

QUESTION #92

What Is Power, and Why Is It Important?

You may remember that a Type I error is also known as level of significance or alpha or α and is the rejection of a true null hypothesis. We want to avoid those kinds of errors. Another type of error we want to avoid occurs when you accept a false null hypothesis. Committing such an error is known as a Type II error or beta or β .

Power is the ability to detect and reject a false null hypothesis and is equal to $1 - \beta$. It is the combination of the sample size and the technique being used that will allow us to minimize Type II error, where something in fact is not true (the null hypothesis) yet we fail to reject it.

Power is a quality of a test of a research hypothesis that we try to assess prior to the actual test of that research hypothesis, and even before in the design of the experiment, and it usually consists of three different factors:

- How large we expect the effect of the treatment to be
- The size of the sample
- The type I error rate we set.

The larger the sample (or sample size), the easier it will be to find a significant difference and the more power the test has to detect and reject false null hypotheses.

As the sample size increases, the sample is more representative of the population and better mimics the characteristics of the population. Hence, one needs a smaller sample than usual to detect any differences.

Finally, as the level of significance becomes less conservative (from, say, .05 to .01), it is “easier” to find significance because the critical value needed to not accept the null is lower.

Any of these three conditions (magnitude of the difference, sample size, and Type I error) can have an impact on power, but they can also each be isolated and manipulated to help increase the odds that the test of any one research hypothesis is powerful enough to detect false differences.

More questions? See #88, #91, and #96.