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ABSTRACT

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The failure to consistently promote stimulus, response, and time generalization has been a major block in the use of behavior analysis principles and techniques for the solution of social problems. The present research analyzes why consistent promotion of generalization has proven so difficult in applied settings.

An examination of the literature indicated that inadequate programming-for-generalization and the research designs in use were the explanations generally given for the failure to obtain generalization; the programming techniques and experimental designs were believed to inhibit generalization. These and related concerns were explored with the result that three issues were identified. First, the ABAB reversal design was thought to promote discrimination as opposed to generalization. Second, the concern was that the use of expected rewards (i.e. rewards that the subjects can plan on coming if their behavior meets a specified criteria) also promoted discrimination.

And third, the present language of generalization appeared inadequate to facilitate studies taking place in social settings.

The present research investigated the three issues by using a multi-element/multiple-baseline design in two classrooms. The design allowed generalization to be studied in four closely related settings in each classroom. Both teachers and students were observed across multiple behaviors. The primary behaviors examined were the types of consequences used by the teacher and the on-task and off-task behaviors of the students. Expected rewards were used in the first of two interventions.

The results revealed that both generalization and discrimination occurred for teachers and students relative to the intervention setting, but the concepts of behavioral contrast and induction fit the situation and the results with greater rigor than did generalization and discrimination. The results indicated that the ABAB reversal design and the expected rewards explanations were issues that developed out of an inadequate conceptual framework and, thus, could not be resolved. This prompted an examination of the differences between applied research and the experimental research where the present conception of generalization developed. Four differences were noted: the complexity of the response contingencies, the complexities of past history, the point at which the generalization test is made, and the reciprocal interaction between contingencies.

Out of the examination of these differences it was concluded that generalization was a problem of behavioral induction and, thus, productive research on generalization depends on the answers to two questions: How can behavior continue to be maintained or changed given initial induction? And how does induction occur for an organism who is in a different spacial/temporal location from where the intervention took place? The answer to the first was outlined in terms of the reciprocal interaction between organism and environment. The answer to the second necessitated asking two questions about the contingencies of reinforcement. They were: How do contingencies of reinforcement interact <u>within</u> the repertoire of an organism? And how are contingencies of reinforcement arranged <u>within</u> and <u>between</u> segments of an individual's history? The last chapter delineated some preliminary answers and, thus, set forth a framework for the analysis of generalization.

TO POP

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CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

Applied behavior analysis has encountered a major problem: the failure to consistently promote stimulus, response, and time generalization. Since the first recognition of the problem (Baer, Wolf, and Risely, 1968), it has been discussed increasingly in the literature, and during the last few years major research has been undertaken to find a solution (e.g., Stokes and Baer, 1977; Conway and Bucher, 1977).

Research preceding that proposed here has taken two main thrusts. The first is based on the belief that the failure to promote generalization rests with the research designs used by behavior analysts, the second on the belief that adequate "generalization programming," using behavior principles, has been left largely untapped.

Solving the design problem would require an alteration in research methodology. Solving the programming problem would require the rigorous application of behavior principles: the programmers would have to "program for generalization."

The two tactics are not mutually exclusive. Improved research designs must evaluate unequivocally the data produced by the programming, and the programming must apply behavior principles that would promote stimulus, response, and/or time generalization whenever such generalizations would be useful.

The proposed research will attempt to solve the generalization problem by both logical and experimental analysis. The logical analysis will focus on the explanations for the failure to promote generalization. The remainder of this chapter will 1) examine the concept of generalization, 2) review the criticism of research designs and programming, and 3) frame a rationale for the research proposed. The discussion of generalization and the review will provide a background for the rationale.

A. THE CONCEPT OF GENERALIZATION

Applied behavior analysts consider generalization in terms of two main categories: stimulus generalization and response generalization. When conditioned behavior is emitted under stimulus conditions different from those present in training, the term stimulus generalization is applied. There are two types of stimulus generalization. One type of stimulus generalization, referred to as <u>response maintenance</u> or <u>resistence to extinction</u>, is the maintenance of behavior in a given setting after intervention has been terminated (Kazdin, 1975 a ; Wahler, 1969). The "given setting" can be anything from the setting in which the intervention took place but has since been removed, to a setting quite distant from the intervention point (e.g., from the classroom to the home setting). The maintenance of behavior is seen as generlization across stimulus conditions because behavior change in one situation (e.g., a classroom in which a "game" intervention is in effect) may generalize to another situation (.e.g, the same classroom after the program is withdrawn). The maintenance of behavior is considered the most important issue after behavior change has been achieved (Jones and Kazdin, 1975; Kazdin, 1977a Koegel and Rincover, 1977).

The second type of stimulus generalization, referred to as transfer of training, is a transfer of behavior from the program intervention situation or setting to another in which no program has been in effect. Unlike the response maintenance situation, the intervention program is in effect when the behavior change occurs in the non-program setting. Transfer of training is the concern of most applied treatment interventions in that the behavior change achieved in one setting (e.g. ward or classroom) was trained for the purpose of being utilized in another (e.g., community or home) (Kazdin, 1977; Marholin, Siegel, and Phillips, 1976).

The categories of response maintenance and transfer of training can often go together in an intervention program. For example, in most intervention programs there could be a two-fold goal, to ensure that behavior change is continued when the individual is removed from the program (maintenance) and placed back into a non-training setting (transfer). Until recently this has not been a major concern for applied behavior analysts (Kazdin, 1977; Marholin et al., 1976; Stokes and Baer, 1977). But notice the distortion that has taken place: maintenance is considered in a <u>never-was-a-treatment</u> environment and transfer is considered <u>after</u> the termination of the intervention.

Response generalization, often referred to as <u>response induction</u>, is said to occur when changes in response classes never directly conditioned covary with changes in a reinforced response class (Kazdin, 1975a; Reynolds, 1975). The covariation can occur "within" (Garcia, 1974) or "outside" (Cooke and Apolloni, 1976) the intervention setting. Within setting response induction, for example, would involve a change in mathematics performance (e.g., number of problems correct) when on-task during mathematics (e.g., Looking at or attending to materials) is being reinforced. Outside setting response induction would involve a change in reading performance during reading period when mathematics behavior is being reinforced in mathematics period. In both cases response induction refers to the change in the probability of a response that exists in the repertoire of the individual.

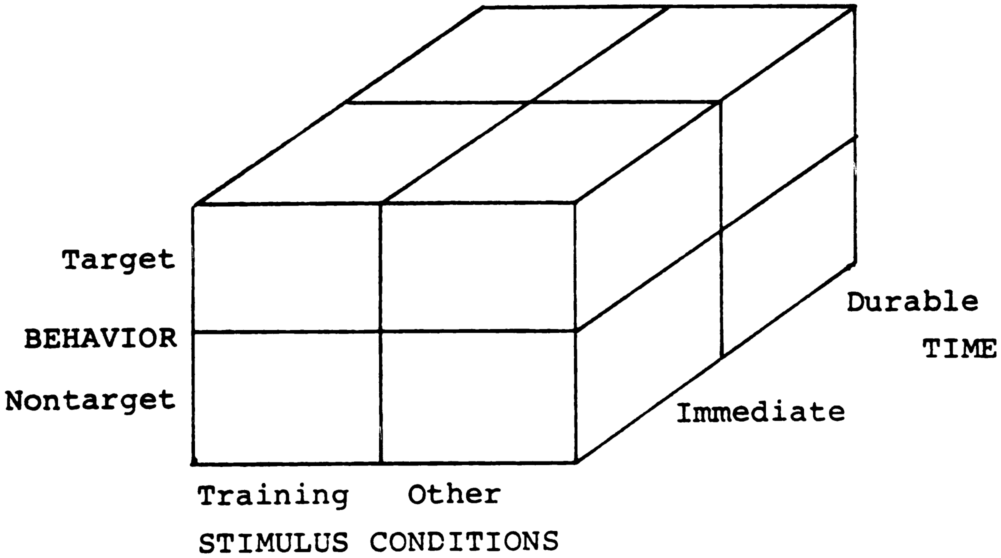
Within and outside response induction has been little explored but is of primary interest to behavior analysts.

Response induction is also closely related to "shaping". The concern is for developing a response not in the repertoire of the individual but which can be progressively approximated by using differential reinforcement on the response variations that occur. In this way a response class is induced which was not in the individual repertoire. Although response induction, as related to shaping and differential reinforcement, is important for applied behavior analysis, it has not been the concern of those interested in generalization in the applied setting.

The concept of response induction is not without its difficulties. The difficulty seems to pivot about the concept of response class with the topics of response differentiation and response variability closely involved. For example, if one has not specified a functional response class (i.e., one that is capable of measuring behavior change that could be due to the intervention manipulations) one may reach conclusions that are grossly inaccurate.

Goldiamond (1975), in a long and complex paper, advocates the use of "alternate sets" of response classes. By alternate sets he is referring to the definition and analysis of classes related to the target response class. The idea appears to be one of delineating response classes in terms of a universal set (all possible behaviors in the situation of interest are in some way included), sets (the classes normally specified as target, plus, the alternate sets which remain and fill out the universal set), and subsets (the classes involved in a micro-analysis of the response sets). Although difficult to implement, the present research attempted it.

Conway and Bucher (1977) clarify the relationships between the types of generalization: response maintenance, transfer of training, and response induction. They ask, "What behavior was changed, under what stimulus conditions, and for how long a time." They portray the relationships in a three-way matrix:



Besides the relationship between response maintenance (time on the matrix) and transfer of training (stimulus conditions on the matrix) that are mentioned above, the relationship of response induction (behavior on the matrix) to maintenance and transfer are apparent. One can see, for example, that induced behavior within or outside the training setting can be of short or long term duration. The ability to assess such three way changes (i.e., across behaviors, settings, and time) would require implementing Goldiamond's ideas on alternate sets.

It is important to explicitly state that the forms of generalization defined above are dependent variables: the maintenance, transfer, and induction of behavior are all dependent on the variation of antecedent and/or consequence stimulus conditions. In other words generalization is, in theory, explainable, predictable and controllable. It is the problem that applied behavior analysts are having in explaining, predicting, and controlling generalization that has prompted the present research.

Some of the research problems seem to be connected to terminology. Although Conway and Bucher (1977) appear to put terminology in a nice concise package, a close examination of the package leaves one with the

B. PROGRAMMING FOR GENERALIZATION

The programming for generalization approach to the generalization problem has asked and attempted to answer two basic questions: to what extent is the generalization problem being investigated and how does one program for generalization? Closely related to the above questions and of special interest is knowledge about the success or failure rate of attempts to program for generalization. At the outset it is important to realize that the categorization of programming into success or failure is extremely tenuous. First of all no researcher has as yet specified to what degree generalization must take place in order to say that the procedures used were, without qualification, successful. In general when researchers have investigated generalization in the applied setting, they have taken any situation which happens to be available even though it may not be ideal.

Second, one wonders at what point the research should be categorized as programming for generalization. When researchers investigate some form of generalization, can one say that they are programming for generalization? From the perspective of applied research with its emphasis on social relevance, one would perhaps give a spontaneous yes. But from the perspective of the researcher with more than a sprinkling of curiosity and limited resources, one's answer may even be a spontaneous no. It has only been very recently that the researcher has come to the point of specifying research activities with the needed detail in regards to generalization (e.g. Kazdin, 1975b; Koegel and Rincover, 1977).

It is with the above considerations that a reader of a review and/or a reviewer must observe generalization research to date. The review that follows will pivot around the extent to which a generalization problem exists and the techniques used for programming. Within both contexts the success or failure of programming will be examined. The coverage of the review will be across much of applied behavior analysis but will only detail examples related to the immediate research areas (i.e., teacher and student behaviors in an educational setting).

1. <u>The Extent of Generalization Research</u>

Generalization research has recently been reviewed by a number of researchers (Conway and Bucher, 1977; Keeley, Shemberg, and Carbonell, 1976; Marholin and Siegel, 1977; Marholin, Siegel, and Phillips, 1976; Warren, 1976; Stokes and Baer, 1977). Several of these address themselves to the question regarding the magnitude of the generalization problem in applied behavior analysis.

Stokes and Baer (1977) found only 270 behavioral studies relevant to generalization. Of these 120, some 44%, were classified by them as contributing to a "technology of generalization." Although they did not clearly distinguish between "relevant" and "contribute", they appear to mean in the former case any study that in an even ancillary way considered examining generalization (i.e., a two week post check by telephone as an examination of maintenance). In the latter case they appear to be concerned with some form of "rigorous" examination of generalization (i.e., a three to six month follow-up using observational procedures). Out of the thousands of studies published in the last ten or so years, to have only 270 consider generalization seems like an extremely small proportion and 120 seems even less so.

Warren (1976) focused on the Journal of Applied Behavior Analysis because it is the least practitioner oriented, and reviewed generalization research for the years 1973 to 1976. He found that 94 of the 159 studies contained in the journal could be viewed as immediately contributing to an applied behavioral technology and were connected with a real-life setting on real-life problems. Of these, 53 of the studies (56% of the sample) failed in any way to address the issue of generalization. Of the remaining 41 studies he found that 28 (30% of the sample of 94 studies) directly measured transfer of training, 20 (21% of the sample) directly measured maintenance, and 27 (29% of the sample) directly measured some form of induction.

Finally, Keeley, Shemberg, and Carbonell (1976) examined not only the extent to which researchers tackled the problem of generalization but the extent to which researchers have been successful. They reviewed the operant studies published in Behavior Therapy, Behavior Research and Therapy, and the Journal of Applied Behavior Analysis for the years 1972 and 1973 which involved manipulating environmental consequences to alter human behavior. Thus, this qualification included operant self-control but excluded modeling studies.

Of the 146 projects which met their criterion, seventeen (11.6% of total 146 analyzed) were concerned with long term maintenance (6 months or more). Three of these were called "unqualified successes." There were four which were categorized as "qualified successes" which meant that changes were in the appropriate direction, but serious methodological problems precluded a clear interpretation of outcome. Two were reported as "mixed successes" which meant that in only some of the subjects or behaviors were changes significant in the traditional or absolute sense. The remaining eight studies "represent six single case reports, and two multiple studies, which lack systematic, objective data, precluding meaningful interpretations of outcomes."

Transfer of training was investigated in fifteen studies (10.3% of total). Seven were considered failures and four were successes. The other four investigations included a qualified, a marginal, and two mixed successes. Only one of these studies examined transfer over the long-term.

Thirteen of the studies (8.9% of total) reported short-term response induction. Of these two were judged successes, one a qualified success, three as mixed successes, one a marginal success, and six as failures. None of the studies specifically measured long-term induction.

The conclusions reached by these reviewers are in general agreement. Keeley et al. (1976) state:

> The present results suggest that researchers stop flooding the literature with demonstration studies of the obvious and sometimes trivial. Continued presentation of reversal designs demonstrating nothing more than stimulus control seems unwarrented...Research establishing boundary conditions of the approach, whatever these are, is sorely needed. Also, researchers must accept the responsibility of studying complex clinical problems in complex settings.

Warren (1976) agrees but his conclusions are framed by a different perspective:

> Recommending to behavior analysts that they measure for generalization is not a novel behavior. But the discovery of how little they do it, even in the most applied situation is disheartening...[and] while the costs of generalization assessments can be quite high, their value to the field should make them worth it.

The above results, no matter how conservatively they are approached, lead to the conclusion that there is in fact an extensive generalization problem. If a technology of generalization is developing as Stokes and Baer (1977) contend, they were correct to call it an "implicit" and "embryonic" one.

2. The Techniques Used to Program for Generalization

The techniques used by the implicit and embryonic technology of generalization have been given various names and positions of importance (Cf. Kazdin, 1977a; Marholin et al., 1976; Stokes and Baer, 1977; Sundel and Sundel, 1975). Researchers utilizing the techniques have two points at which they can attempt to induce generalization. They can program the treatment environment or they can program the non-treatment environment. They can of course do both if the economic, social, and/or political resources are in their favor. But no matter where they choose to intervene, they have to manipulate in some manner the components of the contingencies of reinforcement at their disposal. The manner in which they manipulate a component or components, define a technique. For the most part, the techniques used are consistent with the experimental analysis of behavior.

The purpose here is to give these techniques an even closer relationship to the work done in the experimental analysis of behavior. This will be done by relating the techniques and the various studies which are representative of their implementation to the three terms of a contingency of reinforcement. These include the antecedent stimulus (S^D), the response (R), and the consequent stimulus (S^R).

a. <u>The manipulation of antecedent conditions</u>. Generally this is the area called stimulus control. The techniques used here are most readily employed in the treatment setting and are most applicable to programs aimed at promoting transfer and short-term maintenance. There are two primary categories of techniques. The first, often called programming common stimuli or training common exemplars (Cf., Marholin et al., 1976; Stokes and Baer, 1977), is aimed at associating the target behavior with a broad range of cues.

The use of peer trainers or tutors has proved effective because they are also in the non-treatment environment (e.g., Johnson and Johnson, 1972).

Various objects that have a high probability of appearing in the non-treatment setting can be used as part of the treatment setting (e.g., Allen, 1973; Griffiths and Craighead, 1972; Rincover and Koegel, 1975). This type of antecedent control has been called contexual control.

Multiple trainers have been used to promote transfer across individuals. This is especially prevalent in language training (e.g., Garcia, 1974; Stokes, Baer, and Jackson, 1974).

The placement of "significant others" in a problem setting has been shown effective in altering children's behavior (Meddock, Parsons, and Hill, 1971; Peterson, Merwin, Moyer, and Whitehurst, 1971; Peterson and Whitehurst, 1971; Redd and Wheeler, 1973). The concern is not for the use of the adult as a reinforcing agent but for the adults function as a discriminative stimulus. For example, the entrance of a significant other into a problem classroom could stop inappropriate behavior and set the occasion for appropriate behavior that may be part of a reinforcing contingency within the setting. In principle, if the adult is there long enough and the reinforcing contingency is strong enough, the appropriate behavior may persist in the setting when the adult is absent. Thus, transfer and maintenance occur.

The problem with these techniques is that it is in fact difficult to tell if sufficient exemplars or common stimuli have been used (e.g. Allen, 1973; Stokes, et al. 1974; Rincover and Koegel, 1975). Without the availability of reinforcement in the non-training setting, the transfer that may be achieved would be short-lived

The second category of antecedent techniques has been referred to as "instructional control" (Marholin et al., 1976) and "rule-governed behavior" (Skinner, 1969). In this case the antecedent stimulus represents a contingency of reinforcement that exists in the environment (i.e., the rule as an antecedent stimulus displayed to the individual represents all of or some fraction of the three terms for contingency of reinforcement). The rule can be represented verbally (e.g. Madsen, Becker, and Thomas, 1968; Steinman, 1970a, 1970b; Wilcox, Meddock, and Steinman, 1973) or modeled (Bandura, 1965, 1969; Frederiksen, Jenkins, Foy, and Eisler, 1976; Gladstone and Sherman, 1975; Martin, 1975). The operation of rule governed techniques are dependent on a preceding history of reinforcement for imitating and instruction following. If such a history has occurred, the rule will set the occasion for the rule related behavior.

O'Leary, Becker, Evans, and Saudargas (1969) and Packard (1970) have clearly demonstrated that instructions that have not had a history of reinforcement for being followed do not in fact alter behavior of school children. Medland and Stachnik (1972), on the other hand, have shown that once rules are given a history of reinforcement for being followed, they can at a later date exert some degree of control over the behavior of elementary school children.

But the use of explicit instructions that detail the where, when, and how of a trained behavior has also been shown to perform a discriminative function (i.e., no transfer to other settings). Horton (1975) trained two elementary teachers to use behavior-specific praise. They were told in detail where, when, and how to use it. The result was no transfer to other periods of instruction.

Lovaas, Koegel, Simmons, and Long (1973) explored transfer and maintenance of behavior that has been modeled, imitated, and reinforced. They found that the autistic children transferred but that maintenance was dependent of a supportive, reinforcing post treatment setting.

b. The manipulation of target and target-related behavior. The researcher who wishes (or has no other choice) to induce generalization by manipulating response classes is confronted with all of the problems related to response induction (i.e., the definition of response class, response variability, response diversity, and response differentiation) that were outlined in the terminology section above. It can even involve selecting a behavior that is not a primary target behavior but could lead to the development and increased probability in the non-treatment setting of a response class of primary interest. The decision one makes regarding the classification of the behaviors of interest as instances or response classes will determine if one is going to speak of generalization of these behaviors in terms of transfer of training or response induction.

But pragmatically there are three classes of techniques for inducing generalization through the manipulation of target or target-related responses. The first class involves the selection of behaviors that are compatible with or entry behaviors to other behaviors that are reinforced in the non-training environment. Baer and Wolf (1970) have used the term "behavioral trap" to define this area of techniques. These methods have been used to promote general social behaviors (e.g., Allen, Hart, Buell, Harris, and Wolf, 1964; Altman, 1971; Buell, Stoddard, Harris, and Baer, 1968; Cooke and Apolloni, 1976; Hauserman, Walen, and Behling, 1973; Hingtgen and Trost, 1966; Whitman, Mercurio, and Caponigri, 1970), language development (e.g., Martin, 1975; Merchenbaum, 1969; Schumaker and Sherman, 1970; Wheeler and Sulzer, 1970), and academic behaviors (e.g., Hay, Hay, and Nelson, 1977).

Hay et al. (1977) examined the change in elementary student on-task and academic behaviors depending on which of the behaviors was targeted. They found that academic contingencies had a reliable positive effect on on-task contingencies but the latter did not reliably change academic performance. Their findings were consistent with the literature (e.g., Ayllon and Roberts, 1974; Kirby and Shields, 1972; Ferritor, Buckholdt, Hamblin, and Smith, 1972).

The second class of techniques used to induce generalization through the manipulation of target or non-target behaviors is the selection and training of behaviors that are incompatible with the non-treatment target behavior (i.e., a behavior that is not physically possible if the trained behavior is omitted). A number of studies have reported the decrease in disruptive behaviors that were not under direct contingency control (e.g., Ayllon and Roberts, 1974; Burchard and Tyler, 1965; Marholin, Steinman, McInnis, and Heads, 1975; Winkler, 1970; Winett and Roach, 1973).

The third class of response manipulation techniques involves training a response class in which the generalization of that response class is reinforced (Stokes and Baer, 1977). The studies in the area of "creativity" utilize this technique (e.g., Goetz and Baer, 1971, 1973; Fallon and Goetz, 1975; Goetz and Salmonson, 1972; Holman, Goetz, and Baer, 1976; Parsonson and Baer, 1977). They have in general found transfer, induction, and maintenance.

Mothers and teachers have also been trained by generalized response techniques (e.g., Herbert and Baer, 1972; Parsonson, Baer, and Baer, 1974). Parsonson et al. (1974) taught teachers to administer consequences by using a wide range of examples and non-examples for both the appropriate and inappropriate behaviors of retarded preschoolers. They found that not only did the behavior of the teachers transfer but was still maintained after several months.

The obvious merit of the above types of training techniques are that one can judiciously select target behaviors that can promote generalization by virtue of their relation to non-training contingencies. The obvious drawback to the effective use of the techniques is the lack of available knowledge with regard to the interrelatedness of behaviors.

c. The manipulation of consequence conditions. The focus in this section will be upon the manipulation of positive consequence conditions. The punishment technique (e.g., response cost, time out, reprimands) will not be examined. In general the aim of the positive techniques is tied to long-term maintenance once transfer is accomplished. There are five techniques that are generally available. They include:

(1) intermittent reinforcement

(2) delay of reinforcement

(3) establishing social stimuli as reinforcers

(4) employ non-treatment personnel as reinforcing agents

(5) employ vicarious consequences.

The use of intermittent reinforcement has been shown to be effective in maintaining stable patterns of behavior (Ferster and Skinner, 1957). But it can also be seen as promoting transfer. If the subject cannot discriminate in which setting the reinforcement will occur, behavior may come to be displayed in all of them (Stokes and Baer, 1977). For example, Schwarz and Hawkins (1970) reinforced a child for good-posture, absence of face-touching and appropriate voice loudness as recorded on video tape. Mathematics and spelling sessions were shown back-to-back but only mathematics period behaviors were reinforced. The result was that spelling behaviors changed in desired directions also. In terms of the maintenance of behavior, several researchers have called attention to the fact that further research is needed with regard to human subjects and the use of intermittent reinforcement (Marholin et al., 1976; Stokes and Baer, 1977).

Delay of reinforcement procedures have been used in two ways. The first involves the delay between response and consequence (e.g., Schwartz and Hawkins, 1970), and the second increases progressively the time between token reinforcement and backup reinforcement exchange (Marholin et al., 1976). Using the second delay procedure, O'Leary and Becker (1967) found that token reinforced behavior did not decrease.

The establishment of social stimuli (i.e., praise, smiling, touching) as reinforcers has been used extensively in work with the profoundly retarded (e.g., Lovaas, Freilag, Kinder, Rubenstein, Schaeffer, and Simmons, 1966;

Long, 1969; Walher, 1969). Social stimuli have been shown to be effective in most cases (e.g., Broden, Bruce, Mitchell, Carter, and Hall, 1970; Pinkston, Reese, and LeBlanc, 1973). But a number of studies have not found social stimuli reinforcing (e.g., Lovaas et al., 1966; Quay and Hunt, 1965; Walker, 1969).

The fourth procedure for enhancing transfer and maintenance is in the use of non-treatment personnel as reinforcing agents. Parents, teachers, siblings, and peers have been employed in this capacity as behavioral change agents. The training of these individuals has received a great deal of research. Reviews have been done by O'Dell (1974) and Patterson (1971) with several other general reviews giving it considerable attention (e.g., Conway and Bucher, 1977; O'Leary and O'Leary, 1976). Researchers have shown the effectiveness of parents (e.g., Hawkins, Peterson, Schweid and Bijow, 1966; Patterson, McNeal, Hawkins, and Phelps, 1967), teachers (e.g., Madsen et al., 1968; Phillips, 1974), and peers (Bailey, Timbers, Phillips, and Wolf, 1971; Siegel and Steinman, 1975; Solomon and Wahler,1973; Surratt, Ulrich and Hawkins, 1969) in successfully modifying the behavior of deviant children.

The employment of vicarious consequences is a newly developed technique. Although studies have reported behavior changes of subjects who have not been directly exposed to the reinforcement contingencies (e.g., Bolstad and Johnson, 1972; Broden et al., 1970; Patterson, 1974; Tracey, Briddell, and Wilson, 1974), it was not until Kazdin (1973a, 1977b) began his systematic studies that one could clearly consider reinforcing the behavior of one individual as a way to change the behavior of another in the applied setting. The subject in this case is influenced by antecedent (stimulus) control but the researcher makes this occur by manipulating consequence conditions for another subject. Thus, the technique is classified in the consequence manipulation category. To classify the technique in the consequence category is a moot point. What is not moot is that the subject must have a past history of rule following in order for the treatment to be effective.

d. Contingency manipulation: package techniques. By "package technique" it is meant that the researcher uses a number of component techniques to obtain behavior change and promote generalization. For example, in teacher training, Horton (1975) used instructions (antecedent conditions), modeling (antecedent conditions), graphic displays (antecedent conditions), and intermittent reinforcement (consequence conditions) to promote behavior change and investigate transfer. He was in fact using a package of techniques all discussed above.

Games, tokens, and contracts are three of the most popular package techniques used in behavior analysis research. As implemented to date, they all have one element in common: expected rewards. Expected rewards are of interest at this point because they are seen as powerful methods for rapidly changing behavior but at the same time are seen as techniques that impede the maintenance of behavior. If one is programming-for-generalization, the ability to change behavior rapidly in the intervention setting is important but it is as equally if not more important to maintain the behavior change once the intervention has been terminated. Thus, it seems important that such a problem is resolved.

Essentially, expected rewards can be defined as preintervention statements that describe the contingencies of reinforcement under which an individual will be operating during an intervention. For example, in classroom game procedures, the specification of the game's rules delineates the contingencies; in token economies the rules for token reception spell out the contingencies; and in behavioral contracts the rules of the contractual arrangement represent the contingencies. Expected rewards are, thus, rules or contracts representing contingencies. In all these cases the contingencies are specified prior to the instatement of the intervention.

At least two studies have concerned themselves with expected rewards and the findings were that expected rewards led to faster extinction than unexpected rewards. The authors concluded that a prestatement of contingencies clearly restricted the maintenance of focal behavior (Resnick, Forehand, and Peed, 1974; Kazdin and Polster, 1973).

For some the resolution of the problem of expected rewards seems to deal with the relationship between contracted rewards and intermittent reinforcement, one of the basic procedures for the facilitation of behavior maintenance. The question for these researchers has become one of how do you make explicit the <u>how much</u> and the <u>whats</u> of a contingency contract and still maintain unexpected rewards? According to Kazdin (1975a), "intermittent reinforcement can be readily incorporated into all programs" and that "it is important to make the schedule of reinforcement increasingly intermittent", but how one goes from one explicitly negotiated contract to another, where the second requires more behavior for the same reward, is not explained. A number of writers have attempted to develop techniques but few of these have been evaluated or have been put in a contract context (Schaefer and Martin, 1966; Krumboltz and Krumboltz, 1972; Walker and Buckley, 1974; Macht, 1975).

Levine and Fasnacht (1974) have taken another approach. They have discussed expected rewards in the context of intrinsic and extrinsic reward. They warn that expected rewards may preclude generalization and maintenance because they are extrinsic rewards, rewards perceived by the subject as being external to the behavior being rewarded. The argument they present is that intrinsic rewards, rewards that are connected to or are derived from the behavior being rewarded, would foster generalization and maintenance of behavior. Some examples of extrinsic rewards would be pay, promotion, fringe benefits, etc. Intrinsic rewards would include those over which the individual has a high degree of self-control and are a part of the activity itself (Notz, 1975). The problem with connecting intrinsic and extrinsic rewards with expected rewards is that one turns to internal mechanisms for explanations and, thus, loses contact with what can be manipulated: the contingencies of reinforcement.

One obvious way to resolve the problem of expected rewards would be to discontinue their use, but there are two reasons for not doing so. First, there are the positive aspects of expected rewards, one of which is allowing individuals to check their progress against an established standard, and another is the immediate effect expected reward procedures have on target behaviors. Second, the specification of an expected reward is for the most part a statement of an instructional objective and, as such, represents the application of a foundational concept in educational technology. Both contain the conditions under which behavior is to occur, the behavior, and the performance standards for the behavior. Expected rewards also specify the consequences. To restrict their use in the area of applied behavior analysis would be unwarranted given the evidence to date.

The above unresolved matter of expected rewards will likely remain a mystery until it is seen by the applied researcher as resulting from a larger underlying issue. The issue phrased as a question is: what contingency is being established? Skinner put it as follows:

> Arranging contingencies of operant reinforcement is often confused with describing them. The distinction is as important as that between contingency shaped and rule-governed behavior (1974).

This emphasizes that the contingency established by a researcher is not necessarily the one the subject responds to. The behavior may be of the same form but the controlling variables are different. Thus, they are different operants as are contingency shaped and rule-governed behaviors with the same topography. Beiser (1974) suggests that the contingency that is established might be called the strategy of contracting and not the target behavior of interest. The differences in the controlling variables between the two behaviors appears to be related to the formation of a discrimination in which it is only reinforcing to respond when contractual arrangements in the form of games, tokens, contracts, etc. are available. If this is the case, faster extinction would occur during the non-contract situations. The present research attempts to assess the extent to which expected rewards are involved in the establishment of discriminated behavior which is detrimental to the maintenance of behavior.

C. EXPERIMENTAL DESIGNS AND GENERALIZATIONS

The discussion of the experimental design explanation will focus on the two major designs used in applied behavior analysis research: The ABAB reversal design (ABAB design) and the multiple baseline design (MB design). The ABAB design involves the switching of baseline and intervention conditions. The MB design staggers the introduction of interventions for different behaviors, settings, and/or individuals. The variations of each design simply involve the use of more interventions and/or the use of various staggering strategies across varying numbers of behaviors, settings, and/or individuals.

The experimental design critics have outlined a number of inadequacies in the ABAB and MB designs. It is the purpose of this section to examine and then evaluate their comments in relation to research on generalization.

1. <u>The ABAB Design</u>

The ABAB design and its extensions (e.g., A-B-A-B-BC reversal design) functioned for an extensive period as Applied Behavior Analysis' main approach to the determination of functional relations resulting from the manipulation of the independent variable and the changes occurring in the dependent variable. But as applied research progressed from an emphasis aimed at demonstrating functional relations between basic behavioral principles and behavior to one of developing a technology of behavior, it was expressed by many that the ABAB design was inadequate for the task (Hensen and Barlow, 1976; Kazdin, 1973b, 1975a; Kazdin and Bootzin, 1972; Marholin et al., 1976).

