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Punishment of undesired behavior and reinforcement of desired behavior are two approaches which can be used to decrease the rate of undesirable behavior. The most common approach in prior research has been reinforcement of desired behavior. The effects of punishment have not been thoroughly assessed in applied settings. Laboratory studies have indicated that a combination of these two approaches, punishment of undesired behavior and reinforcement of desired behavior, might be particularly effective in reducing disruptive behavior. The present study compared three approaches in reducing disruptive behavior in preschool children: verbal reprimands for disruptive behavior, verbal reinforcement of appropriate behavior, and a combination of verbal reprimands for disruptive behavior and verbal reinforcement of appropriate bheavior.

Twelve five year-old children, three in each of four kindergarten classrooms, served as subjects. The subjects were the three children in each class with the highest rate of disruptive behaviors. Children were assigned to one of the three treatment conditions such that each classroom had one child in each treatment condition.

Disruptive behaviors were divided into six categories: aggression, property, noise, throwing, running, and orienting.

Each subject was observed for sixteen minutes a day by a pair of trained observers. The study was conducted in two phases: baseline and treatment. Each phase lasted seven consecutive weekdays. During baseline the experimenter randomly reinforced each subject eight times regardless of the type of behavior being emitted. During the treatment phase the experimenter interacted with each subject on the basis of the assigned treatment condition. Subjects in the Punishment condition were administered verbal punishers according to a VI-4 minute schedule. Subjects in the Reinforcement condition were administered verbal reinforcers according to the same schedule. Subjects in the Punishment/Reinforcement condition were administered punishers and reinforcers each on a VI-4 minute schedule.

The data were analyzed separately according to Treatments and according to Schools. The results indicated that there were decreases in disruptive behavior for Schools and a trend was found for Treatments. Differences in the effectiveness of the treatments among the schools were also found. The individual behavior categories were also analyzed. Decreases in Noise behavior were found for Treatments and for Schools. Differences in percentage of Noise and Running behaviors were found among the schools. A trend was indicated for different levels of effectiveness of treatments for Throwing behaviors.

AN EVALUATION OF THREE APPROACHES FOR REDUCING DISRUPTIVE BEHAVIOR IN PRESCHOOL CHILDREN

by

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APPROVAL PAGE

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CHAPTER I

INTRODUCTION

Disruptive behavior in school settings has received much attention in the behavior modification literature. A disruptive student may disturb other children who are studying in addition to interfering with his own academic activities. Operational definitions of disruptive behavior have ranged from non-study behaviors (Hall, Panyon, Rabon, & Broden, 1968) to a classification system involving seven separate behaviors with additional provisions for particular children (Becker, Madsen, Arnold, & Thomas, 1967). Among the more common disruptive behaviors are "out-of-seat" and "talking-out". Other behaviors such as hitting other people, excessive noise, turning around in the seat, being off-task, and running around the room have also been used.

There are five basic approaches which can be used to change the rate of behavior. Two of these approaches involve punishment contingencies. One such punishment contingency is the removal of a positive reinforcer, the other is the presentation of an aversive stimulus. Punishment contingencies reduce the rate of the behavior. Two other contingencies,

which lead to an increase in rate of behavior, involve reinforcement. These contingencies are the presentation of a reinforcer or the removal of an aversive stimulus. The fifth approach is extinction; that is, reinforcing stimuli which previously maintained the behavior are withheld, and the rate of the behavior decreases to its operant level.

In dealing with the reduction of disruptive behavior, it should be remembered that there are also appropriate behaviors. It is beneficial for a treatment program to specify what is manipulated for both classes of behavior. Some contingencies which are under the teacher's control may be maintaining some behaviors within each class; thus, describing precisely the consequences for both classes of behavior, rather than one, would help ensure better control. Given the two classes of behavior (appropriate and inappropriate) and the contingencies previously discussed (punishment, reinforcement, and extinction), it is possible to obtain nine combinations of contingencies and classes of behavior:

1) extinction of both inappropriate and appropriate behavior,
2) punish inappropriate and extinction of appropriate behavior,
3) reinforce inappropriate and extinction of appropriate behavior,

4) extinction of inappropriate and punish appropriate behavior,
5) punish both inappropriate and appropriate behavior,
6) reinforce inappropriate and punish appropriate behavior,
7) extinction of inappropriate and reinforce appropriate behavior,
8) punish inappropriate and reinforce appropriate behavior,
9) reinforce both inappropriate and appropriate behavior.

Since studies have been concerned with reducing disruptive behaviors, methods 3, 6, and 9 have not been used. Furthermore, there is no theoretical evidence to suggest that beneficial effects would occur if methods 1, 4 or 5 were employed. Also, these methods could be criticized on the basis of ethics. The remaining three methods (2, 7, and 8) are discussed in the following pages.

Sulzer and Mayer (1972) suggest, and it is widely held, that teachers generally employ punishment contingencies. Teachers may often feel that a child should be punished for misbehaving, but not "rewarded" for good behavior, since good behavior is "expected" of a child. Only a few studies have investigated the effectiveness of punishment with normal children in classroom settings. In a study by Hall, Cristler, Cranston, and Tucker (1970), three students in a tenth grade French class were retained after school to be

tutored, contingent on low test scores. Within a few days after implementation of this procedure, all three students were achieving better grades. A more relevant study in terms of teachers' behaviors was conducted by O'Leary, Kaufman, Koss, and Drabman (1970). Teachers of second and third grade classes were instructed to use soft reprimands in place of the loud reprimands they usually employed. The use of soft reprimands proved to be an effective punisher for most of the children. The authors noted that some of the teachers had difficulty in using the soft reprimands. The latter two studies also reflect a common error. A punishing event should be defined in terms of its effect, reducing behavior. In school, a low mark and teachers' loud reprimands are generally assumed to be effective punishers. As the above studies indicate, the use of low grades and loud reprimands were not punishing events for the subjects involved.

