Test Assumptions

The final factor that we need to consider is the set of assumptions of the test. All of the statistical tests of means are parametric tests. All parametric tests assume that the populations have specific characteristics and that samples are drawn under certain conditions. These characteristics and conditions are expressed in the assumptions of the tests.

One-Sample *Z* Test

The assumptions of the one-sample ***Z*** test focus on sampling, measurement, and distribution. The assumptions are listed below. One-sample ***Z*** tests are considered "robust" for violations of normal distribution. This means that the assumption can be violated without serious error being introduced into the test. The central limit theorem tells us that, if our sample is large, the sampling distribution of the mean will be approximately normally distributed irrespective of the shape of the population distribution. Knowing that the sampling distribution is normally distributed is what makes the one-sample Z test robust for violations of the assumption of normal distribution.

- **Interval or ratio scale of measurement (approximately interval)**
- **Random sampling from a defined population**
- **Characteristic is normally distributed in the population**

One-Sample *t* Test

The assumptions of the one-sample ***t***-test are identical to those of the one-sample ***Z*** test. The assumptions are listed below. One-sample ***t***-tests are considered "robust" for violations of normal distribution. This means that the assumption can be violated without serious error being introduced into the test.

- **Interval or ratio scale of measurement (approximately interval)**
- **Random sampling from a defined population**
- **Characteristic is normally distributed in the population**

t-Test for Dependent Means

The assumptions of the ***t***-test for dependent means focus on sampling, research design, measurement, and distribution. The assumptions are listed below. The ***t***-test for dependent means is considered typically "robust" for violations of normal distribution. This means that the assumption

can be violated without serious error being introduced into the test in most circumstance. However, if we are conducting a one-tailed test and the data are highly skewed, this will cause a lot of error to be introduced into our calculation of difference scores which will bias the results of the test. In this circumstance, a nonparametric test should be used.

- **Interval or ratio scale of measurement (approximately interval)**
- **Random sampling from a defined population**
- **Samples or sets of data used to produce the difference scores are linked in the population through repeated measurement, natural association, or matching**
- **Scores are normally distributed in the population; difference scores are normally distributed**

t-Test for Independent Means

The assumptions of the ***t***-test for independent means focus on sampling, research design, measurement, population distributions and population variance. The assumptions are listed below. The ***t***-test for independent means is considered typically "robust" for violations of normal distribution. This means that the assumption can be violated without serious error being introduced into the test in most circumstance. However, if we are conducting a one-tailed test and the data are highly skewed, this will cause a lot of error to be introduced into our test and a nonparametric test should be used. The ***t***-test for independent means is not robust for violations of equal variance. Remember that the shape of the sampling distribution is determined by the population variance (s_2) and the sample size. If the population variances are not equal, then when we calculate the difference between sample means, we do not have a sampling distribution with an expectable shape and cannot calculate an accurate critical value of the ***t*** distribution. This is a serious problem for our test. Our alternatives when the asssumption of equal variances has been violated are to use a correction (available in the SPSS program) or to use a nonparametric test. How do we determine whether this assumption has been violated? Conduct a Levene's test (using SPSS).

- **Interval or ratio scale of measurement (approximately interval)**
- **Random sampling from a defined population**
- **Samples are independent; no overlap between group members**
- **Scores are normally distributed in the population**

- **Population variances are equal**

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