left or right. Hand actions are spatially precise, so hand-following might actually teach more precise gaze-following."

Provided by Indiana University

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