

10.3: Cohen's Standards for Small, Medium, and Large Effect Sizes

Cohen's d is a measure of "effect size" based on the differences between two means. Cohen's d , named for United States statistician Jacob Cohen, measures the relative strength of the differences between the means of two populations based on sample data. The calculated value of effect size is then compared to Cohen's standards of small, medium, and large effect sizes.

Table 10.3.1: Cohen's Standard Effect Sizes

Size of effect	d
Small	0.2
Medium	0.5
Large	0.8

Cohen's d is the measure of the difference between two means divided by the pooled standard deviation:

$$d = \frac{\bar{x}_1 - \bar{x}_2}{s_{\text{pooled}}} \text{ where } s_{\text{pooled}} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}} \quad (10.3.1)$$

It is important to note that Cohen's d does not provide a level of confidence as to the magnitude of the size of the effect comparable to the other tests of hypothesis we have studied. The sizes of the effects are simply indicative.

? Exercise 10.3.1

A study is done to determine if Company A retains its workers longer than Company B. It is believed that Company A has a higher retention than Company B. The study finds that in a sample of 11 workers at Company A their average time with the company is four years with a standard deviation of 1.5 years. A sample of 9 workers at Company B finds that the average time with the company was 3.5 years with a standard deviation of 1 year. Test this proposition at the 1% level of significance.

Calculate Cohen's d . Is the size of the effect small, medium, or large? Explain what the size of the effect means for this problem.

Answer

$$\bar{x}_1 = 4s_1 = 1.5n_1 = 11 \quad (10.3.2)$$

$$\bar{x}_2 = 3.5s_2 = 1n_2 = 9 \quad (10.3.3)$$

$$d = 0.384 \quad (10.3.4)$$

The effect is small because 0.384 is between Cohen's value of 0.2 for small effect size and 0.5 for medium effect size. The size of the differences of the means for the two companies is small indicating that there is not a significant difference between them.

Try It 10.3.1

A study is done to determine if Company A retains its workers longer than Company B. Company A samples 15 workers, and their average time with the company is five years with a standard deviation of 1.2. Company B samples 20 workers, and their average time with the company is 4.5 years with a standard deviation of 0.8. The populations are normally distributed.

Calculate Cohen's d . Is the size of the effect small, medium, or large? Explain what the size of the effect means for this problem.

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