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ABSTRACT

This report outlines the limitations and weaknesses of singlecase, time-series research designs, of which the ABAB design is one of the widely used. An alternative design, the simultaneous treatment design, proposed by Browning and Stover (1971), has several advantages over the ABAB design. The design enables an experimenter to simultaneously answer two important questions: (1) to what extent is the target behavior changing? and (2) Which of several possible treatment alternatives is most effective? Unfortunately, the simultaneous treatment design has rarely been used in research studies reported to date. Two case studies are presented to illustrate the utility of the simultaneous treatment design in modifying the classroom behavior of two young children in a Headstart program. In each case a teacher and a teacher's aide recorded data and administered the treatment programs. Problem behaviors of both children were similar and each received the same treatment conditions simultaneously in a counterbalanced order: response-contingent reinforcement (Treatment A) and response-contingent time out (Treatment B). It was determined that Treatment B was significantly more facilitative than Treatment A for Child 1. However, the reverse was true for Child 2. Advantages and limitations of the simultaneous treatment design are briefly reviewed. (Author)

Selection of Behavior Modification Programs Using the Simultaneous Treatment Design: Two Case Studies

Warren C. Lowe

The prevailing research strategy in behavior modification, judging from published reports, is the single subject experimental design, and the ABAB design appears to have gained the widest acceptance from the variety of same-subject strategies which are currently available. As Browning and Stover (1971) have noted, however, there are problems associated with the widely-used reversal-replication design: (1) Stable baselines are often difficult to obtain; (2) sometimes it may be impossible to reverse or withdraw a therapeutic procedure; (3) reversing treatment conditions may pose serious problems, e.g., an inability of the experimenter to reproduce baseline behavior; (4) there may be staff resistance to discontinuing or reversing any aspects of the therapeutic procedures once desired behavioral changes have occurred; (5) the ABAB design generally requires a considerable period of time and historical confounding (Campbell and Stanley, 1966) contributes to interpretive difficulty; (6) successive replications may have the harmful effect of teaching the subject to retrieve undesired behavior more rapidly.

The simultaneous treatment design, proposed by Browning and Stover (1971), avoids most of the above-mentioned problems associated with the ABAB design and, additionally, enables an experimenter to

simultaneously answer two important questions: (1) To what extent is the target behavior changing? and (2) Which of several possible treatment alternatives is most effective? Unfortunately, the simultaneous treatment design has rarely been used in research studies reported to date. This may be due to a lack of knowledge about the practical applications of the design and/or about the statistical procedures involved.

The simultaneous treatment design combines a time series with a special Latin square design where each subject is used as his own control (Benjamin, 1965) and receives all treatments in a repeated-measures fashion. Basically, several treatment approaches are presented simultaneously and successively in counterbalanced order. It is depicted as follows:

$$A - \begin{cases} B \\ C - B \text{ or } C \text{ or } D \\ D \end{cases}$$

where "A" represents the baseline phase, and "B", "C", and "D" each represent a separate treatment procedure. This design is especially useful when an experimenter only has a short time to choose among treatment alternatives (e.g., do we manage disruptive classroom behavior by socially reinforcing cooperative behavior, by withdrawing attention from undesirable behavior, by verbal admonishment, by time-out, or by a combination of several treatments?). It is not always possible to predict the effects of a

particular set of contingencies for an individual, and the simultaneous treatment design lends statistical support to the therapy decision-makin process (McCullough, Cornell, McDaniel, and Mueller, 1974). The following two case studies illustrate the practical usefulness of the design.

Case 1: Roy was an 8 year old white male who was enrolled in the third grade of a public school in a lower middle class district. Although test results indicated that he was of average intelligence, his performance in school was far below average, and his teacher complained that he was "disruptive, hyperactive, and generally unmanageable." Unacceptable behaviors took the form of loud talking, wandering about the classroom, distracting other students, not completing assignments, and daydreaming.

The two treatments compared were similar to those used by McCullough et al. (1974). In Treatment A, Roy received social reinforcement for appropriate classroom behavior (doing assignments, remaining in desk, etc.), while disruptive behaviors were ignored. Treatment B paired social reinforcement with cooperative behaviors, and, additionally, administered "time out" for inappropriate activities. The experimental conditions were administered by the teacher and her aide in a counterbalanced order over morning and afternoon sessions for 4 days.