Kazdin (1973b, 1975a) cites two defects in the ABAB design. In the first he states that the abrupt change in procedures that characterize the design, reduce the probability that generalization will take place. The abrupt changes, it is said, provide cues that lead to a discrimination between reward and non-reward conditions. Tennov (1976) adds that such cues are increased when expected rewards (e.g., tokens, games, and contracts) are utilized. Essentially the argument is that the experimental design is in principle operating like a discrimination training session. The result is a preclusion of generalization.

The second charge of inadequacy is that of multiple-treatment interference. Multiple-treatment interference exists when prior treatments are not erasable and, thus, does not allow the behavior to return to baseline when the reversal condition is reinstated (Campbell and Stanley, 1966). Such interference is often called a carry-over effect (Hensen and Barlow, 1976). A number of researchers have encountered this problem (e.g., Hawkins, Peterson, and Bijou, 1966; Medland and Stachnik, 1972).

The point of importance is that the multiple-treatment or carry over effect is in fact a description of non-reversibility which is generalization. It is this occurrence of generalization that is believed to break up the possibility of clearly issuing a cause and effect statement about the effectiveness of the intervention (independent variable) on the behavior of interest (dependent variable). Because one must be able to make clear cause and effect statements about the intervention before generalization can be usefully evaluated, the non-reversibility of behavior precludes the use of the design in the study of generalization. This argument is easily dismissed if one realizes that the thinking behind it is related to seeing the ABAB design in terms of _intra_-subject replication. If one uses the design in terms of _inter_-subject replication, the design can be used to assess cause and effect, and generalization. Marholin et al. (1976) has stated that the return-to-baseline condition is actually a transfer probe. This is true only if one sees the ABAB design as an inter-subject replication procedure.

Although the multiple-treatment argument can be dismissed, the discrimination argument cannot. The extent to which the charge is true needs to be evaluated. If it is in fact true, the number of designs available to study generalization have been essentially reduced by 50%.

2. _The MB Design_

The MB design problems have been pointed out by Kazdin (1973, 1975a, 1975b, 1975c), Leitenberg (1973), and later by Hensen and Barlow (1976). The major concern with the design as related to generalization is the problem of interdependent or interrelated behaviors, situations, and/or subjects. Leitenberg (1973) describes the interrelated behavior problem as follows:

> "If general effects on multiple behaviors were observed after treatment had been applied to only one, there would be no way to clearly interpret the results. Such results may reflect specific therapeutic effect and subsequent response generalization, or may simply reflect nonspecific therapeutic procedure under investigation" (p. 95).

Of importance for the MB design is that the interdependence problem is a description of the occurrence of generalization.

The absence of a specific effect is assumed to suggest that some extraneous event, rather than treatment, may have led to changes across several behaviors. The result is that cause and effect statements cannot be made.

Kazdin (1975c) further outlines the problems with the MB design by pointing out the inconsistencies in the design's basic assumptions. He states:

> ...the design appears to depend upon two <u>conflicting</u> assumptions about the influence of experimental events: (1) Any confounding influences (extraneous events occurring in time) will affect more than one of the behaviors; and (2) Any nonextraneous events (treatment) will only affect the specific behavior for which it is introduced... If the behaviors selected in a multiple-baseline design are independent (uncorrelated), it may be that either extraneous events or the intervention would only have specific effects (i.e., alter one behavior at a time). If the behaviors are correlated, either extraneous events or the intervention might produce generalized effects (1975c).

The result, Kazdin (1975c) points out, is that when a study shows that the onset of an intervention for one behavior is associated with changes in another behavior as well, it is as equally plausible to attribute the changes to some extraneous events or to the treatment. With these generalized changes, the problem is not being able to decide whether extraneous or intervention events produced the changes. Again, no clear cause and

Three recommendations are given: (1) collect data across baselines (e.g., behaviors, individuals, and situations) which are especially likely to be independent, (2) use as many baselines as possible, and (3) introduce a temporary "reversal" for one of the behaviors to assess the role of the intervention (Kazdin, 1975c). The first is of little help to the applied researcher because of the possibility of interrelatedness in the behaviors of interest. The applied setting does not often allow such a selection of behaviors under the best of conditions. The second recommendation does not seem to have any logic behind it. For example, if you had ten baselines and with one intervention four behaviors changes, you still have the same dilemma: the rival extraneous events could still be the cause and not the intervention. The third recommendation, the use of a temporary reversal phase, puts one right back with the discrimination problem of the ABAB design. The only conclusion left to the investigator interested in establishing reliable techniques for assessing generalization is that even if generalization is achieved, the results cannot be used to demonstrate that the techniques employed are in fact causally related to the outcomes.

What both of the above analyses have overlooked is that the occurrence of interrelated behaviors, situations, and/or subjects is a <u>description</u> of the occurrence of generalization. Viewed in this way interrelatedness as a problem is dismissed in the same way that the carry-over effect was dismissed for the ABAB design: by seeing the design from the perspective of <u>inter</u>-subject replication and not <u>intra</u>-subject replication. Taking such a perspective leads to the ability to issue a causal statement even if the specific determining variables cannot be assessed. The determination of specific controlling variables leaves a new problem: the one of going from reliability to generality (i.e., going from a point of knowledge that allows one to repeat a phenomenon to the point where the necessary and sufficient conditions for the production of the phenomenon is known). One has in effect replaced one problem with another. But like having the right question, having the right problem is critical. Going from reliability to generality is a difficult task. Its importance was noted by Sidman (1960) when he pointed out that it indicates the growth of a science.

In summary, the multiple-treatment and the interrelatedness problems of the ABAB and MB designs respectively are outgrowths of going from description to explanation. When it is said that multiple-treatment effects or interrelatedness of behaviors, situations, and/or subjects is occurring, one is in fact describing the occurrence of generalization and not explaining it as related to the experimental designs. What makes the problem conceptually difficult is that the multiple-treatment effects and interrelatedness problems are rival explanations to treatment effectiveness in terms of going from reliability to generality which is related to the degree of specificity of the causal statements made. Viewing the designs from an inter-subject replication perspective allows one to make causal statements regarding the assessment of generalization. It is only when the designs are used to both examine the occurrence of generalization and replicate the findings within a single subject that problems develop.

The design problem that remains for examination is the discrimination charge made against the ABAB design. The resolution of the other design problem left a new problem: that of going from reliability to generality. The ability to make such a move is dependent on more than just the available experimental designs but depends as much as anything on the conceptual framework within which the researcher works. It is at this point that the problems of terminology discussed earlier become important; for it is terminology that forms the elements of any conceptualization.

D. RATIONALE FOR THE PRESENT RESEARCH

The relationship between the design, programming for-generalization, and conceptual problems mentioned in the introduction and detailed throughout the rest of the chapter comes down to this: programming attempts to overcome all variables that could counter generalization; but the experimental designs and conceptual issues, respectively, can establish situations that impede the development of generalization and/or cloud one's analysis of it. The result is an anomaly: the attempts at securing generalization meet with both success and failure.

It seems evident that there are designs that structure situations in such a way as to prevent or hinder programming techniques from success. The possibility of failure can be due to the form of the environmental structure set up by the investigator as in the ABAB design and the related discrimination problem, or the structure of behavior as in the interrelatedness of behaviors problem. Both are associated with determining specific causal effects.

Allied with design problems, there are the expected reward programming techniques that are thought to impede generalization, and terminological issues that could impede the analysis and synthesis of findings. The result is a conflict between programming for and the evaluation of generalization which leads not only to continued anomaly, but to an unnecessary restriction in the range of usefulness to which applied behavior analysis could be put. Such a possibility necessitates a resolution. One starting point for the eventual resolution could be an experimental investigation of the various programming, terminological, and design problems. This is the purpose of the present research.

The form of the present investigation involves a complex design that could both preclude and foster generalization depending on the perspective one takes on the environmental arrangements it utilizes. The interventions employed were set up so that there was an increase in reinforcement control with each additional intervention. The complex design and hierarchical interventions were selected because they logically allowed one to examine the point at which programming could overcome design structure that generally would preclude generalization and/or the point at which weak programming would be facilitated by design factors. In the last case a non-conflict, harmonious program and evaluation design exist, and generalization results. The research started with only the basic design worked out. The interventions were instated when the data and applied setting allowed it to happen.

In summary, the researcher realized that another attempt to program for generalization would only add a plus or minus to the attempts to program for generalization. An attempt to discover why such failures or successes occurred was of far greater interest. The first step in solving such a problem involved reviewing the elements of the controversy. The present chapter outlined them. The next step was to design an experiment like the one outlined above and then carry it out. How that was done and what was found is delineated in the following chapters.

CHAPTER II

PROCEDURES

Three ingredients were seen as necessary if not sufficient conditions for exploring the problems related to generalization as outlined in Chapter I. The first of these considerations involved behaviors that could be recorded reliably over extended periods of time but yet complex and sensitive enough to assess any possible behavioral changes within and between experimental settings. The second necessary aspect involved teacher instated procedures that could be trained successfully in a short time and economically managed by the teacher once in operation. The third necessity was the need for an experimental design that was complex enough to allow for the exploration of as many possible behavioral changes as can take place given as few interventions as possible.

The primary behaviors selected for the teacher were teacher delivered consequences and non-consequence teacher behavior. For the student they were on-task and non-task. The behaviors for both teachers and students were further subdivided in order to do a microexamination of the changes due to the teacher instated intervention. The teacher directed interventions selected involved group contingencies via a classroom game procedure directed at increasing student on-task behaviors. A second intervention procedure employed teacher administered attention (as a consequence behavior).

The experimental design utilized was a multi-element/multiple baseline design across behavior (students and teachers) and settings (mathematics and reading). The multi-element component of the design, because it alternates intervention periods within a setting (e.g., mathematics period), allowed for further assessment of setting (stimulus) generalization. Each of these conditions will be outlined in detail below.

A. BEHAVIORAL DEFINITIONS

The purpose of this section is to outline the logic for and the relationships involved in the various student and teacher behaviors utilized in the present research. Appendix A contains detailed definitions and examples of behaviors for both students and teachers.

The primary goal in the establishment of the behavioral definitions was to develop behavioral categories that were universal sets of teacher and student behaviors. The aim was to categorize the sum total of the behavior emitted by either students or teachers into sets relative to the target behaviors. The sets would then be broken down into subsets so that the change or non-change in a behavior could be examined at a micro-level. This approach is analogous to the examination of response differentiation as done in the experimental analysis of behavior. The terminology problems discussed in Chapter I guided this analysis. The general categories and their relationships are outlined below.

1. <u>Teacher Behavior</u>

The target behavior for teachers was a set described as "teacher delivered consequences". The alternate set was described as "non-consequence behavior." This two set combination incorporated in it all the teacher behavioral repertoire in the classroom (the universal set). Each of these two sets was further divided into subsets.

The teacher delivered consequence set was subdivided in three different ways: in terms of type, category and direction. The "type" set contained two subsets: continuation or change. A "continuation consequence", as it was called, related to comments or actions by the teacher that had the double function (like in a chain of behavior) of being both a reinforcement and a discriminative stimulus for the student to continue the behavior he or she was performing at that particular time or related to some past activity which the student had engaged in.

The "change consequence" related to comments or actions by the teacher that had the double function of being both the presentation of an aversive stimulus and a discriminative stimulus for the student to change the behavior he or she was performing at that particular time or related to some past activity which the student had engaged in.

The "category" set of consequence behavior contained four subclasses: academic, on-task, general attention, and physical contact. An "academic" consequence was related to comments by the teacher pertaining to the students academic behavior "I like the way you solved that word problem, Mary," was an example of the academic category.

The "on-task" consequence behavior was concerned with comments by the teacher related to the students being task oriented. "Jim, thank you for staying in your seat during math," was an example of the on-task category related to continuation consequences.

The "general attention" category of consequence behavior was concerned with comments by the teacher that related to what the teacher thought of the student as a person or what the student did outside of class. Two examples would be, "Mary, you have a great smile," and "Zelda, your soccer goal in yesterday's game was terrific." Both fell within the continuation consequences category.

The "physical contact" category was concerned with the contact the teacher gave to a student. A pat or hug were considered examples related to the continuation consequence; a slap or kick were related to the change consequence.

The third set of teacher consequences, the "direction" set, was concerned with who the teacher was interacting with. The "direction" set was made up of three subclasses: class, group, and individual. If the teacher was interacting with the class, it was marked as such. When a group was being addressed, it was marked as such. If the teacher was instructing an individual, it was thus recorded. The "individual" set was broken down into targets and non-targets. The targets were given a recording number in each class and, thus, when a group was addressed with a target in it, the direction of attention a target received was recorded.

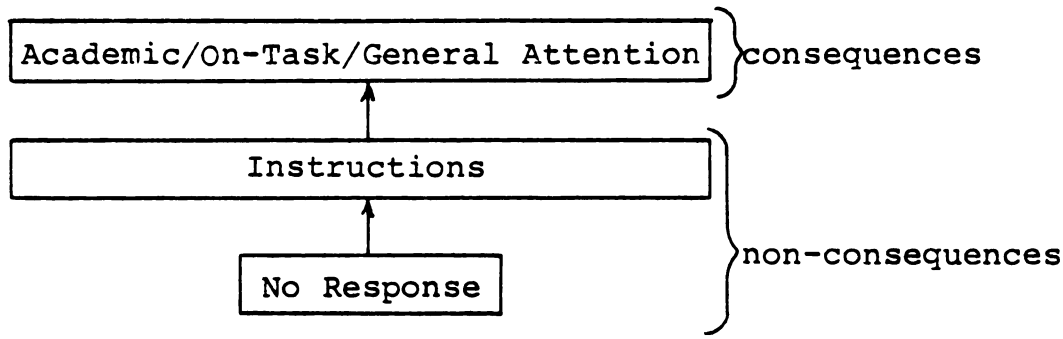
The non-consequence set of teacher behaviors was subdivided in two ways: in terms of category and direction. The direction subset exactly matches that outlined above in the teacher consequence section. The "category" set contained subsets of instruction and no response.

The "instruction" category involved behavior by the teacher directed at shaping a student's performance before or during a task activity. "There are four new words in today's vocabulary builder ... now say then with me ...," is an example.

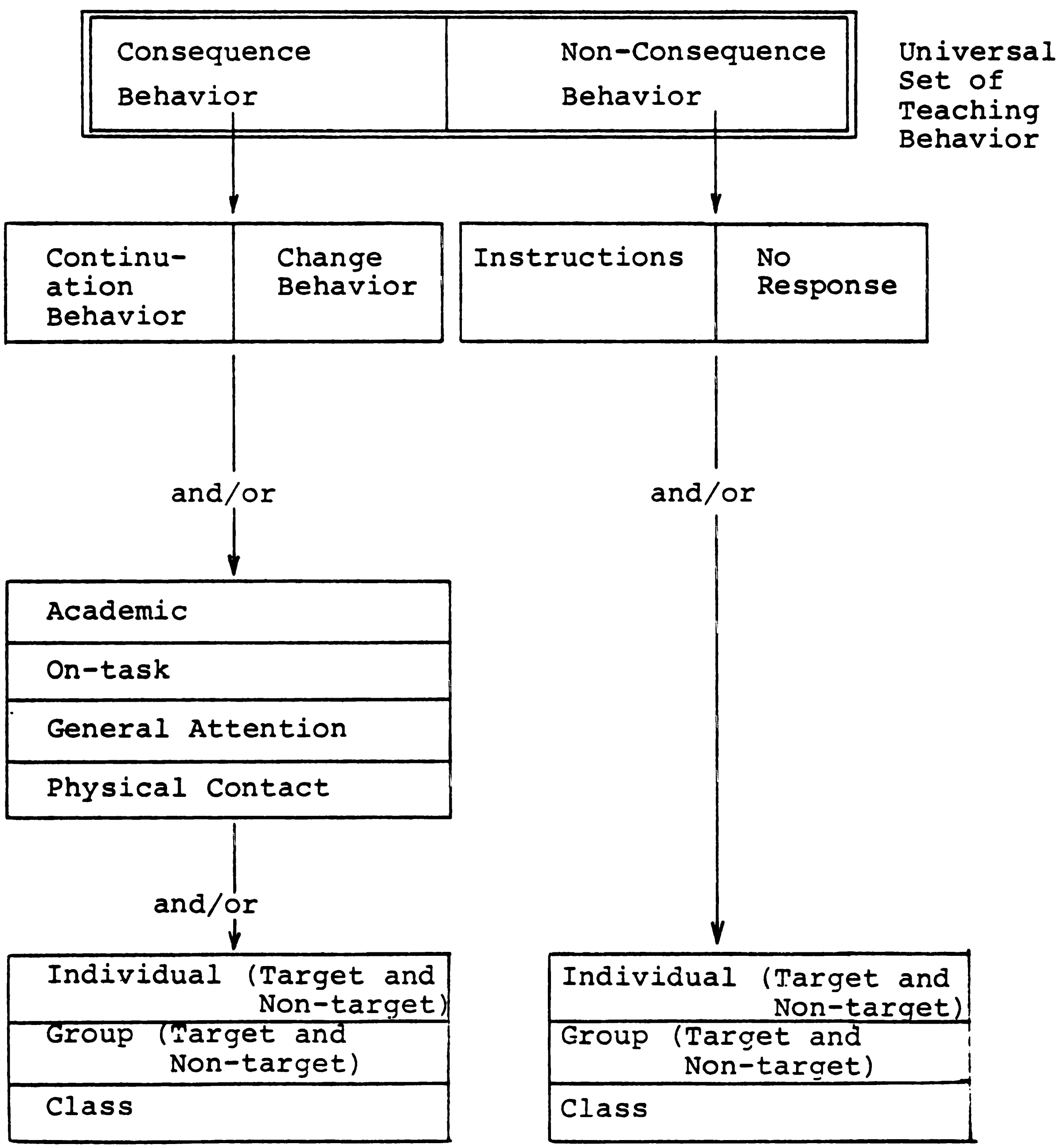
The directions and comments by the teacher were also included in the instruction category. Directions related to statements by the teacher that gave the student an academic task to do. One example related to the class was, "Everyone, please read pages 95 to 110." Comments were statements concerned with granting permission to do a task, general information questions not related to instruction, and statements directed at some non-academic event that was to take place. "Yes, you can go to the office when you are finished," was an example of a comment.

The "no response" category included times when the teacher was not interacting with the students. This included times when the teacher was out of the room, sitting at the desk alone, etc. For recording simplicity the instruction, directions and comments categories where collapsed into one category.

Because the ten-second recording intervals employed could contain more than one category, a hierarchial recording technique was employed. For example, if an interval contained instructions and an on-task comment, the interval was marked on-task. In the hierarchy no response gave way to instructions which in turn yielded to general attention, on-task, and academic categories. The three forms of consequences almost never overlapped. The general purpose of the hierarchy was to emphasize the target behavior set of consequences. The hierarchy can be pictured as follows:



The relationship of sets to subsets of teacher behavior can be represented as follows:



With behaviors thus classified, a detailed analysis of change due to a particular intervention was possible.

2 . Student Behaviors

The target behavior for students was a set described as "on-task". The alternate set was described as "non-task" behavior. These two sets encompassed the entire repertoire of student behaviors. Each of these two sets was further divided into two or more subsets.

"On-task" was divided into the subsets of independent-study and teacher-directed. Independent-study on-task was defined when the student was working alone or with one other student (without teacher present) and he or she was following the teacher's directions and/or classroom rules. Examples would include events like working mathematics problems during mathematics time. Non-examples would include sitting looking out the window or drawing during mathematics period.

Teacher-directed on-task behavior was defined when the student was working with the teacher on a one-to-one basis or as part of a teacher-directed group of students. Examples included reading alone with others in the group with the teacher or reading silently per teacher instructions with teacher present.

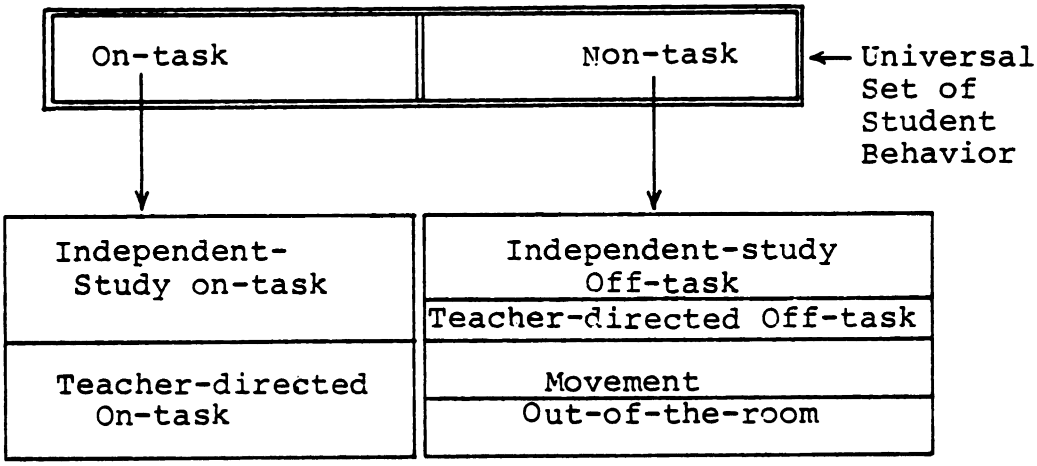
The "non-task" set of behaviors was divided into four subsets: independent off-task, teacher-directed off-task, movement, and out-of-the-room. "Independent off-task" was indicated when the student was not following directions or classroom rules while working independently or with one other student. Talking to a co-worker or just looking out the window were examples.

"Teacher-directed off-task" was defined when the student was off-task with the teacher present. Examples included such events as striking another child while in a teacher directed reading group or talking during the directed activity when the directions were to read silently.

"Movement" was defined when the student was out of his or her seat without permission, directions, and/or paper or book in hand. Talking to neighbor when out of their seat and, in general, any non permissioned out-of-seat behavior was scored as movement.

"Out-of-the room" was defined when the student was at some special activity out of the room or on an errand for the teacher. Other out-of-the-room non-permission instances were classified movement.

The relationship of sets to subsets of student behavior can be represented as follows:



As with teacher behaviors, such a classification allowed for a detailed analysis of change due to a particular intervention.

B. EXPERIMENTAL DESIGN

1. General Description and Logic

The study employed a multi-element/multi-baseline design across subjects, settings, and behaviors. The design was developed from an <u>inter</u>-subject replication point of view. The aim was to examine as many situations as possible. Each of the settings or situations was seen as a point on a generalization gradient. Its gradient position depending on the distance (temporally and/or substantively) from the intervention point (the setting in which the stimulus conditions, antecedent and/or consequent, are manipulated. With such a design, it was possible to examine in detail the change in any number of behaviors across situations. Multiple subjects allowed for the replication of any pattern of behavioral change that might take place.

A graphic illustration of the design is presented in Figure 2.1. The ordinate describes the various subjects and settings that are related to the multiple baseline portion of the design. The subjects include teachers and students; the settings are the morning reading period and the afternoon mathematics period. The two classrooms were not visualized as settings in terms of a point on a generalization gradient. They were, instead, conceptualized as experimental replications. The idea was to see if the two classrooms would produce the same patterns of behavior change (generalization) across their various settings.

The abscissa depicts two settings that are related to the multi-element portion of the design. By multi-element it is meant that there is a rapid alternation of situations (Sidman, 1960; Ulman and Sulzer-Azaroff, 1975). In the present case the situations are represented as different days of the week and concomitant stimulus conditions where interventions do or do not occur (X's and O's respectively). The X's were called game days, i.e., days on which the good behavior game intervention was applied to the mathematics period. The O's were called non-game days, i.e., days on which the game was not applied. The dashes (—) represent weekend or planned vacations. The consecutive calendar days represent the exact number of days in the study exclusive of the prebaseline phase.

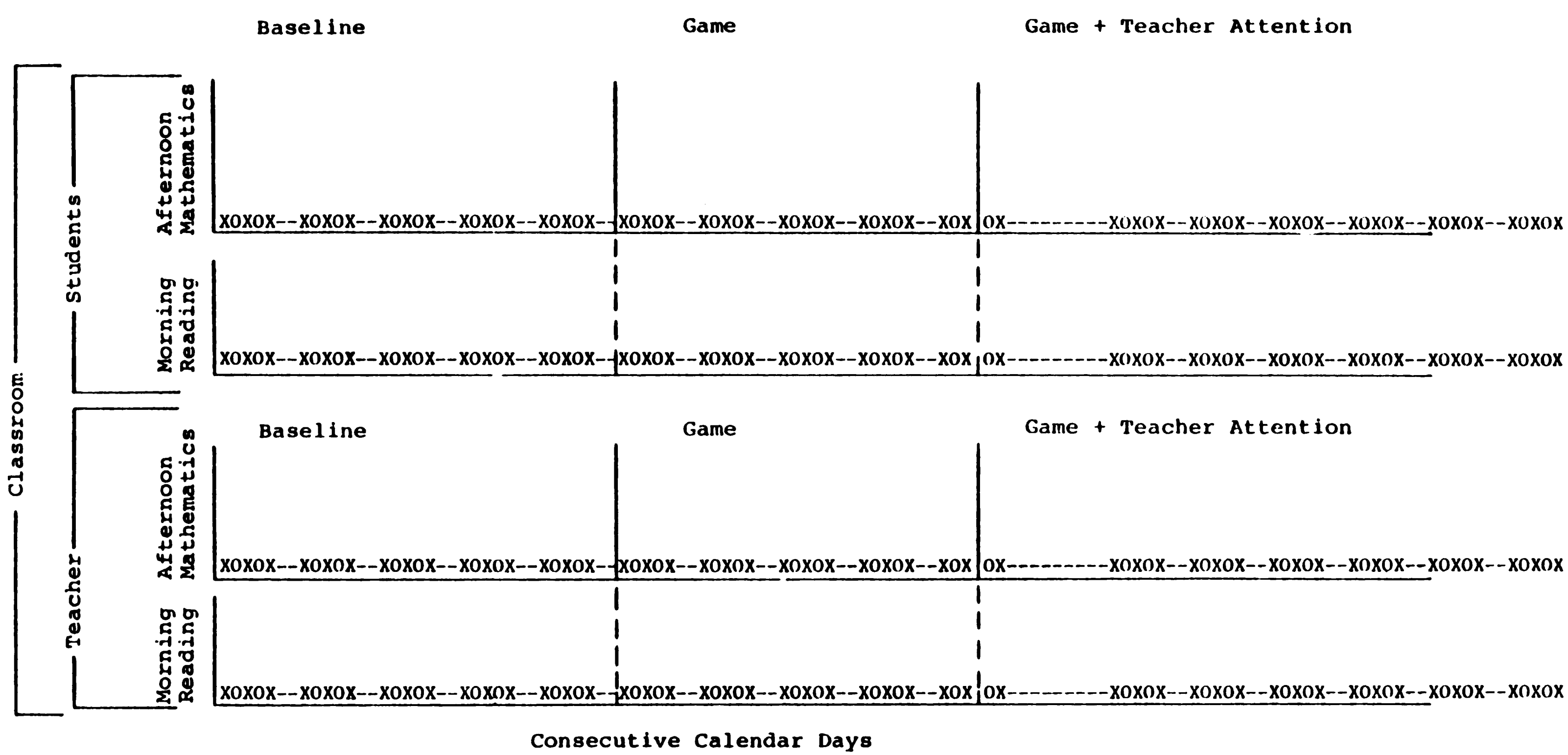


Figure 2.1. Multi-element/multi-baseline design across subjects, settings, and behaviors.

As part A of Figure 2.2 indicates, the game was only applied to the afternoon mathematics period. All game days occurred on Monday, Wednesday, and Friday; and all non-game days occurred on Tuesday and Thursday. Part B of Figure 2.2 presents the situations where the second intervention, teacher attention, is applied. Notice that the game intervention was continued during the second intervention. In each of the situations, the multiple teacher and student behaviors described in the Behavioral Definitions section of this chapter were examined.

2 . Experimental Phases

The experimental design involved four phases: Prebaseline, Baseline, Game, and Game plus Teacher Attention. The details of each phase are presented in the Experimental Procedures section of this chapter. The general structure and flow of activities is described here.

a. Prebaseline. The purpose of this phase was to (1) train observers to use equipment and reliably record, (2) have students and teachers adjusted to observer presents, and (3) work out the behavioral definitions so that they were as similar as possible between classes. The phase lasted three weeks.

b. Baseline. The purpose of the phase was to determine the operant level of student and teacher be-

A. First Intervention:

	(X's) GAME DAY (Monday, Wednesday, Friday)	(O's) NON-GAME DAY (Tuesday, Thursday)
Morning Reading Period		
Afternoon Mathematics Period	+	

B. Second Intervention:

	GAME DAY (Monday, Wednesday, Friday)	NON-GAME DAY (Tuesday, Thursday)
Morning Reading Period	*	*
Afternoon Mathematics Period	* +	*

Figure 2.2. Experimental settings examined in the multi-element/multi-baseline design. The plus (+) indicates the first intervention (the good behavior game) point and the asterisk (*) indicates the second intervention (teacher attention) points. Note that the game is still utilized in the second intervention.

haviors. Game training started during the last week of the phase. The phase covered four weeks.

c. Game. The first intervention, the good-behavior game, is introduced on Monday, Wednesday, and Friday of the afternoon mathematics period. The three other settings (game day reading, non game day mathematics, and non-game day reading) continued baseline conditions. Teacher attention training started the last week of the phase. The phase covered almost five weeks.

d. Game plus Teacher Attention. The phase began officially the day after the teachers were shown the graphs of their consequence behavior and asked to apply to their classrooms what they learned about attention as a consequence for student behavior. Teacher administered attention was considered a supplementary intervention during the game period and the only intervention directly in operation during the other three periods. The extent to which attention could modify or maintain game initiated changes was of interest. The phase lasted seven weeks, one of which was spring vacation.

C. EXPERIMENTAL PROCEDURES

1. Subjects and Setting

a. Setting. The research took place in two elementary classrooms of the second and fifth grades. The elementary school was located within a large university community in central Michigan. The community can be characterized as well educated and middle class. The population could in general be characterized as stable or non-transient.

b. Teachers. Both of the teachers who participated in the research had over ten years teaching experience and their master's degree. Both showed reluctance to participate; the reasons were related to their personal situations, time commitments, and the use to which the research results would be put (i.e., professional evaluation). After meeting with the experimenter and the principal they gave their consent.

c. Students. Fourteen students were selected for observation by their respective teacher, seven from each class. Two of the second grade subjects were lost after baseline; one moved away and another went on a vacation that extended throughout the first intervention phase. The twelve remaining students all had average or above average I.Q.'s that ranged from 100 to 130. All came from intact families.

Each teacher's criterion for student selection was non-specific; it included students who were considered slow with class assignments but it also included those who were ahead on class assignments. In general, they selected students they thought would be interesting to observe, not necessarily ones who had problems related to the behavioral measures being utilized in the present research.

2 . Observation and Recording Techniques

a. Observers: training and reliability. Four observers were used throughout the study. They were undergraduate seniors with interests in educational programs. Observer training occupied the three weeks of the prebaseline phase. The training involved (1) out-of-class recording practice, (2) in-class recording practice, and (3) the development of behavioral definitions.

The out-of-class practice occupied the first week of the prebaseline phase. It involved role playing and observation of the role players as well as preliminary development and memorization of the behavioral categories. The in-class observational practice lasted the rest of the prebaseline phase (2 weeks). Practice at this time involved a procedure where two observers observed the same student or teacher and then debriefed themselves with the experimenter. During the debriefing they first determined the reliability of the recording session and then went over the intervals where disagreements existed and/or interesting events relating to observing/recording had occurred.

Reliability was determined by matching recording sheets interval by interval and then dividing the number of agreements by the number of agreements plus disagreements and next multiplied by 100. In this way reliability was expressed in terms of percent agreement. The reliability criterion required of all observers before the start of baseline observation was 85 percent over the last five reliability checks of four minutes or longer. Reliability checks during the study were carried out weekly on all observers. The experimenter checked an observer by connecting an earphone to the observers cassette recorder, waited for the first line recording cue and then recorded in the identical recording sheet location as did the observer. All checks were four minutes in length.

b. <u>Observation techniques</u>. Two observers recorded during the morning reading periods and two observers recorded during the afternoon mathematics periods. Both teacher and students were recorded simultaneously, meaning that two observers were in the classroom at one time. Two observation samples were taken for each classroom period of morning reading and afternoon mathematics. The samples ranged from 12 to 18 minutes for each observation sample. The result was from 24 to 36 minutes of observation per classroom period, per day. The general recording procedure is as follows: A sample of at least 12 minutes was taken in the second grade classroom of both teacher and students and then the observers moved to the fifth grade classroom which was just beginning the period. After at least 12 minutes of recording both teacher and students in the fifth grade, the observers moved back to the second grade for another 12 minute sample. Finally, the observers moved to the fifth grade for the last sample of at least 12 minutes. This procedure was followed both morning and afternoon. The fluctuation in observational samples was due to the classes having late or early lunch, extra activities (e.g., art, theater, library), and other school programs. In general, classes were from 40 to 55 minutes in length.

