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Discussion forum

Rewarding high-power replication research

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In a recent article for *Nature Reviews Neuroscience*, Button and colleagues showed that the average statistical power in the neurosciences is surprisingly low (Button et al., 2013). Low power leads to low reproducibility and Button and colleagues therefore argued that "improving reproducibility in neuroscience is a key priority". The extent to which neuroscience findings are reproducible is presently unknown, but results from cancer biology are cause for concern: pharmaceutical companies recently revealed that their efforts to replicate published preclinical findings succeed only rarely (Begley & Ellis, 2012; Prinz, Schlange, & Asadullah, 2011; Wadman, 2013).

In an ideal world, neuroscientists read the Button et al. article and take appropriate action: first, to perform a power calculation and boost the number of observations in their studies, and, second, to replicate their own results before submitting them for publication. In the real world, these changes are unlikely to happen. Like most people, neuroscientists are driven mainly by short-term prospects. Imagine for example an aspiring post-doc who has invested $20,000 and half a year's work on an experiment. It is unrealistic to expect this post-doc to refrain from submitting the initial results in favor of running a replication study, thereby investing more money and effort while running the risk that the replication will fail. In general, research in the neurosciences is so costly and time-consuming that most labs cannot afford comprehensive replication efforts lest they stop publishing and start perishing. Hence the conundrum: replication studies are valuable for the field as a whole, but prohibitively costly for the researcher individually.

Fortunately, there may be a partial solution. We suggest that journal editors openly solicit replication attempts for published findings of particular relevance. These findings need not have been published in the journal that solicits the attempt; for instance, the editor of *Cortex* could solicit an attempt to replicate a finding first published in *Nature Neuroscience*. Also, there is no pressure on the editor to solicit replication attempts – it is merely an option, so that the editor retains complete control over the number of published replication attempts in the journal. An additional possibility is for replication attempts to be determined by objective criteria of interest and impact, such as the number of downloads in the first few months after publication of the original report.[1]

After the editor has publicly solicited a replication attempt, different labs can bid for the assignment. A compelling bid includes preregistration of experimental design and planned statistical analysis (Chambers, 2013; Chambers & Munafo, 2013; Wagenmakers, Wetzels, Borsboom, van der Maas, & Kievit, 2012) and offers sufficient power. Sufficient power can be obtained by pooling resources across labs or by applying for replication funding that will hopefully become available soon after the solicit-and-bid procedure finds implementation. The lab that places the winning bid is ensured a publication in the journal that solicited the attempt, conditional only on the quality of the data collection process.

The main advantage of the solicit-and-bid procedure is that it aligns the interests of the field and the individual researcher: instead of shunning replication work, researchers may now actively seek it out. The increased emphasis on the reproducibility of scientific findings benefits policy makers, companies, and enhances the reputation of academic journals. Most importantly, it speeds up the process of scientific discovery by clarifying, at an early stage, which results are replicable and which are not.

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