In research studies, the most often cited approach in public school settings is one which combines the principles of positive reinforcement to increase desirable behaviors and extinction to reduce the frequency of disruptive behaviors. An early study (Becker, Madsen, Arnold, &

Thomas, 1967) used this technique to reduce the frequency of disruptive behaviors in five different classrooms. The design consisted of baseline and treatment phases. Teachers were told to repeat a set of rules to their classes each day. For the first week of treatment, teachers were signaled to inform them when to praise or ignore particular behaviors. A t-test comparing deviant behaviors during baseline and the treatment indicated that the technique was effective. Madsen, Becker, and Thomas (1967) investigated components of the above study in an effort to account for the behavior change. Different phases of the experiment permitted the investigators to contrast praise and ignoring. Statistical analysis indicated that praise was the crucial component of the study.

In a study by Hall, Panyon, Rabon, and Broden (1968), behaviors were classified as either study (e.g., writing the assignment and looking in the book) or as non-study (e.g., being out-of-seat, looking out the window, and fighting). The students in three classrooms were observed. The first grade class did not respond well enough (according to the principal and teacher) to the praise and ignore technique. Adding a game, contingent on the teacher's

subjective evaluation of the class having studied enough, did prove to serve as a reinforcer to increase study behavior. This study again points to the importance of selecting the appropriate reinforcer before deciding that the technique does not work.

A third study, conducted by Ward and Baker (1968), used between-group statistical comparisons. The experimental group consisted of four problem children in three first grade classrooms. Two control groups were used. The first control group, matched for sex, was selected from the same classroom. The second control group, also matched for sex, was chosen from a fourth classroom. All children were administered a battery of psychological tests to assess academic achievement and personality characteristics before and after the experiment. Only the experimental and first control groups were observed. Teachers were instructed to praise appropriate behaviors and ignore disruptive behaviors. The results revealed a significant decrease in deviant behavior from baseline for the experimental group, but not for the control group. The two groups had differed significantly during baseline, but not after treatment. The results of the psychological tests indicated neither improvement nor adverse effects.

Control of disruptive behavior in preschool settings has not received adequate attention. In a study by Brown and Elliot (1965) aggression in three and four year-old boys was examined. The authors differentiated between verbal and physical aggression. An ABAB design was used. The technique applied was attending to appropriate behaviors and extinction of aggressive behaviors. Only physical aggression recovered during the reversal phase. This technique was also effective in reducing the aggressive behavior of a five year-old boy (Scott, Burton, & Yarrow, 1967). Rather than have the teacher carry out the treatment (since it would have been difficult for her to go back to baseline conditions during reversal) a trained "helper" carried out the treatment. Aggressive behaviors were ignored, except when dangerous to other children, and appropriate social responses were reinforced by the helper's attention.

Schutte and Hopkins (1970) designed a program using positive reinforcement and extinction to increase instruction-following behavior in a kindergarten class. The teacher was instructed to repeat ten instructions at two-minute intervals. If a student responded within 15 seconds, the teacher praised

him. The class increased its rate of compliance with the teacher's instructions during the treatment phase.

A study by Pinkston, Reese, LeBlanc, and Baer (1973) investigated the role of teacher attention in maintaining aggressive behavior. They also showed that changing the contingencies of teacher attention decreased the rate of aggressive behavior and increased the rate of appropriate peer interactions. The subject was a three and a half year-old boy with a high rate (28% of total peer interactions) of aggressive responses. The first phase of the study involved the use of extinction for aggressive responses and positive reinforcement for non-aggressive behaviors. This procedure was used to insure a constant rate of teacher attention for all phases. When aggression was reliably reduced, the teacher was instructed to attend to the subject especially when he was interacting with peers. This procedure reliably increased the subject's rate of appropriate peer interactions.

The third approach to reducing disruptive behavior involves punishment of inappropriate behaviors and reinforcement of desired behavior. To date, there have not been any studies conducted in applied settings using this approach.

There are several reasons for believing that this approach merits attention. Azrin and Holz (1966) have suggested that a nonpunished or reinforced alternative response enhances the effectiveness of punishment. A study by Leitenberg, Rawson, and Bath (1970) demonstrated the enhancement effect of a reinforced alternative response. He warned, however, that if reinforcement is discontinued, the response rate to the punished stimulus may increase. The authors suggested a gradual fading of reinforcement, if reinforcement is to be discontinued.

Punishment usually leads to a faster decrease of rate of behavior in comparison to only reinforcing incompatible responses. A teacher may feel that a behavior problem is severe enough to warrant the use of punishment. By providing an alternative response which is reinforced, some of the possible negative side-effects of the punishment procedure may be avoided. Often appropriate behaviors are desired, and providing reinforcement for these behaviors will insure an increase in their rate. Punishment alone in a classroom setting may eliminate undesirable behavior, but the child may not engage in desirable behavior (e.g., the child may no longer run around the room, but sit in his seat doing nothing).

