Effect Size for a Dependent Samples T-Test

In the previous *Guide*, we calculated a dependent-samples *t*-test and found that having people watch an episode of "The Office" increased their average levels of happiness by a statistically significant amount. In this *Guide*, we'll take a look at the size of this effect. (Remember, hypothesis tests tell you statistical significance, whereas effect sizes tell you practical significance.)

Let's start by taking a look at the Cohen's d effect size formula for a dependent-samples t-test:

Cohen's d for Dependent samples t-test

$$d_{\bar{x}_d} = \frac{\bar{x}_d}{s_d}$$

You'll notice that, again, everything in this formula pertains to the difference scores. Again, we won't be needing the original (baseline and post-treatment) data to solve this problem. The numerator is simply the mean ($\bar{x}_d$) of the difference scores and the denominator is simply the standard deviation (s_d) of the difference scores.

Here's the original data, to remind you:

Baseline	Post_Treatment	Differences
37	41	4
33	34	1
29	33	4
21	21	0
23	26	3
24	27	3
24	25	1
36	38	2
38	41	3
28	41	13

Thankfully, too, we already have everything we need for the effect size formula! This is very often the case: **Usually, calculating the actual hypothesis test will naturally give you the values you need for the effect size**.

Recall that the mean of the difference scores is $\bar{x}_d = 3.40$. Also recall that we already have the *variance* of the difference scores, which is $s_d^2 = 13.16$. Importantly, the effect size formula calls for the *standard deviation* of the difference scores, not the variance.

Luckily, finding standard deviation from variance is very simple: we just need to square root the variance. If we do this, we'll end up with a sample standard deviation of $s_d = \sqrt{13.16} = 3.63$.

Already, we have everything needed for the formula:

$$d_{\bar{x}_d} = \frac{\bar{x}_d}{s_d} = \frac{3.40}{3.63} = 0.94$$

There you have it! The Cohen's *d* effect size for this particular dependent-samples t-test comes out to 0.94, which would be considered a (very) large effect. Don't forget, it's easy to interpret effect sizes! Cohen's *d* effect sizes between 0 and 0.2 are considered "small" effects, between 0.2 and 0.5 are considered "medium" effects, and above 0.5 are considered "large" effects. Easy, right?