

Neurobiologists discover cells in the crow brain that respond to a specific number of items

June 9 2015



Crows recognized the number of dots shown in computer displays. Tübingen researchers discovered 'number neurons' in the crow's end-brain that responded to a specific number of items. Credit: Andreas Nieder

An old story says that crows have the ability to count. Three hunters go into a blind situated near a field where watchful crows roam. They wait, but the crows refuse to move into shooting range. One hunter leaves the blind, but the crows won't appear. The second hunter leaves the blind, but the crows still won't budge. Only when the third hunter leaves, the crows realize that the coast is clear and resume their normal feeding activity.

Helen Ditz and Professor Andreas Nieder of the University of Tübingen found the neuronal basis of this numerical ability in [crows](#). They trained crows to discriminate groups of dots. During performance, the team recorded the responses of [individual neurons](#) in an integrative area of the crow endbrain. This area also receives inputs from the visual system. The neurons ignore the dots' size, shape and arrangement and only extract their number. Each cell's response peaks at its respective preferred number.

The study published in the *Proceedings of the National Academy of Sciences (PNAS)* provides valuable insights into the biological roots of counting capabilities. "When a crow looks at three dots, grains or hunters, single neurons recognize the groups' 'threeness' ", says Helen Ditz. "This discovery shows that the ability to deal with abstract numerical concepts can be traced back to individual nerve cells in corvids." What makes this finding even more interesting is that a long evolutionary history separates us from birds. As a consequence, the

brains of crows and humans are designed very differently. "Surprisingly, we find the very same representation for numbers as we have previously discovered in the primate cortex," Prof. Andreas Nieder says. "It seems as if corvids and primates with independently und distinctively developed endbrains have found the same solution to process numbers." Even abstract behavior which we think of as sophisticated mental feats ultimately has biological roots.

More information: "Neurons selective to the number of visual items in the corvid songbird endbrain." *PNAS*, Online Early Edition, Woche vom 8. bis 12. Juni 2015. [DOI: 10.1073/pnas.1504245112](https://doi.org/10.1073/pnas.1504245112)

Provided by Universitaet Tübingen

Citation: Neurobiologists discover cells in the crow brain that respond to a specific number of items (2015, June 9) retrieved 5 May 2024 from <https://phys.org/news/2015-06-neurobiologists-cells-crow-brain-specific.html>

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