Many studies comparing these three approaches (punishment, reinforcement, and punishment plus reinforcement) have been conducted in laboratory settings. These studies have most often employed a two-choice discrimination learning task. The results from such studies have been contradictory. The most prevalent finding has been that there is no difference between an approach using punishment of incorrect responses plus extinction of correct responses and an approach employing punishment of incorrect responses plus reinforcement of correct responses.

An early study by Curry (1960) compared the effectiveness of the three approaches with fifth and sixth grade subjects in a card sorting task. The three verbal reinforcement combinations (VRCs) employed were: PE - every time the subject made an incorrect response the experimenter said "wrong", correct responses were ignored by the experimenter; RE - correct responses were followed by the experimenter saying "right", and incorrect responses were ignored; and RP - correct responses were followed by the experimenter saying "right", and incorrect responses were followed by "wrong". The results indicated that the PE and RP combinations were not different, and both were more effective than the RE combination.

Spence has conducted several studies investigating the efficacy of the three VRCs. In one study (1964) adult subjects performed a word discrimination task, with the RP and PE combinations yielding the fastest learning. A further study (1966), in which children served as subjects, replicated the results of the first study. Two additional groups were included in the second study. These two groups were informed as to the meaning of the experimenter's ignoring a response in the PE and RE groups. It was found that when subjects were informed, there were no differences among the groups, and that the informed subjects performed better than the uninformed subjects. In a final study (1970), Spence determined that the subjects in the RE group interpreted the "ignore" as indicating a correct response or they were inconsistent in interpreting "ignore" as either "right" or "wrong". Interviews with the subjects of the 1964 study had also indicated the subjects' misinterpretation of the meaning of "ignore". Spence has concluded from these studies that in general "ignore" acquires a positive information value when paired with either "right" or "wrong". The subjects in the PE groups were correct in their assumption of the meaning of "ignore",

but the subjects in the RE groups had misinterpreted the information value of "ignore".

Different results have been found by only a few other authors. Rothberg and Harris (1972) employed a size discrimination task with tranposition, an oddity problem with reversals, and a complex discrimination problem. Subjects were first graders. The three VRCs were again used. The different problems indicated different effectiveness levels for the three VRCs. In the first problem, the findings were similar to the above mentioned studies. The RP group was found to have the least number of errors in the second problem, with the PE and RE combinations being less effective. Although the results from the third problem were not significant, the trend indicated that the PE combination yielded the least number of errors. The authors suggested that the results of the third problem presented a difficulty for Spence's information value theory.

Several authors have found the PE combination to be the most effective technique. Penney and Lupton (1961) employed a two-choice discrimination task. Children in the second, fourth, and eighth grades served as subjects. Penney and Lupton's procedure differed from the previous studies.

Instead of using verbal reinforcement combinations, these authors used candy for positive reinforcers and a loud tone as a punisher. The combinations were the same as those previously mentioned. The results indicated that the PE group learned the discrimination faster than the RP group, which in turn was more effective than the RE combination. The authors interpreted their results in terms of reinforcement expectancy. The subjects in the PE group were hypothesized to be frustrated, a condition which would have increased their motivation level. Since the RP group did receive some reinforcement, their motivation level was assumed to be lower. The authors were not able to explain why reinforcement alone led to the lowest level of motivation. Penney (1967) conducted another study to test the reward expectancy hypothesis. During the first study, all children had received candy at the end of each experimental session, possibly influencing future subjects. In the later study no candy was given until all of the subjects had been run. The subjects in the groups involving reinforcement had to return any candy they had earned during the session. The design permitted the experimenters to record the subjects' orienting responses which were made before actually making

the final choice. Subjects in the PE group made more correct responses and more orienting responses than either of the other two groups. Penney suggested that the punished subjects may take more time and be more careful before making a response than the subjects receiving reinforcement.

In summary, the discrimination studies have indicated two possible effects of reinforcement and punishment. Spence has suggested a discrimination or information value hypothesis. The amount of information assumed by the subject will directly affect his performance on the task. Spence hypothesizes that the subjects generally assume "ignore" to mean "right", and thus the RP and PE combinations are functionally the same. Instructing the subjects about the true information value of "ignore" makes all three combinations functionally the same, and there should be no difference among the groups.

Penney suggests a motivational hypothesis. In order to avoid punishment, subjects in the punishment groups should be more careful and take more time before responding than the subjects receiving reinforcement. The RP combination should result in an intermediate performance level, since some care would be taken, but not as much as when punishment alone is used.

It is time that those in behavior modification investigate the effects of these three approaches particularly since teachers often use aversive control in the classroom. However, the literature suggests that reinforcement would be a more effective approach. Although researchers may be hesitant to use punishment because of the possible negative side-effects inherent in the procedure, there are instances in which punishment can be justified. In such cases the reinforcement/punishment treatment combination could be the better alternative than punishment alone. If it could be demonstrated that there is no difference between extinction/punishment and reinforcement/punishment, the latter procedure would be preferred.

The present study was designed to compare the effectiveness of the three verbal reinforcement combinations in reducing disruptive behavior in kindergarten children.

CHAPTER II

METHOD

Subjects

Twelve five year-old children, ten boys and two girls, served as subjects in this study. The subjects were enrolled in four private kindergarten classes in Greensboro, North Carolina,[1] with three subjects in each class. The subjects were selected from each classroom on the basis of data from preliminary observations. During the preliminary observation period the children were randomly divided into three groups, for the purpose of the observation. The size of each group ranged from five to seven children. The groups were observed in a random order each day. Within each group, children were observed successively for one minute periods. The children wore numbers on their backs for purposes of identification during the preliminary observation period. Each child was observed for two minutes a day, for seven consecutive week-days. At the end of the preliminary observations,

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[1] One classroom was used twice, once in the summer and again in the fall. Different children were in the class during the fall term.

the data for each child were summarized, and the three children in each classroom with the largest number of disruptive behaviors were selected as target children. The target children were assigned to one of the three treatment conditions so that each classroom had one child per condition.