Observation within a sample was done on a time sample basis. Each of the seven students were observed sequentially with an observation/record interval of 3 seconds in length. Momentary observation was used with the rest of the three second interval delegated to recording. The procedure was as follows: on cue the observer looked at the first student just long enough to classify the individuals behavior and then recorded it. A second cue informed the observer to turn to the next individual and observe and record. This continued throughout the seven students and then the observer was told to pause. This cycle was repeated twice each minute for 12 minutes and then a one minute observer rest pause occurred. Thus, each student was recorded twice each minute. The result was that each student was observed from 48 to 72 times per class, per day. Students were not aware that they were being recorded individually. Momentary observations taken within 40 seconds of each other (in the present case 30 seconds) have been shown to approximate continuous recordings.

Because of the interest in independent study behavior (as mentioned in the Behavioral Definitions section) a minimum criterion of 15 independent study observations had to be taken per class for the data to be considered as a representative sample. A minimum criterion of 72 observations had to be taken per class in order for the data to be considered as a representative sample of teacher behavior.

Several pieces of apparatus were used by the observers to assist them in the observation and recording of student and teacher behaviors. Recording was done on 21.8 by 35.8 cm recording forms designed specifically for the recording procedures employed (see Appendix B). The teacher and student observer observation/sample of student independent study behavior.

The teacher observations were done concurrently with the students but a 10 second observe/record time sample was used. Again the observation was broken into main blocks of 12 minutes with 6 recordings per minute.

This resulted generally in from 144 to 216 observations per class, per day. Variations outside this range were caused by the teacher leaving the room, consulting with room guests, or equipment breakdown. Due to these exigent situations a record cues were controlled by minature recorders (Sony model TC-56) utilizing pre-programmed cassettes and earphones. The teacher wore a small wireless transmitter (Edcor model PM-1R) and the observer wore a small receiver (Edcor model PR-1R). The teacher observer was, thus, able to follow the teacher's verbal behavior in great detail.

3. <u>Intervention Procedures</u>

Two intervention procedures were employed in the present research. The first was a classroom behavior game which utilized group contingencies. The second was a teacher attention procedure which focused on altering the rate of teacher consequences. The teacher training related to these techniques will be discussed in the Teacher Training Procedures section which follows. The present section will examine the composition of these techniques and their use in the experimental classrooms.

a. <u>The group contingency game procedure</u>. The successful use of group contingencies in the classroom has been well documented (e.g., Barrish, Saunders, and Wolf, 1969; Harris and Sherman, 1973; Medland and Stachnik, 1972; Packard, 1970; Turner, Konarski, and

Johnson, 1976). In general, a group contingency involves a continuum of procedures which have been divided into three main types: independent, dependent, and interdependent group contingencies (Litow and Pumroy, 1975; O'Leary and O'Leary, 1975).

An independent group contingency is established when the same response contingency is simultaneously in effect for all group members, but consequences are given to individuals meeting the response criterion. An example would be to require that in order to receive extra free time each individual of the group must complete 20 math problems during math period. Those who meet the criterion get the free-time those who do not will not receive extra free-time. Expressed as a contingency of reinforcement, the independent group contingency would be as follows:

$$S^D \longrightarrow R \longrightarrow S^R$$

Same rules given to all members of the group.

Some response required for all members of the group.

Consequence given to <u>only</u> those who meet the response criterion.

A token economy is an independent group contingency.

A dependent group contingency is established when the response contingency is in effect for some subset of the group, but consequences are delivered to all the members of the group. For example Ascare and Axelrod (1973) modified the off-task behavior of a few children in various classrooms by having rewards for the class contingent on the reduction of inappropriate behavior. The concept of peer pressure is involved in this group contingency form. Represented as a contingency of reinforcement, the dependent group contingency would be described as follows:

$$S^D \longrightarrow R \longrightarrow S^R$$

S^D: Response rules apply to a subset of the group

R: The same response criterion is required for the subset of individuals

S^R: Consequence is given to all if subset meets response criterion

An interdependent group contingency is defined when the same response contingency is simultaneously in effect for all group members at a group level, and consequences are delivered if group meets group response criterion. For example, Schmidt and Ulrick (1969) used classroom noise level as a criterion for earning a special activities time. The interdependent group contingency represented as a contingency of reinforcement would appear as follows:

$$S^D \longrightarrow R \longrightarrow S^R$$

Response rules apply to the entire group

The same response criterion is applied to all as a minimum or maximum.

Consequence is given to all if group level criterion is met.

In the interdependent contingency, one individual can keep the group from earning the specified consequence. Both the dependent and interdependent group contingencies involve the use of peer pressure to lessen the change of group lose of reinforcement due to a few individuals not following the behaviors that are reward contingent.

The present study uses a variation of the interdependent group contingency that is often called a good-behavior game (Barrish et al., 1969). Here each classroom is divided into two groups each of which had the same contingency in effect. On-task behavior (see Appendix A) served as the response and a minimum criterion was set at 12 of 18 teacher made observation checks of the groups. If the whole group was on-task, it was given a point. A point could be gained by both groups. If one or both of the teams met the response criterion they won the game. The prize was extra free-time and a chance to wear the symbols which represented a winning team effort. (The present study used arm bands for the second grade and sun visors for the fifth.)

The teacher made observational checks were controlled by prerecorded cassette tapes programmed on a VI3' schedule. The teacher varied the tapes so that the room level signal could not be predetermined. The students were also informed that the teacher would not observe the groups exactly on the signal and that the signal only served as a reminder to her to observe the groups in the near future. A wrist counter was used to record observations.

At the start of a game period (mathematics), the teacher introduced the game, put up a large game sign, asked students to repeat the rules of the game, put on their symbol if they had won the last game, and started the tape recorder. The announcement of winning groups was made at the end of the period. Appendix contains further details on the use of the game procedure.

b. <u>The teacher attention procedure</u>. The systematic use of teacher attention was one of the first behavior intervention techniques to be applied to the classroom. It remains one of the most effective and widely used means of changing children's behavior (O'Leary and O'Leary, 1976). The effectiveness of attention has been demonstrated across various subjects (e.g., Madsen et al., 1968; Hall, Fox, Willard, Goldsmith, Emerson, Owen, Davis, and Porcia, 1971), settings (e.g., Schutte and Hopkins, 1970; McAllister, Stachowiak, Bear, and Conderman, 1969), and Behaviors (e.g., Madsen et al., 1968; Kirby and Shilds, 1972).

Attention is considered a consequence the teacher administers contingent on student behavior. The type of attention examined by the present study was divided into continuation and change attention delivered by the teacher. (A detailed presentation of teacher consequence behavior is given in the Behavioral Definitions section and in Appendix A.) The teachers were not asked to deliver a particular rate of attention to students as did Horton (1976) but to just use it as often as possible. The experimenter used prompts and praise during the attention phase to get the teacher to increase continuation attention and decrease change attention. Teacher attention training (see the Teacher Training Procedures section below) emphasized the analysis and kind of use to which attention could be put.

4 . Teacher Training Procedures

Teacher training was divided into two parts. The first, game training was designed to be of short duration so that there would be a clear transition point between baseline and the first intervention. The second, attention training, was longer in duration and involved a less clear transition point between phases. The details of the training are as follows:

a. Game training. The experimenter conducted game training lasted three one and one-half hour sessions that coincided with the termination of baseline. At this time an experimenter developed reinforcement menu was administered by the teachers to their respective classes (Appendix C).

The first part of the training included how a game procedure works, the necessary considerations for setting up a game, an outline for the introduction of a game, and a sample of behaviors to which the game was to be applied. The details of this content is given in Appendix D.

After the introduction to the game procedures, the teachers were asked to decide on the student composition for each team (two teams per class), the rewards the winning team(s) was to get (winners symbol and type of extra free-time), and the name of their game. With the help of the experimenter the teachers determined the specific rules of the game for their class, organized their game introductions, and practiced with the equipment used in the game (tape recorder and wrist counter). Finally, the teachers were asked to role-play their introductions to the game. At no time during this training was teacher attention or the use of social rewards mentioned.

b. Attention training. The heart of the attention training covered five one and one-half hour sessions which coincided with the termination of the Game I phase. Three of these meetings occurred before spring break and two after. The content of the sessions revolved around the use of teacher administered consequences. The analysis of teacher consequences to student behaviors utilized the behavioral definitions used in teacher observations (see Behavioral Definitions section of this chapter and Appendix A) and a graphic display of the teachers consequence behavior. The use of objectives, modeling, shaping, cues, and rules were covered within the context of a simple experimenter developed behavioral teaching model (see Appendix E). The teachers were asked to read Changing Children's Behavior by Krumboltz and Krumboltz. Finally, they were asked specifically to increase their rate of continuation consequences and try to lower their use of change consequences.

A week after the above training, the experimenter met the teachers to inform them of the changes that had occurred. They were asked again to increase their continuation consequences and decrease their change comments. Following this meeting the experimenter continued unsystematically to praise and inform the teachers of their progress in increasing continuation consequences and decreasing change consequences.

In terms of the stimulus control over the teachers use of consequences, the experimenter repeated on a number of occasions, "...that continuation consequences should be used as often and wherever possible." The information given them about their consequence behavior covered both reading and mathematics periods across game and non-game days.

5. Summary and Schedule of Experimental Procedures

Figure 2.3 summarizes the schedule of research events in terms of time periods (date, days of the week, number of school days), experimental procedures in effect (conditions), and the functions of teachers and observers during each experimental condition.

Date	Days of the week	Number of School Days	Conditions	Teacher Function	Observer Function
Jan. 3-21	M-F	15	Prebaseline	1. Instruct class 2. Delineate class schedule and rules 3. Instruct class	1. Observational practice until reliability meets criterion 2. Assist in formulation of final student and teacher behavioral definitions
Jan. 24-	M,W,F	15	Baseline	1. Instruct class 2. Attend in-service sessions to learn about good-behavior game (Feb. 21,22,23) Note: 2nd grade teacher starts game on Feb. 25	1. Observe students and teachers from 24 to 36 minutes per class period and take reliability.
	T,Th	10	Baseline		
Feb. 28-March 30	M,W,F	14	Game (Math) Baseline (Reading)	1. Instruct class 2. Administer Game to students	1. Observe students and teacher from 24 to 36 minutes per class period and take reliability
	T,Th	9	Baseline (all classes)	1. Instruct class 2. Start attention training (March 28, 29, 30)	1. Observe students and teachers from 24 to 36 minutes per class and take reliability checks
March 31-May 20	M,W,F	19	Game (Math) Attention (all classes)	1. Instruct class 2. Administer game 3. Give Attention 4. Finish attention Training (April 12, 13)	1. Observe students and teachers from 24 to 36 minutes per class and take reliability checks
	T,TH	13	Attention (all classes)	1. Instruct class 2. Give attention	1. Observe students and teachers from 24 to 26 minutes per class and take reliability checks

Figure 2.3. Research Schedule.

CHAPTER III

RESULTS

The complexity of the behavioral definitions, the number of subjects observed, and the extended duration of the study resulted in a voluminous amount of data. The extent of the study can be realized when it is recognized that over a quarter of a million data points were acquired during the course of the observations. Data management, even with the computer, proved to be an extensive task. The reason for this being that computer software is not presently available for the study of the longitudinal research done from an $N = 1$ perspective. Although work has and is being done in this area, useful (validated) software is still in the future (Owen White, personal communication, 1977).

The results that follow are concerned with assessing the patterns of behavioral change for students and teachers within and between experimental settings. The patterns of change presented are related to the three problems of generalization research outlined in Chapter I: terminology, experimental design, and programming for generalization.

A. OBSERVER RELIABILITY

Over the course of 76 experimental days, observer reliability checks were performed 41 and 40 times for student and teacher observers respectively. The assessments were divided equally between the four observers and within each classroom. This averaged to a reliability check just under every fourth experimental day for each observer. The distribution of reliability checks across phases was rectangular.

The reliability for student observations averaged 93.2% with checks ranging from 78.5 to 100%. The distribution of reliability scores was negatively skewed with four of the 41 checks being 85% or less and 15 being equal to or greater than 95%. The reliability for the Baseline, Game, and Training phases of the study were 91.5%, 94.6%, and 94.7% respectively. The three percent discrepancy between Baseline and the other phases was due to a teacher rule in one of the classrooms, the problem was eliminated by the second day of baseline.

The reliability of teacher observations averaged 94.2% with checks ranging from 80.8% to 100%. As with the students, the distribution of teacher reliability scores was negatively skewed. Of the 40 checks, three were 85% or less and 20 were 95% or better. The reliability for the Baseline, Game, and Training phases of the study were 92.3%, 94.6%, and 95.4% respectively. The increase in reliability across phases appears to be due to practice and/or the rate of change in response categories used by the teacher.

B. STUDENT BEHAVIOR

Independent-study time gives a clear picture of how the teacher structured the student's classroom activities. It represents the time the student spent following (or not following) teacher direction but was not in direct contact with the teacher. Independent-study time is used as a measure because, first, the remaining time is group time (i.e., the time the student was in contact with the teacher, individually or in a small group); second, most of the student's time was spent in independent-study; and third, the student's on-task behavior (the target behavior for the game intervention) during group-time was almost always at or near the ceiling (i.e., 100%).

Table 3.1 gives the mean percent of classroom-time, per setting, student, and grade spent in independent-study. The percentages are a little higher than "actual" independent-study time because when the teacher addressed the class, the student was recorded as being involved in independent-study. Almost all teacher instruction was individual or small group, and thus, the percentages are not greatly discrepant. For both the second and fifth grade students, the percentage of time spent in independent-study was in the mid- to high-nineties across mathematics

TABLE 3.1. The mean percent of classroom-time spent in independent-study by student, experimental phase, and setting for each grade (classroom).

Grade	Subject	Phase	Morning: Reading Game Day	Morning: Reading Non-Game Day	Afternoon: Mathematics Game Day	Afternoon: Mathematics Non-Game Day
GRADE 2	S1	Baseline	77.0	85.7	97.7	97.6
		Game	75.0	79.9	97.4+	98.0
		Attention	97.1*	78.0*	98.4+*	96.8*
	S2	Baseline	92.7	85.4	96.6	93.8
		Game	78.3	78.5	90.5+	95.6
		Attention	88.7*	85.4*	94.1+*	95.1*
	S3	Baseline	91.5	89.9	93.4	95.2
		Game	85.1	87.6	99.0+	97.5
		Attention	83.8*	97.0*	95.9+*	94.5*
	S4	Baseline	75.0	84.5	97.8	98.1
		Game	84.2	79.2	97.6+	97.5
		Attention	96.4*	79.2*	98.2+*	97.2*
	S5	Baseline	90.4	84.8	98.7	97.7
		Game	79.9	80.2	97.4+	96.9
		Attention	98.9*	81.8*	96.2+*	92.7*

+ - Settings and phases in which the game procedure took place.

* - Settings and phases in which teacher attention was to be increased.

Grade	Subject	Phase	Morning: Reading Game Day	Morning: Reading Non Game Day	Afternoon: Mathematics Game Day	Afternoon: Mathematics Non Game Day
GRADE 5	S6	Baseline	90.1	84.5	94.7	95.5
		Game	74.9	92.8	93.9+	95.0
		Attention	87.0*	90.2*	87.6+*	88.9*
	S7	Baseline	72.3	71.2	97.5	96.7
		Game	70.1	98.1	98.6+	96.9
		Attention	81.0*	60.7*	97.2+*	97.1*
	S8	Baseline	89.3	87.3	97.2	94.7
		Game	78.2	89.0	97.7+	95.7
		Attention	76.2*	95.4*	98.0+*	97.6*
	S9	Baseline	90.3	94.6	94.0	95.1
		Game	96.4	97.9	94.1+	93.9
		Attention	90.6*	88.2*	93.2+*	92.2*
	S10	Baseline	72.4	62.2	95.8	95.2
		Game	73.1	96.9	94.4+	94.5
		Attention	75.5*	61.9*	96.4+*	99.7
	S11	Baseline	93.7	97.5	96.2	95.6
		Game	87.8	87.2	95.2+	95.1
		Attention	100.0*	98.0*	92.9+*	95.3*
	S12	Baseline	88.8	79.3	98.1	97.4
		Game	75.4	92.9	96.5+	94.7
		Attention	85.4*	90.4*	95.4+*	94.3*

(P.M.) settings (game day and non-game day) and phases (Baseline, Game, and Teacher Attention). Both teachers had for the most part individualized mathematics instruction.

The percentage of independent-study time during reading (A.M.), across settings (game day and non-game day) and phases (Baseline, Game, and Teacher Attention), was lower and more variable in both classes than it was during mathematics. The lower percentage was attributed to the teachers' use of small group reading techniques. The variability within reading (i.e., between the two readings settings) was attributed to the somewhat scheduled meeting time with a particular group. The variability across phases was for the most part attributed to the changing of text books. Each time the teacher changed the text a group was using, they would spend a little more time with that group for a week or so.

In general, both classes were structured the same in terms of the manner in which students spent their time. The greatest portion of the students time being given to large amounts of student-directed study-time. It is this portion of the students time to which the analysis turns.

The student's independent-study time had three subcategories: on-task, off-task, and movement. Of the three on-task was of the greatest interest because the game intervention was directed at altering it and clear change patterns emerge from it.

Table 3.2 gives the mean percentage of on-task behavior during independent study-time across settings and phases for both the second and fifth grades. Looking at the table it can be seen that the second grade has stable mean percentages across settings during the baseline phase. The mean percentage of on-task behavior for each student varied only for morning reading game day (Monday, Wednesday, and Friday). In all cases on-task behavior for reading game day was lower than the other three settings which were within three percentage points for all students.

Table 3.2 shows that the Baseline phase on-task behavior for the fifth grade was more variable than it was for the second grade. On-task in the mathematics settings was the least variable. Here, all students had their mean percentages for the two settings within five percentage points of each other. The variability across reading settings was much greater, from 5% to 24%.

After the Baseline phase and with the instatement of game intervention, on-task behavior began to vary across subjects and settings for both grades. The patterns of change that resulted are relevant to the investigation of generalization and experimental design.

The second grade on-task data of table 3.2 is presented in figure 3.1. Part A of figure 3.1 gives the mean baseline on-task percentage and shows the variability across subjects for each setting. Part B of the figure shows the proportion of change in on-task behavior for the Game and

TABLE 3.2. The mean percent of on-task behavior for indpendent-study-time by subject, experimental phase, and setting for each grade (classroom).

GRADE 2

		SETTING			
		Morning		Afternoon	
Subject	Phase	Reading Game Day	Reading Non Game Day	Mathematics Game Day	Mathematics Non Game Day
	Baseline	50.3	55.1	57.8	53.8
S1	Game	44.1	40.1	53.3+	38.4
	Attention	50.2*	51.5*	62.9+*	41.3
	Baseline	49.0	55.1	57.1	53.4
S2	Game	60.0	41.3	58.5+	32.1
	Attention	52.2*	60.3*	66.3+*	40.6*
	Baseline	59.0	63.4	65.7	65.4
S3	Game	54.4	52.6	50.9+	56.7
	Attention	58.8*	60.0*	69.9+*	49.6*
	Baseline	50.8	61.1	58.8	60.7
S4	Game	41.1	45.0	47.2+	42.8
	Attention	39.7*	58.2*	72.8+*	44.7*
	Baseline	41.3	59.4	57.6	59.7
S5	Game	62.6	55.1	55.0+	52.6
	Attention	65.1*	66.3*	71.4+*	47.2*

+ - Settings and phases in which the game procedure took place.

* - Settings and phases in which teacher attention was to be increased.

GRADE 5

		SETTING			
		Morning		Afternoon	
Subject	Phase	Reading Game Day	Reading Non-Game Day	Mathematics Game Day	Mathematics Non-Game Day
	Baseline	65.8	76.2	51.3	46.6
S6	Game	72.3	82.0	74.3+	36.1
	Attention	61.4*	60.8*	63.5+*	33.0*
	Baseline	71.2	47.1	35.9	31.6
S7	Game	81.6	73.7	70.7+	28.6
	Attention	76.9*	84.5*	61.9+*	28.5*
	Baseline	55.1	43.4	34.2	37.9
S8	Game	36.1	47.6	60.4+	36.0
	Attention	52.4*	63.6*	52.4+*	32.6*
	Baseline	42.0	54.1	40.1	35.2
S9	Game	39.9	56.4	36.7+	32.1
	Attention	45.2*	64.4*	54.6+*	32.9*
	Baseline	64.5	49.4	61.2	60.1
S10	Game	60.8	66.4	77.4+	42.3
	Attention	70.7*	82.1*	67.6+*	34.8*
	Baseline	14.4	19.2	35.5	34.7
S11	Game	24.1	22.3	58.5+	24.2
	Attention	21.1*	35.8*	46.0+*	23.4*
	Baseline	64.2	40.5	46.6	47.4
S12	Game	39.7	52.1	65.3+	35.5
	Attention	53.8*	59.1*	58.0+*	28.2*

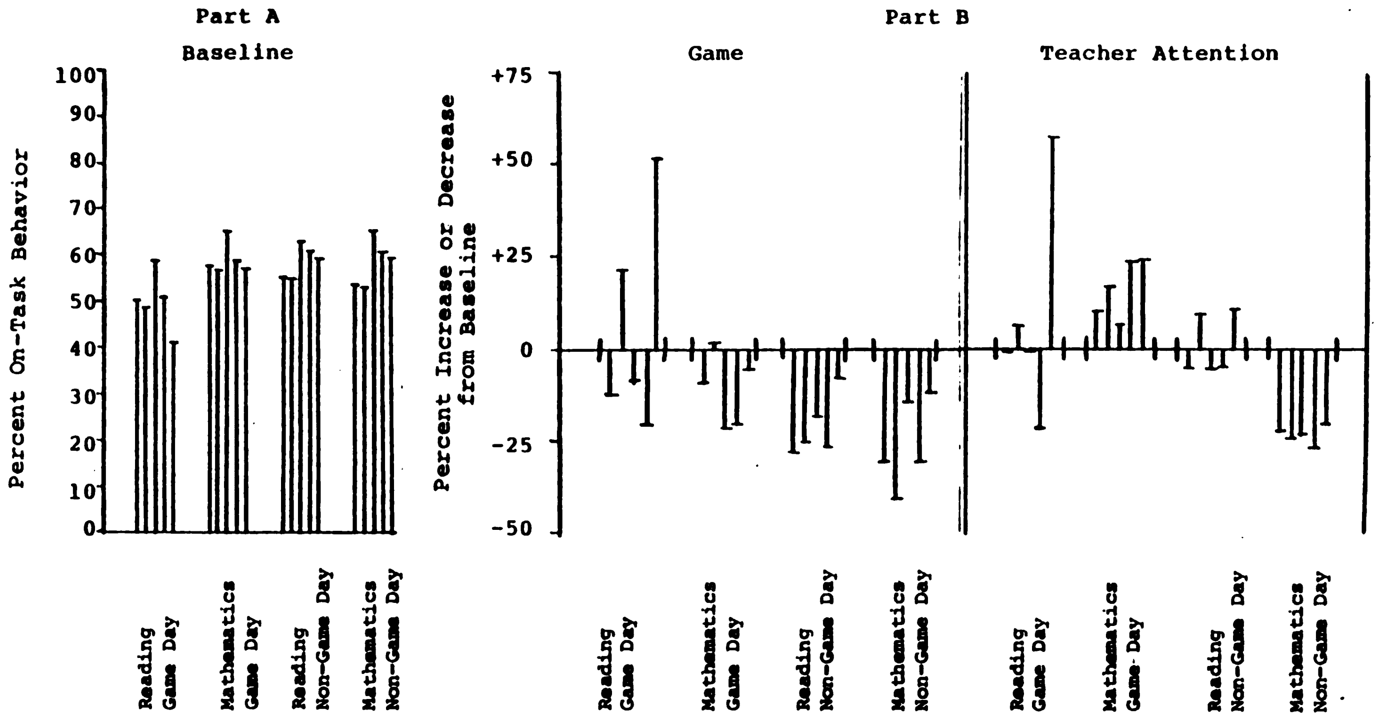


Figure 3.1: Percent change from baseline in on-task behavior for 2nd grade subjects across phases and settings.

the Teacher Attention phases across settings relative to the baseline phase.

Looking first at the Game phase, one can see that during "game time" (afternoon mathematics on Monday, Wednesday, and Friday), the on-task behavior for all but one subject was reduced. This one subject's on-task behavior remained essentially unchanged from baseline.

Four of the five subjects of the second grade class were on the same team. This team won the game 6 of the 12 times it was played during the Game phase. The other team with the one remaining subject won the game 10 of the 12 times.

During the early stages of the Game phase for the second grade, the students employed the "correction" procedure. This procedure involved having a teammate raise his/her hand, proceed to the rule breaker, ask him/her to return to task, and then return to his/her seat. During the later stages, the students employed the "voting" procedure to eliminate team members that they felt were precluding the team from winning. The subject on the team that won 10 of 12 times was voted out during part of the Game phase and, thus, did not participate in all of the rewards.

The failure of the game procedure to facilitate on-task responding came as an unexpected event. It appeared to be related to the teacher's not instating the game as directed in training. The problem points came in the areas of game introduction and motivation, recording accuracy, controlling the voting procedure, and the shaping of on-task behavior. The experimenter initially dealt with the teacher as one who was a passive participant. This approach was modified towards the end of Game phase when it was realized that the teacher was actually resistent to implementing experimenter developed procedures.

Even with the game procedure problems encountered in the second grade, a clear pattern of generalization emerges. Looking at the mathematics non-game day and the reading non-game day for the Game phase, one can see that all five of the subjects had a reduction in on-task responding that was greater than that for the setting where the game intervention was instated. The reduction in on-task behavior ranged from 7.2% to 40% of baseline levels. The reading game day setting shows mixed outcomes for student on-task behavior. Two of the subjects increased substantially but three decreased.

The Teacher Attention phase shows an increase in the mean percentage of on-task behavior across all five subjects for the game-time setting (game procedure). This is a reversal of the direction of behavior change shown in the game-time setting for the Game phase. The reading non-game day setting shows that the responding of three subjects came close to their baseline levels and two subjects reverse their direction of behavior change enough to increase the mean percentage of on-task behavior over that of the Baseline phase. The levels of on-task for the reading game day setting is still mixed across subjects. The reduction in on-task responding that occurred during the Game phase for the non-game day setting, continues during that setting for the Teacher Attention phase.

The fifth grade on-task data of Table 3.2 is presented in figure 3.2. Part A of the figure gives the mean baseline on-task percentage for each setting. Part B of the figure shows the proportion of change in on-task behavior for the Game and Teacher Attention phases across settings relative to the Baseline phase.

Looking first at the Game phase, one can see that during game-time (afternoon mathematics on Monday, Wednesday and Friday), the on-task behavior for all subjects increased over baseline. It also increased for all subjects in the reading non-game setting. The mathematics non-game day setting showed a decrease in on-task behavior for all subjects as it did for the second grade. The reading game day setting duplicated the second grade, the direction of change is mixed.

The subjects of the fifth grade were distributed in teams for the game: three were on one team and four on another. Both teams won the game every time it was played during the Game phase. The students did not utilize the correction and voting procedures.

The substantial increases in on-task behavior for the game-time setting during the Game phase follows the

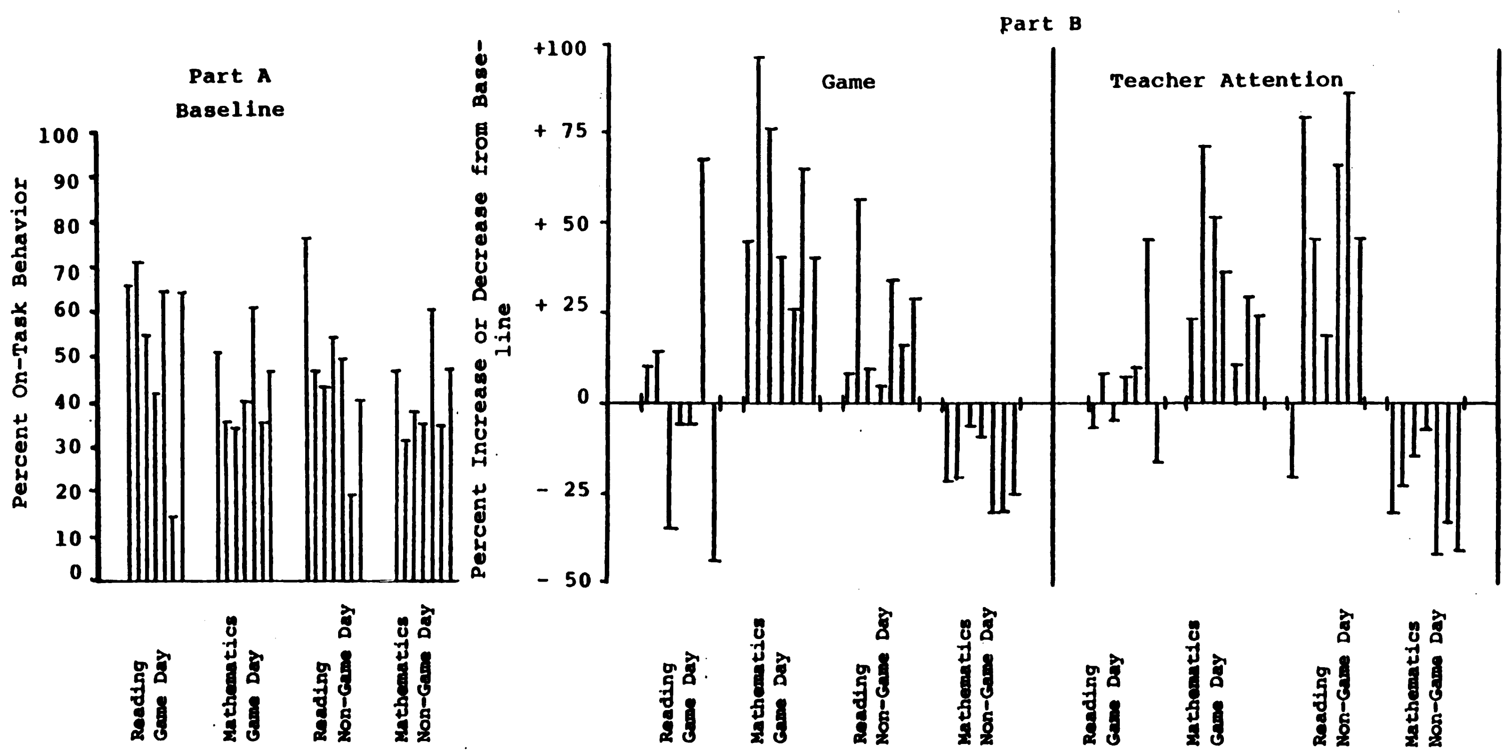


Figure 3.2: Percent change from baseline in on-task behavior for 5th grade subjects across phases and settings.

traditional results obtained using a game procedure. The fifth grade teacher had no problems with introducing or maintaining the game procedure.

The fifth grade's Teacher Attention phase shows the directions of behavior change relative to the Baseline phase to be essentially the same across all settings. Those who increased or decreased their mean percentage of on-task behavior over their baseline levels during the Game phase, remained that way during the Teacher Attention phase. The changes that did occur came in terms of the magnitude of the changes over or under baseline levels.

Outside of the continued mixed results of the reading game day setting, subject number one was the only one who did not follow the above described Teacher Attention phase pattern. For the reading game day and non-game day settings, his behavior reversed its direction from being well above baseline levels during the game phase to being well below it during the Teacher Attention phase. The teacher attention given this subject during these two reading settings changed its form from the Game phase to the Teacher Attention phase. The subject was given substantial amounts of continuation attention openly in front of the class. This change to open, social attention appeared to be followed by long periods of off-task behavior for the student.

The patterns of increasing or decreasing on-task behavior relative to the Baseline phases can be described in terms of behavioral contrast or induction during the

Game phase. The four settings can each represent a "ply" in a four-ply multiple schedule. With a baseline percentage on each setting, the game procedure was introduced and for the remaining settings we have what is either positive or negative contrast, or positive or negative induction depending on (1) the direction of behavior change for the intervention setting and (2) how the other settings change in relation to the change in (1).

The second grade (figure 3.1) reduced its magnitude of responding in the game setting relative to Baseline so that the changes in on-task behavior for the reading non-game day and the mathematics non-game day would have been called negative induction because there was a concomitant decrease in percent on-task relative to the Baseline phase. For the one subject who increases on-task behavior slightly during the game setting, the changes in the non-game day settings would have been called negative contrast. Considering that this subject had the greatest overall decrease in responding for these two settings and such a small increase in responding during the game setting, the percent of on-task during the game setting was probably related to biased sampling and/or some unreliability in observation.

