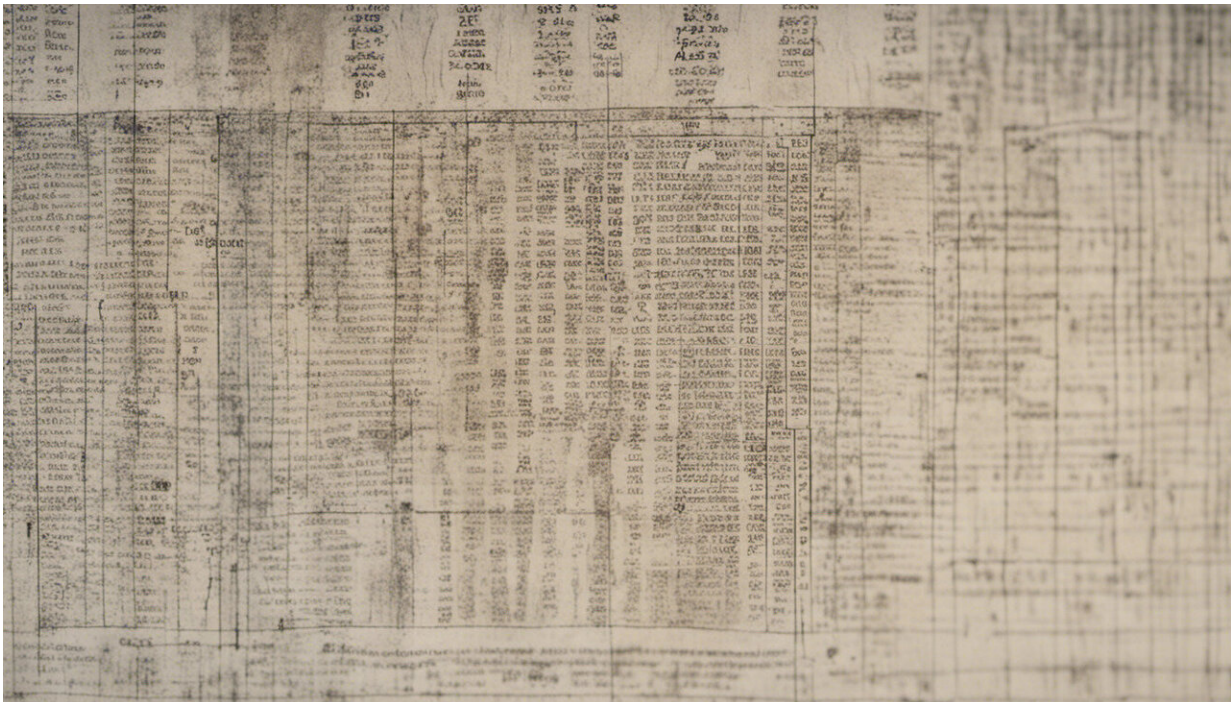


# Research provides evidence of learning and memory six weeks prior to birth

July 8 2015, by Bobbie Mixon



Credit: AI-generated image ([disclaimer](#))

If you've ever been pregnant, did you have a saying you'd repeat to yourself—something about taking things one day at a time, or maybe even wishing that men could know what it's like to carry a child? Or did you have a favorite song you'd listen to obsessively? Well, if you said or heard something like that over and over again during pregnancy, your

newborn may remember it too.

A study funded by the National Science Foundation's Social Behavioral and Economic Sciences Directorate suggests babies begin to acquire knowledge in the womb earlier than previously thought.

Research led by Charlene Krueger, an associate professor at the University of Florida's College of Nursing, and published in the journal *Infant Behavior and Development*, provides evidence that what fetuses hear by their 34th week in utero can inspire learning. That's three weeks earlier than the evidence of learning detected by previous research.

By the 38th week of pregnancy, memory is evident; births normally occur around 40 weeks.

Krueger conducts research on early developmental exposure to sound, specifically maternal voice. She and co-investigator Cynthia Garvan, the University of Florida's statistics director in the Office of Educational Research, asked 32 women to repeat aloud the same 15-second nursery rhyme twice a day for six weeks from their 28th week of pregnancy through their 34th week.

After the 34th week, the mothers stopped reciting the nursery rhyme. All along, they visited a lab at 28, 32, 33 and 34 weeks' gestation to determine whether the unborn babies had familiarized themselves with the nursery rhyme. They also came in for testing at 36 and 38 weeks.

Lab testing involved measuring the fetuses' [heart rates](#) while the unborn babies listened to a recorded female voice repeat the same nursery rhyme that was spoken at home by the mothers.

If the heart rate accelerated, the researchers surmised the fetuses hadn't

totally grasped the new sounds. If the heart rate decelerated, it meant the fetuses found the nursery rhyme familiar.

Krueger and Garvan found that by the 34th week, the heart rates of the fetuses began to decline while listening to the recording. By 38 weeks, four weeks after their mothers stopped repeating the rhyme, testing found statistically evident heart rate deceleration, meaning the fetuses remembered the rhyme.

Meanwhile, a control group of fetuses heard a different rhyme also spoken by a stranger. Since a mother's voice is the main source of sensory stimulation for an unborn baby, the researchers wanted to determine if the fetuses simply were responding to their mothers' voices rather than to a familiar pattern of speech. When this group listened to a recording of a new nursery rhyme, their heart rates slightly accelerated.

Krueger and Garvan concluded that the fetuses in the experimental group were responding to the nursery rhyme; that they begin to show evidence of learning by 34 weeks gestational age; and that they are capable of remembering what they hear inside the womb.

The study's goal was to increase basic knowledge of not only when, but ultimately how, humans learn and remember. This is important to a baby's experience in neonatal intensive care units, as new technologies give preterm infants a greater chance of survival and alter patterns of stimulation for developing [fetuses](#) in and out of the womb.

Further study is needed to more fully understand how ongoing experience, in the context of ongoing development in the last trimester of pregnancy, affects learning and memory.

**More information:** "Emergence and retention of learning in early fetal development," *Infant Behavior and Development*, Volume 37, Issue 2,

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