Observers

Four undergraduate students from the University of North Carolina at Greensboro served as observers. Their training was conducted in three stages. In the first stage, the observers viewed a video-tape of children, while the experimenter explained and pointed out instances of the behaviors to be rated. The observers also practiced using the stop-watches, clipboards, and rating sheets to be used in the experimental sessions. During the second stage of training the observers rated other tapes, according to the coded rating sheets. The observation procedure consisted of watching the target child for 20 seconds and recording the child's behavior on the rating sheet for 10 seconds. The ratings were discussed by the group to assess any differences in recording and to clarify any ambiguities in the criteria for rating the disruptive behaviors. The third stage of training took place in a

classroom with children other than those observed during the preliminary observations. The reliability measure was determined by the following formula: Agreements/(Agreements + Disagreements). The observers worked in pairs, and each pair was trained until the overall percentage of agreement was at least .85. One pair of observers recorded data from two kindergarten classrooms during the summer, and the other pair observed in the other two classrooms during the fall.

Target Behaviors

The behaviors under study were disruptive behaviors. The disruptive behaviors were divided into six categories: 1) "Aggressive behaviors" included hitting, pushing, kicking, and striking another child with an object; 2) "Property behaviors" included destroying property, regardless of whether it was the target child's or another child's (this category included such behaviors as coloring on another child's paper); 3) "Noise behaviors" included stamping feet, clapping, and yelling or talking in a loud voice; 4) "Throwing behaviors" included throwing any object; 5) "Running behavior" included any non-walking behaviors such as skipping and running; 6) "Orientation behaviors" were recorded whenever the target child did not attend to the

teacher when she was talking to the child or to the group. Disruptive behaviors occurring during the 20-second observation interval were recorded during the 10-second recording interval on the coded rating sheets. The observers marked an "Absent" category when there were no occurrences of any of the above behaviors during the 20-second observation interval.

Procedure

Each subject was observed for a 16-minute period each day in the morning, at a time when the children were indoors. The children were engaged in comparable activities across schools. The order of subject observation was randomly determined for each day. The study was conducted in two phases: baseline and treatment. Each phase lasted seven days. Preliminary observations indicated that the teachers rarely interacted with individual children. Also, the teachers were often engaged in various activities involving groups of children. For these reasons, the experimenter acted as mediator. During both phases the teachers were instructed not to initiate interactions with the three target children while they were being observed. Instead, the experimenter interacted with the target children according

to a predetermined schedule. During the baseline phase the experimenter reinforced each target child on the average of every two minutes, regardless of what he was doing, resulting in eight experimenter-initiated interactions, while that child was being observed. During the treatment phase these interactions were contingent on particular behaviors depending on the treatment condition assigned to the child.

Treatment Conditions

Three techniques were employed during the treatment phase. One technique involved punishment of disruptive behaviors and extinction of appropriate behaviors. The only contact initiated by the experimenter with the target child was in the event of disruptive behaviors. These interactions were on a VI-4 minute schedule. When the target child emitted a disruptive behavior during an interval in which an interaction was scheduled, the experimenter administered a verbal punisher, such as "I don't like the way you. . ." (see Appendix A for samples of statements used). If there were no disruptive behaviors, then the experimenter had no contact with the child.

Differential reinforcement of other behavior was the second technique employed. Disruptive behaviors were ignored, and appropriate behaviors were reinforced according to the same schedule as the punishment group. When the target child was not emitting any disruptive behaviors during an interval in which an interaction was scheduled, the child was reinforced by the experimenter using a verbal reinforcer such as "I like the way you're playing quietly over here."

The third technique was the combined use of punishment for disruptive behaviors and reinforcement for appropriate behaviors. The punishers and reinforcers were each administered according to a VI-4 minute schedule.

Continuous reinforcement has been employed in animal studies and in some applied settings when the aim was to increase a discrete response. Continuous reinforcement would have been impossible to carry out in the present study, since any behavior not included in the six target behavior categories could have been reinforced. A teacher with a class of twenty to thirty children would find it difficult to maintain a continuous reinforcement schedule. A variable interval schedule was decided upon as being more realistic for a classroom setting. The VI schedule was an

attempt to equalize the number of experimenter-initiated interactions among the treatments.

The schedules determined the maximum number of experimenter-initiated interactions with the target children. The punishment technique and the reinforcement technique allowed for a maximum of four experimenter-initiated interactions with the target child. The third method allowed for a maximum of four punishers and four reinforcers per session. Both the punishers and reinforcers were directed to the child's behavior and did not place a value on the child himself.

At times when no interactions were scheduled, the experimenter walked around the room, interacting with the other children. When time for an interaction was nearing, the experimenter moved towards the target child. At the first instance of disruptive or appropriate behavior (depending on which group the child was in) the experimenter administered the appropriate consequence to the child.

