8 / SPLIT-PLOT DESIGN— FACTORIAL DESIGN WITH BLOCK-TREATMENT CONFOUNDING

8.1 DESCRIPTION OF DESIGN

Subject heterogeneity is the rule rather than the exception in behavioral research. The randomized block design described earlier enables an experimenter to partially isolate the effect of subject heterogeneity in testing treatment effects. This is accomplished by using matched subjects or repeated measures on the same subject. In a randomized block design, blocks of subjects are composed in such a way that variation among subjects within each block is less than the variation among blocks. A split-plot design with repeated measures or matched subjects represents an extension of this principle to experiments having two or more treatments. This design is appropriate for experiments that meet, in addition to the general assumptions of the analysis of variance model, the following conditions:

1. Two or more treatments, with each treatment having two or more levels, that is, p levels of A, which is designated as a between-block or nonrepeated-measurements treatment, and q levels of B, which is designated as a within-block or repeated-measurements treatment, where p and $q \geq 2$.
2. The number of combinations of treatment levels is greater than the desired number of observations within each block.
3. If repeated measurements on the subjects are obtained, each block contains only one subject. If repeated measurements on the subjects are not obtained, each block contains q subjects.
4. For the repeated-measurements case, p samples of n subjects each from a population of subjects are randomly assigned to levels of the nonrepeated treatment (A). The sequence of administration of the repeated treatment levels in combination with one level of the nonrepeated treatment is randomized independently for each block. Exception to this procedure is made when the nature of the repeated treatment precludes randomization of the presentation order.
5. For the nonrepeated-measurements case, p samples of n blocks of q subjects from a population of subjects are randomly assigned to levels of treatment (A). After this, levels of treatment (B) are assigned randomly to the q subjects within each block.