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ABSTRACT
              Change Group Analysis is suggested as a technique
for examining the correlates of the differential effects of a
compensatory education program within the group of enrolled pupils.
It is based on using pretest-posttest relative changes for forming
criterion groups and then using multiple disciminant analysis to
uncover patterns of predictor variables among relevant demographic,
cognitive, and affective measures. The technique's potential for
avoiding reliance on the artifactual properties of both regression
phenomena and gain scores is discussed. It is suggested that the
technique would be useful when post hoc matching or covariance
analysis might produce misleading or even erroneous conclusions about
the overall effectiveness of an intervention program. A confirmatory
empirical study is proposed. (Author)

A SUGGESTED APPROACH FOR EXAMINING THE EFFECTS OF

A COMPENSATORY EDUCATION PROGRAM

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Abstract

·A technique for examining the correlates of the differential effects of a compensatory education program within the group of enrolled pupils is suggested. It is based on using pretest-posttest relative changes for forming "criterion" groups and then using multiple discriminant analysis to uncover patterns of "predictor" variables among relevant demographic, cognitive, and affective measures. The technique's potential for avoiding reliance on the artifactual properties of both regression phenomena and gain scores is discussed. It is suggested that the technique would be useful when post hoc matching or covariance analysis might produce misleading or even erroneous conclusions about the overall effectiveness of an intervention program. A confirmatory empirical study is proposed.

Problem Statement

Analyses of the benefits of compensatory education programs have usually been directed toward describing the overall effect of these programs on the entire groups of enrolled pupils. That is, the post-treatment performance of these pupils on some criterion measure is compared with their pre-treatment performance on that same measure or with the performance of some contrast group. Indeed, in some of the more elegant designs, both pre-post absolute changes and the performance of some constrast group might be employed. These evaluation strategies are enticingly simple and

straightforward, but they potentially can lead to biased,
and even incorrect, conclusions. This point will be
elaborated upon later in this paper.

At the moment, however, it is more appropriate to
proceed with the main purpose of this paper, which is to
suggest an alternate evaluation strategy. This is a
technique for discovering the correlates of relatively
different success patterns within the group of pupils
enrolled in the program. The assumptions are that (a) not
all of the pupils will have benefited equally from the
treatment and (b) there are meaningful and systematic
correlates of these differential success patterns. The
proposed technique is addressed to such questions as, "What
kinds of pupils, from which sorts of homes, receiving what
types of instruction in which sorts of programs, and in what
kinds of communities, do relatively well (or poorly) in
Program Such-and-Such?"

Method

This proposed technique, "Change Group Analysis" (CGA),
is a combination of a simple ranking procedure and a
powerful multivariate analytic method. Pupils are ranked on
the basis of their performance on one of the customary pre-
and post-treatment measures, such as an achievement test.
Then the distributions of these measures are divided into
equal numbers of pupils. For expository purposes, they are
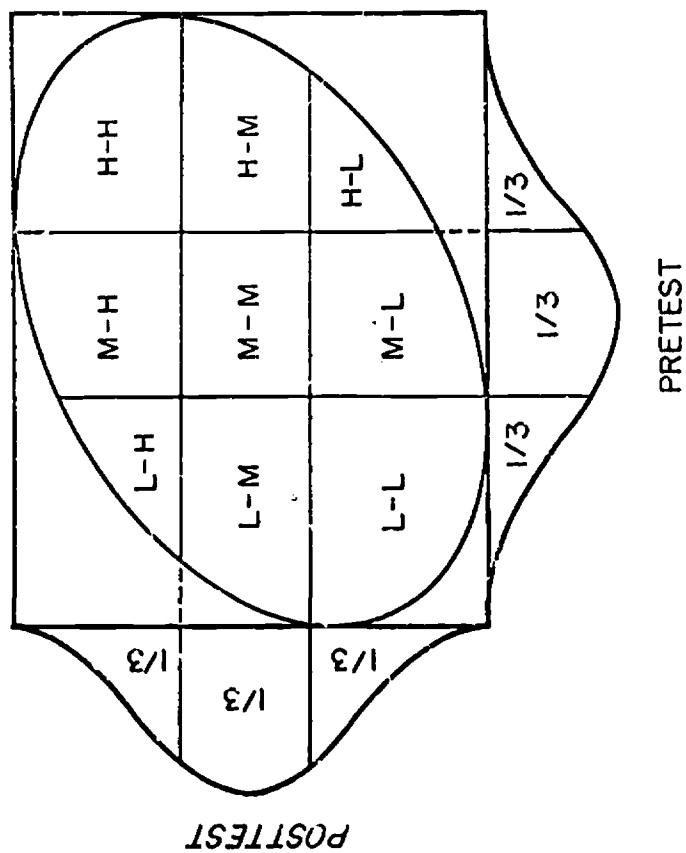here divided into thirds, as in Figure 1. In practice, the

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FIGURE 1. CHANGE GROUPS

POSTTEST

PRETEST

number of splits to be made would depend on both the number of pupils involved and the strength and shape of the relationship between the marginal variables. The bivariate distribution, when the marginals are split into thirds, is thus divided into up to nine "Change Groups" (CGs). The designations, "low-low" (L-L), "low-middle" (L-M), and so forth, indicate the initial and final relative positions of the members of each CG.

Next, all of the available and possibly relevant data on the pupils are used as "predictor" variables for multiple discriminant analysis (Cooley & Lohnes, 1962; Rao, 1952; Tatsuoka & Tiedeman, 1954), seeking maximum discrimination among the CGs. Potential predictor variables include the wealth of demographic data typically gathered in compensatory education evaluation: those on the pupils themselves, their families, teachers, schools, and communities. These data also include the cognitive and affective measures obtained in the course of the intervention program. Indeed, the variables used for forming the CGs for one CGA are potential predictor variables for other CGAs.