The fifth grade (figure 3.2) increased its magnitude of responding in the game setting relative to baseline so that the changes in on-task behavior for the reading non-game day setting would have been called positive induction. The decreases in responding for the mathematics non-game day setting would have been called negative contrast.

The Teacher Attention phase can be described in terms of an attempt, through a general intervention procedure, to alter the type of contrast or induction that has occurred as the result of the single manipulation undertaken during the Game phase.

The mean number of 10 second intervals per hour for continuation (e.g., "Great job John, keep it up!") and change (e.g., "Get back to your seat, Mary.") consequences (attention) are presented in table 3.3 for each subject by experimental phase and setting. Although the classes were not one hour long and did vary slightly, as noted in Chapter II above, the rate per hour is used to give a proportional measure of delivered consequences per unit of time.

It is immediately evident that there was an almost complete lack of continuation attention to the subjects for Baseline and Game phases. There is a rise in continuation attention during the Teacher Attention phase.

The rate for mathematics game-time and non-game day settings hovered around one per hour for the second grade. The fifth grade was below one per hour for the mathematics non-game day setting but around one-point-five per hour for the mathematics game-time setting.

TABLE 3.3. The mean number of 10 second intervals per hour containing a continuation or change comment by the teacher which were related to the subject across experimental phases and settings.

			SETTING							
			Morning				Afternoon			
			Reading Game Day		Reading Non-Game Day		Mathematics Game Day		Mathematics Non-Game Day	
			Behavior		Behavior		Behavior		Behavior	
Grade	Subject	Phase	Cont.	Change	Cont.	Change	Cont.	Change	Cont.	Change
GRADE 2	S1	Baseline	.1	4.0	.0	4.7	.0	10.9	.0	8.8
		Game	.1	4.3	.0	2.4	.0+	1.2+	.0	8.0
		Attention	.1*	4.5*	.8*	4.8*	1.1*+	1.5*+	1.0*	4.0*
	S2	Baseline	.2	4.2	.1	5.0	.1	10.5	.1	9.0
		Game	.1	4.2	.1	.9	.1+	1.6+	.0	9.4
		Attention	.4*	4.7*	.7*	4.4*	1.1*+	1.5*+	1.1*	3.4*
	S3	Baseline	.1	5.3	.0	4.9	.0	8.5	.2	8.8
		Game	.0	4.3	.1	1.8	.0+	.8+	.0	8.6
		Attention	.3*	5.6*	.2*	4.2*	.8*+	1.0*+	1.1*	3.9*
	S4	Baseline	.0	3.0	.1	4.7	.0	14.9	.1	9.4
		Game	.0	3.9	.2	2.3	.0+	1.4+	.0	9.2
		Attention	.0*	4.4*	.9*	5.2*	1.0*+	1.1*+	1.0*	3.7*
	S5	Baseline	.1	4.9	.0	5.3	.0	10.2	.1	8.7
		Game	.0	4.9	.0	3.1	.0+	1.3+	.0	9.6
		Attention	.1*	4.6*	.6*	4.6*	1.0*+	1.5*+	1.1*	3.5*
GRADE 5	S6	Baseline	.3	2.2	.1	1.0	.2	3.4	.3	3.9
		Game	.2	2.2	1.0	1.9	.1+	.4+	.2	3.5
		Attention	1.4*	2.3*	.7*	1.4*	2.0*+	.2*+	.9*	2.1*
	S7	Baseline	.3	1.2	.0	1.8	.1	5.3	.1	7.1
		Game	.1	2.2	.0	1.6	.2+	.1+	.3	3.1
		Attention	.3*	2.3*	1.8*	1.7*	1.7*+	.3*+	.7*	2.1*
	S8	Baseline	.2	2.5	.2	.9	.1	4.4	.0	3.9
		Game	.0	1.9	1.2	1.5	.3+	.5+	.2	2.5
		Attention	1.0*	2.1*	.6*	1.2*	1.4*+	.2*+	.8*	1.8*
	S9	Baseline	.4	1.4	.1	1.2	.0	3.6	.1	3.9
		Game	.0	1.5	.0	1.2	.4+	.4+	.0	2.3
		Attention	.8*	1.3*	1.4*	1.2*	1.4*+	.2*+	.6*	1.9*
	S10	Baseline	.4	1.1	.1	1.4	.0	3.4	.1	3.6
		Game	.2	1.7	.0	1.3	.2+	.2+	.3	2.4
		Attention	.4*	1.5	1.7*	1.2*	1.4*+	.2*+	.6*	2.2*
	S11	Baseline	.0	1.3	.0	1.7	.1	3.2	.2	3.7
		Game	.0	1.3	.1	1.6	.2+	.2+	.0	4.0
		Attention	.1*	1.2*	.8*	1.4*	1.6*+	.4*+	.8*	2.0*
	S12	Baseline	.3	1.3	.2	1.0	.2	3.5	.1	3.4
		Game	.1	2.0	.0	1.2	.2+	.4+	.1	2.7
		Attention	1.2*	1.7*	.7*	1.8*	1.6*+	.2*+	.8*	2.2*

+ - Settings and phases in which the game procedure took place.

* - Settings and phases in which teacher attention was to be increased.

The data displayed in table 3.3 and figure 3.1 for the second grade, indicate that the increase in continuation attention and the continued in changed attention on the average were correlated with the reversal of on-task during the mathematics game-time setting. But the decrease in on-task that occurred from the Baseline phase to the Game phase for afternoon mathematics on the non-game days was not eliminated for any subject.

The data displayed in the fifth grade section of table 3.3 and figure 3.2 reveals that no clear pattern of change emerged during the Teacher Attention phase. The mean percentages remain generally the same even with the increase in continuation attention and the continued decrease in change attention. As with the second grade, the addition of attention was not enough to overcome the negative contrast established in the mathematics non-game day setting, there was a further mean percent loss of on-task behavior for six of the seven subjects.

The trend and variability of the contrast and induction phenomenon are of interest because contrast and induction have been considered transient phenomenon in a two-ply schedule and because it relates to generalization of behavior over time (maintenance). A longitudinal presentation is given for four subjects, two from each class. They were selected because their performances represent some of the considerations that have to be made in the analysis of generalization phenomenon. White's (1972) median trend analysis procedure is used.

Figures 3.3, 3.4, 3.5, 3.6 give the percentages of on-task behavior for subjects 2, 3, 7, 10 respectively. All four settings are indicated. Closed circles represent game-days for Mathematics (game-time) and reading, and open circles represent non game days for reading and mathematics. The dashed phase line indicates for reading the point at which changes due to the game intervention could have begun to occur.

Although the contrast and induction patterns are evident for the mean percent of on-task behavior shown in figures 3.1 and 3.2, such patterns are not clearly evident in the examination of trend direction. For example, during the game time setting some subjects showed gradually increasing trend during the Game phase that reverses direction during the Teacher Attention phase (e.g., S10, figure 3.6). Others showed flat or decreasing trends during the Game phase that continued or began to decrease during the Teacher Attention phase (e.g. S7, figure 3.5). For the subjects (S7 and S10) and setting (game time) used in the above examples, the direction change does not seem too important because it is accompanied by large changes in "step". (A step indicates the difference between where the end of one trend line meets the phase change line and the beginning of the next trend line meets the phase change line. If the beginning of the second trend line meets the phase change line above the point at which the end of

Subject 2 (2^{nd} Grade)

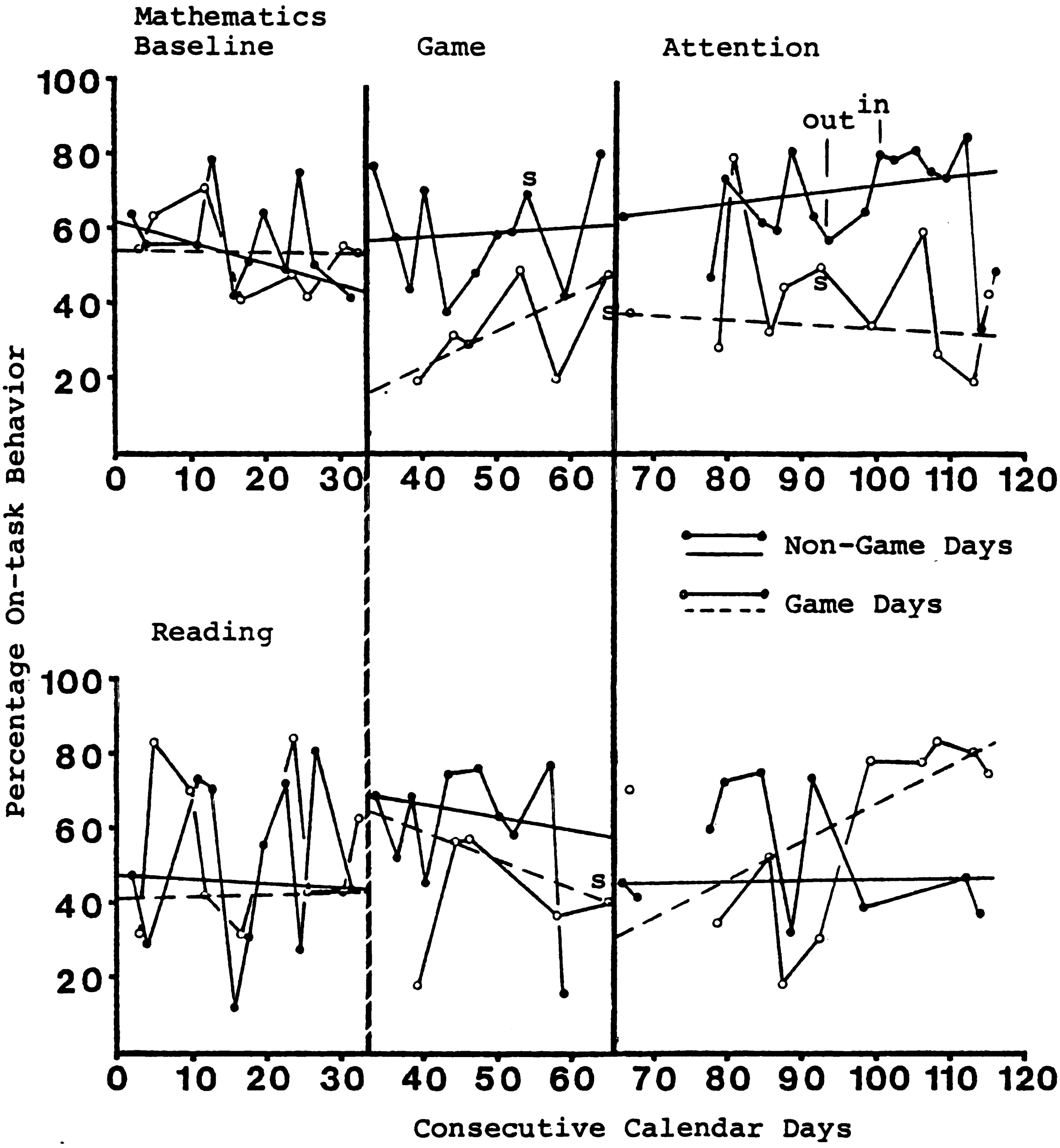


Figure 3.3: On-task behavior for Subject 2 across phases and settings. "S" indicates substitute teacher. "In" and "out" indicate ejection from and instatement back into the game.

Subject 3 (2^{nd} Grade)

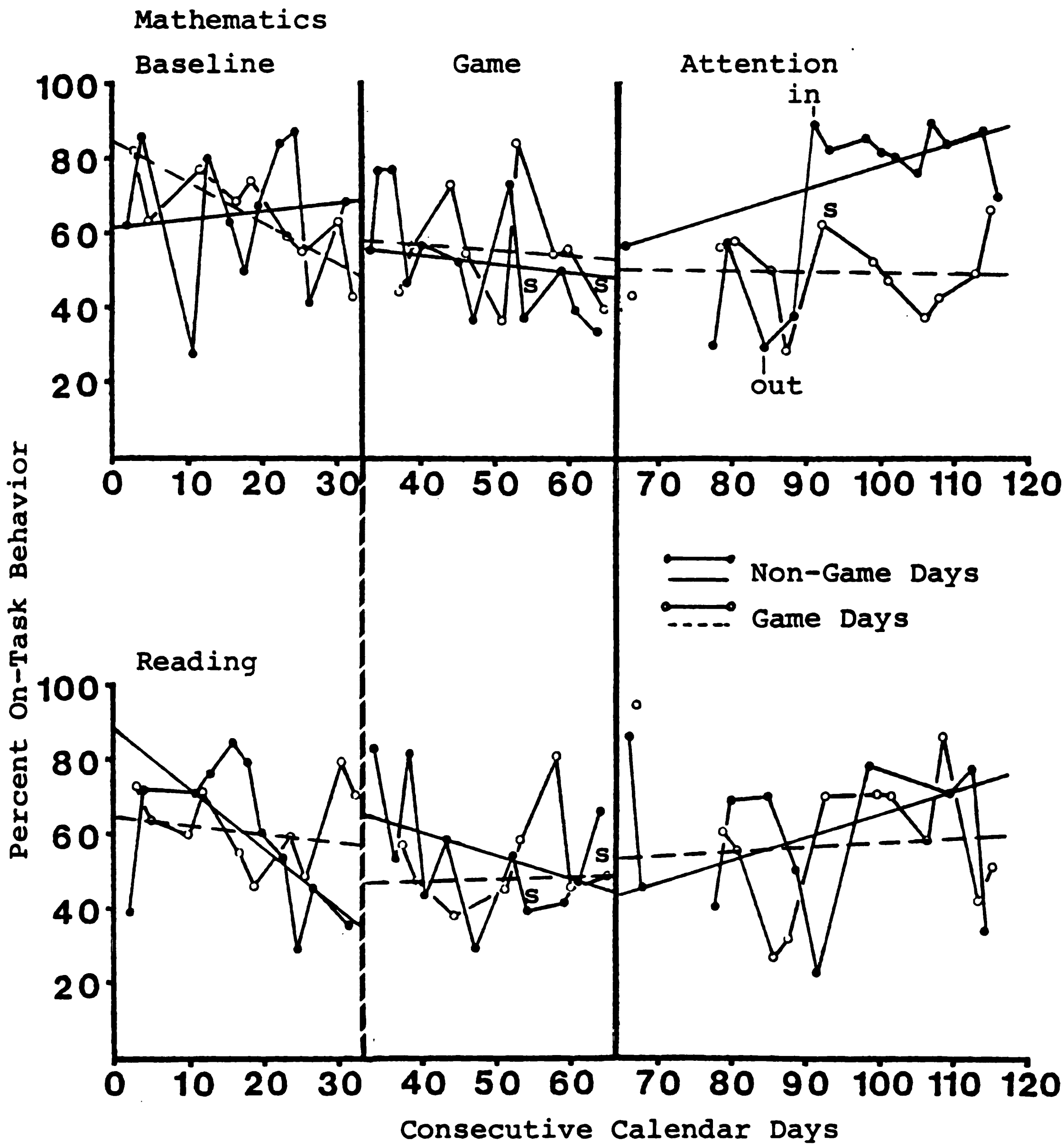


Figure 3.4: On-task behavior for subject 3 across phases and settings. "S" indicates substitute teacher. "In" and "out" indicate ejection from and instatement back into the game.

Subject 7 (5^{th} Grade)

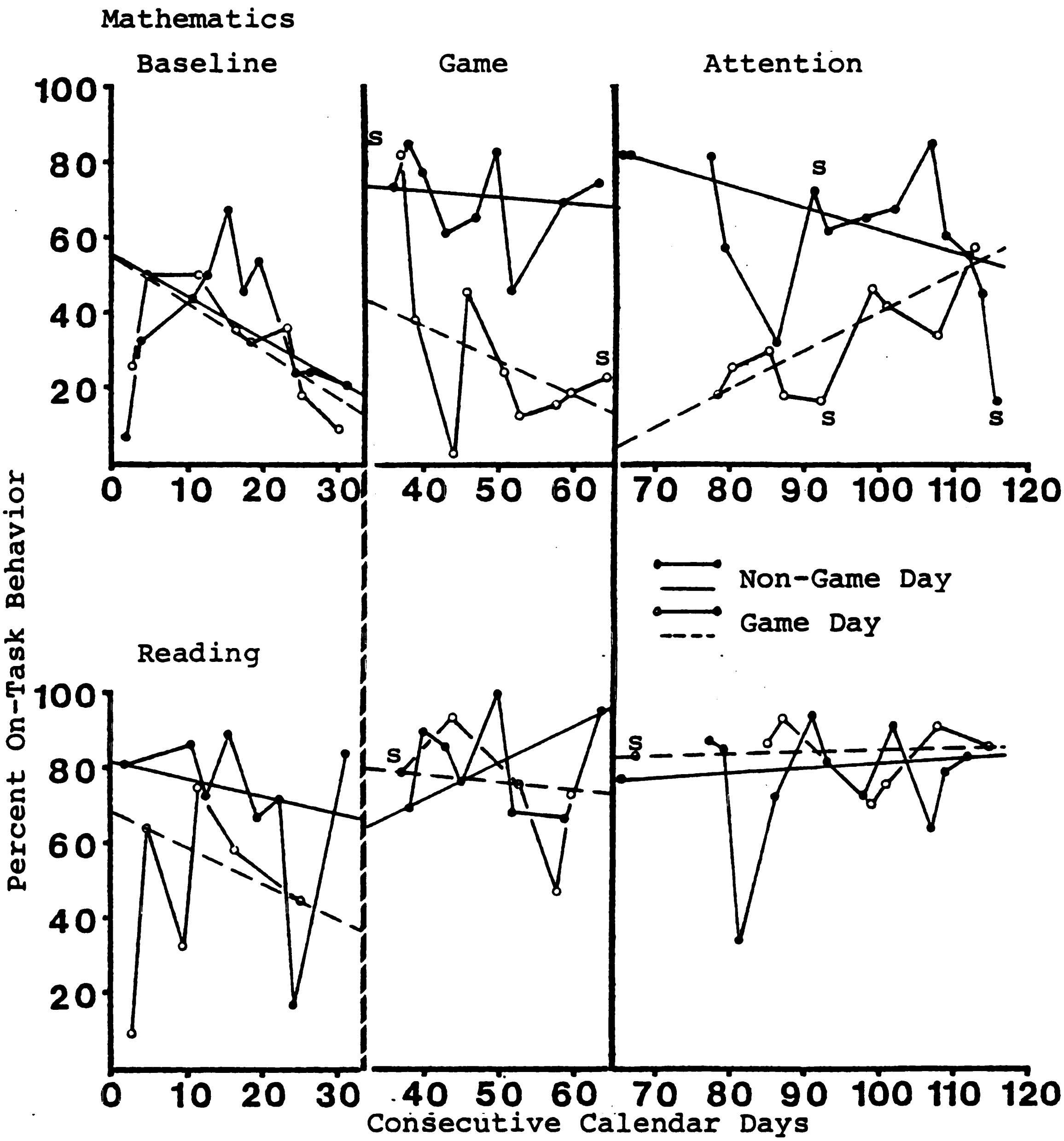


Figure 3.5: On-task behavior for Subject 7 across phases and settings. "S" indicates substitute teacher.

Subject 10 (5^{th} Grade)

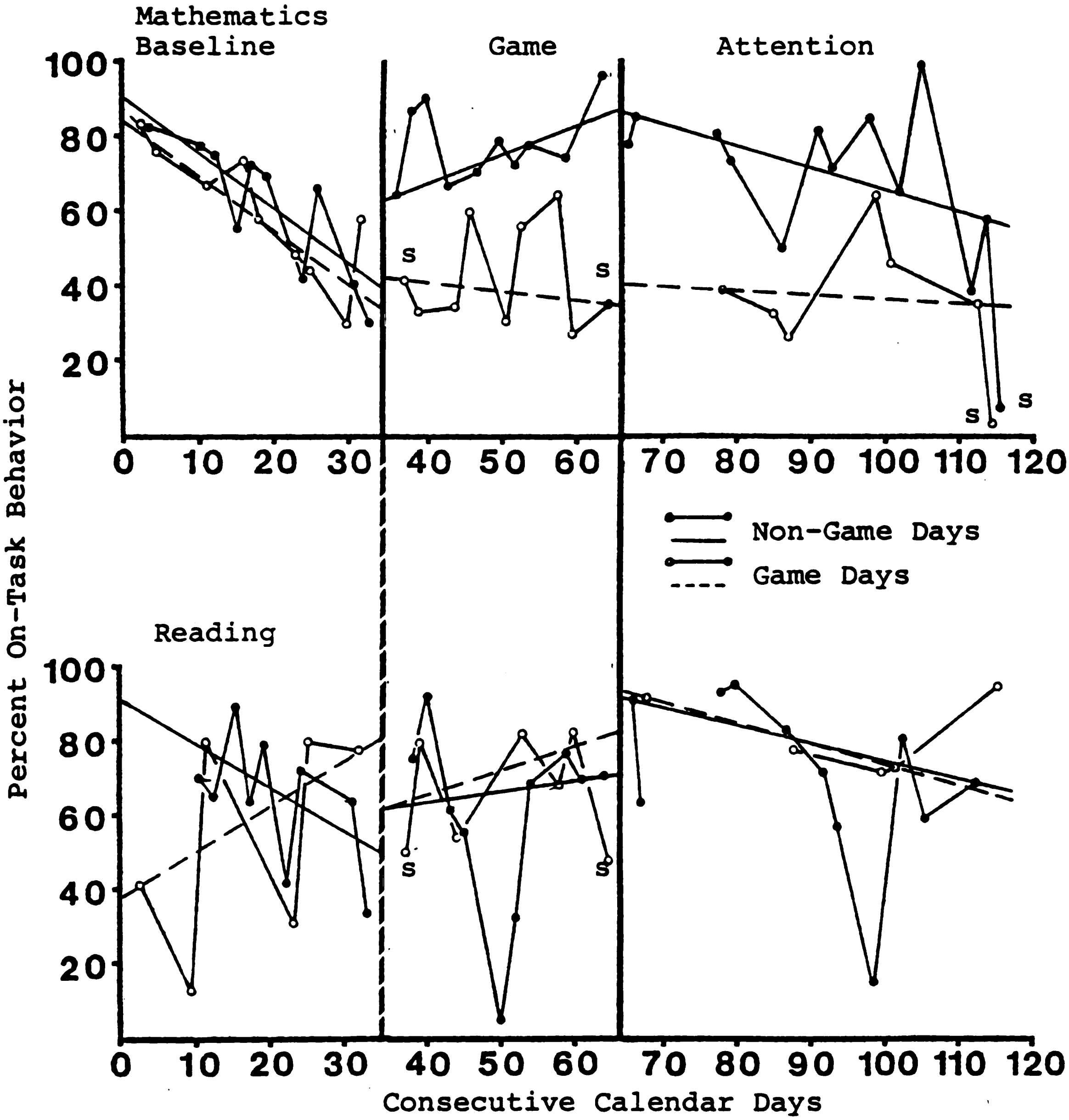


Figure 3.6: On-task behavior for Subject 10 across phases and settings. "S" indicates substitute teacher.

the first trend line meets the phase change line, it is called a step "up". The reverse is a step "down". The step indicates the immediate or initial effect of an intervention.)

Taking trend direction and step into account, there is an even greater lack of pattern especially for non-game time settings. For example, subject 7 (figure 3.5) showed an initial step up for non-game day mathematics during the Game phase which indicates initial positive induction but over the course of the phase because the trend is decreasing the overall result is negative contast. Analysis is further complicated by the increasing trend in the non-game day mathematics setting during the Teacher Attention phase. Subject 10 (figure 3.6), on the other hand, seemed to maintain the negative contrast for the non-game day mathematics setting over both the Game and Teacher Attention phases. The slightly decreasing trend lines for both the phases indicate the maintenance of the negative contrast for subject 10.

The induction and contrast that are present in the analysis of the mean percent on-task for the Game phase (figures 3.1 and 3.2) for the reading settings, covered all possibilities in terms of trend (e.g. figures 3.3 to 3.6). With the addition of teacher attention one can also see in these figures the differential changes across subjects. Some decreasing, some mixed, and some increasing trends.

Subjects 2 (figure 3.3) and 3 (figure 3.4) illustrate the effects of peer influence. Both of these subjects were removed from the game during the Teacher Attention phase by their peers and were later reinstated by a peer vote (see indicator arrows in figures). In both cases the reinstatement correlated with a high and stable rate of responding during most of the remaining game presentations. For subject 2 there was also a dramatic increase and stabilizing of on-task behavior for the non-game day reading setting. Subject 3 also has a correlated increase during the non-game day reading setting but it is not as dramatic nor as lasting as subject 2 had. The non-game day reading setting was the setting in which all of the fifth grade exhibited positive induction during the Game phase and in general increased the on-task behavior even further over baseline during the Teacher Attention phase (see figure 3.2). The second grade subjects in this setting exhibited decreased on-task behavior relative to the Baseline phase across all subjects. But during the Teacher Attention phase the decreased responding was almost eliminated in the setting (see figure 3.1).

C. TEACHER BEHAVIOR

The mean percentage of class time each teacher spent engaged in instruction, consequence, and no-response behaviors across settings and experimental phases is presented in table 3.4. It is a description of how the teachers spent their time. The instruction class of behavior included the three previously defined classes of instructions, directions, and comments. Consequence behavior includes the two subclasses of attention behavior: continuation and change. The no-response category is the time the teacher was not in direct contact with the students.

The table shows that on the average teacher one spent 76% of her time on instruction across settings and phases. Of the remaining time, 13% was devoted to giving consequences and 11% to activities not directly involving the students. The pattern of time use was similar for teacher two. On the average across settings and phases, 81% of teacher two's time was spent on instruction, 10% on consequences, and 9% on activities not directly involving students.

The consequence category of behavior followed clear patterns of change across settings for both teachers during intervention phases. Figure 3.7 shows the percentage of baseline consequences delivered across settings for the Game and Teacher Attention phases. During the Game

Table 3.4. Mean percent of class time each teacher spent engaged in instruction consequence, and no-response behaviors across settings and experimental phases. The teacher behavior classes of instruction, consequence, and no response categories are indicated by "I", "C", and "N" respectively.

Teacher I (2nd Grade)

Setting

		Morning						Afternoon					
		Reading Game Day			Reading Non-Game Day			Mathematics Game Day			Mathematics Non-Game Day		
	Behaviors	I	C	N	I	C	N	I	C	N	I	C	N
Phase	Baseline	70.9	13.7	15.4	79.5	14.0	6.5	68.9	20.1	11.0	77.0	18.2	4.8
	Game	76.3	9.7	14.0	82.7	7.7	9.6	78.3	5.7	16.0	73.2	18.3	8.5
	Attention	76.5	15.0	8.5	80.3	14.8	4.9	76.3	8.3	15.4	71.8	14.1	14.1

Teacher II (5th Grade)

Setting

		Morning						Afternoon					
		Reading Game Day			Reading Non-Game Day			Mathematics Game Day			Mathematics Non-Game Day		
	Behaviors	I	C	N	I	C	N	I	C	N	I	C	N
Phase	Baseline	87.3	8.1	4.6	79.1	9.8	11.1	78.7	12.7	8.6	71.9	15.3	12.8
	Game	81.6	8.0	12.4	88.0	7.1	4.9	83.8	2.4	13.8	79.4	13.3	7.3
	Attention	82.7	11.3	6.0	85.7	9.6	4.7	79.5	8.2	12.3	82.5	10.4	7.2

phase, teacher delivered consequences in the game setting fell to 29% of their baseline level for teacher one and 19% for teacher two. The morning reading non-game day also had a substantial reduction in consequence behavior with teachers one and two dropping to 55% and 74% of their baseline levels respectively. The morning reading game day setting had teacher one responding at 71% of her baseline level but teacher two was responding at 99% of baseline. For the fourth setting, afternoon mathematics non-game day, teacher one delivered consequences at baseline levels and teacher two was delivering them at 87% of baseline.

The Teacher Attention phase results, displayed in figure 3.7, show that changes in consequence behavior for both teachers followed the same pattern. The two morning reading settings exhibited behavior change that resulted in both teachers having consequence behavior that was at or above baseline levels, thus, overcoming the reductions that occurred in the Game phase. The mathematics gametime setting showed an increase in consequence behavior for both teachers over the Game phase but still far less than baseline -- teachers one and two respectively displayed 41% and 65% of their baseline behavior. The mathematics non-game day setting in which consequence behavior remained close to baseline levels during the Game phase, showed reductions to 78% and 68% of baseline levels for teachers one and two respectively.

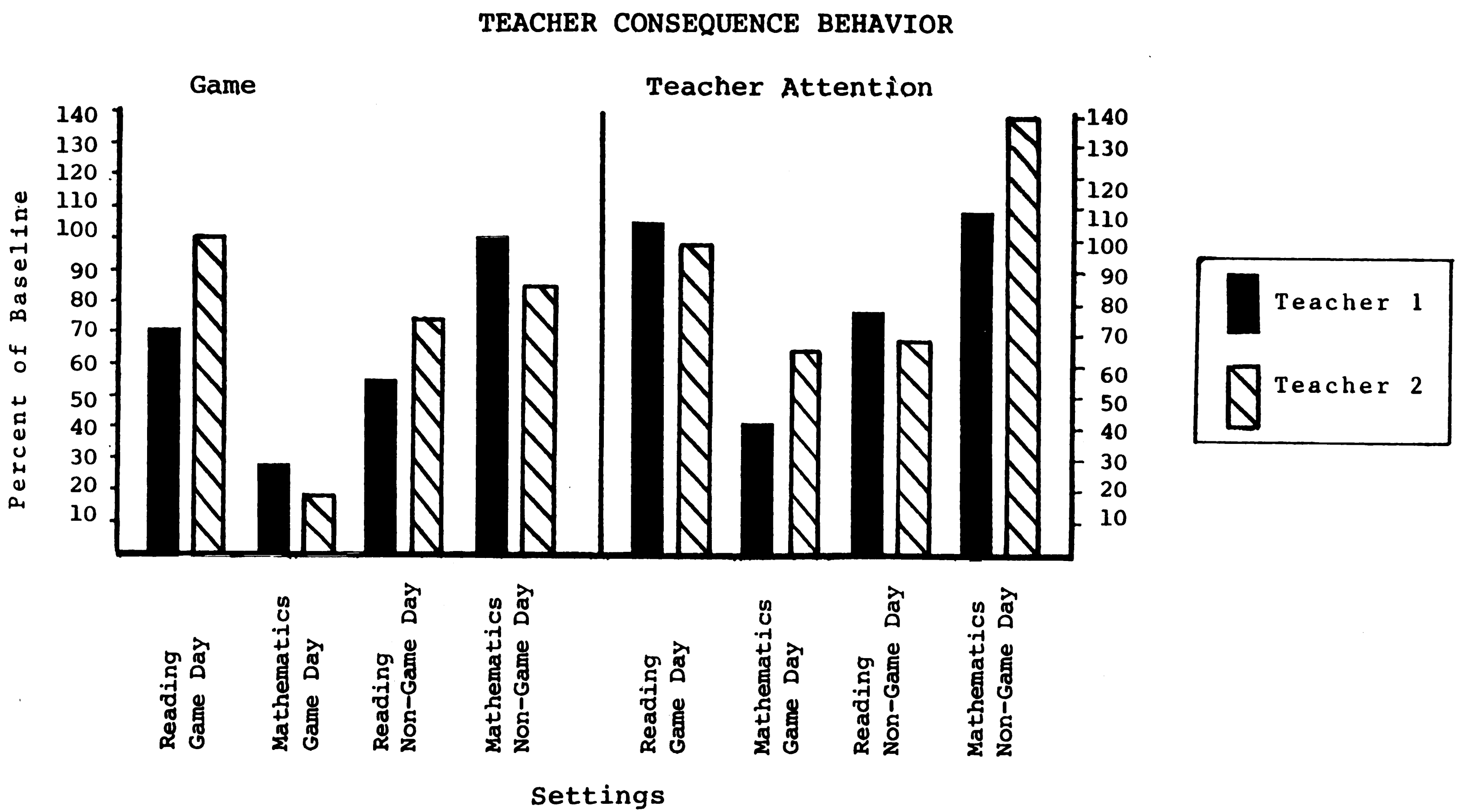


Figure 3.7: The mean percentage of consequence behavior for each teacher relative to their baseline performance across intervention phases and settings.

Although there were large, patterned changes in consequence behavior during the Game phase, there were no interventions aimed at its alteration until the Teacher Attention phase. The only procedural change that took place during the Game phase was the teacher's instatement of the game in one of the four settings. The one other change that occurred during the Game phase was the change in student on-task behavior. These two events, the introduction and operation of the game and the resulting student change in on-task behavior, were correlated with the teacher's change in consequence behavior.

