Reproducibility Crisis

Statistical significance
Example of the p-value

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Matt had discovered that extremists quite literally see the world in black and white. With a p-value of 0.01!!!

However, he couldn’t reproduce his results one year later.
**PROBABLE CAUSE**

A $P$ value measures whether an observed result can be attributed to chance. But it cannot answer a researcher’s real question: what are the odds that a hypothesis is correct? Those odds depend on how strong the result was and, most importantly, on how plausible the hypothesis is in the first place.

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**Before the experiment**

The plausibility of the hypothesis — the odds of it being true — can be estimated from previous experiments, conjectured mechanisms and other expert knowledge. Three examples are shown here.

- **The Long Shot**
  - 19-to-1 odds against
  - 95% chance of no real effect
  - 5% chance of real effect

- **The Toss-Up**
  - 1-to-1 odds
  - 50% chance of no real effect

- **The Good Bet**
  - 9-to-1 odds in favour
  - 90% chance of no real effect

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**The measured $P$ value**

A value of 0.05 is conventionally deemed ‘statistically significant’; a value of 0.01 is considered ‘very significant’.

- $P = 0.05$ for **The Long Shot**
  - 30% chance of no real effect
  - 70% chance of real effect

- $P = 0.01$ for **The Toss-Up**
  - 29% chance of no real effect
  - 71% chance of real effect

- $P = 0.05$ for **The Good Bet**
  - 89% chance of no real effect
  - 11% chance of real effect

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**After the experiment**

A small $P$ value can make a hypothesis more plausible, but the difference may not be dramatic.

- **The Long Shot**
  - 89% chance of no real effect
  - 30% chance of real effect

- **The Toss-Up**
  - 29% chance of no real effect
  - 71% chance of real effect

- **The Good Bet**
  - 96% chance of no real effect
  - 4% chance of real effect
Other problem...
Positivism!
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