Chapters 1 - 8

$$\sigma^2 = \frac{SS}{N} = \frac{1}{N}\sum(X-\mu)^2 = \frac{1}{N}\left[\sum X^2 - \frac{\left(\sum X\right)^2}{N}\right]$$

$$\sigma^2 = \frac{SS}{N} = \frac{1}{N}\sum f(X-\mu)^2 = \frac{1}{N}\left[\sum fX^2 - \frac{\left(\sum fX\right)^2}{N}\right]$$

$$s^2 = \frac{1}{n-1}\sum(X-M)^2 = \frac{1}{n-1}\left[\sum X^2 - \frac{\left(\sum X\right)^2}{n}\right]$$

$$s^2 = \frac{SS}{n-1} = \frac{1}{n-1}\sum f(X-M)^2 = \frac{1}{n-1}\left[\sum fX^2 - \frac{\left(\sum fX\right)^2}{n}\right]$$

z = (score - M) / σ

$$\sigma_M = \frac{\sigma}{\sqrt{n}}$$

$$\text{Cohen's d} = \frac{\text{mean difference}}{\text{standard deviation}}$$

Chapter 9. Introduction to the t statistic

$$t = \frac{M - \mu}{s_M}$$

$$s_M = \sqrt{\frac{s^2}{n}}$$

df = n-1

$$\text{Cohen's } d = \frac{\text{mean difference}}{\text{sample standard deviation}}$$

$$r^2 = \frac{SS_{Treatment}}{SS_{Total}} = \frac{t^2}{t^2 + df}$$

Chapter 10. t Test for Two Independent Samples

$$s^2_{\text{pooled}} = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2} = \frac{SS_1+SS_2}{df_1+df_2}$$

$$s_{M_1-M_2} = \sqrt{\frac{s^2_{pooled}}{n_1}+\frac{s^2_{pooled}}{n_2}} \quad = \sqrt{s^2_{pooled}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)} \quad = \sqrt{\left(\frac{SS_1+SS_2}{df_1+df_2}\right)\left(\frac{1}{n_1}+\frac{1}{n_2}\right)} \quad = \sqrt{\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}$$

$$t = \frac{(M_1-M_2)-(\mu_1-\mu_2)}{s_{M_1-M_2}} \quad = \frac{M_1-M_2}{\sqrt{\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

$df = n_1 + n_2 - 2$

$$[(M_1-M_2)-(t \bullet s_{M_1-M_2})] \le \mu_1-\mu_2 \le [(M_1-M_2)+(t \bullet s_{M_1-M_2})]$$

$$d = \frac{\text{mean difference}}{\text{standard deviation}} \quad = \frac{M_1-M_2}{\sqrt{s^2_{\ pooled}}} \quad = \frac{M_1-M_2}{s_{pooled}} \quad = \frac{2t}{\sqrt{df}}$$

$$r^2 = \frac{t^2}{t^2+df}$$

Chapter 11. t Test for Two Related Samples

$$s_D^2 = \frac{SS_D}{n-1}$$

$$S_{M_D} = \sqrt{\frac{s_D^2}{n}} \quad or \quad S_{M_D} = \frac{s_D}{\sqrt{n}}$$

n = the number of pairs

$$t = \frac{\mathrm{M_D} - u_D}{\mathrm{S_{M_D}}} \quad = \frac{M_D}{\sqrt{\frac{s_D^2}{n}}} \quad = \frac{M_D}{\sqrt{\frac{1}{n}\left(\frac{\sum D^2 - \frac{(\sum D)^2}{n}}{n-1}\right)}}$$

$$M_D - (t)(s_{M_D}) \le \mu_D \le M_D + (t)(s_{M_D})$$

$$\text{Cohen's d} = \frac{\text{mean difference}}{\text{standard deviation}} = \frac{M_D}{s_D}$$

$$r^2 = \frac{t^2}{t^2+df}$$

Chapter 13. Introduction to ANOVA

$$SS_{total} = \sum X^2 - \frac{G^2}{N}$$

N = Total Number of Observations; G = Grand Total

df = N -1

$$SS_{Between} = \sum \frac{T^2}{n} - \frac{G^2}{N}$$

T = Each individual Treatment, or Group Total; G = Grand Total

df = k-1

$$SS_{\text{within treatments}} = \sum SS_{\text{inside each treatment}}$$

df = N - k $\quad = SS_{total} - SS_{between}$

$$\text{Tukey's } HSD = q\sqrt{\frac{MS_{\text{within treatments}}}{\text{n}}}$$

where the value of q is found in TableB.5 of G&W

$MS_{\text{within treatments}}$ is the within-treatments variance estimate from ANOVA

and n is the number of scores in each treatment

Scheffé uses F ratio, but numerator is different from that employed in ANOVA (the denominator remains the same as in ANOVA)

- The numerator of the F ratio is the $MS_{Between}$ based only on the means being compared
- Although the numerator is based on only two means, the df for the numerator is the same as for the omnibus F: k-1 (number of groups – 1)
- The denominator is the MSWithin based on the overall ANOVA.

Chapter 14. Repeated Measures and Two-Factor ANOVA

Independent Groups and Repeated Measures:

$$SS_{total} = \sum X^2 - \frac{G^2}{N}$$

N = Total Number of Observations; G = Grand Total

df = N -1

$$SS_{BetweenTreatments} = \sum \frac{T^2}{n} - \frac{G^2}{N}$$

T = Each individual Treatment, or Group Total; G = Grand Total

df = k-1

$$SS_{\text{within treatments}} = \sum SS_{\text{inside each treatment}}$$
$$= SS_{total} - SS_{between}$$

df = N-k (IndependentGroups)

df = $\sum$ df inside each treatment (Repeated Measures)

$$(SS_{\text{Factor A}}) = \sum \frac{T^2_{\text{Row}}}{(n_{\text{Row}})} - \frac{G^2}{N}$$
$df_{\text{Factor A}}$ = number of rows-1

$$(SS_{\text{Factor B}}) = \sum \frac{T^2_{\text{column}}}{(n_{\text{column}})} - \frac{G^2}{N}$$
$df_{\text{Factor B}}$ = number of columns-1

$$(SS_{\text{AxB}}) = SS_{\text{Between Treatments}} - SS_{\text{Factor A}} - SS_{\text{Factor B}}$$
$$(df_{\text{AxB}}) = df_{\text{Between Treatments}} - df_{\text{Factor A}} - df_{\text{Factor B}}$$

Repeated Measures

$$SS_{\text{Between subjects}} = \sum \frac{P^2}{k} - \frac{G^2}{N}$$
$$df_{\text{Between subjects}} = n - 1$$

$$SS_{\text{Error}} = SS_{\text{Within Treatments}} - SS_{\text{Between Subjects}}$$
$$df_{\text{Error}} = df_{\text{Within Treatments}} - df_{\text{Between Subjects}}$$

Chapter 15. Correlation and Regression

$$SP = \Sigma XY - \frac{\Sigma X \Sigma Y}{n} \qquad r = \frac{SP}{\sqrt{SS_X SS_Y}}$$

$$SS_X = \Sigma X^2 - \frac{(\Sigma X)^2}{n}$$

$$b_{yx} = \frac{SP}{SS_X} \qquad a_{yx} = M_Y - b_{yx} M_X$$

Chapter 16. Chi-Square

$$X^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

Goodness of Fit, df = C-1;

Independence, df = (R-1) x (C-1)

$$\phi = \sqrt{\frac{\chi^2}{n}}$$

$$Cramer's\ V = \sqrt{\frac{\chi^2}{n(df)}}$$ df = the smaller of R or C