

Tukey's and Dunnett's Multiple Comparison Methods

The Tukey method, or honest significant difference test, conducts all possible pairwise comparisons and controls the EER to equal the alpha level that you specify. If making fewer than all pairwise comparisons, Tukey's method will overcorrect and can result in lower power to detect significant differences. However, with the Tukey method, you can ensure that the EER is, at most, your chosen alpha, regardless of how many pairwise comparisons you make.

Dunnett's method is a specialized multiple comparison test that enables you to compare a single control group, such as a placebo in a drug trial, to all other groups or treatments. This method controls the EER to be no greater than α when all treatments are compared to the control group, and it accounts for the correlation that exists between the comparisons. Many more multiple comparison procedures exist. The different approaches vary in how much they control the experimentwise error rate.

Lowering the Type 1 error rate increases the Type 2 error rate, that is, it reduces the statistical power. In some situations, a Type 1 error is worse than a Type 2 error, or vice versa. For example, if we're screening plant compounds looking for a cure for cancer, having the high power to detect a useful compound is more important than avoiding false positives (or reducing Type 1 error rate), especially if the compounds will be rigorously tested in follow-up studies. Later in the follow-up studies, having a low Type 1 error rate is more important than power because we don't want to recommend a cancer treatment that doesn't work for sick patients. In these situations, we can use different multiple comparison procedures for different research goals.