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DAILY NEWS 4 August 2017

# Bees are first insects shown to understand the concept of zero



**Aiming for a bee plus in maths**

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By **Sam Wong**

Bees seem to understand the idea of zero – the first invertebrate shown to do so. When the insects were encouraged to fly towards a platform carrying fewer shapes than another one, they apparently recognised “no shapes” as a smaller value than “some shapes”.

Zero is not an easy concept to comprehend, even for us. Young children learn the number zero later than other numbers, and often have trouble identifying whether it is less than or more than 1.

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Apart from ourselves, some other animals grasp the concept of zero, though. Chimpanzees and monkeys, for instance, have been able to consider zero as a quantity when taught.

With their tiny brains, bees may seem an unlikely candidate to join the zero club. But they have surprisingly well-developed number skills: a previous study found that they can count to 4.

To see whether honeybees are able to understand zero, Scarlett Howard at RMIT University in Melbourne and her colleagues first trained bees to differentiate between two numbers. They set up two platforms, each with between one and four shapes on it.

On one platform, bees were given a sweet sucrose solution, and on the other a nasty-tasting quinine solution. Previous research has found that bees learn more quickly if they are not merely rewarded for correct choices, but also punished for wrong ones.

The researchers trained the bees to associate a platform that had fewer shapes on it with the sweet reward, until they made the right choice 80 per cent of the time. The bees were put through further tests with differently shaped objects to confirm that they were responding to the number of shapes and not their appearance.

Next, when given a choice between two or three shapes and “zero” shapes, bees picked zero most of the time.

### **Wider range**

In a second experiment, other bees were trained in the same way, but this time they had to choose to land on a platform with either zero or between one and six objects. They consistently chose zero, but were less accurate and took more time when the other option was one rather than six objects.

The fact that the numerical distance between the two quantities on offer seemed to affect how challenging the bees found the problem provides further evidence that the bees conceive zero as a number, Howard told the Behaviour conference in Estoril, Portugal, this week.

Such experiments suggest that bees' comprehension of zero is similar to that of some humans and primates, she said. But it's unclear why they have this ability. “We still have some things to figure out about why they can do this,” said Howard.

Few attempts have been made to test whether animals other than primates can recognise zero as a number, says Susan Healy at the University of St Andrews, UK. “The notion that an invertebrate did it would overturn the books quite a lot,” she says.

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A shorter version of this article was published in *New Scientist* magazine on 12 August 2017