



**Fig. 1.** A continuum of experimental exploration and the corresponding continuum of statistical wonkiness. On the far left of the continuum, researchers find their hypothesis in the data by post-hoc theorizing, and the corresponding statistics are “wonky,” dramatically overestimating the evidence for the hypothesis. On the far right of the continuum, researchers preregister their studies such that data collection and data analyses leave no room whatsoever for exploration, and the corresponding statistics are “sound” in the sense that they are used for their intended purpose. Much empirical research operates somewhere in between these two extremes, although for any specific study the exact location may be impossible to determine. In the grey area of exploration, data are tortured to some extent, and the corresponding statistics are somewhat wonky. Figure downloaded from Flickr, courtesy of Dirk-Jan Hoek.

the reliability of the statistical results. It is important to stress again that we do not disapprove of exploratory research as long as its exploratory character is openly acknowledged. If fishing expeditions are sold as hypothesis tests, however, it becomes impossible to judge the strength of the evidence reported.

Together with other fairy-tale factors, the pervasive confusion between exploratory and confirmatory research threatens to unravel the very fabric of our field. This special issue features several papers that propose remedies to right what is wrong, such as changes in incentive structures (Nosek et al., 2012) and an increased focus on replicability (Bakker et al., 2012; Frank & Saxe, 2012; Grahe et al., 2012). In the next section, we stress a radical remedy that holds great promise, not just for the state of the entire field but also for researchers individually.

### Good Science: Confirmatory Conclusions Require Preregistration

Science can be good in many ways, but a key characteristic is that the researcher is honest. Unfortunately, an abstract call for more honesty is unlikely to change anything. Blinded by confirmation bias and hindsight bias, researchers may be convinced that they are honest even when they are not. We therefore focus on a more concrete objective: separating exploratory experiments from confirmatory experiments.

The articles by Simmons et al. (2011) and John et al. (2012) suggest to us that considerable care needs to be taken before researchers are allowed near their own data: They may well

torture them until a confession is obtained, even if the data are perfectly innocent. More important, researchers may then proceed to analyze and report their data as if these had undergone a spa treatment rather than torture. Psychology is not the only discipline in which exploratory methods masquerade as confirmatory, thereby polluting the field and eroding public trust (Sarewitz, 2012). In his fascinating book *Bad Science*, Ben Goldacre discusses several fairy tale factors in public health science and medicine, and concludes:

What’s truly extraordinary is that almost all of these problems—the suppression of negative results, data dredging, hiding unhelpful data, and more—could largely be solved with one very simple intervention that would cost almost nothing: a clinical trial register, public, open, and properly enforced (...) Before you even start your study, you publish the ‘protocol’ for it, the methods section of the paper, somewhere public. This means that everyone can see what you’re going to do in your trial, what you’re going to measure, how, in how many people, and so on, *before you start*. The problems of publication bias, duplicate publication and hidden data on side-effects—which all cause unnecessary death and suffering—would be eradicated overnight, in one fell swoop. If you registered a trial, and conducted it, but it didn’t appear in the literature, it would stick out like a sore thumb. (Goldacre, 2009, pp. 220–221)

We believe this idea has great potential for psychological science as well (see also Bakker et al., 2012; Nosek et al.,