

	One-Way ANOVA	Two-Way ANOVA	Chi-Square
Research Situation	Testing differences between two or more sample means collected from different groups (e.g., freshmen, sophomores, juniors, seniors). Only one IV	Testing differences between four or more sample means where there are two IVs (e.g., Factor 1 Drug: A or B; Factor 2 Gender: Male or Female)	Analyzing frequency counts Use goodness of fit with one grouping variable and test of independence with two
1. Assumptions	-Appropriate measurement -Normality -Independence -Homogeneity of variance	-Appropriate measurement -Normality -Independence -Homogeneity of variance	-Appropriate measurement -Independence -Expected frequency at least five per cell
2. Hypotheses	H ₀ : All means are equal H ₁ : At least one mean is different from one other mean	Test for three effects -Main effect of Factor A (e.g., Drug) -Main effect of Factor B (e.g., Gender) -A × B Interaction (e.g., Drug × Gender)	H ₀ : The frequencies do not deviate from what is expected H ₁ : The frequencies do deviate from what is expected
3. Critical region	$df_{\text{between}} = g - 1$ $df_{\text{within(error)}} = N - g$	Between <i>df</i> (numerator) -Main effect of Factor A, $df_A = a - 1$ -Main effect of Factor B, $df_B = b - 1$ -A × B Interaction, $df_{A \times B} = (a - 1)(b - 1)$ Within(error) <i>df</i> (denominator) $-df_{\text{within(error)}} = N - ab$	Goodness of fit $df = (\text{Categories} - 1)$ Independence $df = (\text{Columns} - 1) (\text{Rows} - 1)$
4. Test statistic	Overall ANOVA $SS_{\text{between}} = n \left(\sum M^2 - \frac{(\sum M)^2}{g} \right)$ $MS_{\text{between}} = \frac{SS_{\text{between}}}{df_{\text{between}}}$ $SS_{\text{within(error)}} = \sum SS_{\text{each treatment}}$ $MS_{\text{within(error)}} = \frac{SS_{\text{within(error)}}}{df_{\text{within(error)}}}$ $F = \frac{MS_{\text{between}}}{MS_{\text{within(error)}}$	Post hoc pairwise comparisons $HSD = q \sqrt{\frac{MS_{\text{within(error)}}}{n}}$ Compute <i>F</i> for Factor A, Factor B, and interaction We use SPSS for these computations and simple effects Each <i>MS</i> is computed as $\frac{SS}{df}$ Each <i>F</i> is computed as $\frac{MS}{MS_{\text{within(error)}}$	$\chi^2 = \sum \frac{(OF - EF)^2}{EF}$ For goodness of fit: <i>EF</i> for each cell is predicted proportion * Total Frequency For independence: $EF = \frac{(RT)(CT)}{N}$
5. Effect size	Overall ANOVA $\eta_p^2 = \frac{SS_{\text{between}}}{SS_{\text{between}} + SS_{\text{within(error)}}$.01, .06, .14	Overall ANOVA $\eta_p^2 = \frac{SS_{\text{between}}}{SS_{\text{between}} + SS_{\text{within(error)}}$.01, .06, .14 Pairwise comparisons $d = \frac{M_1 - M_2}{\sqrt{SD_p^2}}$.2, .5, .8	For 2 × 2: $\phi = \sqrt{\frac{\chi^2}{N}}$ All others: $\phi = \sqrt{\frac{\chi^2}{N(df^*)}}$ $df^* = (\text{Columns} - 1) \text{ OR } (\text{Rows} - 1)$, whichever is smaller