APPENDIX B Selected Statistical Formulae

To help refresh your memory and understanding of the major statistical tests mentioned in the text, we have included complete formulae in this appendix. In all but one instance we present the raw-score formulae. (The one exception is the calculation of variance, where we present the deviation-score formula.)

In all instances, we have attempted to present the simplest formulae. If they look confusing or unfamiliar, consult your instructor; there are numerous ways to write these formulae. The meaning of statistical symbols and notations are presented where they might be confusing or unfamiliar. With these formulae you should be able to work any of the examples from the text by hand.

I. Variance and Standard Deviation

Sample

$$\text{Variance} = \frac{\Sigma(X-\overline{X})^2}{N-1}$$

$$\text{Standard Deviation} = \sqrt{\text{Variance}}$$

Population

$$\text{Variance} = \frac{\Sigma(X-\overline{X})^2}{N}$$

$$\text{Standard Deviation} = \sqrt{\text{Variance}}$$

II. Pearson Product–Moment Correlation Coefficient

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{\left[N\Sigma X^2 - (\Sigma X)^2\right]\left[N\Sigma Y^2 - (\Sigma Y)^2\right]}}$$

where N = the number of *pairs* of scores

III. *t* Test for Independent Samples

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{\left[\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N_1}\right] + \left[\Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N_2}\right]}{(N_1 - 1) + (N_2 - 1)}\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

IV. *t* Test for Related Samples

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{\sum D^2 - \frac{(\sum D)^2}{N}}{N-1}\left(\frac{1}{N}\right)}}$$

where D = difference between measurement 1 and measurement 2

N = the number of *pairs* of scores

V. One-Way Analysis of Variance

Between Groups Sum of Squares

$$SS_{BG} = \left[\frac{(\sum X_1)^2}{N_1} + \frac{(\sum X_2)^2}{N_2} + \ldots + \frac{(\sum X_j)^2}{N_j}\right] - \frac{(\sum X_{Total})^2}{N_{Total}}$$

Within Groups Sum of Squares

$$SS_{WG} = \left[\sum X_1^2 - \frac{(\sum X_1)^2}{N_1}\right] + \left[\sum X_2^2 - \frac{(\sum X_2)^2}{N_2}\right] + \ldots + \left[\sum X_j^2 - \frac{\sum X_j{}^2}{N_j}\right]$$

Total Sum of Squares

$$SS_{Total} = \sum X_{Total}^2 - \frac{(\sum X_{Total})^2}{N_{Total}}$$