STATISTICAL TECHNIQUE IN REVIEW

An **analysis of variance (ANOVA)** statistical technique is conducted to examine differences between two or more groups. There are different types of ANOVA, with the most basic being the **one-way ANOVA**, which is used to analyze data in studies with one independent and one dependent variable. More details on the types of ANOVA can be found in your research textbook and statistical texts (Burns & Grove, 2005; Munro, 2001). The outcome of ANOVA is a numerical value for the *F* statistic. The calculated *F*-ratio from ANOVA indicates the extent to which group means differ, taking into account the variability within the groups. Assuming the null hypothesis of no difference among groups is true; the probability of obtaining an *F*-ratio as large or larger than that obtained in the given sample is indicated by the calculated *p* value. For example, if $p = 0.0002$, this indicates that the probability of obtaining a result like this in future studies is rare, and one may conclude that group differences exist and the null hypothesis is rejected. However, there is always a possibility that this decision is in error, and the probability of committing this Type I error is determined by the alpha (α) set for the study, which is usually 0.05 that is smaller in health care studies and occasionally 0.01.

ANOVA is similar to the *t*-test since the null hypothesis (no differences between groups) is rejected when the analysis yields a smaller *p* value, such as $p \leq 0.05$, than the alpha set for the study. Assumptions for the ANOVA statistical technique include:

1. normal distribution of the populations from which the samples were drawn or random samples;
2. groups should be mutually exclusive;
3. groups should have equal variance or homogeneity of variance;
4. independence of observations;
5. dependent variable is measured at least at the interval level (Burns & Grove, 2005; Munro, 2001).

Researchers who perform ANOVA on their data record their results in an ANOVA summary table or in the text of a research article. An example of how an ANOVA result is commonly expressed is:

$$F_{(1,343)} = 15.46, p < 0.001$$

Where:
F is the statistic
1 is the group degrees of freedom (*df*) calculated by $K - 1$, where K = number of groups in the study. In this example, $K - 1 = 2 - 1 = 1$.
343 is the error degrees of freedom (*df*) that is calculated based upon the number of participants or $N - K$. In this example, 345 subjects – 2 groups = 343 error *df*.
15.46 is the *F* ratio or value
p indicates the significance of the *F* ratio in this study or $p < 0.001$.

There are different types of ANOVA, but the focus of these analysis techniques is on examining differences between two or more groups. The simplest is the one-way ANOVA, but many of the studies in the literature include more complex ANOVA techniques. A commonly used ANOVA technique is the **repeated-measures analysis of variance**, which is used to analyze data from studies where the same variable(s) is (are) repeatedly measured over time on a group or groups of subjects. The intent is to determine the change that occurs over time in the dependent variable(s) with exposure to the independent treatment variable(s).