The changes in consequence behavior during the Game phase can be described, as was the student on-task behavior, in terms of behavioral contrast and induction. Again, the four settings represent a four-ply multiple schedule. The only setting that had the contingencies manipulated was the game-time setting in which the teachers introduced the game. Relative to the changes in consequence behavior that occurred in this setting, the changes in the reading non-game day setting can be described as negative induction for both teachers since their consequence behaviors decreased. Teacher one displayed further negative induction in the reading game day setting. Teacher two showed a small amount of negative induction in the mathematics non-game day setting.

The Teacher Attention phase changes in consequence behavior can not be described in terms of contrast or induction across settings because there was no baseline involved in the training setting and because the teachers were asked to use consequences in all settings. The changes that take place can be described as stimulus generalization from the attention training setting to the four classroom settings.

The continuation and change subclasses of consequence behavior exhibit clear patterns of change which complicates the stimulus generalization description of teacher attention given above. Figure 3.8 shows the mean percentage of continuation and change consequence behaviors across settings and phases relative to the baseline phase. Looking first at the Baseline phase, it can be seen that the percentages of continuation and change behaviors across settings was very consistent for both teachers. Each exhibited high percentages of change attention and low percentages of continuation attention. In terms of their total consequence behavior across the four settings, this averages to 3.2% for teacher one and 11.6% for teacher two. But in terms of their total clasroom behavior this averages to .5% and 1.3% respectively. Both teachers had many days in which no continuation attention was given.

The Game phase section of figure 3.8 shows how consequence behavior changed across settings with the

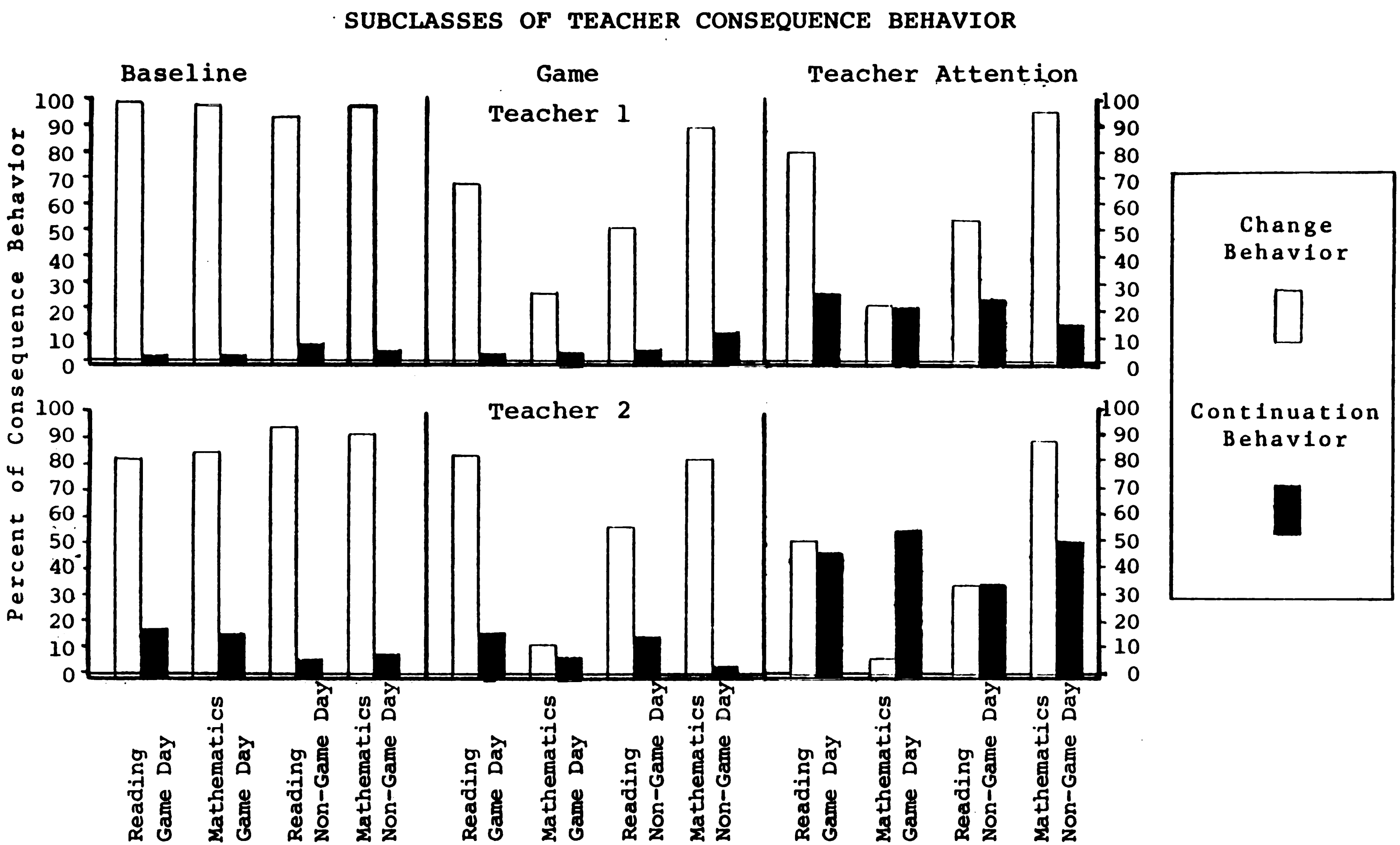


Figure 3.8: The mean percent of continuation and change behavior across phases and settings.

introduction of the game in the mathematics game-time setting. For both teachers the reduction in consequences occurred in the subclass of change attention. The pattern of change across settings was very similar for each teacher with the greatest reductions coming in the game-time and the reading non-game day settings. The fluctuations in continuation behavior were very small in terms of the total behavior of the teachers.

During the Game phase continuation attention compared to total teacher behavior was almost identical to baseline. Teacher one and two respectively exhibited .8% and 1.2% of their total behavior as continuation attention across the four Game phase settings.

The effects of attention training during the Teacher Attention phase are, also, shown in figure 3.8. On the average across settings, teacher one increased her continuation attention 660% over baseline. Continuation attention was close to the floor during baseline which in great part accounts for the magnitude of the change. Relative to the total percentage of consequence behavior of the Teacher Attention phase, teacher one exhibited 25% as continuation attention and 75% as change attention. Thus, the teacher had change attention three times that of continuation attention during the Teacher Attention phase.

During the Teacher Attention phase teacher one's continuation attention across settings rose to 3.4% of her total classroom behavior. In terms of the number of 10 second recording intervals per hour (360), 12.2 on the average would contain a continuation comment. The baseline average was 1.8 intervals per hour.

Teacher two changes in the categories of consequence behavior during the Teacher Attention phase look dramatic. The increase in her continuation attention over baseline levels was 408%. For the phase, 51% of her consequence behavior was continuation attention and 49% was change attention. Relative to her total classroom behavior across settings, continuation attention averaged 5.5% during the phase. In terms of the number of 10 second recording intervals per hour (360), 19.8 on the average would contain a continuation comment as compared to 4.7 for baseline.

The trend and variability exhibited across settings in change attention for teachers one and two are presented in figures 3.9 and 3.10 respectively. The change attentions are shown as the percentage of total classroom behavior. Teacher one (figure 3.9) shows an extensive amount of variability across baseline settings. The median trend lines (White, 1972) indicate slightly decreasing baseline slopes for reading (about .4% of the total classroom behavior over a seven day period). For mathematics the trend lines indicate slighly increasing baseline slopes about .3% of the total classroom behavior

Teacher 1

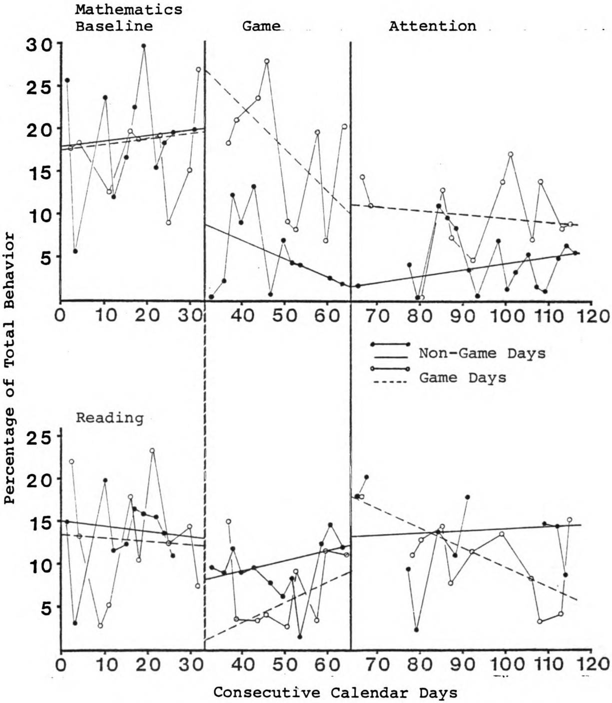


Figure 3.9: Teacher 1 change attention as the percentage of total behavior across phases and settings.

Teacher 2

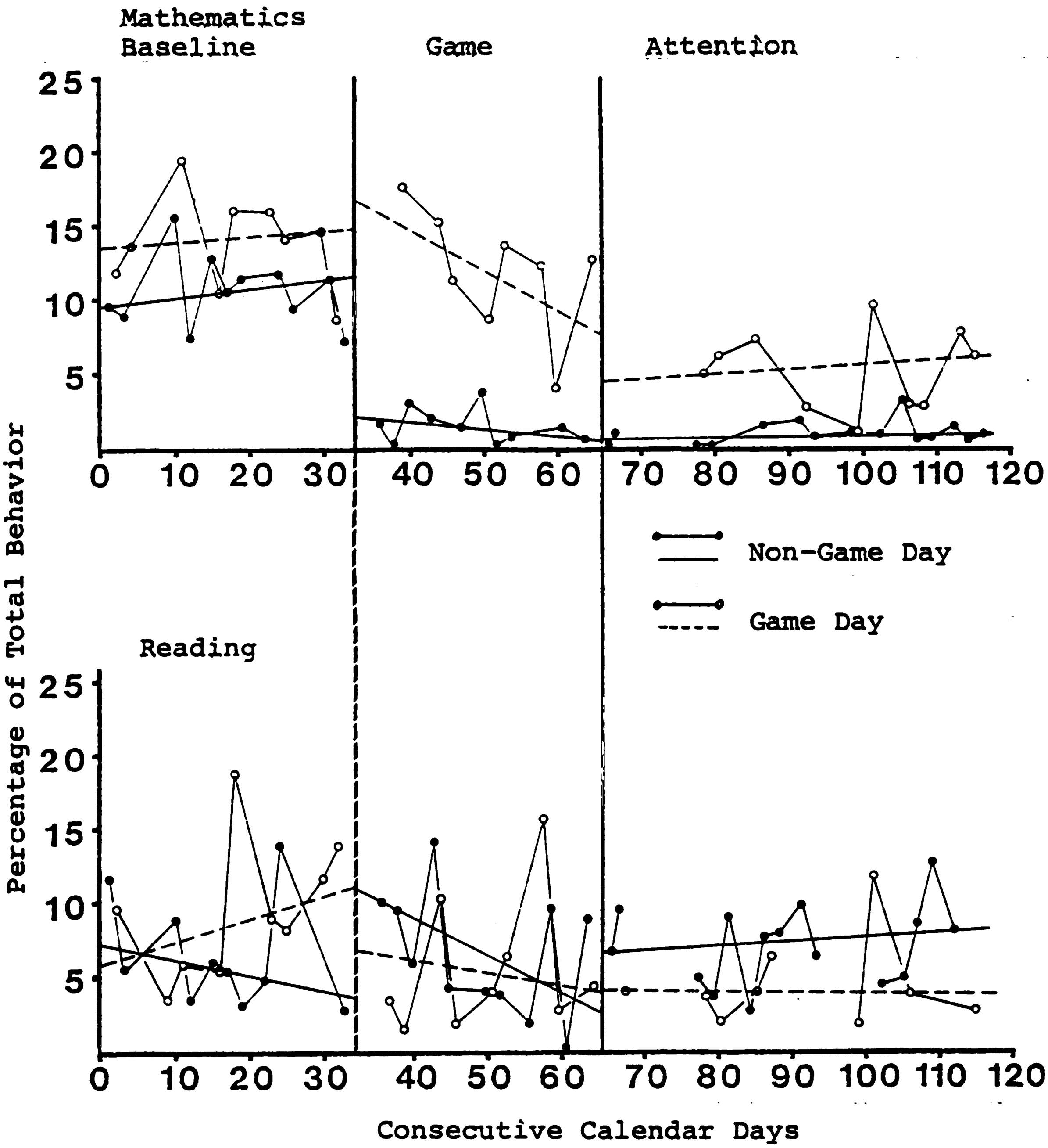


Figure 3.10: Teacher 2 change attention as the percentage of total behavior across phases and settings.

over seven days). With the instatement of the Game phase there are large steps down from the baseline phases for three of the four settings. The mathematics non-game day had a large step up from baseline.

The slopes of the trend lines for the two reading settings were both increasing and end at close to baseline levels. The rate of increase per seven calendar days was about 1% for the reading game day setting and about 2% for the non-game day setting. The mathematics settings had decreasing slopes. The seven calendar day decrease was about 1.6% for the game time setting and 7% for the non-game day setting. Thus, the alterations in the rate of change attention were transient for the reading settings but not for the mathematics settings. The alterations in change attention for the mathematics non-game day setting were almost non existent but the alterations that took place in the mathematics game-time setting continued to decrease and approach the floor.

During the Teacher Attention phase there was a flattening out of the increasing slope that had occurred in the reading game day setting of the Game phase. The rate of behavior had returned to baseline levels and appeared to maintain that level throughout the entire phase. The reading non-game day setting exhibited a reversal in the direction of trend for change attention from the Game phase. The decreasing trend was at a rate of 1.6% per seven calendar days. In the mathematics settings there was a continued use of low percentages of change attention compared to the Baseline phase.

Teacher two's (figure 3.10) pattern of change attention paralleled that of teacher one for the mathematics settings. But for the reading settings the differences begin in baseline with lower levels of change behavior and a trend in the non-game setting that is increasing at a fairly rapid rate (2% per seven calendar days). This increasing slope took a large step down during the Game phase and remained there throughout the rest of the study. The slightly decreasing trend in the reading game day setting during the Baseline phase showed a large step up but a rapid reversal during the Game phase. The decrease was at a rate of 3% per seven calendar days. During the Teacher Attention phase the behavior took a step up from the Game phase and remained slightly above baseline for the entire Teacher Attention phase.

CHAPTER IV

DISCUSSION

The goal of the present research was to examine the problems that were said to contribute to applied behavior analysis' unsuccessful attempts to promote the various types of generalization. The problems discussed in Chapter I were related to terminology, experimental design, and programming for generalization. The present chapter does three things. First, the terminological experimental design, and expected rewards problems are reexamined given the results presented in Chapter III. Second, the differences between basic and applied research on generalization are outlined. And third, thequestions that need answering if behavior analysis is going to advance its knowledge on generalizations are delineated.

A. TERMINOLOGY

In the area of terminology, the question remaining from Chapter I was, are there specific forms of generalization? The experimental arrangement employed allowed for an examination of behavior change across multiple situations and behaviors for teachers and students. The results revealed that for the teachers the behavior changes across situations resulted in a concomitant change in response class. The consistent changes in the consequence class of behavior showed consistent changes in the subclasses of continuation and change. This indicates that stimulus and response generalization were occurring together.

Concurrently, it needs to be remembered that there was no intervention instated for the teachers during the Game phase. Yet there were dramatic changes in consequence behaviors across settings. The changes involved the reduction of behavior in the consequence category with close to all of this reduction taking place in the subclass of change behavior. This outcome seems to further complicate an answer to the question, are there any specific forms of generalization? The complication appears to be related to the interaction between the parties involved in a behavior change procedure, in this case, students and teachers.

The present results indicate that the interaction is reciprocal. That is, the teacher instated changes altered the students, whose changes in turn altered the teachers. The extent to which this form of interaction is significant is moot but it leads to the primary question for behavior analysis: what is the cause of the change in behavior? In the present case, one can ask to what extent did the changes in teacher consequence behavior alter the student's behavior over and above that of her game intervention behavior? The present research cannot answer such a question but a framework for the analysis of such a question will be outlined in the last chapter.

For the students the concepts of behavioral contrast and induction fit the results better than did stimulus generalization. It needs also to be mentioned that in the settings where student on-task behavior was lower than its baseline level, the students appeared quieter and less disruptive (e.g., out of their seats, etc.) than during baseline. This observation was made by a number of observers. It is regrettable that no equipment was available or response parameters defined to quantitatively evaluate what was casually observed. But to some small degree it lends support to the observations that stimulus and response generalization were occurring simultaneously.

Although the research did indicate that the present classification of generalization into types was inadequate, it failed to resolve the terminological problem in any obvious way. What it did do was indicate some directions that need to be taken. These directions will be outlined in the last chapter.

B. EXPERIMENTAL DESIGN

The unresolved experimental design problem was the ABAB design discrimination charge. This charge argued that the alteration between intervention and non-intervention phases created conditions that promoted discrimination: the subject learned to respond differently in the two situations. The student results indicate that there was some form of discrimination problem. This was clearly evident for the fifth grade students with the introduction of the Game phase, the first intervention. In this case on the non-game day there was a large decrease in on-task behavior during the mathematics setting but, also, a large increase during the reading setting (see figure 3.2). Considering only setting (stimulus) changes, these results can be taken as negative contrast and positive induction respectively. From the perspective of stimulus control, the results are discrimination and generalization respectively. Of special importance is the fact that both non-game day mathematics and reading are the "A" of the ABAB design but are different settings. The instructions to the students were that the game, the "B" of the design, was to be played only during Monday, Wednesday, and Friday mathematics period. The question reamining is, why weren't the results the same on both of the non-game day settings?

The second grade, during the game phase, showed the same results in both non-game day settings (see figure 3.1). Their results could be described as negative contrast for both settings, or from the viewpoint of stimulus control it is a double discrimination. But in this case the targeted behavior was below baseline and when the teacher attention intervention was instated this pattern was broken up with a trend towards the pattern shown by the fifth grade where the game was effective from the first intervention.

The alterations in teacher change behavior were similar to student changes in that differential alterations were recorded for non-game day settings. During the Game phase, both teachers had mathematics non-game day change behavior remain close to baseline levels (see figure 3.8) but the reading non-game day setting showed substantial reductions in change behavior. The teachers' changes like those of the students can be described in terms of behavioral contrast or induction. The difficulty is that the exact type of contrast or induction cannot be determined because one is not sure how the contingencies changed for the teachers. There was in fact no experimenter instated changes in contingencies. Taking the stimulus control perspective, the modification in teacher change behavior for the reading and mathematics non-game days relative to the game can be described as generalization and discrimination respectively.

Since both the teachers change in the same direction relative to the game and the non-game day settings, this may add support to the casual observation by observers that the second grade students' behavior was altered during the game but not in the direction planned for or recorded. This points out the difficulty in implementing an alternate set approach to research.

In general, the discrimination explanation for the ABAB design does not appear adequate. Outside of the one target, one intervention setting ABAB design, the discrimination charge seems not only conceptually inadequate but intimately tied to the above mentioned terminological difficulties. The tie between the inadequacy of the discrimination charge and the terminological difficulties is simply that the discrimination charge as an explanation fails to account for the data and that the discrimination charge is an explanation that originates within the existing terminological framework. Thus, there appears to be a need for new perspectives on experimental design and description. These are outlined in the next chapter.

C. EXPECTED REWARDS

The expected-rewards programming for generalization technique, represented by the game intervention, could have played a part in the consistent decrease in non-game day mathematics on-task behavior for both the second and fifth grades. The expected rewards, as has been explained in Chapter I, can be represented as a contingency of reinforcement and as such can to varying degrees specify the conditions under which behavior is to occur. In this case the word "mathematics" in the instructions to the students could have set up a discrimination with "Monday," "Wednesday," and "Friday" being in somewhat less control over on-task behavior. This differential control explanation is somewhat supported by the lower percentage of mathematics non-game day on-task behavior for both classes. But if the word mathematics was the cause of the lowered on-task behavior during the non-game day mathematics setting, what was the cause of the increase for the fifth grade and the decrease for the second grade during the non-game reading setting? In other words, where does the control come from? Could it be related to the instructions and if so what could be the mechanism of its transmission? Or could it be related to the change in teacher behavior? In the present complex environmental arrangement, the expected rewards explanation does not receive confirmation or disconfirmation, it simply leads to further questions.

The results of the present research indicate that the explanations given for the problems encountered with generalization phenomena as specified are inadequate. The indication is that the explanations are too simplistic to deal with the complex interrelationships that develop out of multiple setting, subject and behavior research. Thus, the problems of generalization were not resolved; they were given new perspective. The remainder of this chapter will attempt to highlight and outline that perspective.

D. THE DIFFERENCES BETWEEN BASIC AND APPLIED RESEARCH

Behavior analysis was spawned in an isolated environment. The environment was the Skinner box. The restricted nature of this environment assured sufficient simplicity to reveal basic relationships that formed the framework for a scientific description of behavior. As a descriptive science, behavior analysis used the successful control of behavior as its validation principle. It focused on behavior change and restricted itself to the discovery of powerful, always-effective variables.

Like any successful science it was applied to an ever widening set of conditions and organisms. Enough key pecks and bar presses had been observed, analyzed, and controlled by many researchers. Some of them turned to that limitless domain of behavior called social problems. It was at this time that applied behavior analysis began.

The applied behavior analysts set out to see if the powerful, always-effective variables operated in the expanded set of conditions called the "real world". Baer (1978) has called such research "generality-testing", and since this is what the experimental analyst does both should be considered "basic" researchers. He puts it as follows:

> "Generality-testing research is no less generality-testing research simply because it was done by someone supremely uninterested in testing generality. The research still constitutes a test...
>
> "...behavior analysis does not contain much in the way of completely prescribed solutions, as yet. Rather, it contains some examples of solutions to selected problems, usually simpler than the current targets, and some principles, and some rules of thumb. Therefore, the solution to the current problem...usually requires innovation, improvisation, and

variation on prior themes... In the logic of experimental analysis, we should never dismiss a solution to a social problem as a mere application of a principle we already knew. It is not the principle which is at issue, but the generality of the principle. If we have not used that principle to solve that social problem before then we do not know if the generality of that principle extends that far, or is too delimited to apply there. We need to know; the science needs to know: our most basic question is not to detect principles, but to evaluate the generality of the numerous principles already in hand (Bear, 1978)."

Sidman (1960) was more specific in his discussion of generality-testing. He delineates five areas of generality: subject, species, variable, process and method. Applied behavior analysis research on generalization is not only generality-testing the process of generalization but it also involves subject (e.g., the mentally retarded to the average classroom student), species (e.g., rats and pigeons to human beings), variable (e.g., intermittant reinforcement is often used), and method generality (e.g., reinforcement schedules are employed) as well. Thus, the extrapolations for the isolated environment in which generalization research began to the everyday world in which it now takes place differ greatly in their complexity. The questions and anomalies that arise from the present and previous research on generalization may have been foreseen by Sidman (1960) almost twenty years ago. He states:

"Our problem is...one...of obtaining sufficient understanding of both rats and

> men to be able to recognize resemblances in behavioral <u>processes</u>. We must be able to classify our variables in such a manner that we can recognize similarities in their <u>principles of operation</u>, in spite of the fact that their phsyical specification may be quite different (Sidman, 1960, p. 27)."

The problems encountered with terminology, experimental design, and expected reward techniques indicates that the process of generalization as originally formulated is not sufficiently developed to deal with the wider context encountered in applied behavior analysis research. To the extent to which there are resemblances in the principles of operation between the two divergent contexts, it is apparent that they have not been elucidated. The next aim is to highlight those resemblances and departures.

The extrapolations from the restricted contexts of the early generalization research to the applied research settings differ in four important respects. In order to compared and contrast these differences, Guttman and Kalish (1956) and the present research will be used as reference points.

1. <u>Complexity of Response Contingencies</u>

The early research defined and observed only a single isolated response contingency. Goldiamond (1975) has defined this procedure as research originating within a unilinear system. All behavioral alternatives (competing behavior) are defined solely by the negation or exclusion from that single set (contingency). For Guttman and Kalish

(1956) the key-peck with a specified range of force was defined as the response class of a contingency and only this one contingency was specified. In the generalization test phase only shifts in response rates for responses falling within the specified range could be detected. The result is the classic stimulus generalization gradient.

In contrast the present research defined multiple response contingencies in multiple settings. The use of multiple response contingencies (alternate sets) allows for the examination of behavior change outside the target set. The difference between defining one or two sets is not trivial as Goldiamond (1975) points out:

> "Indeed, consideration of only-one well-defined stimulus set as basic, rather than minimally-two, has led to differing experimental results. These differences have been used to support and generate theoretical differences which are not trivial in science or in application (p. 51)."

The differing experimental results and the theoretical implications are what is in part being considered in the remainder of this chapter.

2. <u>Complexity of Past History</u>

The second important difference between basic and applied generalization research is that of the ontogenetic history of the organisms studied. In the restricted environment, such history was limited to the behavior independent contingency of the home cage and the single behavior dependent contingency of the experimental chamber during response acquisition. After the acquisition training was complete, the generalization testing phase was carried out under a behavior independent contingency.

The past history of the present research subjects is not only long but unknown. Baseline rates are some indication of what the subject is doing under present contingencies. But they give no indication of how the extensive past history will interact with the interventions to be instated. The trend analysis results of the present research support this fact.

3. The Point at which the Generalization Test is Made

The third difference in generalization research is the point at which the generalization test is made. Guttman andKalish (1956) test for generalization after the response acquisition training. In applied settings such a testing procedure is a form of stimulus generalization called maintenance or time generalization. However, much of the generalization testing in applied settings is done across stimulus conditions while the intervention is on going. This form of testing is somewhat related to the Blough (1967) test for generalization technique but closely resembles the multiple reinforcement schedule paradigm where behavioral contrast and induction are explored (e.g., Reynollds, 1961). It is also akin to the multi-operant research undertaken by Findley (1962). It is important to note that the experimental analysis of behavior researchers do not ignore the paradigmatic difference between research on behavioral contrast or induction with that of stimulus generalization. The applied researcher does not often consider that the research undertaken is of closer resemblance to multiple schedule research than it is to generalization research procedures.

4. <u>The Reciprocal Interaction of Contingencies</u>

The fourth difference in generalization research is the extent of the "reciprocal interaction" between organism and environment. In the Guttman and Kalish (1956) experiment, the generalization test stimuli are presented and responded to without any reciprocal change, there is no consequence to responding to the testing stimulus. The environment does not change as a result of the organisms action. Generalization under these circumstances is an extinction based, transient phenomenon. In contrast the test for generalization in applied research can result in the subject's responding and this responding can change the extra-treatment environment. If the extra-treatment environment undergoes change, reciprocal interaction has started. One of the three types of change can occur to the subject's behavior: First, there can be an increase in the rate of the response class of interest. For example, the reciprocal change in teacher consequence behavior could have reinforced the same behavior as did her intervention behavior which was the start of the reciprocal interaction cycle. Second, the response class can be modified because the reciprocal interactive process could modify the original contingencies, thus, the shaping of behavior can occur. For the teacher the shift in consequence behavior subclasses indicated that the change in student behavior during the game setting had altered the consequence response class. Third, both a shaping and rate change could occur. The change in teacher consequence behavior across settings during the teacher intervention phase contained both a response class change and a change in rate. These three possibilities respectively represent stimulus, response, and the combination of stimulus and response generalization.

Without the utilization of alternate sets to detect the three types of behavior change, any assessment of generalization would be incomplete. From one perspective, that of measurement, alternate sets are concerned with increasing the precision of measuring behavior change. From another, the researcher's experimental question, alternate sets deal with the contingencies available for the subject to respond to.

The above differences in basic and applied generalization research emphasize the underlying point of the present section: The separate classes of behavior change called stimulus and response generalization are an inadequate conception of what is occurring in an environment containing alternate sets of contingencies for a subject to respond to.

The concept of reciprocal interaction suggests how behavior can continue to be maintained or changed given initial induction. The question that remains is, how does induction occur for an organism who is now in a different spacial/temporal location from where the initiating intervention took place? In an environment consisting of alternate sets of contingencies of reinforcement, the answer to how behavior is induced is to ask two questions about the contingencies of reinforcement. The first is, how do contingencies of reinforcement interact within the repertoire of an organism? The second is, how are contingencies of reinforcement arranged within and between segments of an individual's history? The answers would delineate an analytic framework from which applied and basic researchers will be able to advance behavior analysis as a descriptive science which deals with the causes of the change in behavior. Such a framework should help researchers in at least four ways. First, it should help an experimenter clarify and relate the experimental question to an adequate experimental arrangement. Second, it should facilitate the researcher by putting the research in the context of the existing body of knowledge. Third, it should orient the researcher in the selection of measurement and control techniques by relating the research to others with similar type problems. And fourth, it should foster the development of a series of experimental questions that should lead to related sets of functional relations. It is at this last point that systemization begins and leads one from reliability to generality by spelling out the necessary and sufficient conditions for the occurrence of a phenomenon.

Although it is useful to lay out new questions and specify the criterion by which the answers should be judged, it is just as important to lay out the general form the answers would take given present knowledge. The last chapter outlines such a form.

CHAPTER V

A FRAMEWORK FOR THE ANALYSIS OF GENERALIZATION

In the previous chapter, it was concluded that productive research on generalization depends on the answers to two questions: How can behavior continue to be maintained or changed given initial induction? How does induction occur for an organism who is in a different spacial/temporal location from where the initial intervention took place? The answer to the first was outlined in terms of the reciprocal interaction between organism and environment. The answer to the second necessitated asking two questions about the contingencies of reinforcement. They were:

1) How do contingencies of reinforcement _interact_ _within_ the repertoire of an organizm?
2) How are contingencies of reinforcement _arranged_ _within_ _and_ _between_ segments of an individual's history?

The answers to these two questions are seen as necessary in order to proceed with research on generalization that takes place in a complex interactive environment. This chapter outlines the answers to the two questions.

A. THE INTERACTION OF CONTINGENCIES OF REINFORCEMENT

The experimental and theoretical advances of recent years, growing in large part out of the work of Skinner (1969) and his contemporaries (e.g., Catania, 1971, 1973; Staddon, 1973; Staddon and Simmelhag, 1971), indicates that the dichotomy between operant and respondent behavior cannot be sustained. The strict adherence to the distinction, according to Staddon (1973), will if anything hold back the advance of behavior analysis. Skinner (1969, 1974, 1975, 1977) has turned increasingly to the use of the concept of a contingency of reinforcement which can subsume both operant and respondent behavior. He defines a contingency of reinforcement as the interrelationship between (1) the occasion upon which a response occurs, (2) the response, and (3) the reinforcing consequence. If a stimulus in the sequence has no effect, it is because the stimulus plays no important role in the contingency. Two types of contingencies have been distinguished by Skinner: phylogenetic and ontogenetic. The distinction is concerned with the identification of the variables responsible for the provenance of behavior and the extent to which they are accessible. The two types of contingencies do not act independently.

1. The Single Contingency

In order to understand how alternate sets of contingencies can interact to induce behavior, it is necessary to examine the operation, that is, the interaction of the components of a single contingency, a unilinear set. A single contingency can be diagrammed as follows:

$$[S^D \rightarrow R] \leftarrow S^R .$$

The consequence stimulus, S^R, as diagrammed indicates an influence over the antecedent (discriminative) stimulus, S^D, and the response component, R. Given the extent to which the S^R is specified, it can exert control over one or both of the S^D and R components. For example, in non-discrimination training, which can be diagrammed as

$$[(\ ) \rightarrow R] \leftarrow S^R,$$

the S^R is made contingent only on a specified response and the result is a change in the rate/and or response class depending on the extent to which the contingency is specified to the subject. As indicated by the ( ) in the diagram, the context in which the response is given is not specified. But in discrimination training both the S^D and R are specified by the contingency and, thus, the S^R is delivered contingent on the relationship between the two. A behavior independent contingency specifies that the consequence is delivered contingent on some aspect of the context or time, it can be diagrammed as

$$[S^D \rightarrow (\ )] \leftarrow S^R.$$

This relation would generally be described as a contingency which is related to behavior with operant properties, that is, behavior which is described as emitted (i.e., induced by some unknown source) and susceptible to modification from consequence stimuli. In contrast there is respondent behavior which is elicited by the antecedent stimulus and not extensively susceptible to modification by consequence stimuli. It can be diagrammed as

$$[S^D \rightarrow R] \leftarrow (\ )$$

with the ( ) indicating that a consequent stimulus does not play a role in the behavior's induction, only the antecedent stimulus is necessary.

