

DOCUMENT RESUME

ED 408 783

EC 305 664

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 TITLE Analysis of Aggression of Children with Severe Behavior Disorders in School Environments. Final Report.  
 INSTITUTION Kansas Univ., Parsons.  
 SPONS AGENCY Special Education Programs (ED/OSERS), Washington, DC.  
 PUB DATE [92]  
 NOTE 88p.  
 CONTRACT H023C00127-92  
 PUB TYPE Reports - Descriptive (141)  
 EDRS PRICE MF01/PC04 Plus Postage.  
 DESCRIPTORS \*Aggression; \*Behavior Disorders; \*Classroom Communication; Classroom Environment; Elementary Education; \*Emotional Disturbances; Inclusive Schools; Mainstreaming; Positive Reinforcement; Praise; \*Student Placement; Teacher Response; \*Teacher Student Relationship

ABSTRACT

A series of studies involving 19 elementary students with severe emotional disturbance (SED), who were identified as aggressive, and 19 typical students in different types of educational settings, investigated the relationship between school environments and the aggressive behavior of children with SED. The social interactions of the children who were aggressive were examined as well as the settings and events within the school environment that may be associated with aggressive behavior. Results from the study found: (1) the rates of interactions were significantly higher in the segregated settings than in the integrated settings; (2) no significant differences were found among the children with SED in the rates of aggression, disruption, and negative verbal responses in different settings; (3) teachers' rates in delivering reinforcement were extremely low, with the teachers in segregated settings giving more positive consequences than did the teachers in the integrated settings; (4) teachers' responses to students' hand-raising behavior was low and, in several cases, teachers were far more likely to respond to the students' inappropriate behavior than to the students' hand-raising behavior; and (5) when teachers increased praise, the rate of students' disruptive behavior decreased. Appendices composing more than half the report include articles and papers on the specific studies and findings: (1) "Classroom Interactions of Children with Behavior Disorders" (Richard E. Shores and others); (2) "Classroom Management Strategies: Are They Setting Events for Coercion?" (Richard E. Shores and others); (3) "Lag Sequential Analysis as a Tool for Functional Analysis of Student Disruptive Behavior in Classrooms" (Philip L. Gunter and others); "A Case Study of the Effects of Aversive Stimuli in Instructional Interactions on the Disruptive Behaviors of a Child Identified with Severe Behavior Disorders" (Philip L. Gunter and others); and "Teacher/Student Proximity: A Strategy for Classroom Control through Teacher Movement" (Philip L. Gunter and others). Contains 18 references. (CR)

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ANALYSIS OF AGGRESSION OF CHILDREN WITH SEVERE BEHAVIOR  
DISORDERS IN SCHOOL ENVIRONMENTS

FINAL REPORT  
GRANT #HO23C00127-92

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# ANALYSIS OF AGGRESSION OF CHILDREN WITH SEVERE BEHAVIOR DISORDERS IN SCHOOL ENVIRONMENTS

## Final Report

The major purpose of this project was to investigate the relationship between school environments and the aggressive behavior of children with severe emotional disturbance (SED). Of particular interest in this research project was the social interactions of aggressive children with teachers and peers within classrooms. In addition to the social interactions, we also have attempted to identify setting events within the school environment that may be associated with aggressive behavior. Setting events are those events that increase or decrease the probability of stimuli having effects on a given student behavior. In the present research, we have specifically focused on day to day changes in the environment that may effect aggressive behavior, as well those more static setting events such as classroom organization that provide structure to classroom environments. We proposed four major goals:

Goal 1. To identify through direct observation teacher antecedent and subsequent behaviors and classroom setting events that have a high probability of predicting aggressive behavior of children identified as SED and who have a history of aggressive behavior.

Goal 2. To identify the antecedent and subsequent behaviors of children's aggressive interactions with peers.

Goal 3. To functionally analyze through single subject experimental studies the variables identified through direct observation of teacher/student interactions.

