SELECTION OF THE BEST TREATMENT IN A PAIRED-COMPARISON EXPERIMENT[1]

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1. Introduction and summary. In the method of paired comparisons several "treatments" under investigation are presented in all possible pairwise combinations to a judge who states which member of each pair he prefers. The experiment may be repeated by the same judge or carried out by several judges acting independently. Expressions of no preference may be permitted but we shall exclude this and other complications. The method is widely used when no meaningful absolute measurements can readily be made on the "treatments," a term which may stand for "stimuli," "objects," and the like. By concentrating on just two treatments each basic comparison is free of the confusing effects which may arise when more than two treatments are compared simultaneously. There are also situations, as in testing a variety of contact lenses for irritability, when two is the only possible block size. The results of the experiment may be summed up in the total number of preferences or the "score" obtained by each treatment. We define the best treatment as the one with the highest expected score.

This paper deals with two procedures in which the emphasis is on the selection of the best treatment. Such methods have received considerable attention in many settings since the basic work by Bechhofer [2]. Making assumptions analogous to his we obtain tables giving the smallest number of replications ensuring that with at least a specified probability the best treatment will emerge with the highest score. However, it is interesting to note that in the present case the procedure does not have the usual conservative properties associated with Bechhofer's approach.

The second method is concerned with the selection of a subset of the treatments which will include the best treatment with at least a specified probability (see Gupta [7] and Gupta and Sobel [8]). In contrast to the first method which stresses the determination of experiment size prior to experimentation this approach, as we apply it, is a method of analysis which allows the elimination of inferior treatments. Further experimentation on the selected treatments may be necessary. If a more detailed grouping or ranking of the treatments is required, without special emphasis on the best treatment, other methods of analysis are more suitable [10]. In order to guarantee the inclusion of the best member in the subset at some prescribed probability level we assume that the treatments are judged on a characteristic which satisfies a linear model. Table 2 makes the

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