The extent and speed to which behavior can be changed by the instatement of a contingency is dependent on the control that is exerted by antecedent and/or consequent stimuli, and the extent to which antecedent control can be modified by consequent stimuli. Such control is dependent on the history of the organism both phylogenetically and ontogenetically. Thus, the contingencies of reinforcement represent a diverse continuum of behavior and its controlling variables: at one end exists phylogenetically developed behavior called respondent, and at the other, exists ontogenetically developed behavior called operant.

The degree to which behavior change is realized is dependent on the sensory (input-output) limits of the organism, and the technology available to specify the contingency to the organism and measure the behavior change that occurs under the contingent conditions.

2. <u>Alternate Sets</u>

How do alternate sets of contingencies of reinforcement interact? A two-ply set is diagrammed as

$$1: \quad [S_1^D \rightarrow R_1] \leftarrow S_1^R$$

$$2: \quad [S_2^D \rightarrow R_2] \leftarrow S_2^R$$

and allows for a clarification of the above question. The question becomes, given a change in contingency one (1) what process(es) are necessary for a change in the behavior of contingency two (2)? This is clearly a question about the processes which control behavioral induction, the dependent variable of interest.

The identification of the process(es) involved in the induction of behavior for any particular set of contingencies requires, besides a great deal of research, an understanding of (1) the interaction of contingency components as specified in the section on the single contingency, and (2) the identity between the corresponding components of the set. Considering the identical element aspect, the two-ply set diagrammed above can be altered as follows:

$$
\begin{array}{lccccc}
1: & [S_1^D & \rightarrow & R_1] & \leftarrow & S_1^R \\
 & \updownarrow & & \updownarrow & & \updownarrow \\
2: & [S_2^D & \rightarrow & R_2] & \leftarrow & S_2^R
\end{array}
$$

with the double direction arrows indicating that there can be reciprocal interaction between the corresponding elements of the two contingencies. The subscripts on the stimulus and response components of the two sets could be mixed or arranged in any manner as in a multiple schedule of reinforcement where in behavioral contrast research the responses for both contingencies are generally of the same class (e.g. Key Peck) as are the consequences for at least the baseline phase.

The aim in outlining the processes by which sets of contingencies interact is not to be exhaustive, at present that may be impossible, but to illustrate some primary points of importance. Also there will be no consideration of the arrangements these contingencies may have to each other, that consideration is reserved for the next section of the Chapter.

Consider, first, two sets that exhibit stable baselines. The sets could look like

$$1: \quad [S_1^D \rightarrow R_1] \leftarrow S_1^R$$

$$2: \quad [S_2^D \rightarrow R_2] \leftarrow S_2^R \ .$$

Given a change in S_1^R of contingency one that increases the rate of R_1 and does not establish a different degree of stimulus control between $S_1^D \rightarrow R_1$, change in the contingencies can come about in several possible ways. First, if there is some form of identity between S_1^R and S_2^R, S_2^R could be increased or decreased in terms of its reinforcing function. For example, the elements of mathematics game time rewards (S_1^R) were something like extra free-time, teacher attention, and peer attention to say nothing of the activity itself. The elements of the reading non-game day (S_2^R) were at least teacher and peer attention. Thus, element overlap could have existed. If S_2^R was increased and the contingent relation between $[S_2^D \rightarrow R_2] \leftarrow S_2^R$ was one that specified strict stimulus control between $S_2^D \rightarrow R_2$, then not only could R_2 change rate from the change in S_2^R but it could come under different stimulus control. This is the first step in reciprocal change within the repertoire of an organism.

Second, there could be reciprocal change from the externally unaltered contingency (number two) in the direction of the externally altered contingency (number one). This reciprocity could come from the changes the organism undergoes in relation to S_2^D. If the S_2^D stimulus has in fact been an influence in the modification of the organism, as indicated by the $S_2^D \rightarrow R_2$ control changes from baseline, then if some form of identity exists between S_1^D and S_2^D, there could be a change in the $S_1^D \rightarrow R_1$ control without a change in the experimenter specified contingency. Returning to the classroom, the externally unaltered reading non-game day contingency could, after its modification, alter the externally adjusted mathematics game time contingency through identity of contextual elements. Such changes would only show up as rate changes if the experimenter's measurement equipment was not set up to look for subtle changes in response patterns related to stimulus control elements.

Finally, there could be response identity between elements of the two contingencies, R_1 and R_2. If R_1 rate was increased as it was suggested above, then elements of R_1 could be substituted as part of R_2. One could ask of the present research, what is the relation between mathematics (R_1) and reading (R_2)? Another example would be a shift in a problem solving strategy under one set of conditions given the successful utilization of a different but similar strategy under a second set of conditions. If the contingency specified by the research is not defined and/or measured to the degree necessary to detect the changes, one would not observe the response topography shift.

The interactions discussed above would be diagrammed as follows:

$$\begin{array}{lccccc} 1: & [S_1^D & \rightarrow & R_1] & \leftarrow & S_1^R \\ & \uparrow & & \downarrow & & \downarrow \\ 2: & [S_2^D & \rightarrow & R_2] & \leftarrow & S_2^R \end{array}$$

The vertical arrows indicate how the interaction occurred to produce behavior change. In this case S_2^D influenced S_1^D, R_1 influenced R_2, and S_1 influenced S_2^R before behavior change in this two set example stabilized. What needs to be stressed is that the interactions taking place and the resultant behavior change were due to three interrelated events: (1) The degree to which the contingencies were specified and controlled, (2) the spacial-temporal arrangements of the contingencies, and (3) the identity between the corresponding contingency components. The first is related to experimental control and will not be discussed except to mention the importance of specifying and measuring the relevant variables, both dependent and independent. The second will be discussed in the section on the arrangements of contingencies of reinforcement. The third is the next topic of concern.

3. The Interaction of Contingencies and the Concept of Identity

The problem of specifying the degree of identity between corresponding components of sets of contingencies is the problem of "similarity" and the attempts to define it. It is a problem which not only has a long history in psychology but, also, cuts across many seemingly diverse areas of research. The similarity of stimuli and responses was a problem with the transfer of training experiments using nonsense syllables or motor skills. Osgood (1949) developed his transfer surface to predict the degree of transfer depending on the similarity of stimuli and responses. Its failure was due in part to its inability to adequately specify the properties of similarity.

Another example where the problem of similarity exists is observational learning. Whitehurst (1978) points out that virtually every work on observational learning or imitation is based on similarity. But he notes that no one has defined it or been able to point out when it occurs (to say nothing of the fact that a great deal of imitation does not involve the use of response similarity).

For the present analysis the problem of similarity of corresponding contingency components in alternate sets is solved by seeing it as a dependent variable which is determined by the past history of the organism. The prediction and control of identity is perhaps difficult but not impossible. The more access one has to past history the less of a problem it becomes. An understanding of how contingencies are arranged will help one get such access.

B. THE ARRANGEMENT OF CONTINGENCIES OF REINFORCEMENT

To describe how contingencies of reinforcement are arranged is to delineate a classification system. Classification systems are the vehicle on which the analysis and evaluation of data proceed. The development of an adequate classification system has been the turning point in various developmental phases in the physical sciences. For example, in chemistry the first real leap in knowledge came when phenomena were classified in terms of weight instead of color. Another of chemistry's descriptive leaps came with the development of a symbolic notation that served as a catalyst for the development of theory by providing a framework within which existing and future knowledge could be systematized (Michner, 1959).

For the experimental analysis of behavior, the first classificatory step was Skinner's (1938) distinction involving operant and respondent behaviors. The next step was the conception of the contingencies of reinforcement and their relationship to the phylogenetic and ontogenetic development of behavior (Skinner, 1969). It is at this point that the past history of the organism could be conceptualized in terms directly related to those of present history. It provides the vehicle for behavior analysis to expand beyond the isolated system where it now demonstrates precise control over the phenomena of interest. But the conception of contingencies of reinforcement and their importance in an individuals development is insufficient by itself. The anomalous findings and the lack of integration of data in the area of generalization is evidence for futher research efforts. It is believed that the efforts should revolve around a classification system which represents the historical arrangements of the contingencies of reinforcement.

The primary criteria for an adequate classification system is its ability to facilitate systemization of experimental data and in delineating areas of research. The difficulty with meeting the criteria is that behavior analysis is, as said, historical and developmental. The question is, how can one represent the present and the past without recourse to having events take place in some other dimension? For systemization to take place, various forms of similarity must be found between different observations (c.f., Sidman, 1960). If findings are to be integrated, the past and present must be classified on a single dimension, at one level of analysis. The resulting integration of knowledge at one level of analysis is for Skinner (1938) the defining characteristic of a descriptive science.

The classification of the past and present in terms of sets of contingencies of reinforcement that are structured (arranged) in various ways will solve the problem. The building blocks for the classification system are the contingencies of reinforcement. The arrangements of contingencies will give the blocks a discernible structure allowing for comparisons between other structures involved in the development of the organism. The interaction of past structures (as context variables) with present structures (as causal variables) results in a behavior change (as effect). The specification of the context, cause, and effect is the functional relation. A descriptive science is founded on the systemization of such relations.

The arrangement of contingencies is bound up with temporality: the organism is behaving in time. Psychologists have been hesitant to ascribe causality to events far apart temporally and have, thus, established the spacial concept of control. They have used cognitive and motivational terms referring to mediating mechanisms which represent a past or future event in the present. Racklin (1974) has put it as follows:

> "They [mediating mechanisms] have served for the psychologist as the ether family served the physicist, as a way of bridging between causes and their consequences when these causes and their consequences were separated by an entity through which it was not believed that causality could act. In the case of the physicist this entity was unfilled space. In the case of the psychologist this entity is an unfilled temporal interval." (p. 95-96)

The concept of control over extended temporal intervals is critical to a science which is historical and developmental. The concern is for the development of response components in the organism's behavioral repertoire. The permanence of those components will depend on the various arrangements of contingencies over the organism's history.

1. Arrangements of Contingencies[1]

Since all behavior occurs on a temporal continuum all contingencies of reinforcement are arranged sequentially. A sequential arrangement can be diagrammed as:

$$\ldots \rightarrow \boxed{[S_1^D \rightarrow R_1] \leftarrow S_1^R} \rightarrow \boxed{[S_2^D \rightarrow R_2] \leftarrow S_2^R} \rightarrow \boxed{[S_2^D \rightarrow R_3] \leftarrow S_3^R} \rightarrow \ldots$$

This is often called a chain where one contingency leads to another that could be quite different or very similar. The time spent in any contingency can also be different. The dots before and after the contingencies indicate that one is examining a portion of the stream of behavior. The analysis that follows will restrict itself primarily to the arrangement of just two sets of contingencies. No concern will be given to the amount of difference between the contingencies or the time the organism spends on any single contingency. What the sequential analysis leaves out are the "options" and "cycles" behavior goes through.

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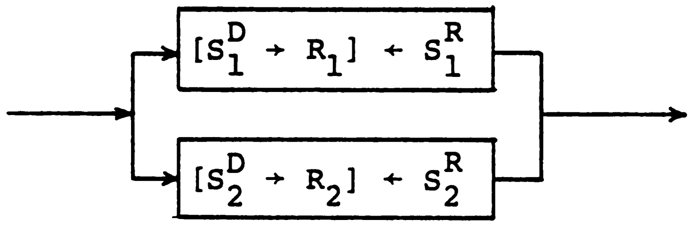
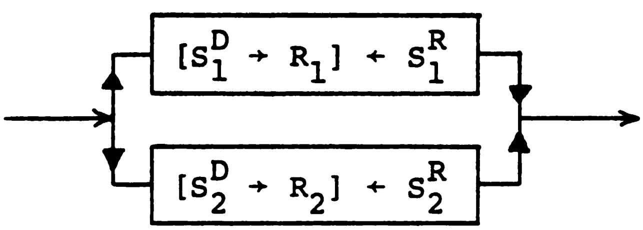
[1] The aim is not to develope a complete notational system, for that see Findley (1962) and Mechner (1959). The concern is to outline some possible arrangements of contingencies with the stress being placed on arrangements not on notational systems.

Options are the parallel arrangements of contingencies. They represent the points in time where the organism has available two or more contingencies. Options have been designated as reversible or non-reversible (Findley, 1962). A reversible option can be diagrammed as:



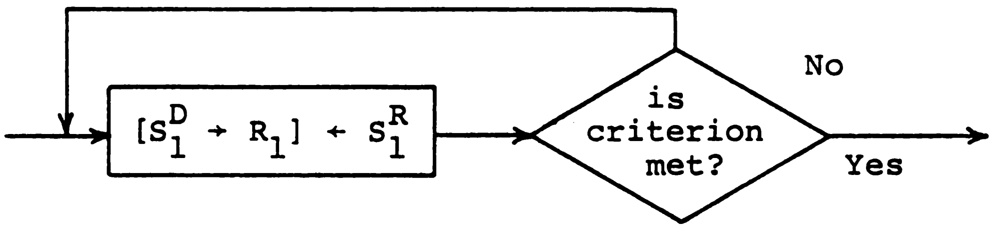
The organism in this arrangement can perform one of three ways. The first is to move back and forth between the two contingencies until both are fulfilled. The second is to satisfy one of the contingencies and move on. If the option has "compatible" contingencies, which means that they can be performed at the same time, the organism can respond a third way which is to satisfy both contingencies at the same time before moving on.

The non-reversible option can be diagrammed as:



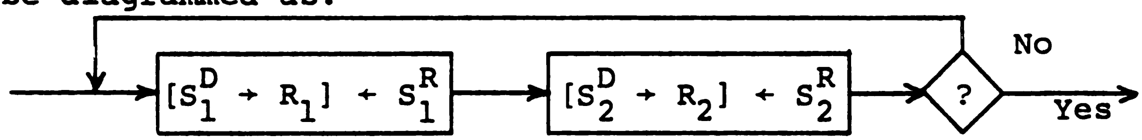
The organism entering this option can perform only one way. The initial choice of one of the contingencies determines what the organism can continue to respond to.

Cycles are repetitious presentations of various sized sequences or options. The free operant procedure with an organism under a non-discriminated simple schedule of reinforcement represents a single contingency that cycles. It can be diagrammed as:



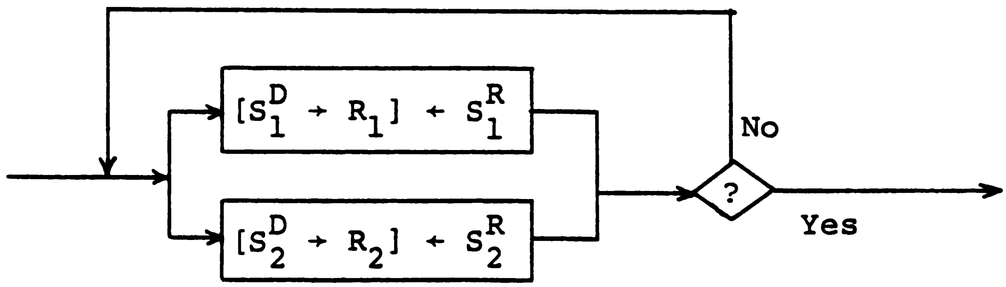
This is a unilinear arrangement and is not of direct interest in generalization research. The important aspect of the diagram is the diamond which specifies the criterion to move on to another contingency. In the free operant situation the criterion is usually something like number of reinforcements delivered and/or the time spent in the contingent situation. In classrooms the criterion is usually time without respect for the completion of the contingency.

An alternate set in a sequence that cycles would be diagrammed as:



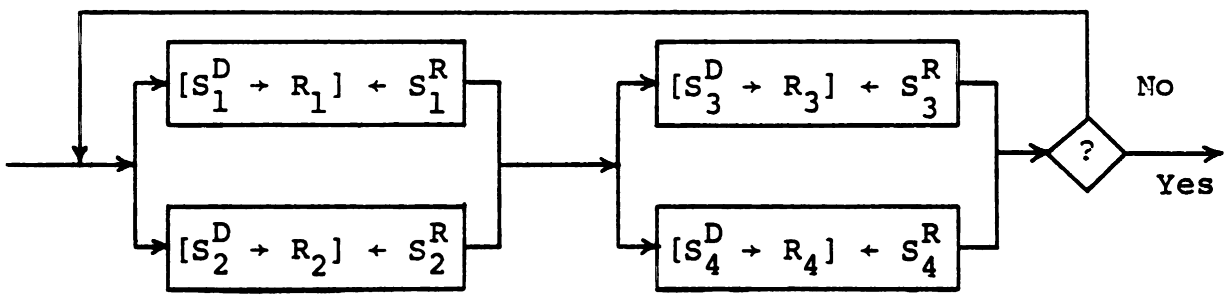
This diagram is similar to a discrimination experiment and as was cited earlier the amount of difference that exists in the specification of the contingencies will determine the form of future behavior. With cycles the order of presentation of the contingencies can follow a fixed, patterned, or random sequence.

Putting options and cycles together one gets:



The diagram is representative of a concurrent reinforcement schedule. In the classroom the diagram could represent a reading session where the student can read or perhaps talk to his or her friends. With small modification the diagram could be made to represent a reversible or non-reversible cycling option. If the option is reversible the contingencies could be compatible or incompatible.

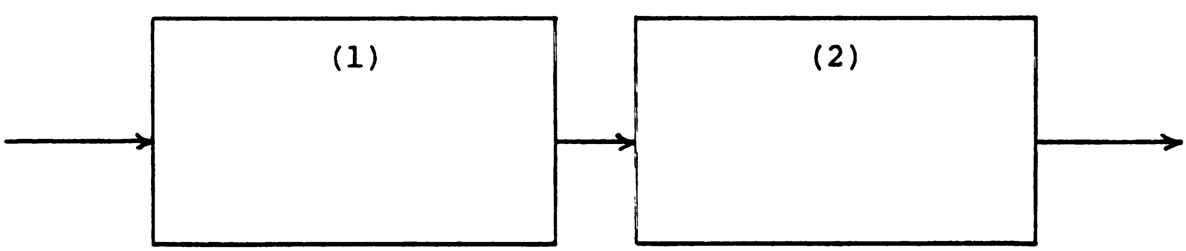
The next degree of complexity would involve putting a sequence of options into a cycling pattern. It could be diagrammed as:



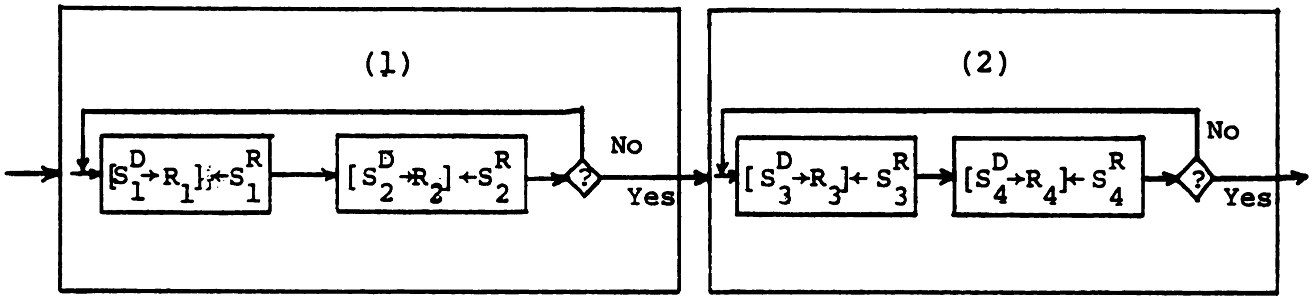
As in the previous diagrammed arrangement, the options could be reversible or non-reversible with the reversible having compatable or incompatable contingencies.

The important point to be remembered in all of the arrangements outlined is that they represent important independent variables in the determination of behavior. If the pattern of behavior for two organisms are the same and the arrangements are different, one must look into the history of organisms for the answer. Similarly, if the pattern of behavior for two organisms is different in the same arrangement, one must again look into the history of the organisms for the answer. These two statements are predicated on the knowledge that the researcher has checked and rechecked the adequacy of his or her experimental control procedures and measurement apparatus.

The historical arrangements which could be called the phases of an experiment, an intervention change, or an organisms developmental elements can be represented as large sequential arrangements containing any of the types of arrangements so far outlined. The basic diagram would be:



One element of past history (1) is shown with one element of present history (2). The arrow tells that the organism is progressing from the one to the next. Filling in the elements of history with two simple cycling discrimination experiment sequences we get:



The detailed specifications of S-deltas, home cage deprivation contingencies, etc. have been left out. Of interest

If an organism with a history of continually varying arrangements (1's) is repeatedly given one particular arrangement interspersed within the others (2's) with the result that the behavior change for this contingency arrangement is the same, one is witnessing the controlling power of the elements of the contingencies of reinforcement involved in that arrangement. It is related to the discovery of always-effective variables spoken of in an earlier section of this chapter. In this example the variables involved (expressed here as arrangements of contingencies) were always-effective enough to reverse behavior change within a single subject.

Given that one is dealing with behaviors one does not care to reverse, the second arrangement of contingencies, (2), in the above discrimination experiment could proven always-effective by providing different organisms with different prior histories (1's) and then seeing if the second arrangement (2) will produce the same pattern and rate of behavior in all the subjects. If it does the variables are proven to be always-effective across organisms.

But what happens when the variables used in the arrangement of contingencies are not always-effective? What happens when the extrapolated experiment (the generality-test) does not produce behavior change within the range of precision that was possible in the isolated system research or is needed to solve a social problem? The starting point for answering the question is an examination of the arrangements of contingencies of reinforcement. It does not appear to matter if the problem is one of experimental procedures, actual differences in the principles of operation of the involved processes, or in the nature of the past history of the organism; the examination of contingency arrangements should start the researchers problem solving behavior in a useful direction.

2. Examples of Arrangements

Throughout the presentation on the arrangements of contingencies of reinforcement the work of Guttman and Kalish (1956) has been contrasted and compared to the present research. At this point it would be instructive to diagram these two pieces of research and a few others that are of related interest.

The Guttman and Kalish (1956) experiment is diagrammed in figure 5.1. In this illustration training is one segment of history and testing another. The behavior independent contingencies (B.I.C.) is an aspect of history that runs throughout the life of the organism, the organism is always recycled back to it. Looking at the training segment of history one sees that the alternate set is not completely specified. The physical specification is only a darkened chamber during the S^{Δ} and if the response occurs during that time the reinforcing stimulus is not delivered. The history during testing indicates that no stimulus consequence is present. The outcome measure is indicated by the letter C.

The Blough experiment (1967) is diagrammed in figure 5.2. Notice that the only difference in history is the continuation of the reinforcement contingency during the testing sequence. This represents for the testing phase the clearer specification of alternate sets. It is this slight difference in testing (present history that results in faster extinction and greater discrimination to the nonreinforced test stimuli. The outcome differences for Guttman and Kalish, and Blough are illustrated in figure 5.3. It indicates that with the Blough (1967) experiment there is little generalization beyond the organisms sensory limits to detect change. But Guttman and Kalish (1956) got a much wider generalization gradient. These subtle

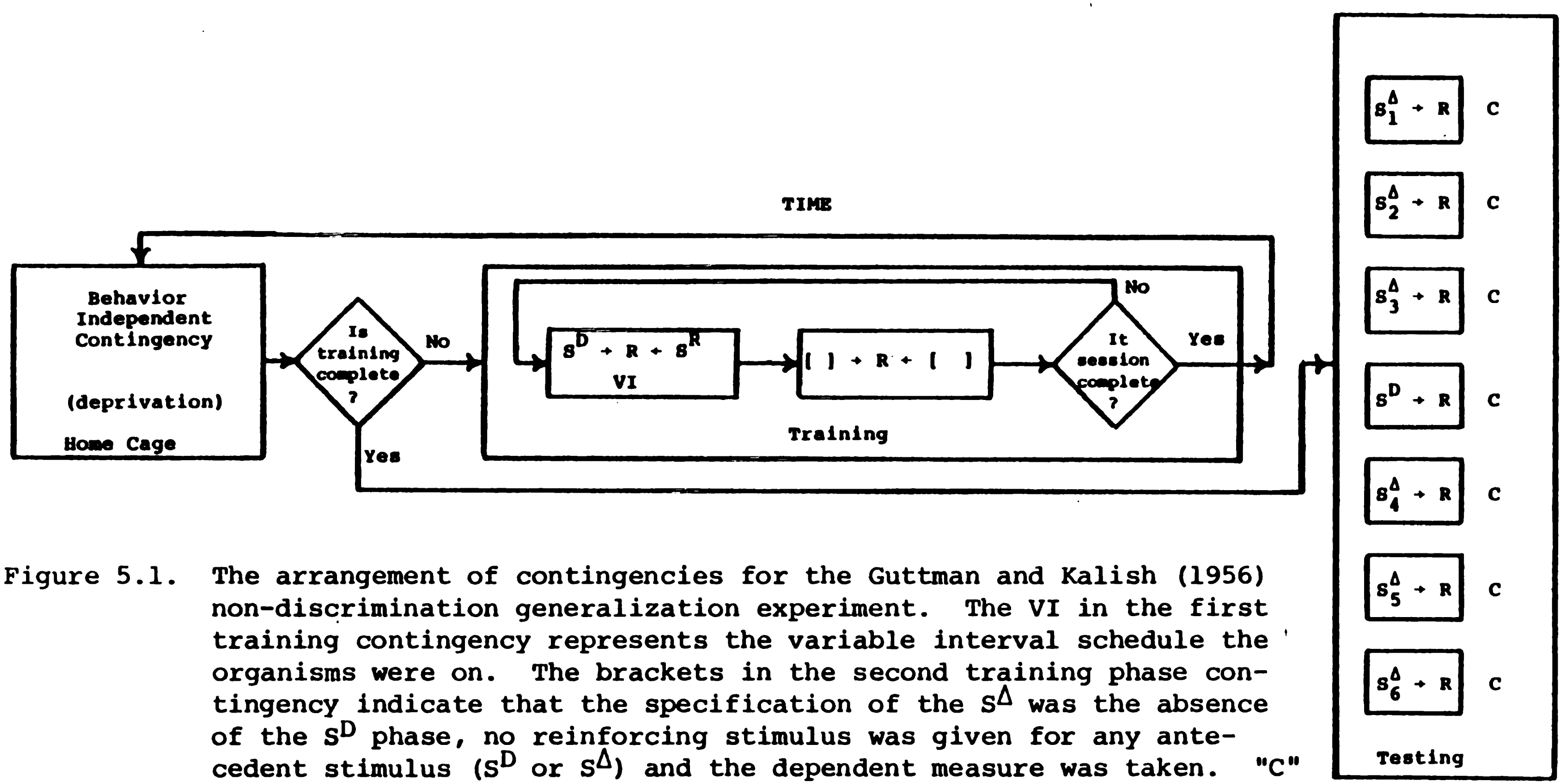


Figure 5.1. The arrangement of contingencies for the Guttman and Kalish (1956) non-discrimination generalization experiment. The VI in the first training contingency represents the variable interval schedule the organisms were on. The brackets in the second training phase contingency indicate that the specification of the S^Δ was the absence of the S^D phase, no reinforcing stimulus was given for any antecedent stimulus (S^D or S^Δ) and the dependent measure was taken. "C" indicates the points where the dependent variable was measured.

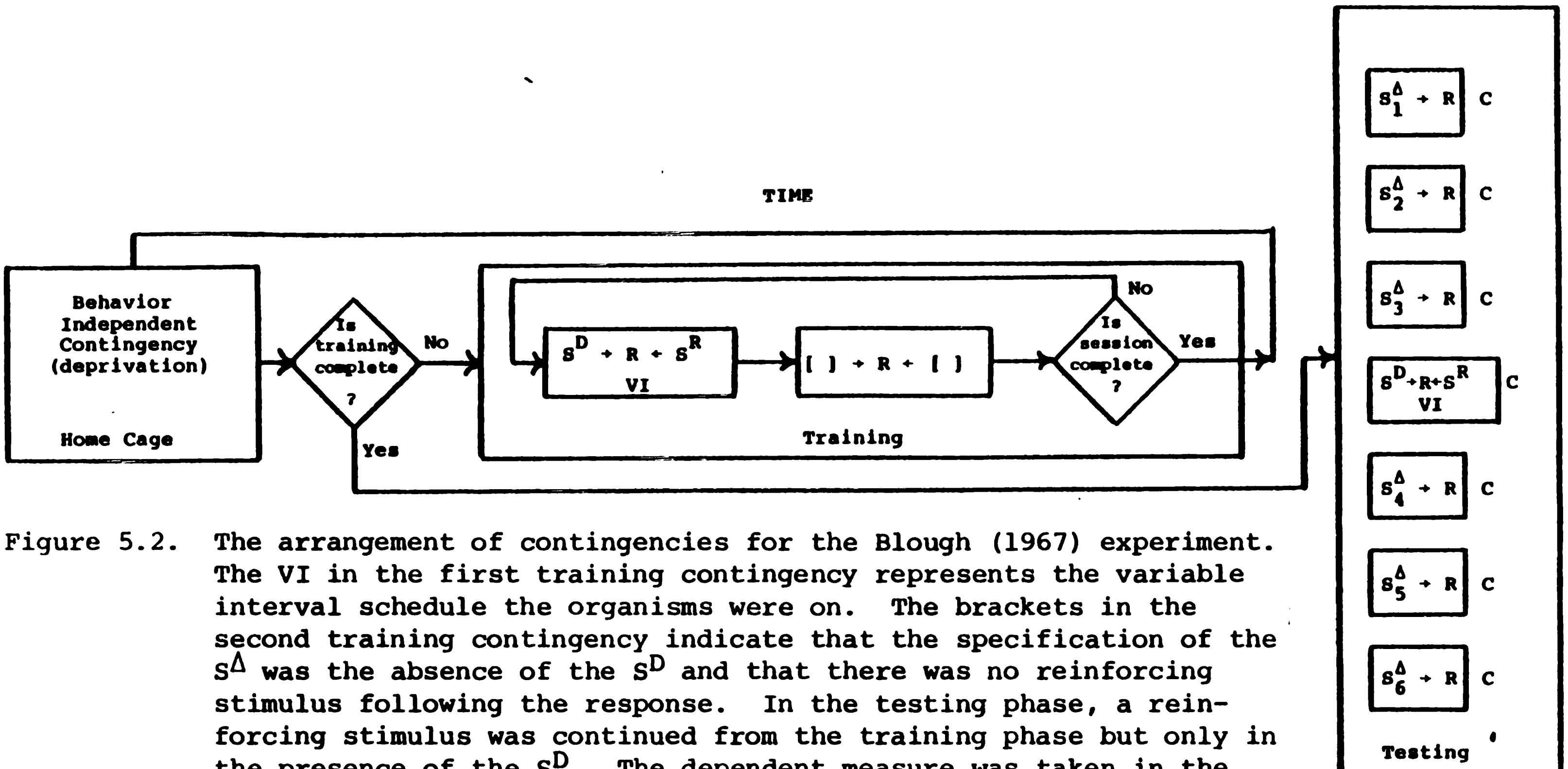


Figure 5.2. The arrangement of contingencies for the Blough (1967) experiment. The VI in the first training contingency represents the variable interval schedule the organisms were on. The brackets in the second training contingency indicate that the specification of the S^Δ was the absence of the S^D and that there was no reinforcing stimulus following the response. In the testing phase, a reinforcing stimulus was continued from the training phase but only in the presence of the S^D. The dependent measure was taken in the testing phase. "C" indicates the points where the dependent variable was measured.

