

Infants, as Early as 6 Months, Do See Errors in Arithmetic

August 7 2006

Using advanced brain sensor technology developed at the University of Oregon, researchers have confirmed often-debated findings from 1992 that showed infants as young as six months know when an arithmetic solution is wrong.

Andrea Berger and Gabriel Tzur, both at Ben-Gurion University of the Negev in Israel, conducted new tests with 24 infants (14 males and 10 females) between six and nine months of age. The infants were shown one or two dolls in a videotaped puppet theater. Their view was then blocked briefly and the number of dolls was left unchanged, or one was added or removed. As in the earlier research, the infants looked longer when the screen was removed and the number of dolls differed from the previous exposure.

In this new case, however, the infants wore special brain-monitoring netting manufactured by Electrical Geodesic Inc., a University of Oregon spin-off company. The 128-electrode netting allowed for much more extensive brain-wave monitoring than was available previously.

The data was analyzed at the University of Oregon. The mean time for infants who saw the same number of dolls before and after was 6.94 seconds. They held their gaze longer (8.04 seconds) when the number of dolls differed. The time of measurement ended when a child looked away from the display.

The findings were published this week online ahead of publication in the

Proceedings of the National Academy of Sciences. They provide clarity to the scientific debate that surfaced soon after Karen Wynn, a Yale University psychologist, first published her results in *Nature* (Dec. 31, 1992), said Michael I. Posner, a professor of psychology at the University of Oregon.

“The research tends to confirm that the varying looking times of the infants are due to a deviation in their expectations,” Posner said. “It also shows that the same anatomy exists in infants as in adults.” The latter point, he said, goes against the idea that basic changes in brain anatomy occur between infancy and adulthood.

“A bigger consequence for us,” he said, “is that the origin of the executive attention system must go back to infancy.” Research previously had indicated that this system, which is related to decision-making and task switching, does not develop until a child is 2.5 years of age.

The presence of an executive-control system in 6-month-old infants was a surprise, Posner said. While infants are not yet able to regulate their behavior when detecting their own errors, the researchers wrote, “Our data indicate that the basic brain circuitry involved in the detection of errors is already functional before the end of the first year of life.”

The approach for the research was the brainchild of Berger, who had been a postdoctoral researcher at the University of Oregon before moving to Ben-Gurion University. Berger, Tzur and Posner were co-authors of the paper.

To see a video of a child in the study, see:
waddle.uoregon.edu/media/InfantEyes.mp4

Source: University of Oregon

Citation: Infants, as Early as 6 Months, Do See Errors in Arithmetic (2006, August 7) retrieved 19 April 2024 from

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