

Three-month-old infants can learn abstract relations before language comprehension

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Three-month-old babies cannot understand words and are just learning to roll over, yet they are already capable of learning abstract relations. In a new study, Northwestern University researchers show for the first time

that 3-month-old infants can learn same and different relations.

"Recent theories have suggested that humans' fluency in relational learning—our ability to make comparisons between objects, events or ideas—may be the key difference in [mental ability](#) between us and other animals," said Dedre Gentner, professor of psychology in the Weinberg College of Arts and Sciences at Northwestern and a senior author of the study. "While some non-human primates can learn abstract relations, they require extensive training—sometimes thousands of trials—to do so."

Erin Anderson, lead author of the study and a graduate student in psychology at Northwestern, said, "We know that by four years of age, children can detect and use relations like same and different. What we didn't know was when this ability begins. In this study, we asked whether young [infants](#) could form abstract relations."

The researchers began by showing the infants multiple pairs of toys. Half the infants saw pairs of toys that were the same (such as two Elmo dolls); the other half saw pairs with different toys (such as an Elmo doll next to a pink block). Then they tested what infants had learned by measuring their looking time at pairs that they had never seen before—one pair showing the relation they had seen, and the other pair showing the relation they had not seen. The results showed that infants looked longer at the relation they had not already seen—even when the objects involved were new to the infants.

"If infants had only learned the pairs we showed them, but not the relation between the toys, they should have looked equally between these pairs of new toys," Anderson said. "What we found, however, was that infants looked longer at pairs showing the unfamiliar relation, showing they had abstracted the relations in a few as six trials. These results constitute the earliest evidence for abstract learning in humans."

Some of the results may be particularly surprising, the researchers noted.

"Contrary to the typical idea that more examples are always better for learning, infants in our study performed better when they had fewer examples, but more chances to compare between them," said Susan Hespos, professor of psychology at Northwestern and a senior author on the study. "Specifically, 3-month-olds learned the relations when they saw two alternating pairs (AA, BB), but not when they saw six pairs (AA, BB, CC, DD, EE, FF) during the learning phase. At this early age, comparison and repetition is more helpful for learning an abstract relation."

The researchers argue that the repetition helped the infants go beyond the objects to focus on the relation between them. This finding is consistent with previous research in children and adults, which shows that attention to individual objects can interfere with relational learning.

"Finding this same pattern suggests that this is a lifelong process from infancy to adulthood," Anderson said. "Until now, it was not clear whether adults' sophisticated relational processing stemmed from experience with language and human culture. That this ability is present at 3 months of age shows that analogical processes exist prior to language learning."

The researchers speculate that language learning may even capitalize on this pre-existing relational ability.

"Comparison within pairs promotes analogical abstraction in three-month-olds" published recently in *Cognition*.

Provided by Northwestern University

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