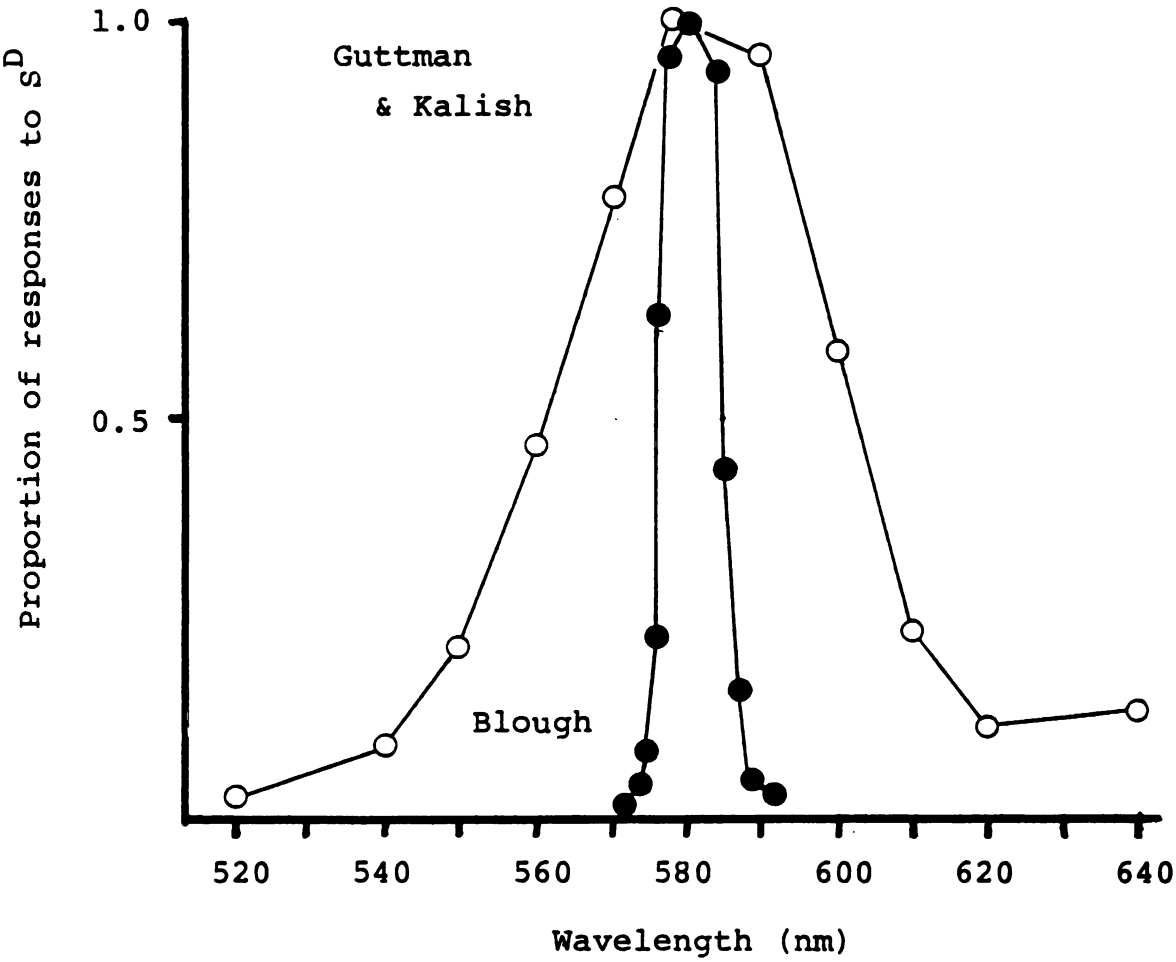


Figure 5.3. A comparison of two ways to test for generalization. During testing in the Guttman and Kalish (1956) experiment, pigeons were not rewarded at all. During testing in the Blough (1967) experiment, pigeons were rewarded for pecking during the S^D but not during the S^Δ. The result was a sharper gradient. For comparison the gradients are normalized about the S^D value. (From Rachlin, 1975).

differences in the generalization setting indicate that if expected rewards or the ABAB design arrangements do set up discriminations, the techniques needed to "break up" such discriminations may be profoundly simple. They may involve nothing more than some verbal statement that relates the reward condition with that of the non-reward condition.

An interesting variation on the Guttman and Kalish (1956) technique is the one that produces a gradient called the peak shift (Hanson, 1959) where the highest level of responding occurs in the presence of an S^{Δ} stimulus displaced away from the S^{D} stimulus in the direction opposite the alternate but specified contingency, $S^{\Delta} \rightarrow R \leftarrow [\ ]$. The difference in experimental procedure from Guttman and Kalish (1956), as illustrated in figure 5.4, takes place during training where the alternate contingency, $S^{\Delta} \rightarrow R \leftarrow [\ ]$, is clearly specified.

The outcomes of the peak-shift and the Guttman and Kalish (1956) experiments are presented together in figure 5.5. These dramatic differences illustrate what a slight shift in historical background, in terms of the relation between alternate sets, can do. The peak-shift is often referred to as demonstrating relational learning and the necessary condition for its occurrence is the clear specification of alternate sets in the organism's past history. It was the inability to specify the controlling variables in past history with respect to relational

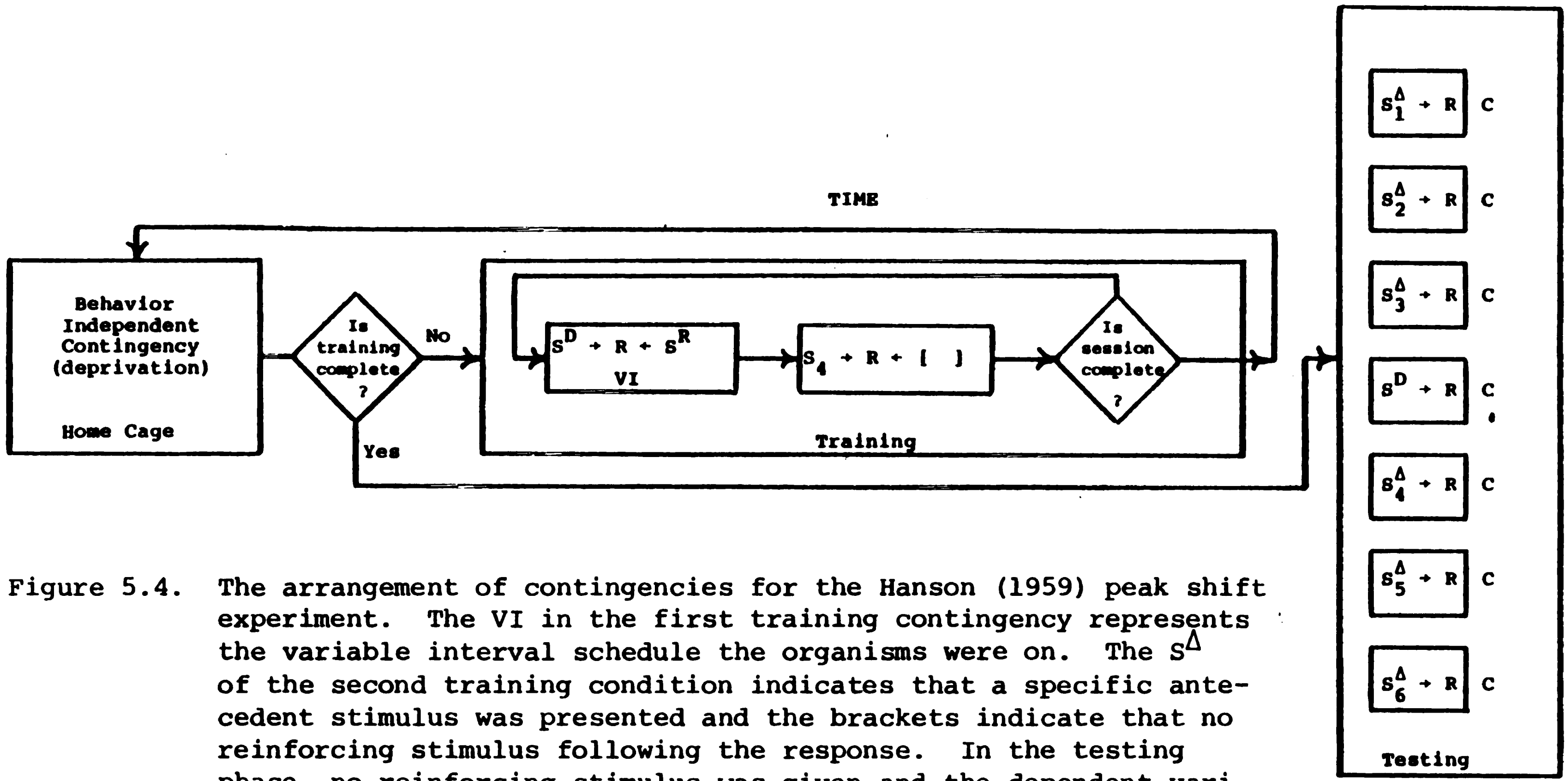


Figure 5.4. The arrangement of contingencies for the Hanson (1959) peak shift experiment. The VI in the first training contingency represents the variable interval schedule the organisms were on. The S^Δ of the second training condition indicates that a specific antecedent stimulus was presented and the brackets indicate that no reinforcing stimulus following the response. In the testing phase, no reinforcing stimulus was given and the dependent variable was measured as noted by "C".

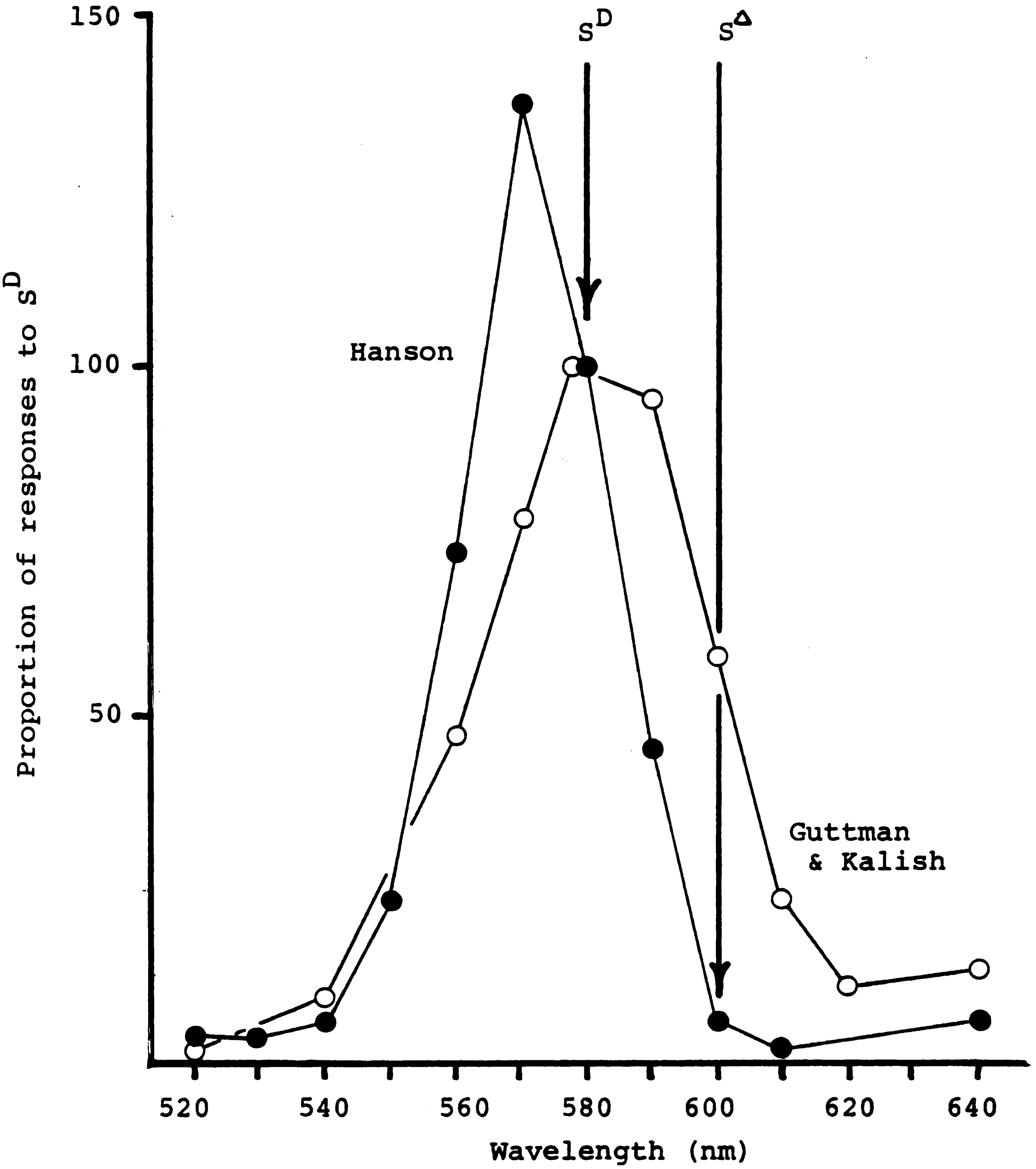


Figure 5.5. A comparison of two ways to <u>train</u> for generalization. During training in the Guttman and Kalish experiment, the S was not used as an alternate set. During training in the Hanson experiment, the S was used. The result was a shift in key-peck responding away from S^Δ. Neither experiment employed reward during testing. For comparison the gradients are normalized about the S^D value. (From Guttman and Kalish, 1956, and Hanson, 1959).

learning that lead to the confrontation between behaviorist and gestalt psychologists in the first half of this century (Goldiamond, 1975).

Contrast and induction experiments (e.g., Reynolds, 1961) have a great deal in common with peak-shift experiments during the training phase (past history). Both have clearly specified the antecedent stimulus in thier alternate sets although they are not as close in terms of sensory modality in contrast and induction experiments. The major difference is that the contrast and induction experiment has the alternate set on a reinforcement schedule during the training phase instead of the extinction schedule used in the peak-shift experiment. The arrangement of the contrast and induction experiment (Reynolds, 1961) is illustrated in figure 5.6. Notice that response rate is taken during training in the contrast and induction experiment. The testing phases of the two experiments make radical departures. During the testing phase of this experiment notice that the second contingency is changed. The extent and direction of its alteration is what defines the behavior change as contrast or induction. For example if the second component of testing is altered to an extinction contingency then one can get negative induction (i.e., the rate of the non-altered component decreases as does the altered extinction component) or positive contrast (i.e., the rate of the non-altered component increases as the

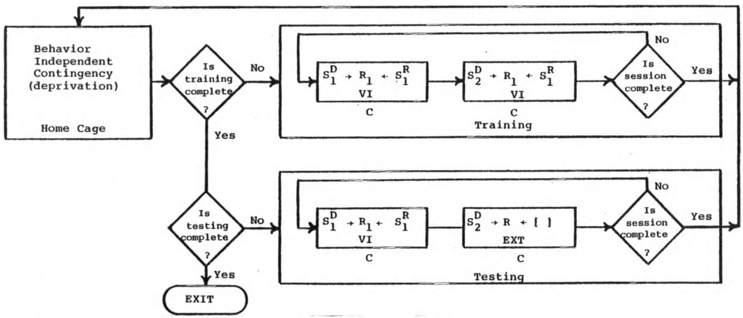


Figure 5.6. The arrangement of contingencies for the Renold's (1961) induction and contrast experiment. Variable interval (VI) and extinction (EXT) schedule of reinforcement were used in the training and testing phases. The dependent measure was taken, as indicated by the "C", during both training and testing phases. One of the determinants in whether contrast or induction will occur is how the second contingency in the testing phase is altered (i.e. reinforcement increased or decreased). The use of extinction (EXT) in the present arrangement results in positive contrast.

extinction component decreases). The variables determining which occurs are related to the interaction of contingencies in this particular arrangement. Positive induction and negative contrast can occur when the altered component has an increase in reinforcement in the testing component. The four types of results are illustrated in figure 5.7. Such contrast and induction results have been found to be either permanent or transient (Mackintosh, 1974).

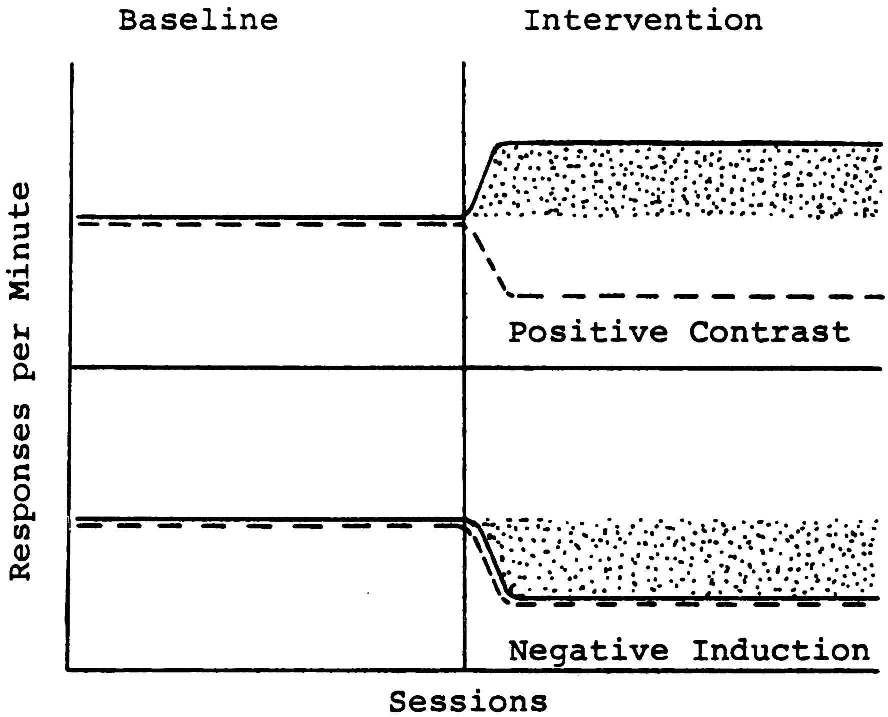
It would be interesting to integrate the data on these generalization experiments by performing a multiple schedule contrast experiment but also put in the wide range of stimulus that are involved in the testing phase of the Guttman and Kalish, Blough or peak-shift experiments. It would be interesting to see how they could vary as the various forms of contrast or induction developed.

Richards (1972) found that delay of reward also produced behavioral contrast but not as reliably across subjects as did a change in the reinforcement schedule to extinction. This indicates that neither a reduction in reinforcement frequency nor response rate during the alternate component are necessary for the production of contrast. More important it shows that some variables being dealt with or encountered in the interaction of contingencies situations are not always-effective.

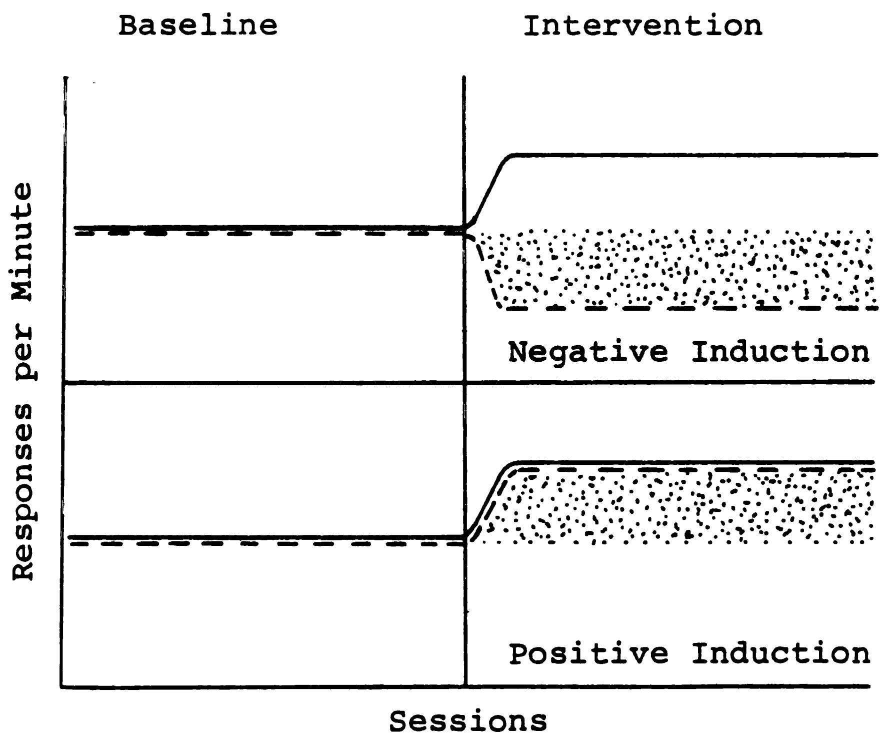
The interaction of schedules need not occur only between the components of the schedules being reinforced.

Figure 5.7. Schematic diagrams of the four types of behavioral interactions. In part A, Baseline behavior has stabilized in two different settings with the same reinforcement schedule. During the Intervention phase, the reinforcement schedule associated with the second setting (dashed line) is changed to extinction (no reinforcement); the result is a decrease in response rate. The upper portion of part A indicates positive contrast (shaded area) or an increase in response rate in the first setting; the lower portion indicates negative induction (shaded area) or a decrease in response rate in the first setting. In both the upper and lower sections of part A, the schedule of reinforcement was never changed in the first setting (solid line).

In part B the Baseline phase is identical with part A. During the Intervention phase, the reinforcement schedule associated with the first setting (solid line) is changed so that greater reinforcement is given; the result is an increase in rate of responding. The upper portion of part B indicates negative induction (shaded area) or a decrease in response rate in the second setting; the lower portion indicates positive induction (shaded area) or an increase in response rate in the second setting. In both the upper and lower portions of part B, the schedule of reinforcement was never changed in the second setting (dashed line).


Baseline
Intervention
Responses per Minute
Positive Contrast
Negative Induction
Sessions

A


Baseline
Intervention
Responses per Minute
Negative Induction
Positive Induction
Sessions

B

They can occur where the organism is not under an experimental contingency. Schedule-behavior is an example. Jacquet (1972) used multiple schedules in an arrangement similar to contrast experiments but access to water was on a behavior independent contingency (B.I.C.). The experiment is diagrammed in figure 5.8. During the training phase (past history) and the testing phase (present history), the animal had free access to water (the behavior independent contingency). With the changing of the second food-reinforced set during testing, contrast occurred in the food reinforced behavior. But there was also a concomittant change in drinking behavior, indicating interactions outside the closely related food reinforced set. In other words the extent of behavioral change is dependent on what is available for the organism to respond to. In the complex applied environment, access is greatly expanded. And it could be that differential access across experiments is one reason for the promotion or non-promotion of generalization even when the number of settings are the same.

The present experiment expanded not only the number of behaviors available and recorded in a setting but the number of settings as well. The results as indicated in chapter III were contrast and induction relative to the altered contingency across settings for one of the behaviors, i.e., on-task. The arrangements of contingencies

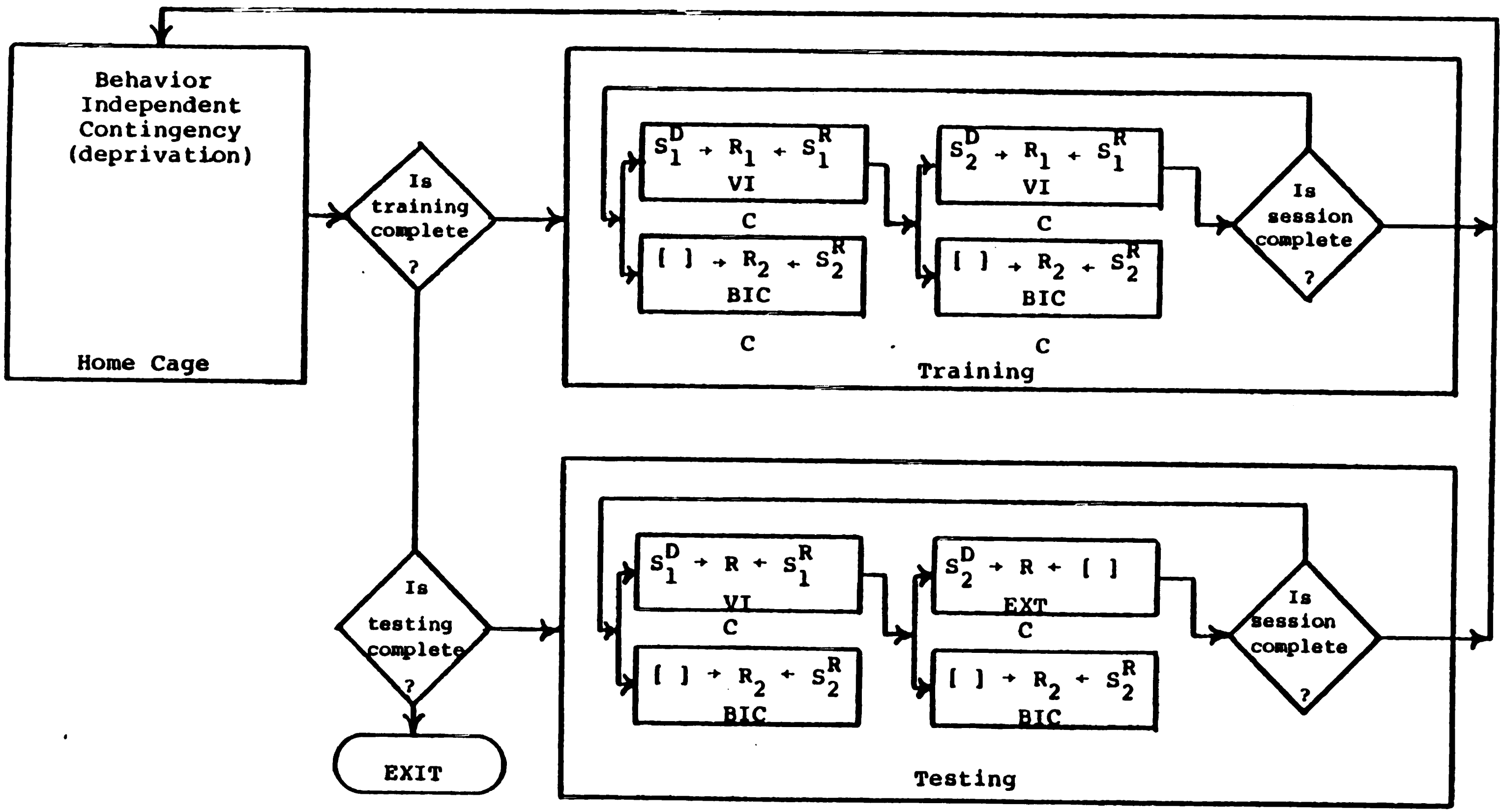


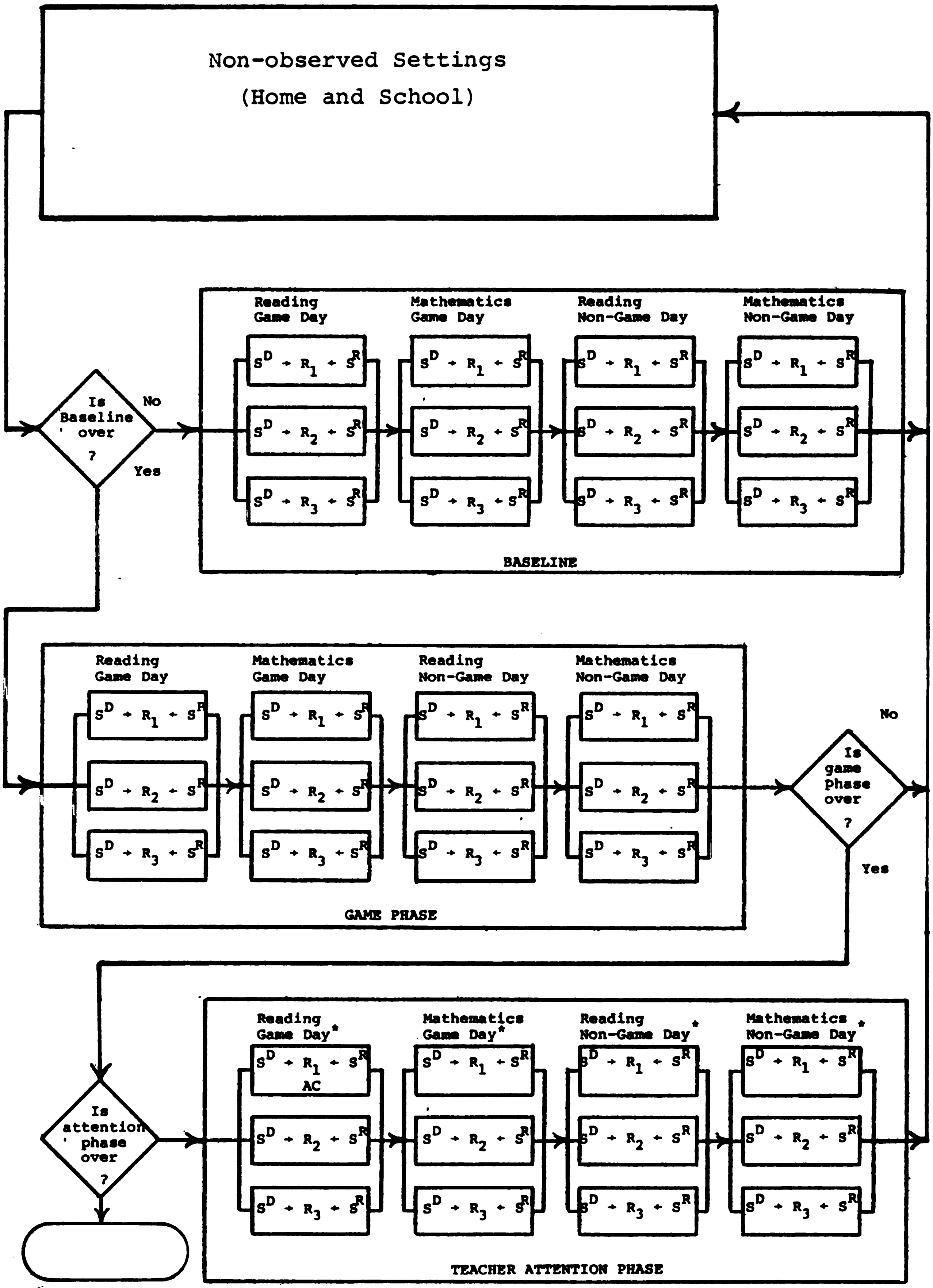
Figure 5.8. The arrangement of contingencies for the Jacquet (1972) schedule induced licking experiment. The schedules of reinforcement used in the Training and Testing phases were variable interval (VI), extinction (EXT), and a behavior independent contingency (BIC). The R_1 represents bar pressing and R_2 water licking with S_1^R being pellets and S_2^R water. The change in water licking that results when the bar pressing schedule is altered from variable interval reinforcement during training to extinction during testing is referred to as schedule induced behavior.

for the students is diagrammed in figure 5.9. Although the S^D and S^R components of the contingencies cannot be clearly specified, one can see that a four set sequence of a three-ply concurrent cycle exists during each phase of the experiment with each cycle leading back to the non-school setting which is precluded by eight years or so of divergent history (not shown). Even with the eight years of divergent history not included in the analysis of arrangements, the patterns of outcome for the students are consistnet considering the control procedures used.

Returning to figure 5.9, the four set sequence corresponds to the game and non-game days for mathematics and reading. The three-ply concurrent cycle is related to the on-task, off-task, and movement response classes observed for the student. The reciprocal interaction between teachers and students would be specified by altering the sequence and cycle in which the change in contingencies took place.

The complex interactions that occurred in this experiment indicate that the advancement of generalization research will take place when researchers begin to control environments so that they know what arrangements are involved and the extent of the behaviors that are accessible to the organism. Research with such knowledge should be able to establish what variables are needed to maintain or shape behavior in various environments given its initial

Figure 5.9. The arrangement of contingencies for the present experiment. The pluses (+) and asterisks (*) indicate the settings across phases where interventions were instated. The response classes measured are represented by R_1 (on-task), R_2 (off-task) and R_3 (movement). Such arrangements indicated that interaction resulted in both contrast and induction relative to the instated contingencies (see results and discussion in Chapters 3 and 4).


Non-observed Settings
(Home and School)
Is Baseline over ?
No
Yes
Reading Game Day
Mathematics Game Day
Reading Non-Game Day
Mathematics Non-Game Day
$S^D \rightarrow R_1 \rightarrow S^R$
$S^D \rightarrow R_2 \rightarrow S^R$
$S^D \rightarrow R_3 \rightarrow S^R$
BASELINE
Reading Game Day
Mathematics Game Day
Reading Non-Game Day
Mathematics Non-Game Day
GAME PHASE
Is game phase over ?
No
Yes
Is attention phase over ?
Reading Game Day*
Mathematics Game Day*
Reading Non-Game Day*
Mathematics Non-Game Day*
AC
TEACHER ATTENTION PHASE

induction. The knowledge should also allow the researcher to explore the parameters of initial induction.

Controlling arrangements and accessibility to contingencies is a primary concern for the experimental analysis of behavior; but applied behavior analysis need not and cannot rely on it. The analysis and measurement of arrangements and accessibility may even be of greater concern. If one analyzes and measures such things, one can, as Baer (1978) put it, do generality-testing research. Such research will be useful because the analyses and measurements made will outline the similarities and differences between experimental and applied research; one will be able, as Sidman (1960) has said, to "recognize similarities in their principles of operation." The long run result is the systemization of knowledge and the clarification of research areas and problems; these as noted earlier in this chapter, were the primary criteria for an adequate classification system.

A final note is that unrelated areas of psychology can be integrated using the arrangement of contingencies classification system. For example, the work of Seligman (1975) on helplessness can be classified in terms of the arrangements of contingencies as can all the transfer of training experiments that have been concerned with concepts like proactive and retroactive inhibition. In both of these cases it is the arrangements in past history and the interaction of the components of the contingencies that lead to the results obtained. The reader is invited to apply the outlined classification system and the concept of the interaction of contingencies to these areas of research to witness the power of the scheme to systematize areas of research.

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APPENDICES

APPENDIX A

Teacher and Student Behaviors

TEACHER BEHAVIOR

I. CONTINUATION (+)/CHANGE (-)

A teacher's verbal and non-verbal contact with students will be viewed as either directed at changing or continuing the behavior of the student.