CHAPTER III

RESULTS

The mean reliability for the two pairs of observers across all behaviors was .932. The mean agreement for Pair 1 was .949 with a range of .85 to 1.00. The range of mean agreement for the individual behaviors was .899 (Orienting behaviors) to .98 (Property behaviors). The overall mean for Pair 2 was .914 with a range of .85 to 1.00. The range of mean agreement for the individual behaviors was .84 (Orienting behaviors) to 1.00 (Property behaviors and Running behaviors).

The dependent variable was the percentage of intervals during which one or more disruptive behaviors occurred. For data analysis, an average of the percentages was taken over the last three days of each phase.[2] The means are presented in Table 1. The means were then transformed using the arcsin transformation (Winer, 1971, p. 399-400)

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[2]Two subjects were present for only two of the three days. One subject missed one day of baseline and the other subject missed one day of the treatment phase. The data for these two subjects were averaged for the two days they were present. Both subjects were in the Reinforcement/Punishment group.

TABLE 1

MEAN PERCENTAGE OF DISRUPTIVE BEHAVIOR FOR EACH SUBJECT FOR THE LAST THREE DAYS OF THE BASELINE AND TREATMENT PHASES

	Punishment		Reinforcement		Punishment/Reinforcement	
	B	T	B	T	B	T
School 1	.465	.152	.083	.057	.203	.083
School 2	.177	.104	.219	.349	.161	.237
School 3	.437	.354	.125	.276	.344	.276
School 4	.500	.271	.521	.328	.448	.250

for the purpose of data analysis. A Tukey test for non-additivity was performed on the difference scores (Baseline - Treatment) to determine if there was an interaction between Treatments and Schools (Kirk, 1968, p. 137-139). Four analyses were performed on the data for overall disruptive behavior. The first analysis was a two factor repeated measures analysis of variance to evaluate behavior changes as a function of Treatments (between factor) and of Phase (within factor). An analysis of covariance, using baseline data as the covariate, was performed to evaluate changes in disruptive behavior as a function of Treatment conditions. A repeated Measures analysis of variance to evaluate changes in behavior as a function of the Schools and Phase was the third analysis. An analysis of covariance, with baseline data once again being used as the covariate, allowed for an evaluation of disruptive behavior changes as a function of Schools.

The Tukey test for nonadditivity was not significant ($F = .97$), indicating that there was no interaction between Treatments and Schools on overall behavior.

The analysis of variance on Treatments (see Table B1 of Appendix B[3]) did not yield a significant effect. However,

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[3]All tables labeled "B" are to be found in Appendix B.

there was an indicated trend for the Phase effect ($.10 > p > .05$). This latter finding suggests that there was a change from baseline without differences among the treatments. There were no significant differences among the treatments according to the analysis of covariance (Table B2).

Table 2 presents the analysis of variance for Schools. The Phase effect was significant ($F = 5.6699$; $df = 1, 8$; $p < .05$), indicating a decrease in the percentage of intervals containing disruptive behaviors from baseline to treatment. Table 3 summarizes the analysis of covariance for Schools. There was a significant School effect ($F = 4.9179$; $df = 3, 7$; p .05). A Scheffé post hoc analysis indicated that there was greater decrease in disruptive behavior in School 1 than in School 3 (C.V. = .52; $p < .05$).

Changes for the individual behavior variables were also analyzed. The means for the individual behaviors are presented in Table 4. As before, a Tukey test for non-additivity was performed on the difference scores for each of the individual behaviors. Both an analysis of variance and an analysis of covariance were performed for all of the behaviors, and again Treatment effects and School effects were analyzed separately.

TABLE 2

ANALYSIS OF VARIANCE SUMMARY TABLE FOR SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.9606	.3202	3.4420
Subjects within Schools	8	.7442	.0930	
Phase	1	.1848	.1848	5.6699 *
Schools X Phase	3	.3259	.1086	3.3329
Phase X Subjects within Schools	8	.2607	.0326	

*$p < .05$

TABLE 3

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.4097	.1366	4.9179 *
Error	7	.1944	.0278	

*$p < .05$

TABLE 4

MEAN PERCENTAGE OF INTERVALS DURING WHICH DISRUPTIVE BEHAVIOR OCCURRED FOR EACH SUBJECT FOR THE LAST THREE DAYS OF EACH PHASE FOR THE INDIVIDUAL BEHAVIOR CATEGORIES

		Punishment		Reinforcement		Punishment/ Reinforcement	
		B	T	B	T	B	T
School 1	A*	.224	.000	.062	.021	.052	.042
	P	.021	.000	.040	.000	.062	.000
	N	.139	.104	.031	.016	.078	.101
	T	.000	.000	.000	.000	.016	.000
	R	.087	.000	.052	.000	.000	.010
	O	.109	.052	.000	.021	.079	.031
School 2	A	.052	.042	.108	.177	.068	.177
	P	.031	.000	.066	.021	.000	.083
	N	.066	.021	.104	.109	.010	.000
	T	.010	.010	.083	.082	.010	.000
	R	.021	.031	.031	.062	.000	.000
	O	.000	.000	.000	.000	.130	.000
School 3	A	.000	.021	.000	.021	.062	.010
	P	.010	.041	.000	.010	.078	.062
	N	.234	.425	.104	.043	.232	.255
	T	.005	.042	.010	.021	.031	.000
	R	.000	.021	.000	.021	.015	.000
	O	.010	.104	.010	.177	.062	.000
School 4	A	.047	.062	.094	.000	.010	.000
	P	.010	.000	.031	.031	.000	.000
	N	.453	.212	.422	.276	.328	.265
	T	.026	.010	.010	.021	.000	.000
	R	.042	.052	.250	.139	.250	.211
	O	.010	.000	.000	.000	.010	.000

*A, Aggressive behaviors; P, Property behaviors; N, Noise behaviors; T, Throwing behaviors; R, Running behaviors; O, Orienting behaviors.

