

Reliability of neuroscience research questioned

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New research has questioned the reliability of neuroscience studies, saying that conclusions could be misleading due to small sample sizes.

A team led by [academics](#) from the University of Bristol reviewed 48 articles on neuroscience [meta-analysis](#) which were published in 2011 and concluded that most had an average power of around 20 per cent – a finding which means the chance of the average study discovering the effect being investigated is only one in five.

The paper, being published in *Nature Reviews Neuroscience* today, reveals that small, low-powered studies are 'endemic' in neuroscience, producing unreliable research which is inefficient and wasteful.

It focuses on how low statistical power – caused by low sample size of studies, small effects being investigated, or both – can be misleading and produce more false scientific claims than high-powered studies.

It also illustrates how low power reduces a study's ability to detect any effects, and shows that when discoveries are claimed, they are more likely to be false or misleading.

The paper claims there is substantial evidence that a large proportion of research published in scientific literature may be unreliable as a consequence.

Another consequence is that the findings are overestimated because

smaller studies consistently give more positive results than larger studies. This was found to be the case for studies using a diverse range of methods, including brain imaging, genetics and animal studies.

Kate Button, from the School of Social and Community Medicine, and Marcus Munafò, from the School of [Experimental Psychology](#), led a team of researchers from Stanford University, the University of Virginia and the University of Oxford.

She said: "There's a lot of interest at the moment in improving the [reliability](#) of science. We looked at neuroscience [literature](#) and found that, on average, studies had only around a 20 per cent chance of detecting the effects they were investigating, even if the effects are real. This has two important implications - many studies lack the ability to give definitive answers to the questions they are testing, and many claimed findings are likely to be incorrect or unreliable."

The study concludes that improving the standard of results in [neuroscience](#), and enabling them to be more easily reproduced, is a key priority and requires attention to well-established methodological principles.

It recommends that existing scientific practices can be improved with small changes or additions to methodologies, such as acknowledging any limitations in the interpretation of results; disclosing methods and findings transparently; and working collaboratively to increase the total sample size and power.

More information: 'Power failure: why small sample size undermines the reliability of neuroscience' by Katherine Button, John Ioannidis, Claire Mokrysz, Brian Nosek, Jonathan Flint, Emma Robinson and Marcus Munafò in *Nature Reviews Neuroscience*.

Provided by University of Bristol

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