Discussion

The discussion of CGA must begin with what it is not. That is because, at first glance, CGA might appear to be a device for capitalizing on regression effects or for performing an analysis on gain scores without taking into account the methodological problems associated with gain

scores.

When two tests are imperfectly correlated, examinees below the mean on one test are predicted, through the use of a linear regression equation, to be below the mean on the other test, but not as far below, in standard deviation units. This predicted statistical "regression toward the mean" may or may not actually occur in fact (Hays & Winkler, 1970). When it does, we term it a "regression effect." When persons are selected for an experiment (or for an intervention program) because they deviate from the mean on some measure or on a variable related to that measure, and when that same measure is used as a posttest, these regression effects may then provide sources of invalidity for the interpretation of the results of the experiment (Campbell & Stanley, 1963).

But in CGA, it is the pupils' relative scores, rather than their absolute scores, that are used as the basis of the pupils' CG assignments. Neither a systematic movement of the group as a whole toward its population mean nor an artifactual constriction of the posttest variance would affect these relative standings.

On the other hand, suppose that the pupils in the program were members of different populations, with population parameters. If regression effects were then operating, the members of the various populations would be regressing toward different means and would be doing so at

different rates. This introduces a dilemma. Considering
all of the participating pupils to be members of the same
population, one in which there are meaningful subgroups
whose combinations of personal and program demographic,
cognitive, and affective attributes lead to different
relative changes, is the purpose of CGA. Even if all or
part of these patterns of change are due to different
regression effects, the fact is that those changes still
will have taken place. This is the dilemma: are these
differential change patterns the result of the varying
sensitivities of different subgroups to the treatment
manifolds or is it merely that a complexity of different
regression effects is being observed? It may very well be
that the extent to which program- and teacher-related
variables relate to CG membership will determine which
hypothesis will be accepted.

Although the regression-effects question is one of
obvious complexity, that surrounding the utilization of
change scores is simpler. The methodological problems
associated with the interpretation of change scores is well
documented. See, for instance, Harris (1964). But, since
CGA relies on changes in relative, rather than absolute,
performance, it is not, strictly speaking, based on change
scores. If it were, and if it were the bivariate
distribution, not the marginals, that were divided, the CGs
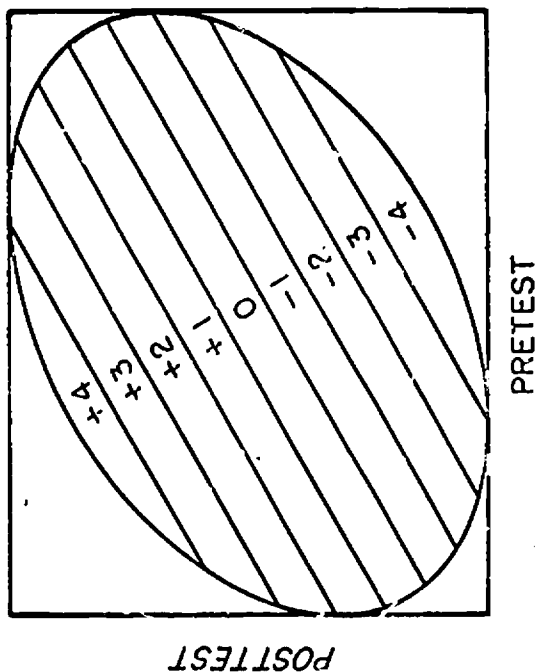would be formed as in Figure 2. But with the CGs formed as

FIGURE 2. GROUPS FORMED ON THE BASIS OF GAIN SCORES

in Figure 1, L-L, M-M, and H-H are considered to be separate groups, although the members will have had approximately equal change scores (if the pretest and posttest scores are related in a linear fashion). This is also obviously true for those in L-M and M-H and also for those in M-L and H-M. With multiple discriminant analysis, the differences among all of the CGs are maximized. That is, the intent is to separate L-L and M-M, which will have had somewhat similar performances, as much as L-H and H-L, whose performances will have differed greatly.

As already mentioned, the use of relative standings obviates the assumption of linearity of regression of posttest on pretest. It should also be noted that these measures need not be assumed to have attained an interval scale.

At the outset of this paper, it was suggested that CGA be employed for examining the relative differential effects of a compensatory program within the group of enrolled pupils, somewhat as a supplement to the more traditional approaches which focus on the absolute performances of those in the group as a whole, usually comparing the group performance with that of some contrast group. Often either this contrast group is selected through a post hoc matching technique or else the data analysis is performed with covariance analysis. For some time, the problems of interpretation following post hoc matching have been well

known (Campbell & Stanley, 1963). But covariance analysis
can also lead to misleading and even erroneous conclusions
(Campbell & Erlebacher, in press; Lord 1967, 1969). The
point here is that CGA might provide the only suitable
alternative for evaluation of a program when the evaluator
is faced with a necessary but completely ex post facto
investigation.

Further Research

The next step is to perform CGA on some real data.
Artificially-generated data would be unsatisfactory because
the rules for generating these data would have to be too
deterministic. In any event, a very large number of pupils,
on each of whom a great many relevant measures are
available, would be needed. This would normally be the case
with CGA. It is intended for the evaluation of projects
that are large-scale, at least regional, if not national, in
scope. For a confirmatory study, an even greater-than-usual
number of pupils will be needed. The reason is that this
group should be randomly divided such that two or more
parallel CGAs could be performed. The agreement of the
results obtained therefrom would provide evidence for the
consistency of the technique.

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