THE ANALYSIS OF GROUP CONTINGENCY DATA

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The data analyses utilized in group contingency projects are reviewed. Previous studies are cited to emphasize advantages of nonconsolidated ("individual") over consolidated analyses. Several procedures are described that enable applied researchers to incorporate nonconsolidated data analyses in group contingency studies.

DESCRIPTORS: group contingency, data analysis, applied research

Behavior modifiers are using group contingencies with an increasing variety of populations and problems. (Group contingencies are defined as behavior-consequence relationships in which the receipt of reinforcing or aversive stimuli for one or more of the group members depends, at least in part, on the behavior of some other group member[s].) Employment of group contingencies to reduce cash shortages in a small business (Marholin and Gray, 1976), to increase creativity among elementary school students (Glover and Gary, 1976), to increase the verbalizations of severely retarded residents (Williams, Martin, McDonald, Hardy, and Lambert, 1975) exemplify only a portion of such applications. Other authors (Greenwood, Hops, Delquadri, and Guild, 1974; Hake and Vukelich, 1972; Litow and Pumroy, 1975; Neumann, 1976) have already reviewed segments of the literature and have attempted to organize the diversity of group contingency procedures. In general, group contingencies appear of growing interest and utility to applied behavior analysts.

CURRENT STATUS

This paper deals with the types of data analyses used in studies that have utilized group contingencies in applied settings. The research designs (*e.g.*, reversal, multiple baseline) or statistical techniques (*e.g.*, *t*-test, analysis-of-vari-

ance) used in these studies are not discussed. Rather, the combination/noncombination of individual subject data is the primary concern.

In a consolidated analysis, the data of individuals within a group are combined. Typically, averages of the group responses are computed (*e.g.*, Harris and Sherman, 1973). Nonconsolidated analyses, on the other hand, do not involve combining the data of different subjects. Rather, single-subject data are presented (*e.g.*, Long and Williams, 1973). Results under both types of analyses may be subjected to statistical examination (Gentile, Aubrey, and Klein, 1972; Gottman, 1973) or may simply be presented in graphical form (*e.g.*, Harris and Sherman, 1973; Marholin and Gray, 1976). Group contingency studies can utilize nonconsolidated analyses, consolidated analyses, or a combination of both types.

The data analyses of at least three group contingency projects suggest that the exclusive use of consolidated analyses may yield ambiguous conclusions. Andrews (1972) employed a group contingency and two other conditions in a reversal design with school students. During the group contingency condition, appropriate class-

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room behavior by all students resulted in free time for the entire class. Class free time was lost if one student "misbehaved". A significant main effect indicated that task-relevant behavior was highest during the group contingency phase. Examination of individual subject data, however, only partially confirmed this finding. Three of the nine students, the three with high baseline frequencies of appropriate behavior, were not responsive to the group contingency condition; six students with relatively low baselines did react to the treatment. A nonconsolidated analysis was necessary to discern the baseline-subject responsiveness relationship in the Andrews (1972) experiment.

Frankosky and Sulzer-Azaroff (Note 1) implemented individual and group contingencies with institutionalized retarded men. During the experimental period, residents sorted colored blocks while observers monitored appropriate and inappropriate social behavior (*e.g.*, back-patting, threats) and task performance. The consolidated analysis revealed that "a higher frequency of appropriate social behavior and a lower frequency of inappropriate social behavior occurred under group task and reward conditions than under individual reward conditions". Nonconsolidated analyses found clear effects with four residents but three other subjects were less responsive. One resident increased his appropriate social behavior *but also slightly increased his inappropriate behaviors*. Reasons for such variation could not be explained. However, this variation would have been obscured if any consolidated data had been analyzed.

Neumann (1976) provided a third example. One individual and two group contingencies were employed in a study in which response maintenance, among other variables, was monitored in a token reinforcement system with chronic psychotics. Maintenance referred to the continuation of treatment effects after termination of the treatment procedures. Statistical examination of the group's data found one group contingency superior to the other *vis-a-vis* response maintenance. Both group contingencies

were superior to the individual contingency. Closer inspection of the individual data uncovered a high degree of patient response variability. Not one of the 17 subjects present during the entire experiment would be considered a model subject. That is, none of the individual profiles (*i.e.*, the nonconsolidated analyses) exactly replicated the pattern found with the consolidated analysis. Lack of strong experimental manipulations and presence of phase effects probably account for this discrepancy.

