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How early do children's brains distinguish objects and movement?

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Credit: Philippe Put

Human beings are born with a visual system already predisposed to see (and mentally representing) objects as discrete perceptual units. Movement is an important visual feature, but how early in a child's development is it represented independently from the object itself? And what function does this skill serve in the development of cognitive abilities? Research conducted with the collaboration of SISSA, and published in *Cognition*, shows that this skill develops very early in infancy. Not only: its presence in mice suggests a genetic basis for it.

As human beings we are "visual" animals. We base much of our survival on vision and it's no coincidence that a major part of our brain is devoted

to this sense. We are born with a predisposition to glean important information from the visual scene, whereas we acquire other skills over the course of our development. Many neuroscientists, for example, believe we are born "ready" to identify and represent objects in our visual field, and that therefore the skill is innate. Scientists are now turning their attention to other characteristics of visual elements such as, for example, object motion: how early is movement represented independently from the object itself? Is it an innate or acquired skill? Is it useful for the development of other cognitive functions?

Alan Langus, a SISSA neuroscientist, and a group of co-workers studied the behaviour of a sample of very young infants (4 months old). "Within only a few months from birth humans construct a representation of movement that is independent from that of the object," explains the researcher. "The technique we used, which maps eye movements, does not allow us to work with younger infants and test their ability at birth, but we have other clues suggesting that there may be an innate basis for this cognitive function." Langus and colleagues compared the performance of the infants with that of mice, in a series of parallel experiments.

"The behavioural response observed in the mice was identical to that seen in the infants," explains Marina Nespor, a SISSA neuroscientist who coordinated the study. "From this we infer that these animals have a similar representation to that present in the human brain."

Mice, explains Langus, are phylogenetically quite distant from humans. "This means that there is a wide range of species between them and us. We can hypothesise that if a certain function is present in rodents and humans, then it will also be present in the majority of mammals." This observation is important, as it demonstrates that the ability to represent movement as an independent perceptual unit underlies our representation of the world, and may be innate. "The ability to represent movement in

such an early, fast and precise manner may serve other purposes in addition to identifying moving objects. It may even have a function in language development" explains Langus, who concludes: "we are now investigating this point in particular, with a new series of experiments."

More information: "Spontaneous object and movement representations in 4-month-old human infants and albino Swiss mice." *Cognition* Volume 137, April 2015, Pages 63–71 DOI: 10.1016/j.cognition.2014.12.010

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