

# Statistical Power and ANOVA - Introduction

## Introduction

In this section you'll continue to deepen your knowledge of hypothesis testing and t-tests by examining the concept of power; an idea closely related to type II errors. With that, you'll see how the rate of type I errors, power, sample size, and effect size are intrinsically related to one another. You will then move on to ANOVA - Analysis of Variance, which allows you to test for the influence of multiple factors all at once.

## Statistical power

Statistical power is equal to  $1 - \beta$  where  $\beta$  is the rate of type II errors. As you will see, power is related to  $\alpha$ , sample size, and effect size. Typically a researcher will select an acceptable alpha value and then examine required sample sizes to achieve the desired power such as 0.8 (or higher).

## Welch's t-test

After an initial exploration of statistical power, you'll take a look at Welch's t-test. This is an adaptation of the unpaired student's t-test you've seen previously which allows for different sample sizes or different variances between the two groups.

## Multiple comparisons

From there, you'll look at some of the issues that arise when trying to perform multiple comparisons - from the risks of spurious correlations to the importance of corrections such as the Bonferroni correction to deal with the cumulative risks of type I errors inherent in multiple comparisons.

## ANOVA

Finally, you'll take a look at the more generalized procedure for conducting multiple comparisons: Analysis of Variance or ANOVA. You'll see that ANOVA of only two groups is statistically equivalent to a two sided t-test. That said, ANOVA fully supports comparing multiple factors simultaneously.

## Summary

Without a good understanding of experimental design, it's easy to end up drawing false conclusions. In this section, you'll cover a range of tools and techniques to deepen your understanding of hypothesis testing and ensure that you design experiments rigorously and interpret them thoughtfully.