

# Some parts of memory still developing deep into childhood

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A new study provides evidence that one important part of memory undergoes substantial development even after the age of 7.

Researchers found that [episodic memory](#) – the ability to remember not only what happened, but where and when – takes longer to develop than often assumed.

That means young [children](#) may have no problem with remembering certain simple events or facts. But in some cases, they may have difficulty placing them in the right place, time or context.

The results have widespread implications, including what [young children](#) can be expected to learn in school, and the reliability of their testimony in court cases.

"It is often assumed that most development in [memory](#) occurs by the time children have completed preschool, but we found a lot happens in memory development after 7 years of age," said Vladimir Sloutsky, co-author of the study and professor of psychology at The Ohio State University.

"Children under the age of 7 do pretty well at remembering individual events. But our results suggest they may have difficulty at times placing these memories in context of when and where they happened."

Sloutsky conducted the study with Hyungwook Yim, a doctoral student

in psychology at Ohio State, and Simon Dennis of the University of Newcastle in Australia. Their results appear online in the journal *Psychological Science*, and will be published in a future print edition.

Dennis said children experience major difficulty remembering events that have overlapping elements.

For example, a child may have no problem remembering that he always has math class in the morning and reading class in the afternoon.

But he will have problems remembering if on Mondays he has a math class in the morning and reading class in the afternoon, but on Wednesdays the times are reversed: the math class is in the afternoon and the reading class is in the morning.

"You need to develop a more complex [memory structure](#) to handle this, and our results suggest children just don't have the capacity to do that," Dennis said.

The study included two related experiments with 4- and 7-year-old children and adults.

In one experiment, participants were shown pictures of six pairs of objects that had to be remembered together when they were in a red house, such as a couch and a bicycle, and a dog and coffee cup. Some of the participants were then shown that in a blue house, the same objects appeared with different pairings.

The researchers made sure that each child remembered the pairs that were found in each house, so that these simple memories were not an issue.

What the researchers really wanted to know was whether children could

correctly keep track of the overlapping elements of the memories, such as that the dog was paired with the coffee cup in the red house, but the dog was paired with the couch in the blue house.

The results showed that children had great difficulty remembering the different pairings in the red house versus the blue house.

"Children had a problem when there was overlap in what they had to remember from one context to another. They didn't have the ability to create the more complex memory structures they needed," Yim said.

The researchers thought that perhaps houses were not interesting enough for the children and they just ignored it. So in the second study, the researchers had the pairs of objects associated with cartoon characters that the children would be familiar with, such as Elmo and Dora the Explorer. This was to see if making the context more interesting and relevant to the children (compared to the houses in the first experiment) would improve their memory.

However, the results showed the children's performance did not significantly improve with the cartoon characters, rather than the houses. Only adults had reliable memories of how objects were paired in each context.

Sloutsky said the findings suggest teachers and textbook authors need to keep in mind the limits of what children are capable of learning in elementary school.

For example, consider the history of the relationship between the United States and England. A teacher may try to explain to students that at some points in history, England was a U.S. foe, while at other times it was an ally.

"Remembering when England was an ally and when it was an enemy may be difficult for children, even if the teacher provides context, because of the overlapping elements," Sloutsky said.

In a courtroom, a young child who witnessed a crime may have difficulty putting together all the elements of what they saw, when they saw it and where, according to Yim.

"We really need to understand what children can and cannot remember," Yim said. "Asking young children to put together all the pieces of some episodic memories may be more than they can realistically achieve."

Sloutsky said the findings show that not all parts of memory develop at the same pace in children.

"Some parts of memory are nearly fully developed by 4 years of age. But some components of memory are still developing even after children reach 7 years of age."

Provided by The Ohio State University

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