A BIBLIOGRAPHY ON PROPERTIES OF EXPERIMENT DESIGN, 1950-1967

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Abstract

A number of authors have discussed such properties of experiment design as efficiency, balance, orthogonality, sensitivity, replication, blocking, and randomization. A listing of papers on properties of experiment designs from 1950 through 1967 was prepared and is presented in the present paper.
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The author has been concerned with a bibliography on most aspects of the lay-out of, the conduct of, and analysis of data from experiments. At present, a bibliography up to and including papers published in 1967 is being readied for publication. From this bibliography it was desired to obtain a bibliography on the properties of experiment designs where an experiment design is defined to be the arrangement of the selected set of treatments in the experiment; this is the subject of the paper. The selection of treatments for inclusion in an experiment design is denoted as the treatment design. The properties associated with treatment design are not considered herein.

There is a need for rigorously defining properties of experiment and treatment designs. Several formulations of definitions appear to be desirable to cover various situations. For example, one of the most useful would be a combinatorial definition. A second definition often used relates to the relationships of parameters. A third definition could be formulated in terms of the properties of \( N'W \) where \( N \) is the design matrix denoting the occurrence of treatments in blocks (or other stratification categories such as rows and columns). Other forms of defining a property of an experiment design may be useful.

Sir Ronald A. Fisher stated three basic properties of experiment design for comparative experiments and related them pictorially as follows:
Orthogonality, efficiency, and sensitivity are other Fisherian properties of experiment designs. These properties as well as several others are discussed in the papers listed below. Several of the papers deal with empirical results on a property of experiment designs, e.g. efficiency. Other papers treat a property from a theoretical or from a mathematical point of view.


Chakrabarti, M. C. [1963], On the C matrix in design of experiments. JISA 1: 8-23.


Dar, S. N. [1962], On the comparison of the sensitivities of experiments.
JRSSB 24:447-453.

Dar, S. N. [1964], Comparison of the sensitivities of dependent experiments.
Biometrics 20:209-212.


d'Herbemont, G. [1962], Considérations géométriques sur les plans d'expérimentation.


Ehrenfeld, S. [1956], Complete class theorems in experimental design. Proc.


Fry, P. R. and Taylor, W. B. [1954], Analysis of virus local lesion experiments.

Geidal, H. and Schuster, W. [1961], Zur Verrechnung von Feldversuchsergebnissen nach dem lateinischen Quadrat und dem lateinischen Rechtek. Z. Acker-
Pflanzenbau 113:425-432.


James, A. T. [1957], The relationship algebra of an experimental design. AMS 28:993-1002.

Kapse, Y. S. [1953], Efficiency of different experimental designs with special reference to intra-class correlations. JISAS 5:179-189.


Kiefer, J. [1962], Two more criteria equivalent to D-optimality of designs. AMS 33:792-796.


Lessman, K. J. and Atkins, R. E. [1963], Optimum plot size and relative efficiency of lattice designs for grain sorghum yield tests. Crop Sci. 3:477-481.

Lindley, D. V. [1956], On a measure of the information provided by an experiment. AIMS 27:986-1005.


Nair, K. R. [1952], Relation between efficiency of incomplete block designs and the intra-class correlations associated with incomplete and complete blocks. JISAS 4:149-152.


Rao, P. V. [1963], The robustness of ANOVA for a class of 2-associate PBIB designs (abstract). AMS 34:684.


Stone, M. [1961], Non-equivalent comparisons of experiments and their use for experiments involving location parameters. AMS 32:326-332.


Venturini, W. R. and Jorge, J. P. N. [1962], Eficiência do delineamento factorial 3\(^3\) em blocos de 9, em uma série de experimentos de adubação do algodoeiro. (Efficiency of a 3\(^3\) factorial design for cotton fertilizer experiments.) Bragantia 21:631-637.


vaz de Arruda, H. [1954], Efficiência do delineamento em blocos ao acaso, em experiências comparativas de variedades e híbridos de milho. (Efficiency of randomized block designs in experiments to test corn varieties and hybrids.) Bragantia 13:217-222.

Wattier, J. B. [1954], Efficiencies of alternative designs in estimating the corn yield in Iowa. M. S. Thesis, Iowa State Univ.


Abbreviations

AMS = Annals of Mathematical Statistics.

Bull. ISI = Bulletin de l'Institut Internationale de Statistique.


JRSSA = Journal of the Royal Statistical Society, Series A.

JRSSB = Journal of the Royal Statistical Society, Series B.