Aggressive behavior. The test for nonadditivity did not indicate an interaction between Treatments and Schools ($F = .07$). The analysis of variance for Treatments did not indicate any significant changes (Table B3). The analysis of covariance for Treatments likewise did not indicate any differences among the treatments (Table B4). Table 5 presents the results of the analysis of variance for Schools on aggressive behavior. There was a significant School effect ($F = 4.9584$; $df = 3, 8$; $p < .05$). A Scheffé post hoc analysis indicated that there was a higher percentage of intervals containing aggressive behavior in School 2 than in School 3 (C.V. = .41; $p < .05$). There were no other differences among the schools. The analysis of covariance indicated a trend ($.10 > p > .05$) for the School effect (Table B5).

Property behavior. There was no interaction between Treatments and Schools according to the test for non-additivity ($F = 1.54$). The analysis of variance for Treatments did not show any significant effects (Table B6). There were no differences among the treatments indicated by the analysis of covariance for Treatments (Table B7). Neither the analysis of variance nor the analysis of covariance for Schools indicated significant effects (Tables B8 and B9).

TABLE 5

ANALYSIS OF VARIANCE SUMMARY TABLE FOR AGGRESSION ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.6138	.2046	4.9584 *
Subjects within Schools	8	.3301	.0413	
Phase	1	.1394	.1394	2.1093
Schools X Phase	3	.2730	.0910	1.3774
Phase X Subjects within Schools	8	.5286	.0661	

*$p < .05$

Noise behavior. The Tukey test did indicate an interaction between Treatments and Schools on Noise behavior ($F = 1.64$).[4] Table 6 shows the analysis of variance for Treatments. There was a significant Phase effect ($F = 9.7182$; $df = 1, 9$; $p < .05$) indicating a decrease in Noise behavior from baseline to treatment. There were no significant differences among the treatments according to the analysis of covariance (Table B11). Table 7 summarizes the analysis for Schools. There was a significant Phase effect ($F = 7.8252$; $df = 1, 8$; $p < .05$), indicating that Noise behaviors decreased across all schools. This analysis also showed a significant Schools effect ($F = 7.2846$; $df = 3, 8$; $p < .05$). A Scheffé *post hoc* analysis indicated that there was a higher percentage of intervals containing Noise behaviors in School 4 than in either School 2 or School 1 (C.V. = .71; $p < .05$). No differences were found among the schools according to the analysis of covariance for Schools (Table B12).

Throwing behavior. There was an interaction between Treatments and Schools according to the Tukey test for non-

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[4]See Table B10 for the difference scores of the behaviors indicating significant Treatment X School interactions.

TABLE 6

ANALYSIS OF VARIANCE SUMMARY TABLE FOR NOISE ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.2329	.1164	.2999
Subjects within Treatments	9	3.4941	.3882	
Phase	1	.1831	.1831	9.7182 *
Treatments X Phase	2	.0763	.0382	2.0261
Phase X Subjects within Treatments	9	.1696	.0188	

*p < .05

TABLE 7

ANALYSIS OF VARIANCE SUMMARY TABLE FOR NOISE ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	2.7282	.9094	7.2846 *
Subjects within Schools	8	.9987	.1248	
Phase	1	.1831	.1831	7.8253 *
Schools X Phase	3	.0587	.0196	.8366
Phase X Subjects within Schools	8	.1872	.0234	

*$p < .05$

additivity (F = 2.69). There were no significant effects indicated by the analysis of variance for Treatments (Table B13). However, there was a trend for the Treatment X Phase interaction ($.10 > p > .05$). The analysis of covariance also indicated a trend ($.10 > p > .05$) of differences among the treatments (Table B14). Neither the analysis of variance nor the analysis of covariance for Schools indicated any significant effects (Tables B15 and B16).

Running behavior. A significant interaction between Treatments and Schools was indicated by the test for nonadditivity (F = 23.96). No significant effects were indicated by either the analysis of variance or the analysis of covariance for Treatments (Tables B17 and B18). Table 8 presents the results of the analysis of variance for Schools. The Schools effect was found to be significant (F = 6.8472; df = 3,8; $p < .05$). A Scheffé post hoc analysis indicated that there was a higher percentage of Running behavior in School 4 than in either School 3 or School 1 (C.V. = .56; $p < .05$). The analysis of covariance did not show any differences among the schools (Table B19).

Orienting behavior. The interaction between Treatments and Schools was not significant according to the Tukey test

TABLE 8

ANALYSIS OF VARIANCE SUMMARY TABLE FOR RUNNING ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	1.5602	.5201	6.8472 *
Subjects within Schools	8	.6076	.0759	
Phase	1	.0629	.0629	1.5801
Schools X Phase	3	.0961	.0320	.8049
Phase X Subjects within Schools	8	.3186	.0398	

*$p < .05$

for nonadditivity ($F = 1.31$). There were no significant effects indicated by the analysis of variance for Treatments (Table B20). The results of the analysis of covariance did not indicate any differences among the Treatments (Table B21). There were no significant differences indicated by the analysis of variance for Schools (Table B22). There was a trend for the Schools effect ($.10 > p > .05$) indicated by this analysis. The analysis of covariance indicated a trend ($.10 > p > .05$) of differences among the Schools (Table B23).

