What's the young infant representation of number like?

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Abstract

In discussions of the ontogenetic origins of numerical abilities to date, most of the research suggests that infants establish representations of numbers of objects presented visually, auditorily, and haptically. The question is not whether babies are sensitive to differences in number. The focus lies on what models can better account for the wealth of data. Some have suggested that the infant number capacity is in the format of object file representations, and is characterized by a small set size – ones, twos, threes, perhaps fours, predicted by limitations of short-term storage of an object file model (Uller et al., 1999). Others have proposed that the infant counting abilities are in the format of analog representations, roughly in a format comparable to that of rats and pigeons (Xu & Spelke 2000), where limit is not a concern. The task is to bring data to bear on this question to help decide between the two alternative models.

Uller and Leslie (2000) began to address this issue. Utilizing the looking time technique, they showed 12-month-olds 2+1 and 2+0 event where two objects go behind a screen, then either 1 is added or 0 is added. The outcome is always 2. Another group of 12-month-olds see parallel events with 3, namely, 3+1 and 3+0. Babies are able to understand 'exactly 2', but not 'exactly 3', which provides support for an object file model.

More recently, Uller (2001) investigated whether 12-month-olds understand exactly two using *reaching and searching time* as dependent measures. Twelve-month-old infants were shown 2 objects go into a box, then either a third one being added (2+1) or nothing being added (2+0) into the box. The outcome was always 2. In this study, she confirmed Uller and Leslie's (2000) looking time findings that 12-month-olds understand what "exactly two" means. Parallel results were found by Feigenson, Carey & Hauser (in press) in a forced choice experiment testing 10- and 12-month-old infants. Here, babies had to choose between different numbers of graham crackers, namely, 2 vs 3, 3 vs 4, and 3 vs 6. The researchers found that babies only chose the bigger number in the small discrimination cases. When they saw 3 vs 6 and 4 vs 6, they randomly picked one or the other.

In the current paper, I make the case for focusing on the young infant capacity for small number representation. I will argue that this is a capacity that can be found spontaneously in humans, nonhuman primates, avians and even lower vertebrates. I will also argue that this is a capacity that should be considered primitive and foundational, perhaps at the core of cognition. I will review the proposals available to date on the young infant representation of small number, and examine possible implementations that can be derived from these considerations.

References

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