RECIPROCAL TRANSFORMATION

If the square of treatment means and standard deviations are proportional, a reciprocal transformation may be appropriate. A transformed score X' is given by

$$X' = \frac{1}{X} \quad \text{or} \quad X' = \frac{1}{X + 1}.$$

The latter formula should be used if any scores are equal to zero. A reciprocal transformation may be useful when the dependent variable is reaction time.

ANGULAR OR INVERSE SINE TRANSFORMATION

The angular transformation is given by

$$X' = 2 \arcsin \sqrt{X},$$

where X is expressed as a proportion. It is not necessary to solve for X' in the above formula; a table of values of X from .001 to .999 is given in Table D.13. The transformed values in Table D.13 are in radians. Bartlett (1947) suggests that $\frac{1}{2n}$ or $\frac{1}{4n}$ be substituted for $X =$ zero and $1 - \frac{1}{2n}$ or $1 - \frac{1}{4n}$ be substituted for $X = 1$, where n is the number of observations on which each proportion is based. An angular transformation may be useful when means and variances are proportional and the distribution has a binomial form. This condition may occur when the number of trials is fixed and X is the probability of a correct response that varies from one treatment level to another.

SELECTING A TRANSFORMATION

We have already described situations where particular transformations have been found to be successful. An alternative approach to selecting a transformation uses the fact that means and variances are unrelated for normally distributed treatment populations. The correct transformation to use for a set of data is the one that removes the relationship between the sample means and variances. This can be determined by graphing the means and variances on the x and y axes respectively, for each transformation and selecting the one that appears to remove the dependency relationship best. The correctness of the selected transformation can be verified by inspecting the transformed treatment distributions for normality and homogeneity of variances.

An additional procedure for selecting a transformation is to apply each of the transformations to the largest and smallest score in the treatment levels. The range within each treatment level is then determined and