10.4: Non-Parametric Analysis of Dependent Samples

Do you remember when to use non-parametric analyses?

? Exercise 10.4.1

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Answer

Use non-parametric analyses when you expect that your distribution or the population is not normally distributed, or if your data starts out as ranked information.

So what is the non-parametric alternative analysis for dependent t-tests? The Wilcoxon Matched-Pairs Signed-Rank test!

When to Use the Wilcoxon?

Use the Wilcoxon signed-rank test when there are two paired quantitative variables that are not normally distributed, or two paired variables that are ranks. This is the non-parametric analogue to the paired *t*–test, and you should use it if the distribution of differences between pairs is severely non-normally distributed.

Hypothesis

Because we are dealing with ranks, the hypotheses will discuss medians instead of means.

Research Hypothesis: The median of the pretest will be lower than the median of the posttest.

Null Hypothesis: The median of the pretest will be similar to the median of the posttest.

Note that this is different from the research hypothesis of the dependent t–test, which is that the *means* will be different.

How To

There's no formula for this statistical analysis! Instead, you find the difference of each pairs' scores, rank them, and compare to a critical value. Here are the steps:

1. Find the Differences between each pair of scores.
2. Rank the absolute value of the Differences for each participant from smallest to largest, with the smallest difference getting a rank of 1, then next larger difference getting a rank of 2, etc. Give average ranks to ties.
3. Add the ranks of all of the positive Difference scores, then add the ranks of all of the negative Difference scores.
4. The smaller of these two sums is the test statistic, W (sometimes symbolized T_s).
5. Compare the test statistic to a value in a critical value table. Unlike most test statistics, *smaller* values of W are less likely under the null hypothesis. However, it is unlikely that you will need to calculate this by hand, so you can rely on statistical software to provide the actual probability of a Type I error of rejecting a null hypothesis when it's true (p-value).

In Closing

Non-parametric analyses are fairly rare because most of the parametric analyses are robust to non-normal distributions so we just continue to use them. That's why we won't spend too much time on the actual calculations now; if you ever do need to conduct a non-parametric analysis, you will probably already be using statistical software to do it. For now, the important thing to remember is that there are alternative statistical analyses if your data does not appear to be normally distributed.

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