The first eight volumes of the *Journal of Applied Behavior Analysis* (1968 to 1975) were surveyed to determine the type of analyses employed within group contingency reports. Treatment articles with human subjects were included in the survey. Only 28 (8.8%) of the 318 treatment articles used group contingencies. Of these 28, 22 (78.6%) employed consolidated analyses, whereas six (21.4%) utilized both analyses. No study employed only nonconsolidated analysis. This survey, and informal evaluations of other journals, indicate that most group contingency studies use consolidated analysis.

Averaging data is especially prevalent in group contingency research, as opposed to other behavioral studies, for at least three reasons. First, group contingencies, by definition, involve other people. The group format of the clinical or experimental procedure may direct researchers toward consolidated rather than nonconsolidated analyses. Second, the overall response of the group may be of primary applied interest. The data analyses follow this practical concern. Third, gathering individual-subject data for an entire group is more time consuming than collecting group data. For instance, in a small classroom of 10 students, a teacher may simply push a response counter every time the target behavior occurs. Utilizing a response counter (or response check sheet) for each student would obviously take more time and/or be more confusing. Unfortunately, little attention has been directed toward alternative methods of incorporating nonconsolidated analyses within group contingency research.

FUTURE DIRECTIONS

Nonconsolidated analyses should be used in group contingency research. By not combining data, independent variable control over the dependent variables can be more easily monitored, maintained, and varied as experimentally or clinically required. Such experimental control and involvement with individual subjects has been valued by behavior analysts (Allen and Magaro, 1971; Baer, Wolf, and Risley, 1968; Michael, 1974). In fact, behavior analysts have eschewed group comparison or between-subject research designs because of their inability to provide a functional analysis of individual behavior (Sidman, 1960, Skinner, 1950). Use of nonconsolidated analyses may be particularly important in group contingency studies. Unplanned and possibly important interactions (*i.e.*, praise, instructions, threats) have been observed in a number of populations including juvenile delinquents (Graubard, 1969), mentally retarded residents (Frankosky and Sulzer-Azaroff, Note 1), elementary school students (Greenberg and O'Donnell, 1972; Kubany, Weiss, and Sloggett, 1971), and chronic psychotics (Neumann, 1976; Winkler, 1970). Consolidated analyses preclude the discovery and evaluation of nonresponsive subjects and subjects who influence and are influenced by others in the group.

A number of methods exist by which nonconsolidated analyses can be employed within group contingency studies along with *consolidated* analyses. The nonconsolidated results can be used in making decisions concerning the extension of phases or a change in procedure. In addition, nonconsolidated data are then available for evaluation after the study is completed. At least one of the following procedures can be utilized in most investigations:

1. Collect continuous individual information on only a subset of the group (Packard, 1970). In a class of 10, it may be impractical to gather information on all 10 students. Little extra effort, however, would be needed to monitor one or two subjects within the group. These students

would be the "target subjects" whose data would be carefully examined.

2. Divide the experimental period into segments for data-collection purposes. Only one subject in the group would be monitored per segment. Every subject would be observed in a varying pattern. The average of these individual data segments would yield the daily "group results".

3. Utilize time-sampling procedures (Kubany and Sloggett, 1973). Instead of attempting to monitor all subjects during an entire study, gather information on all subjects only during some small subset of the day. For example, a teacher might be able to collect individual data on all subjects during several varying observation periods but not for the entire class period.

4. Utilize interval recording (*e.g.*, Mitchell and Stoffelmayr, 1973) with a subset of the group. Instead of recording every incident of a behavior, only record whether or not the target behavior has occurred for the individual(s) during a specified time period. For example, a teacher in a classroom of 10 could easily check a piece of paper if one or two students engaged in the target behavior within a specified time period. Consolidated data for all students would be monitored with a response counter (or other nonselective monitoring instrument).

5. Choose target behaviors that leave "physical" products (Loeber, 1971). For example, button presses, weight measures, or test scores are much easier to observe and record than yelling, out-of-seat behavior, or eye glances. None of the latter activities leave a "trace" of their existence and, therefore, are likely to require more time and effort to record. Nonconsolidated analyses would be easier to perform with target behaviors that leave "physical products".

The particular methodology used in group contingency studies will vary from study to study. The experimental problem, the interests of the researchers, and the size of the group are among the variables that effect the selection of a monitoring procedure. Whatever method is chosen, the increased use of nonconsolidated

analyses in group contingency studies is likely to increase the utility of this area of research. "To show an orderly change in the *average* rat or ape or child is not enough, since learning is a process in the behavior of the individual" (Skinner, 1950).

REFERENCE NOTE

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