

Scientists find brain function most important to maths ability

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Scientists at the University College London have discovered the area of the brain linked to dyscalculia, a maths learning disability. The finding shows that there is a separate part of the brain used for counting that is essential for diagnosis and an understanding of why many people struggle with maths.

The paper, published online today in the *Proceedings of the National Academy of Sciences* (PNAS), explains that an area of the brain widely thought to be involved in processing number information generally, in fact has two very separate, specific functions. One function is responsible for counting 'how many' things are present and the other is responsible for knowing 'how much'.

It is the discovery of the part responsible for counting or numerosity that is a major finding for Professor Brian Butterworth, who also published 'The Mathematical Brain' and is an authority on dyscalculia. He believes his finding is the key to diagnosis of dyscalculia.

Professor Butterworth, of the UCL Institute of

Cognitive Neuroscience, said: "Now that we know where to look for the differences in brain activation between those who suffer from dyscalculia and those who don't have the learning disorder, we will be able to come up with better diagnosis and insights.

"Some years ago, my colleague, Professor Uta Frith, found the part of the brain responsible for dyslexia. That discovery has led to a much better understanding of the condition, promising better diagnosis and treatment. We hope our discovery will lead to similar insights into dyscalculia – a similar learning disability but one that is still relatively unknown to the general public."

There were two experiments that looked at brain activity in the intraparietal sulcus (IPS) – the area known to be involved in processing number information - using an fMRI scan. The first analysed brain activity when subjects were counting and the second looked at activity when they were assessing quantities.

Professor Butterworth said: "There are two ways of counting things. Imagine assessing how many men versus women are in a room by counting them at the door as they enter the room, let's say three women and four men, and then try assessing the difference by looking at the room when everyone is present. Both methods of assessing the number of people should produce the same result. Instead of assessing numbers of men and women, subjects saw blue and green squares shown in a sequence or blue and green squares shown on screen at the same time. We found that both methods activated the same brain region.

"But when we showed subjects the colours merged and appearing either as a continuously changing square or as one cloudy coloured rectangle different results were produced and a different brain network lit up. This is because the brain was no longer able to try to count the objects. Instead it

had to assess how much colour was in the block and guess whether there was more of one colour or another.

“By comparing these two types of stimulus, we identified the brain activity specific to estimating numbers of things. We think this is a brain network that underlies arithmetic and may be abnormal in dyscalculics.”

Source: University College London

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