Goal 4. To functionally analyze through single subject experimental studies the variables identified through the direct observation studies of the student/peer interactions.

To accomplish these goals, a series of studies was proposed. For Goals 1 and 2, a direct observation study was conducted within classrooms of children defined as severely emotionally disturbed (in Kansas, children with severe behavior disorders) who also had a history of

aggressive behavior. This direct observation study utilized a data system that was exhaustive in coding the interaction between teachers and target children, and these children and their peers. In addition, we concurrently collected data to aid us in analyzing the setting events that might modify the probabilities of the specific antecedent and subsequent behavioral events. This was done by coding some of these setting events into the laptop computer, and by having the teacher complete a daily check list. Activities of Goals 3 and 4 include studies of the teacher and target student interactions and the target student's interactions with peers. These goals were met through experimental studies. The purpose of the experimental studies was to provide a functional analysis of those behaviors of the teachers and children that significantly affect the aggressive and other inappropriate behavior of SED students. Some of these behaviors were identified through the accomplishments of Goals 1 and 2. The experimental studies consisted of single subject designs that allowed systematic manipulation of identified teacher behaviors to assess the functional effects on the behavior of children identified as aggressive. In addition, a few setting event variables that were identified as producing significant effects were also submitted for experimental analysis. In each study, the attempt was made to alter the rate of the behavior of children identified as aggressive by decreasing the inappropriate (aggressive, disruptive and negative) behaviors and in increasing prosocial behavior within the classroom environments. Specific studies will be described later in this report.

### Goals 1 and 2

The major accomplishments of the activities associated with these goals resulted in the direct observation study reported in the Journal of Emotional and Behavioral Disorders, 1, 1993, 27-39. A copy of this manuscript may be found in Appendix A.

In this study, forty students were identified for observation in 20 classrooms. Twenty students were defined as aggressive and 20 classmates were defined as non-aggressive. Each student was the target of observation during classroom activities. One group of students was in self-contained special education classrooms (segregated classrooms) specifically designed for

students with severe emotional disturbance. The second group was served in the regular education classroom (integrated classrooms). We therefore had an opportunity to assess the differences in the interactions between students who were integrated and students who were segregated, which led to a modification of our analysis procedures. We designed the study to allow an analysis of the interaction of the students in four groups: integrated aggressive SED; integrated non-aggressive, non-handicapped students; segregated aggressive SED; and segregated non-aggressive SED. Each group consisted of 10 students. After six observations, one of our segregated aggressive SED children (the primary targets) was transferred to a different program outside our cooperating districts. Therefore, the final analyses were based on 38 students with nine target students in segregated settings with the corresponding nine cohorts. The children were defined as aggressive through the use the Child Behavior Checklist/Teacher's Report Form (Achenbach-Edelbrock, 1988). Students who scored above one standard deviation on the aggressive scale were considered aggressive students. Students with scores at or below the mean on the scale were considered non-aggressive. The analyses of the direct observation data included a two-by-two analysis of variance. Included in the main effects were classroom placement (integrated, segregated) and child classification (aggressive, non-aggressive). The rate of each behavior was calculated and submitted for analysis.

The analyses revealed several interesting results. First, the rates of interactions were significantly higher in the segregated than in the integrated settings. Second, the rate of aggression was too low to be interpreted (N=less than 3 in several cells). Therefore, codes for aggression, disruption and negative verbal/gestural responses were collapsed and the resulting analyses revealed no significant differences among the groups (although the children without SED classification in the regular classroom had a lower rate of these behaviors than did the other three groups with SED classification). One interpretation of these data reflects on the use of the Child Behavior Checklist/Teacher's Report Form (Achenbach-Edelbrock, 1988). It appears that the checklist discriminated aggressive and non-aggressive students if completed by teachers in regular classrooms. However, the special education teachers' ratings did not discriminate between those

students who demonstrated aggressive behavior and those who did not have aggressive behavior in segregated special education classrooms.