Results

Appropriate behavior occurred approximately 25% of the time during the 5-day baseline observation periods. Table 1 summarizes the results of the Latin square analysis. Treatment B was significantly more effective than Treatment A in modifying inappropriate classroom behavior ($p < .05$). Cooperative behavior occurred approximately 48% of the time when Treatment B was administered, but only about 29% during Treatment A administration. Treatment B was continued exclusively during the final 9 days of the study, and appropriate behavior rose to 91%. Follow-up data were obtained after 4 weeks and after 8 weeks, and appropriate behavior remained at a high level (87% and 89%, respectively).

Case 2: Carlos was a 9 year old Spanish American male who was enrolled in the third grade. Test results indicated that he scored in the low average range of measured intelligence, but school achievement was minimal. He had, in fact, repeated the second grade and was not doing satisfactory work in any area in his current class. Behavior problems were similar to those exhibited by Roy (Case 1), except that, in addition, Carlos often engaged in fights with other students, used profanity, and talked back to the teachers. Treatment programs similar to those in Case 1 were used to modify the student's behavior.

Results

Appropriate classroom behavior occurred less than 20% of the time during the 5-day baseline observation periods. Table 2 summarizes the results of the Latin square analysis. As can be seen, Treatment A was more facilitative than Treatment B ($p < .05$). Cooperative behavior occurred 41% of the time when Treatment A was administered, but less than 28% of the time under Treatment B administration. Treatment A was continued for an additional 9 days and at one-month and two-month follow-up, cooperative behavior was being maintained at 76% and 73% levels.

SUMMARY

Two case studies were presented to illustrate the utility of the simultaneous treatment design in selecting treatment programs to modify the classroom behavior of two students. In each case a teacher and a teacher's aide recorded data and administered the treatment programs. Problem behaviors of both children were similar and each received the same treatment conditions simultaneously in counterbalanced order: social reinforcement for appropriate behavior -- inappropriate behavior ignored (Treatment A) and social reinforcement paired with "time out" for inappropriate behavior (Treatment B). Using the special Latin square, repeated-measures methodology of the simultaneous treatment design, it was determined that Treatment B was significantly more facilitative than Treatment A for Child 1. However, the reverse was true for Child 2. In each case the more effective treatment

program was maintained. A handout of the statistical procedures involved in the simultaneous treatment design and summary table for the design is attached.

References

Browning, R. & Stover, D. Behavior modification in child treatment. Chicago: Aldine-Atherton, 1971.

Campbell, D. & Stanley, J. Experimental and quasi-experimental designs for research. Chicago: Rand McNally, 1966.

McCullough, J., Cornell, J., McDaniel, M., & Mueller, R. Utilization of the simultaneous treatment design to improve student behavior in a first-grade classroom. Journal of Consulting and Clinical Psychology, 1974, 42, 288-292.

Footnote

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Table 1

Source	SS	df	MS	F
Experimenters	1.38	1	1.38	2.15
$Error_1$	3.86	6	.64	
Treatments	6.27	1	6.27	7.2 *
Days	1.02	1	1.02	1.17
$Error_2$	5.19	6	.87	

Table 2

Source	SS	df	MS	F
Experimenters	2.54	1	2.54	3.43
$Error_1$	4.42	6	.74	
Treatments	4.65	1	4.65	6.2 *
Days	.36	1	.36	.48
$Error_2$	4.51	6	.75	

* $p < .05$

One Subject Latin Square Design

where: A = Experimenters
B = Treatments
C = Days

(1) G^2/mp^2

(2) ΣX^2

(3) $\Sigma A^2/mp$

(4) $\Sigma B^2/mp$

(5) $\Sigma C^2/mp$

(6) $\Sigma (ABC)^2/m$

(7) $\Sigma p^2/$

Summary Table for
Simultaneous Treatment Design

Source		df
A	(3) - (1)	(p-1)
$Error_1$	(7) - (3)	p(m-1)
B	(4) - (1)	(p-1)
C	(5) - (1)	(p-1)
$Error_2$	(6) - (1) -(7) +(3)	p(m-1) (p-1)