Performing the continuation comment can be viewed operantly as:

$$S^d \longrightarrow R_1 \longrightarrow S^{r+}/S^d \longrightarrow R_1$$

S^d	R_1	S^{r+}/S^d	R_1
room situation	student behavior	teacher comment to continue its double function	student response desired by teacher

The change comments can be viewed operantly as:

$$S^d \longrightarrow R_1 \longrightarrow S^{r-}/S^d \longrightarrow R_2$$

S^d	R_1	S^{r-}/S^d	R_2
room situation	student behavior	teacher comment or action to change to response 2	adjusted response

A (+) will indicate a continuation comment, a (-) a change comment. Continuation and change classifications will apply to On-task, Academic, General attention, and Physical contact categories; they will NOT apply to the neutral categories of Instruction, Directions, No response, and Comments.

II. CATEGORIES OF TEACHER BEHAVIORS

Academic (A): Comments by the teacher concerned with the student(s)' academic behavior as defined by teacher directions and rules.

"I would like you to finish your reading assignment." (A-)
"Your reading has really improved, John." (A+)
"Great work, everyone." (A+)
"I want you to all get back to your math!" (A-)

Note: "You did great on your assignment." (A+)
"You really paid attention to the assignment." (O+)
"You were given directions, do them!" (A-)

Use of the words "assignment" or "directions" puts it in the academic category UNLESS REFERENCE IS MADE TO ATTENTION, which is (0).

ON-TASK (O): Comments by the teacher that refer to the class, a group, or an individual, and are concerned with the student(s)' attending to teacher-specified activities.

"Stop chewing gum, Mary." (0-) (against teacher-specified rule)
"I like the way you are quiet, Mary." (0+)
"Mary, I told you to pay attention to the assignment." (0-) (in this case it is 0 and not Academic because of referral to attention)
"Shush, Jane." (0-)
"I asked you boys to sit in your seats!" (0-)

GENERAL ATTENTION (G): Comments by the teacher concerned with non-academic behavior. Such behaviors include personal aspects of the students, activities outside the classroom, or any activity not incompatable with academic activities (nose-picking, smoking - unless there is a rule which would make it off-task, etc.)

"Fantastic socks, Harpo." (G+)
"Your soccer game was very good yesterday, Jim." (G+)
"Jumpy, you need to please take a bath tomorrow, OK?" (G-)

PHYSICAL CONTACT (P): Actions by the teacher related to an individual. It may be used alone or usually concurrently with another category.

"Great work, John'" (pats shoulder) (PA+)
(teacher puts child forcibly into seat) (P-)
"Sit in your seat!" (puts into seat) (PO-)

Note: an arm on chair while instructing student does NOT count, but an arm ON his shoulder does count.

INSTRUCTION (I): Comments by the teacher directed at shaping a student(s)' performance before or during a task activity. This also includes non-verbal "checking" or students as they work.

"There are four new words in today's vocabulary...now say them with me..." (I)
"Your 'N' is almost correct (takes hand)...but it is really more like this (moves hand to form criterion 'N') ...see?" (PI)
"Notice the topic sentence, what does it tell you?...now answer #3...#4... that is correct." (I)

Note: If followed by a "great!" or "fantastic", scored as A+. If simply a "correct" or "OK", just scored as "I".

DIRECTIONS (D): A subclass of Instructions which involves comments by the teacher concerned with giving the students academic tasks to do. This includes "given" directions, not repeated every day, for things such as activities to do when work has been completed.

"Please read chapter six, everyone." (D)
"Read pages 30-69, James." (D)
"You all may take out your art and finish it." (D)

COMMENTS (C): A subclass of Instructions which involves statements by the teacher related to granting permission to do a task, general information questions not related to instruction, and statements directed at some non-academic event that will take place.

"John, is the teacher in the hall?" (C)
"Yes, you may begin your project now that you have finished your math." (C)
"Lunch is changed to 11:30 today so we can attend the play at 12:30." (C)
"Because the snow is so bad, we will stay in for recess." (C) -- non-academic

NO RESPONSE (N): Times when the teacher is not interacting with the class.

(teacher is out of the room) (N)
(teacher is sitting alone at desk) (N) -- even if checking on students? or is this I?
(teacher marking papers)

III. DIRECTION OF TEACHER ATTENTION

Class (C): "Everyone, please open your book to page 37." (C)
"Class, line up at the door." (C)

Group (G) of two or more students:

"This group is doing great!" (G)
"You two had better stop talking." (G)

Individual (I):

"Zelda, please do the next ten problems." (I)
"What time is it, Burt?" (I)

Target (number): <u>scored as individual</u>. Each target is given a number. If John is number 4, a comment to him is (4).

<u>scored as group</u>. If John is number 4 and Jim is number 5, a comment to both of them only is (4,5).

IV. HIERARCHY OF RECORDING CATEGORIES

If a ten-second recording interval contains more than one category, the category to be recorded will depend on its place in the hierarchy of categories that was determined by the researcher's interests. In other words the category that yields to another lower on the hierarchy. The hierarchy is as follows

$$\left.\begin{array}{c}\text{Academic}\\ \uparrow \\ \text{On-task}\\ \uparrow \\ \text{General Attention}\\ \uparrow \\ \text{Instructions}\end{array}\right\}\ \text{Physical Contact}$$
$$\begin{array}{c}\uparrow \\ \text{No Response}\end{array}$$

Physical contact was recorded with all the no-response category. It is recorded alone only if it is performed without comment by the teacher.

V. SCORING TEACHER BEHAVIORS

1. The direction of attention (C or G or I or target number) is marked in the first box as the examples show. The distinction between class, group, or individual, or target is dependent on the orientation of the teachers verbal statements and physical presents. If there is no specific orientation to a group or individual, then the direction of the statement is to be classified as class. If the teacher clearly specifies a group by name or presents, then the direction of the behavior is to be marked as group. For example, Mrs. _______'s room the reading groups she sits with in the morning would be considered a group. For a target or individual to be classified as the direction of attention the teacher must have physical proximity and/or verbal specificity related to an individual or target.

I		

2. If the direction of attention is to a group and a target is part of the group, then a target number is included in the middle box next to the group designation. Examples

G	4	

3. If the direction of teacher attention is to a group and a non-group target in the same recording interval, then the direction of attention is marked with the target number. The target has precidence over all other direction classifications. The individual has precidence over the group and the group over the class.

4. If two individuals are addressed by name and one is a target, mark the target number in the direction box.

4		

5. The specificity or category of the teachers behavior is marked in the third box. Example

		C+

6. If the interval contains an attention category and part of it is continuation and part of it change directed, then the change (minus) is given priority.

7. If a behavior category and direction begin and continue through several intervals then draw a continuation line. Example:

G	4	I							4		A+

8. If the direction or category of teacher behavior changes, then use only a partial continuation line. Examples:

a.

G	4	I			A-

b.

I		I	G		

9. Remember when scoring teacher behavior that the interval to be recorded is the one announced on the tape. The interval ends with the presentation of the number on the tape. After recording the direction and specificity of the teachers' behavior the rest of the interval is devoted to observation. During the observation try to make as much visual and auditory contact as you can with the teacher.

STUDENT BEHAVIORS

On-Task (+): Marked when the student is following the teacher's directions and/or permission.

1. Students can be marked on-task if working together but they must clearly be working together. For example, working on a math problem or figuring out a word in a text or library book is to be considered on-task.

2. During a class or group reading time, a student can look at the person reading or at book. They can not play with things like rubberbands or draw on paper or book (these are considered group off-task).

Off-Task (-): Marked when the student is not following the teachers' directions and/or permission.

1. Drawing in class is marked off-task.

2. Looking away from work is marked off-task.

3. Hitting, kicking, talking, etc. at desks is marked off-task.

Movement (M): Marked when the student is out of his/her seat without permission, directions, and/or paper or book in hand.

1. Out of seat is defined as not being able to touch the top of desk without bending or taking a step. A student may be out of his chair and still not be out of his/her seat.

2. If the student stands in line to see teacher he/she is to be marked (M). Marked (G) only if in close proximity to teacher and having the teacher's attention.

3. Sharpening pencils is marked (M).

4. Going to the bathroom is marked (M).

5. Returning from out of the room is marked (M).

6. Movement to the sign-out sheet is marked (M).

7. Exception: out-of-the-seat is marked on-task (+) when the student has paper or book in hand. If student stops to talk or interact with others about non assignment matters, he/she is to be marked (M).

Out-of-Room (O): Marked when the student is out of the room.

Group Work (G): Marked when the student is in a group with the teacher or is receiving individual attention/instruction from the teacher. The category is marked (G-) if the student's behavior is off-task in teacher's presence.

NOTES ON OBSERVING FOR HIGH RELIABILITY:

1. Follow the definitions to the letter -- do not judge student behavior or infer what is going to happen.

2. Find an observational viewpoint that lets you see all targets without turning head back and forth.

3. Before you begin recording go over the observation pattern (visual sweep) and spot and place all targets.

4. If on the scan of the previous place of the students finds that he/she is not there, then look at teacher to see if contact is taking place there and if it is not then mark (M) and look during the next pause for the student.

5. If you must move to a better location.

6. Relax and try to get an immediate "grove" to the recording. Try to feel at ease in the room -- this is best done by following the first five rules above.

7. Memorize students and definitions!

8. When in doubt about class assignments or rules, ask teacher.

9. Can you think of any more?

APPENDIX B

Student and Teacher Recording Forms

Teacher

SHEET NO.______________ OBSERVER______________ DATE______________

						6
						12
1	2	3	4	5	6	
						18
						24
1	2	3	4	5	6	
						30
						36
1	2	3	4	5	6	
						42
						48
1	2	3	4	5	6	
						54
						60
1	2	3	4	5	6	
						66
						72

						6
						12
1	2	3	4	5	6	
						18
						24
1	2	3	4	5	6	
						30
						36
1	2	3	4	5	6	
						42
						48
1	2	3	4	5	6	
						54
						60
1	2	3	4	5	6	
						66
						72

						6
						12
1	2	3	4	5	6	
						18
						24
1	2	3	4	5	6	
						30
						36
1	2	3	4	5	6	
						42
						48
1	2	3	4	5	6	
						54
						60
1	2	3	4	5	6	
						66
						72

Student

SHEET NO. ____________ OBSERVER ____________ DATE ____________

1	2	3	4	5	6	7	1	2	3	4	5	6	7	
														15
														30
														45
														60
														75
														90
														105
														120
														135
														150
														165
														180

1	2	3	4	5	6	7	1	2	3	4	5	6	7	
														15
														30
														45
														60
														75
														90
														105
														120
														135
														150
														165
														180

1	2	3	4	5	6	7	1	2	3	4	5	6	7	
														15
														30
														45
														60
														75
														90
														105
														120
														135
														150
														165
														180

APPENDIX C

Reinforcement Menues

5th Grade and 2nd Grade

5th Grade

NAME: ______________________________

HOW MUCH WOULD YOU LIKE FREE-TIME TO DO OR BE INVOLVED IN THE FOLLOWING?
Choose one answer for each.

		not at all	a fair amount	very much
1.	Having time to work on special individual projects....................................			
2.	Having time to work on special group projects.			
3.	Holding class outdoors in good weather........			
4.	Talking to a friend			
5.	Having a rap session with a teacher and/or Friends...			
6.	Having a class party..........................			
7.	Writing a letter to a friend.................			
8.	Writing letters to penpals around the world...			
9.	Buying your wayout of homework or exams through paying attention to work during class time....			
10.	Displaying your work on bulletin boards in hallways....................................			
11.	Displaying your work in the principal's office.			
12.	Being a group leader for a lesson (teacher for a lesson!)...................................			
13.	Playing games of your choice.................			
14.	Extra gym time for individual sports..........			
15.	Displaying your picture in the hallway when your work is finished on time................			
16.	Displaying your picture in the principal's office when your work is finished on time.....			
17.	Extra gym for group sports....................			
18.	Being in charge of taking attendence..........			
19.	Being awarded a "Great Work" button for finishing your work on time..................			
20.	Performing on a musical instrument...........			

(2)

	not at all	a fair amount	very much
21. Looking at interesting buildings...............			
22. Looking at beautiful scenery.................			
23. Hiking or walking...........................			
24. Taking fieldtrips to see			
a. animals..............................			
b. science projects......................			
c. historical places.....................			
d. others: ____________...........			
25. Singing			
a. alone................................			
b. with others..........................			
26. Being right			
a. by guessing what somebody is going to do..................................			
b. in an argument........................			
c. about your work......................			
d. on a bet.............................			
27. Solving problems			
a. by yourself..........................			
b. with others..........................			
c. math problems........................			
d. science problems.....................			
e. puzzles..............................			
f. your problems........................			
g. other's problems.....................			

(3)

	not at all	a fair amount	very much
28. Completing a difficult job			
a. by yourself............................			
b. with others............................			
29. Having people seek you out for your company...			
30. Having people seek you out for your advice....			
31. Having people seek you out for your helpfulness.....................................			
32. Being praised			
a. about your appearance....................			
b. about your work.........................			
c. about your hobbies......................			
d. about your physical strength............			
e. about your athletic ability.............			
f. about your clear thinking...............			
g. about your friendliness.................			
h. about your being helpful to others......			
i. about your understanding of others......			
HOW WOULD YOU LIKE TO BE IN THE FOLLOWING SITUATIONS?			
33. You have just completed a difficult job. Your friends come by and praise you for a "job well done."......................................			
34. You are at a party. Somebody walks across the room and smiles at you in a friendly way, and says, "I'm glad to meet you. I've heard many good things about you from your friends"..........			
35. You have just led your team to victory. An old friend comes over and says,"That was great work! Let me treat you to a Big Mac.".........			
36. You are walking along a mountain pathway. You notice beautiful lakes, streams, flowers, and trees. You think to your self how great it is to be able to see all of this, to have the chance to wander alone out in the country.....			

2nd Grade

NAME: ____________________

1. I like to have free-time.

yes	No

2. I like people to thank me for hard work.

yes	No

3. I like to be hugged by a friend

yes	No

4. I would like an award for doing my work.

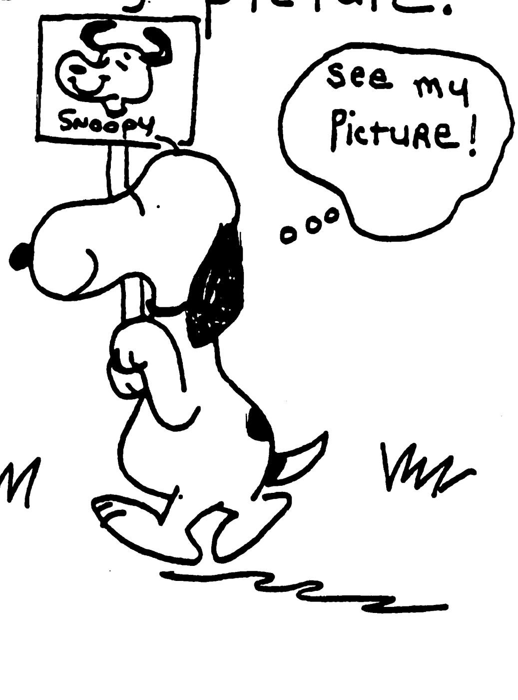
yes	No

5. I like to read.

yes	No

6. I like people to see my picture.

yes	No



7. I would like extra art time.

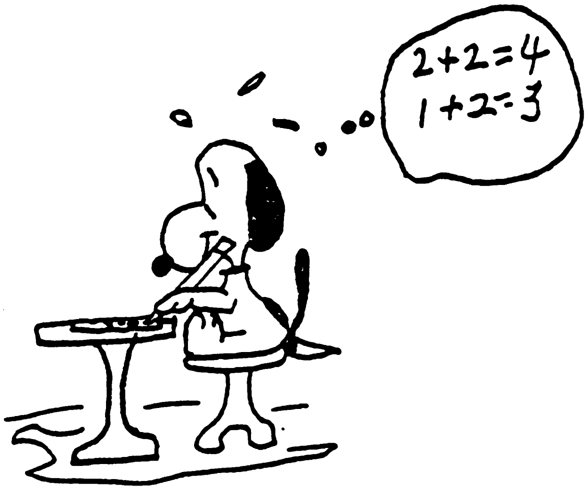
yes	No

8. I like to sit by friends.

yes	No

9. I like To do math.

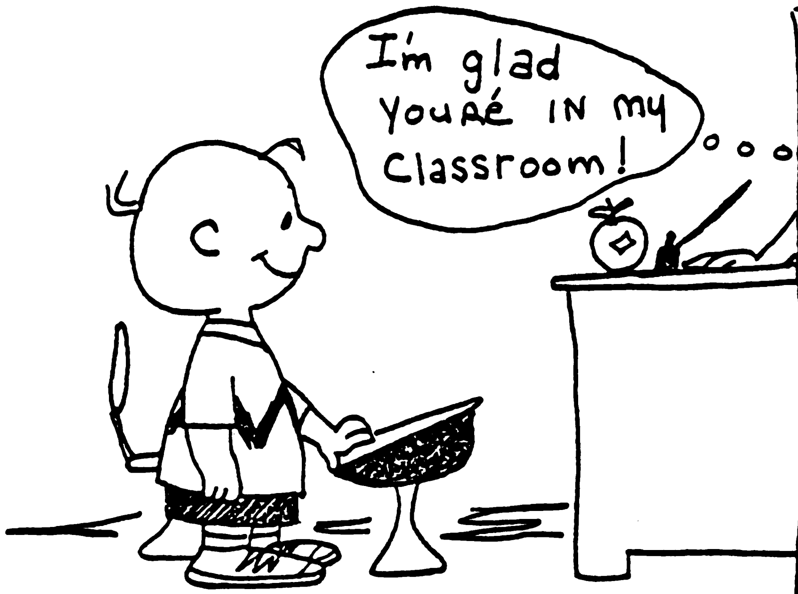
Yes	No



10. I would like to always do my work.

Yes	NO

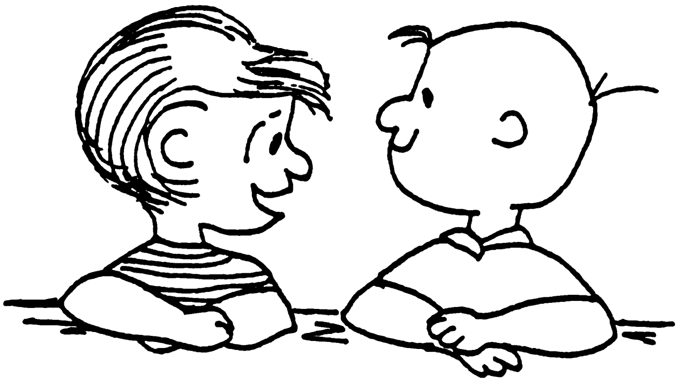
11. I want the teacher to like me.



yes	No

12. I would like more time to talk to my friends.

yes	No



APPENDIX D

Game Procedures

NOTES ON PLAYING A CLASSROOM COOPERATION GAME

I. Introduction:

A cooperation game is designed to foster compatible behaviors in the classroom between students and students and teachers. What follows will go over how the game procedure works, some considerations that need to be made when playing a game, an outline for introducing a game, and a set of behaviors that should guide the formation of the rules of the game.

II. How the game procedure works:

Compatible behaviors can be conceptualized as sets of behaviors that may be different but contribute to the same end. The parts of any machine are good examples: they all are different but they all contribute to the same end -- the operation of the machine. If the parts contribute as designed, then the end is achieved. In the classroom the teacher contributes and so does the student. If the contributions are not in line with the goal, the goal will not be reached. The concept is simple; the hard part is trying to make it happen. In order to make it happen, one needs to understand (in terms of analysis and synthesis) the contingencies that exist in the classroom.

A contingency of reinforcement can be represented as follows:

$$S^D \dashrightarrow R \dashrightarrow S^R$$

The S^D represents the various conditions in the classroom that set the occasion for some response, R, to occur. These conditions include a variety of things from the structure of the room, the way the students sit (tables, individual desks, study carrels). The number and activities of other students, and the teacher's behavior. All of these and many others are in every classroom. The idea is to arrange them so that they are all compatible with and contribute to the same goal. The game procedure arranges the behavioral components of the classroom so that the goal can be reached.

The response of the students, R, can be seen as the goal to be reached. Responses like attending-to-work can be seen as subcomponents of the important goals like reading and math. You can teach such behaviors like attending-to-work directly or indirectly. The game attempts to teach them direction so that one has confidence that major goals like reading and math can be achieved or if they are not, the reasons have a better chance of being determined.

The response, R, is followed by a consequence, S^R, which makes the response more or less probable of occurring in the future under the same conditions (S^D). Thus, the three terms, $S^D \dashrightarrow R \dashrightarrow S^R$, represent a contingency of reinforcement that will raise or lower the chance that a response will occur. If the chance is that the response will occur <u>more frequently</u>, then the consequence is called punishment. The game procedure utilizes positive techniques.

Examples of contingencies in the classroom:

1. The teacher gives a set of math problems to students and says, "please go right to work on these, I would like everyone to finish by recess." (The set of problems and the teachers instructions which specify the form, duration, and latency of the response, are the anticedent conditions or S^D of the contingency.) Next the children work hard and everyone finishes by recess. (The response component of the contingency.) Just before they go to recess the teacher says, "Since you all finished before recess, like I asked, you can all have five minutes of extra recess." (The consequence, S^D, if positive will raise the chance that that class of behavior will occur again in the same and similar situations.)

Technically this is a class-level contingency because the same conditions, responses, and consequences apply to everyone in the class.

2. The teacher is working with a reading group and tells them to work quietly by themselves while she works with another group. (The anticedent conditions, S^D, are workbooks, the members

of the group, and the teacher's instructions which specify the form of the response.) The children work quietly while the teacher is away. The teacher who occasionally looks over at the group and notes the quiet work behaviors that the group is emitting. Upon her return to the group she says, "I noticed that all of you were quiet while I was away and because of that you can, if you can still be quiet (remember that others are still working), you can work on your art projects." (The consequence for performing the response is doing art projects. If doing art projects is a reward, the probability of working quietly in a group will go up and will be reflected in the future by quiet group work.)

This group-level contingency applies the same conditions, response, and consequence to every individual in the group.

A group or class level contingency is used in a cooperation game procedure because it is easy to administer and, most importantly, because it helps foster compatible contingencies in the classroom. It does this by establishing one strong contingency that interrelates the members of the class so that they must work together to achieve some mutually desired objective.

In any classroom many contingencies of reinforcement exist. Some are in conflict with and some are compatible with the learning objectives of the teacher. For example an incompatible contingency can be represented as:

1. S_1^D-----R_1-----S_1^R
2. S_1^D-----R_2-----S_2^R

Let the first contingency (1) represent the contingency arranged by the teacher. Verbally it could be described as students given math problems in a group with the instructions to work quietly and quickly so that they finish by lunch time (S_1^D conditions). The students working quietly and quickly would be the response (R_1). The consequence could be extra free-time (S_1^R). The second contingency could represent a contingency set up by a student's peers. The description could go something like the following: The student's are given math problems and the instructions to work quietly and quickly in their group (the same S_1^D conditions as the first contingency). But instead of working the students talk and play (R_2). The consequences could be peer attention (S_2^R).

The real question is which contingency is the strongest, which produces a consequence that will raise the chance that the response associated with it will occur more frequently in the future? From the amount of talking and playing that goes on in the classrooms of most any school, the question is not hard to answer. The cooperation game is one of the primary procedures for eliminating such incompatible contingencies in the classroom in a positive manner.

III. Some considerations in setting up a game:

The first consideration deals with finding out what is a reinforcement or positive consequence to all the students in a class. This consideration can be taken care of by administration of a reinforcement menu. This is just a list of things and activities the students might like to have or do. Observation of student activities can also be used. What do they do when given free-time? If they do or participate in an activity with a high frequency, then it is probably a rewarding activity. Finally, one can just directly ask the student what kinds of activities he/she would like to participate in. The problem with this procedure is that they do not think of many of the activities that you as a teacher have at your disposal.

The second consideration is for how one introduces the game to the class. This is important because it sets the tone of all that is to follow. It is a matter of "selling" the game and the consequences that have been picked. A little show biz and step-this-way enthusiasm are the keys to success. It is good to know and remember that the game is a temporary thing on the road to building independent learners -- even they will laugh at it in the future. But for the present it is a needed tool.

The third consideration is for defining the behaviors of interest. It is a very important consideration because it is closely tied with a clear and concise introduction, and determines if the teacher can objectively evaluate student behavior and if students can identify if they are following the behaviors established for the game. The best technique is to define a general class of behavior like attending-to-work and then go over all the examples and non-examples that apply to your classroom, and the various special situations that arise from time to time.

The fourth consideration is for variation of consequences and conditions of the game. This means: have something new or unknown always in the fire -- burn them with curiosity. This makes them think of the present by way of the future. This requires that the game-maker has to look and listen for what is new or the latest fad. New words or phrases to talk about the game help vary conditions. A surprise consequence will keep them on their toes.

IV. An outline for the introduction of a game:

The teacher can follow the points below in outlining the game to a class. In the higher grades it is often good to put the game in an instructional context. In other words relate it to their development as individuals, preferably to something that you have done in social studies. The introduction would include the following:

1. The teacher explains that they are about to play a game that involves dividing the class into teams and that each team could win the game.

2. The game will be played on Monday, Wednesday, and Friday, and only in mathematics (specify exact time).

3. When a team or teams won the game, the teams or team would receive extra privileges and free-time.

4. Example that there are certain rules to follow -- like in all games -- in order to win.

5. Whenever all the team members follow the rules then and only then could they win the game. They are to work as a team.

6. The teacher will check on their following of the rules by use of a tape recorder and a wrist-counter (explain and show how it all works).

7. The teacher will check on the students following of the rules about __ times during the game period. And if the group was following the rules __ of the __ times, then the team(s) would win the game.

8. If the team had an individual that precluded the team from winning, the team could vote the individual out of the game and, thus, lose all privileges and free-time the group gained by winning the game.

9. If the team had an individual who they felt had really improved or helped them as a team win the game they could give that person a special award (suggest some things they have to pick from or a special symbol to give to the person).

10. If a member of the team is not following the rules, there is a procedure whereby the other team members can remind the individual to follow the rules. They do this by following the permission procedure of raising the hand and then proceding to the person to ask them what they are doing and if such a thing follows the rules of the game.

In introducing the game, set everything out step by step. Write it all down on the board. Give them as many choices as possible within the game but it is suggested that the game not be an option in itself. A parent does not let the child choose if they want a vegetable or not but gives a choice of what kind of vegetable. Good nutrition like good behavior cannot be achieved without knowledge of what is needed to be healthy (be it physically or behaviorally).

V. Game behaviors:

The behaviors will be gone over carefully during our meeting prior to the start of the game. The main class of behavior should be attending-to-work. Some examples are as follows:

1. Sitting in your seat.
2. Eyes on work.
3. Asking permission.

Some non-examples:

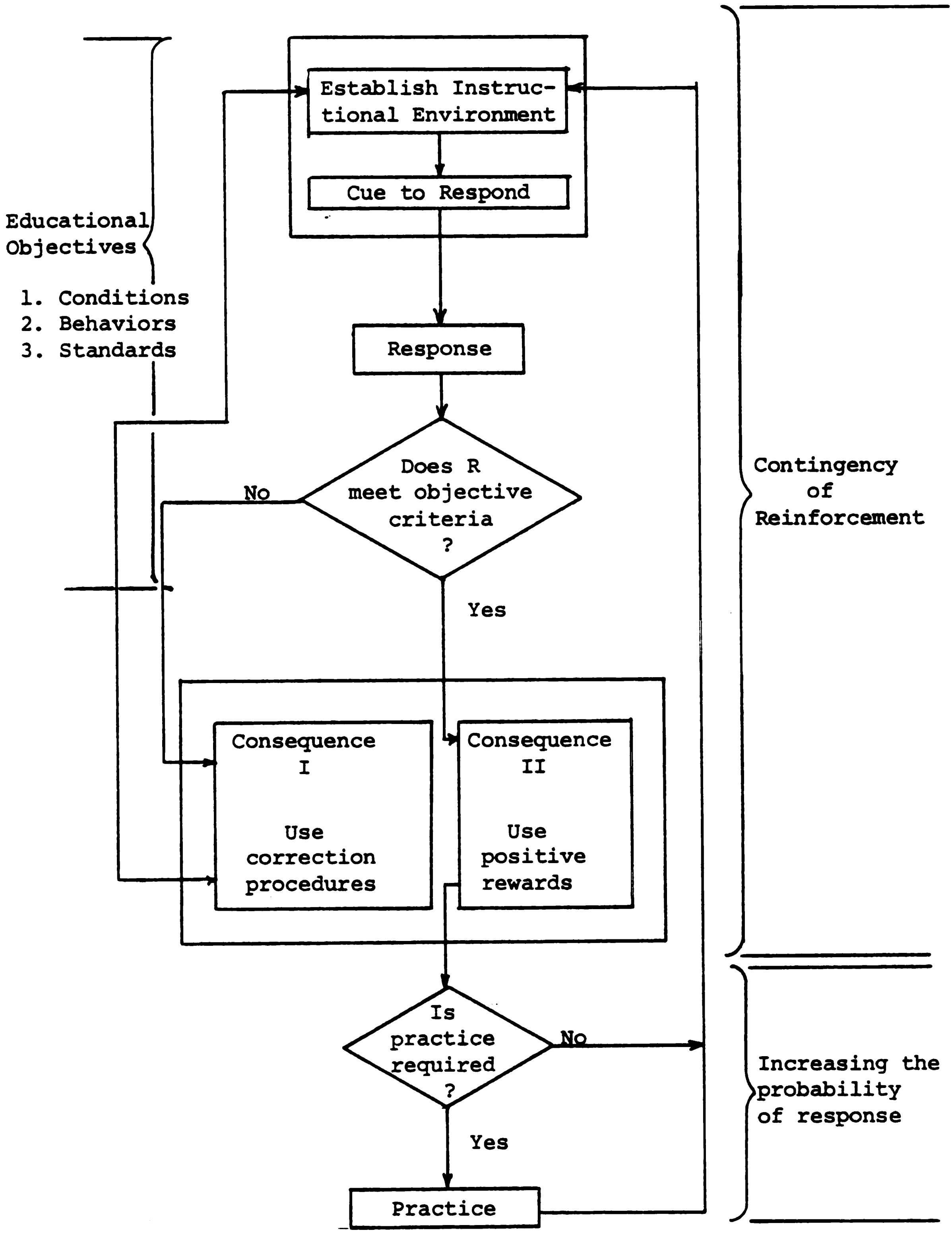
1. Talking during independent work.
2. Throwing things.
3. Hitting others.

The important thing is to make the game such that they are given as much freedom to move around as possible. But make it contingent on thinking about what they are doing before they do it. Call the procedure gaining self-permission and they will see it in a positive light. For example, they can move about the room when they need to by first raising their hand and thinking about what they are going to do (or they put on a I-have-thought-in-advance hat) and then they can proceed to do the thing that they have considered and found necessary to do. If the signal to check on the students is given then you can tell that they are not just going places for the fun of it (if you find them breaking the rules with the hat on, that can mean not only the non-gaining of a point but the loss of a point).

APPENDIX E

Teaching/Learning Model used in Teacher Training

Teaching/Learning Model



THE TEACHING/LEARNING MODEL: SOME CONSIDERATIONS

I. Establishing Instructional Environments

1. What supports are necessary for the response to occur?
    a. Prompts
    b. Modeling
    c. Rules
2. Make the conditions of the terminal response as close to those in the natural environment as possible.
3. Consider the speed with which prompts are faded.

II. Cue to Respond

1. What modality is more appropriate (facilitating) for student response in question?
2. Is the cue part of the natural environment? If not gradually replace with the cues that do exist in the natural environment.

III. Response

1. Is the response easy to identify (operationally defined)?
2. What response prerequisites does the student possess? (This is related to the degree of environmental structure that needs to be arranged.)

IV. Consequence I: Correction Procedure

1. What modality will best facilitate correction?
    a. Physical guidance

b. Repeating the rules

c. Remodeling and imitation of response components

d. Combinations of a, b, and c.

V. Consequence II: Positive Reinforcement

1. Reinstate the contingency directly or by question procedures.

2. If response is new and critical for the learner, make the reinforcing stimulus as strong and obvious as possible.

3. Consider the reinforcing stimulus modality and its relation to the students reinforcement history.

a. verbal praise

b. Physical contact (the pat or the hug).

VI. Practice

1. Consider if the response is critical to the learner. If it is the response probability must be high and this requires practice.

2. Consider if the response is complex. If it is then practice will integrate the response components.

Note: There is a need to consider the simultaneous operation of different response levels. In the establishment of a contingency of reinforcement in the classroom, the interaction of the response levels needs to be considered. Three levels exist that need direct attention. These are the social, emotional, and academic levels.