CHAPTER IV

DISCUSSION

The results of the analyses indicate that there were decreases in the number of intervals containing disruptive behaviors. A trend was indicated for the Phase effect in the analysis for Treatments. The analysis of variance for Schools indicated a significant Phase effect. The constant across all schools was the three treatments. The three treatments may have been equally effective in reducing disruptive behavior. It should be noted that both analyses (for Treatments and for Schools) compared the same data for the Phase effect. Although the subjects were randomly assigned to the Treatment conditions, the grouping by Schools yielded a smaller error than the Treatment grouping.

The results for the individual behaviors indicated some changes as a function of Phase. Noise behavior changed according to the analyses for Treatments and for Schools.

It is possible that there were slight changes in the other behaviors and that the changes in Noise behavior were most important in the analysis of overall behavior. The

percentages of occurrence of the behaviors may partially explain the influence of the Noise behaviors. First, it should be noted that the subjects in this study had very low percentages of disruptive behavior compared to other studies. If the percentages are low to start with, relatively small decreases can occur. A restricted range for behavior change could be one reason for the small number of significant results. Second, Noise behaviors had the highest percentage of occurrence in comparison with the other behaviors used in this study. As a result, there was more opportunity for change with Noise behaviors. When absolute differences in percentages are compared, there were larger decreases in Noise behaviors. These differences are reflected in the Phase effect of the analyses of variance performed on the data. A significant Phase effect was found according to both Treatments and Schools for Noise behavior. Only one other behavior, Throwing, indicated a trend for the Phase effect according to Treatments. In terms of relative differences [(% during baseline - % during treatment) / % during baseline], the changes in Noise behaviors appeared to be the same in comparison with the other behaviors. These relative differences are reflected

in the analyses of covariance. Although School 4 had a higher rate of Noise behaviors, the relative decreases of the other schools were not different from the relative difference in School 4.

According to the analyses of covariance for Schools, in addition to a change in overall behavior, there was a trend for differential changes in Orienting behaviors. It may be that the situation in which the treatments were employed was a factor in determining the effectiveness of the treatments. The analyses of covariance indicated differences among the schools. The three treatments were the only constant across schools. Thus, it may be assumed that the treatments were more effective in some schools than in others. The Tukey test for nonadditivity also indicated Treatment X School interactions for three out of six of the behaviors. Another factor may account for the Treatment X School interactions. Interpair observer reliabilities were not assessed. Some differences were found between schools in which separate pairs of observers were recording. However, differences were also found between schools in which the same pair of observers was recording data.

O'Leary and Kent (1973) discussed the importance of changing the design of behavior modification research and suggested that group designs should be employed in testing the generalizability of the findings of previous behavior modification research. The authors referred to a study at Stony Brook (unpublished) in which teacher differences were found, noting that the effect of the two approaches under study was in part a function of the teacher. The results of the present study also indicated that the effectiveness of the treatment techniques varied with schools.

Throwing behavior yielded an interesting finding. There was a trend for the Treatment X Phase interaction and the analysis of covariance also indicated a differential change among the treatments. This finding may have been due to one of two factors. First, different treatments may have differential effects on particular behaviors. The different effects would account for the trends for this behavior and the lack of effects for the other behaviors. Second, there may have been a large enough difference in the baseline among the treatments, such that there was more opportunity for change in one group than in another.

There are several implications of the present study for future research. First, the present study was an N = 1

design, which did not allow for testing the School X Treatment interaction in the same manner as the main analyses were performed. Difference scores have been used in the past in studies involving only one treatment. But in the present study, an insignificant result would have made it unclear whether there was any change, or whether all groups changed an equal amount. It may be found that prior teacher-child interactions determine the effectiveness of different treatment procedures. For example, children in classrooms in which verbal punishment is used often may respond more to a Reinforcement/Extinction procedure than to one employing punishment. If such a relationship were found, it would have to be taken into consideration in applying the various treatment techniques.

Second, the two behavior classes used in the present study limited the discussion of generalizability. A decrease in disruptive behavior led to an increase in appropriate behaviors by definition. However, the analyses of the individual behaviors did not allow for such conclusions. A child may have stopped yelling in the room, but instead of increasing the rate of appropriate behaviors, the child may have begun to run around the room. Further research in

comparisons of approaches would benefit by including three classes of behavior: disruptive, appropriate, and a third, intermediate class which is neither disruptive nor appropriate, such as withdrawn behaviors. If this change were made, it would be possible to look at the effects of punishment procedures. Also, some behaviors may be affected by others. This three-way classification system may be a method of evaluating these interbehavior correlations.

Finally, a control group should be included in future research. Data from the other children in the classroom could reflect day-to-day variability. These data, in turn, could be used to reduce the variability in the target child's behavior when analyzing the data.

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APPENDIX A

EXAMPLES OF SENTENCES USED AS REINFORCERS AND PUNISHERS

Reinforcers

"I like the way you're playing here."

"I like the picture you drew."

"I like to see you reading."

Punishers

"I don't like it when you fight."

"I don't like to see you knock down what you just built."

"It bothers me to see you scribble over your picture."

"It hurts my ears when you yell like that."

"I don't like to hear you talk so loud."

"I don't like to see you throwing things inside."

"I don't like it when you run inside."

"I don't like to see you looking around when the teacher is talking to you."

