UNIVERSITÉ PARIS DESCARTES

cnrs
dépasser les frontières

Inserm
Institut national
de la santé et de la recherche médicale

• Communiqué de presse • 18/03/2014

Neonates are able to make connections between space, time and number.

From birth, babies already have a representation of space, time and number. This has been proven by Dr Maria Dolores de Hevia, Dr Véronique Izard, Aurélie Coubart, Professor Elizabeth Spelke and Professor Arlette Streri from the Psychology and Perception Laboratory (Paris Descartes University/CNRS/Inserm) in a study published in *PNAS*.

The origin of our understanding of space, time and number is a subject examined by various disciplines such as philosophy, experimental psychology, developmental psychology and cognitive science. Space, time and number are connected both in the real world and the human mind, but how do we come to understand these connections? Do we learn to connect these concepts based on sensory experience by observing their correlations in the world around us or are our minds capable of understanding them innately from birth?

To answer this question, a test protocol was set up in the maternity unit of Bichat Hospital which recorded the visual attention of 96 neonates with an average age of 2 days (aged between 7 and 96 hours). The experiment put them in a situation where they had to use two of their senses: sight and hearing. In the first phase, a sequence of sounds evoking a numerical quantity (6 or 18 syllables) and/or a time period (1.4 or 4.2 seconds) was played to the babies over a period of one minute while they watched a moving line on a screen. In the second phase, the researchers presented new visual and auditory events, which were different to the first phase. These events were changed either congruently (1) in the same direction (e.g. longer line, larger number of sounds) or incongruently in opposite directions (e.g. longer line, smaller number of sounds).

The results show that neonates respond when these values change congruently. They are therefore able to make the connection between a numerical quantity and/or a time period and a length in space. This test protocol proved that just hours after birth, humans are already sensitive to the common structure of time, space and number, which corroborates philosophical theories such as those espoused by Kant. We still need to establish whether this applies to other quantitative dimensions such as light and sound and to determine the cerebral bases of these predispositions.

(1) With different elements matching and corresponding.

Publication

Representations of space, time, and number in neonates

Maria Dolores de Hevia [a,b,c], Véronique Izard [a,b], Aurélie Coubart [a,b], Elizabeth S. Spelke [d], and Arlette Streri [a,b]

[a] Paris-Descartes University, Sorbonne Paris Cité, 75006 Paris, France
[b] Perceptional Psychology Laboratory, Centre National de la Recherche Scientifique (CNRS), Joint Research Unit (UMR) 8158, 75006 Paris, France
[c] Cognitive Neuroimaging Unit, Institut National de la Santé et de la Recherche Médicale (Inserm) U992, 91191 Gif-sur-Yvette, France
[d] Laboratory for Developmental Studies, Department of Psychology, Harvard University, Cambridge, MA 02138

PNAS, 17 March 2014, doi:10.1073/pnas.1323628111

Contact presse
Université Paris Descartes
Pierre-Yves Clausse
01 76 53 17 98
presse@parisdescartes.fr