One Sample t Test

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> ### Descriptive Statistics

> c(length(Outcome), mean(Outcome), sd(Outcome))

[1] 8.000000 4.000000 3.116775

> ### Inferential Statistics

> t.test(Outcome,mu=7)

      One Sample t-test

data:  Outcome
t = -2.7225, df = 7, p-value = 0.02966
alternative hypothesis: true mean is not equal to 7
95 percent confidence interval:
 1.394311 6.605689
sample estimates:
mean of x
        4
```

See the earlier annotated output for details of how these are computed from frequency distributions.

The Standard Error of the Mean ("SE") provides an estimate of how spread out the distribution of all possible random sample means would be. Here it's calculated as:

$$SE_M = \frac{SD}{\sqrt{N}} = \frac{3.117}{\sqrt{8}} = 1.102$$

The "t", "df", and "p" values provide the results of the statistical significance test. First, *t* provides the standardized statistic for the mean difference:

$$t = \frac{M - \mu}{SE_M} = \frac{-3.000}{1.102} = -2.722$$

The *t* statistic follows a non-normal (studentized or *t*) distribution that depends on degrees of freedom. Here, $df = N - 1 = 8 - 1 = 7$. A *t* with 7 *df* that equals -2.722 has a two-tailed probability (*p*) of .030, a statistically significant finding.

The Mean Difference is the difference between the sample mean (*M* = 4) and the user-specified test value (*u* = 7). For the example, the sample had a mean one point higher than the test value. This raw effect size is important for the significance test, the confidence interval, and the effect size.

Cohen's "d" provides a standardized effect size for the difference between the two means.

$$d = \frac{M - \mu}{SD} = \frac{-3.000}{3.117} = 0.963$$

Given Cohen's heuristics for interpreting effect sizes, this would be considered a large effect.