APPENDIX B

SUPPLEMENTARY TABLES

TABLE B1

ANALYSIS OF VARIANCE SUMMARY FOR TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.1074	.0537	.3027
Subjects within Treatments	9	1.5973	.1775	
Phase	1	.1848	.1848	4.1773
Treatments X Phase	2	.1885	.0942	2.1303
Phase X Subjects within Treatments	9	.3982	.0442	

TABLE B2

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.1032	.0516	.8238
Error	8	.5009	.0626	

TABLE B3

ANALYSIS OF VARIANCE SUMMARY TABLE FOR AGGRESSION ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.0018	.0009	.0086
Subjects within Treatments	9	.9421	.1047	
Phase	1	.1394	.1394	1.6337
Treatments X Phase	2	.0034	.0169	.1984
Phase X Subjects within Treatments	9	.7678	.0853	

TABLE B4

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR AGGRESSION ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.0914	.0097	.0737
Error	8	1.0531	.1316	

TABLE B5

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR AGGRESSION ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.6536	.2179	3.6406
Error	7	.4189	.0598	

TABLE B6

ANALYSIS OF VARIANCE SUMMARY TABLE FOR PROPERTY ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.0311	.0156	.3229
Subjects within Treatments	9	.4336	.0482	
Phase	1	.0874	.0874	1.7971
Treatments X Phase	2	.0495	.0247	.5090
Phase X Subjects within Treatments	9	.4378	.0486	

TABLE B7

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR PROPERTY ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.0686	.0343	.5590
Error	8	.4908	.0613	

TABLE B8

ANALYSIS OF VARIANCE SUMMARY TABLE FOR PROPERTY ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.1710	.0570	1.5532
Subjects within Schools	8	.2937	.0367	
Phase	1	.0874	.0874	2.1321
Schools X Phase	3	.1593	.0531	1.2950
Phase X Subjects within Schools	8	.3280	.0410	

TABLE B9

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR PROPERTY ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.2186	.0729	1.4965
Error	7	.3408	.0487	

TABLE B10

TABLE OF DIFFERENCE SCORES FOR THOSE BEHAVIORS INDICATING A TREATMENT X SCHOOL INTERACTION

		Punishment	Reinforcement	Punishment/ Reinforcement
School 1	Noise	.1104	.1003	.3658
	Throwing	.0000	.0000	.2537
	Running	.5988	.4601	-.2003
School 2	Noise	.2287	-.0162	.2003
	Throwing	.0000	.0037	.2003
	Running	-.2838	-.1493	.0000
School 3	Noise	.4185	-.2196	-.0536
	Throwing	-.2713	.0906	.3540
	Running	-.2838	.2909	.2496
School 4	Noise	.5197	.3079	.1370
	Throwing	.1236	-.0835	.0000
	Running	-.0498	.2831	.0927

TABLE B11

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR NOISE ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.0862	.0431	1.2361
Error	8	.2791	.0349	

TABLE B12

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR NOISE ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.1312	.0437	1.3074
Error	7	.2341	.0334	

TABLE B13

ANALYSIS OF VARIANCE SUMMARY TABLE FOR THROWING ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.1110	.0555	1.0513
Subjects within Treatments	9	.4751	.0528	
Phase	1	.0188	.0188	2.0450
Treatments X Phase	2	.0656	.0328	3.5735
Phase X Subjects within Treatments	9	.0826	.0092	

TABLE B14

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR THROWING ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.1342	.0671	4.1139
Error	8	.1305	.0163	

TABLE B15

ANALYSIS OF VARIANCE SUMMARY TABLE FOR THROWING ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.2097	.0699	1.4853
Subjects within Schools	8	.3764	.0470	
Phase	1	.0188	.0188	1.0425
Schools X Phase	3	.0042	.0014	.0773
Phase X Subjects within Schools	8	.1440	.0180	

TABLE B16

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR THROWING ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.0246	.0082	.2389
Error	7	.2401	.0343	

TABLE B17

ANALYSIS OF VARIANCE SUMMARY TABLE FOR RUNNING ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.0827	.0413	.1784
Subjects within Treatments	9	2.0852	.2317	
Phase	1	.0629	.0629	1.5217
Treatments X Phase	2	.0426	.0213	.5146
Phase X Subjects within Treatments	9	.3722	.0413	

TABLE B18

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR RUNNING ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.0282	.0141	.1879
Error	8	.5999	.0750	

TABLE B19

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR RUNNING ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.3252	.1084	2.5049
Error	7	.3029	.0433	

TABLE B20

ANALYSIS OF VARIANCE SUMMARY TABLE FOR ORIENTING ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.0723	.0362	.3398
Subjects within Treatments	9	.9579	.1064	
Phase	1	.1655	.1655	3.0194
Treatments X Phase	2	.1966	.0983	1.7931
Phase X Subjects within Treatments	9	.4934	.0548	

TABLE B21

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR ORIENTING ACCORDING TO TREATMENTS

Source of Variance	df	SS	MS	F
Treatments	2	.1135	.0568	1.0478
Error	8	.4335	.0542	

TABLE B22

ANALYSIS OF VARIANCE SUMMARY TABLE FOR ORIENTING ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.5623	.1874	3.2040
Subjects within Schools	8	.4679	.0585	
Phase	1	.1655	.1655	2.0398
Schools X Phase	3	.0408	.0136	.1676
Phase X Subjects within Schools	8	.6492	.0811	

TABLE B23

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR ORIENTING ACCORDING TO SCHOOLS

Source of Variance	df	SS	MS	F
Schools	3	.3152	.1051	3.1727
Error	7	.2318	.0331	

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