

Both hemispheres of the brain process numbers

January 27 2016



Researchers of the Jena University and the Jena University Hospital discovered that the visual processing of numbers takes place in both hemispheres of the brain. Credit: Jan-Peter Kasper/FSU

Researchers of the Jena University and of the Jena University Hospital

located an important region for the visual processing of numbers in the human brain and showed that it is active in both hemispheres. In the *Journal of Neuroscience* the scientists published high resolution magnetic resonance recordings of this region.

The human [brain](#) works with division of labour. Although our thinking organ excels in displaying amazing flexibility and plasticity, typically different areas of the brain take over different tasks. While words and language are mainly being processed in the left hemisphere, the right hemisphere is responsible for numerical reasoning. According to previous findings, this division of labour originates from the fact that the first steps in the processing of letters and numbers are also located individually in the different hemispheres. But this is not the case, at least not when it comes to the [visual processing](#) of numbers.

Neuroscientists of the Friedrich Schiller University Jena and of the Jena University Hospital discovered that the visual processing of numbers takes place in a so-called 'visual number form area' (NFA) - in fact in both hemispheres alike. The Jena scientists were the first to publish [high resolution magnetic resonance](#) recordings showing the activity in this region of the brain of healthy test persons. The area is normally difficult to get access to.

In their study Dr. Mareike Grotheer and Prof. Dr. Gyula Kovács from the Institute for Psychology of Jena University as well as Dr. Karl-Heinz Herrmann from the Department of Radiology (IDIR) of the Jena University Hospital presented subjects with numbers, letters and pictures of everyday objects. Meanwhile the participants' brain activity was recorded using magnetic resonance imaging (MRI). Thus the researchers were able to clearly identify the region in which the visual processing of numbers takes place. The small area at the underside of the left and right temporal lobe reacted with increased activity at the presentation of numbers. Letters and other images but also false numbers lead to a

significantly lower brain activity in this area.

Although the Jena team already knew from other scientists' previous research where they had to look for the area, a lot of developmental work went into the newly published story. "This region has been a kind of blind spot in the [human brain](#) until now," Mareike Grotheer says. And here is why: Hidden underneath the ear and the acoustic meatus, surrounded by bone and air, previous MRI scans showed a [number](#) of artefacts and thus obstructed detailed research.

For their study the Jena scientists used a high-performance 3 tesla MRI scanner of the Institute of Diagnostic and Interventional Radiology (IDIR) of the Jena University Hospital. They recorded three-dimensional images of the brain of the test subjects at an unusually high spatial resolution and hence with only very few artefacts. In addition these recordings were spatially smoothed whereby the remaining 'white noise' could be removed. This approach will help other scientists to investigate a part of the brain that until now had been nearly inaccessible. "In this region not only numbers are being processed but also faces and objects," Prof. Kovács states.

More information: M. Grotheer et al. Neuroimaging Evidence of a Bilateral Representation for Visually Presented Numbers, *Journal of Neuroscience* (2016). [DOI: 10.1523/JNEUROSCI.2129-15.2016](https://doi.org/10.1523/JNEUROSCI.2129-15.2016)

Provided by Friedrich Schiller University of Jena

Citation: Both hemispheres of the brain process numbers (2016, January 27) retrieved 5 May 2024 from <https://medicalxpress.com/news/2016-01-hemispheres-brain.html>

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