The finding that the self-contained segregated classrooms had significantly more teacher/child interactions than did the regular classroom was also not a surprising result. The number of children in segregated classrooms is much smaller, with each classroom having no more than eight students, a teacher and at least one paraprofessional present. The regular classrooms had as many as 30 children, a teacher and one paraprofessional (primarily responsible for the child identified as SED). It appeared that there were simply more opportunities for interactions in the segregated environments than in the integrated environments. However, the reader is reminded that in most classrooms there was an aide assigned specifically to the student with SED. Therefore the difference in numbers of students in the classrooms cannot completely account for the differences in the rates of interaction between teachers and students.

The teachers' rates in delivering reinforcement were extremely low, with the teachers in segregated settings giving more positive consequences than did the teachers in the integrated settings. However, even in segregated settings, the rates were still rather low. (i.e., one every 16 minutes to children defined as aggressive and one every 12 minutes to students defined as non-aggressive). In the integrated settings, the aggressive students received approximately 1.5 positive consequences per hour while their cohorts (non-aggressive, normally developing children) received one positive consequence per two hours. From these data, it appears that teachers engage in demanding behaviors that far exceed the use of positive consequences. Even the highest probability of teacher's behavior in consequating a student's aversive behaviors (i.e., aggression, disruptions and negative verbal/gestural) was to provide additional commands (i.e., "To do," positive mands or "Stop doing," negative mands). The absence of teachers' involvement in the peer-target student's negative interactions should also be noted.

The structured classroom checklist did not reveal differences between integrated/segregated settings. The integrated settings were as structured as the segregated setting. This was somewhat surprising, yet it may have been due to the checklist not providing a "spread" in the

classrooms. The structured classroom checklist did not discriminate those classrooms that may have had more "structure" than others. The second analysis consisted of lag sequential analyses being performed on all the interaction data by groups. The lag sequential analyses provided a probability statement that given one event another event will occur. The significance of the probabilities was analyzed by the binomial z-test that makes a statistical comparison between the unconditional and conditional probabilities of the behavior. The reader is referred to the manuscript in Appendix A for a more thorough report of this study.

In addition to the published study, three additional outcomes resulted from the activities associated with Goals 1 and 2. First, the data indicated that the rates interactions between targeted students and their peers were very low, therefore the majority of the subsequent studies focused on the interactions between teachers and their students who were considered aggressive. Second, the sequential analyses of the individual data appeared to be useful in providing a method of identifying potential antecedent and consequent stimuli that may be serving as reinforcers for inappropriate classroom behavior. A series of studies was designed to assess the usefulness of lag sequential analysis as a procedure to be used in the functional analysis of classroom behavior. The results of these studies will be discussed under Goal 3. Third, it appeared from the interview with teachers and our informal observations of classrooms that the teachers' major method of controlling student behavior was using general classroom management strategies that were most often implemented by aversive procedures. This observation stimulated a literature review to aid us in gaining a better understanding of teachers' use of the strategies. The results of this effort produced a manuscript that was published in Behavioral Disorders (See Appendix B for a copy of this article) and provided the basis of another field initiated research proposal for a more thorough investigation of the phenomenon.

#### Goals 3 and 4

The single subject studies associated with Goals 3 and 4 included several studies that were based on results of the group analyses. The purpose of these studies was to test the effects of the identified variables (i.e., teacher behavior) on the aggressive, disruptive and other inappropriate



classroom behaviors of students with histories of aggressive behavior. The direct observation study indicated that interactions among students were very low. Therefore, the studies were focused on the effect of teachers' behavior on students' appropriate and inappropriate behavior. Although we had designed several peer interaction studies, none was completed. In addition to the low rate of peer interactions another major factor prevented the direct investigation of peer interaction through the single subject experiments. Most often, baseline data, gained through directly observing targeted students and the resulting sequential analysis of the interactions, strongly suggested that the primary independent variable controlling student's inappropriate behavior was teacher behavior (i.e., highest conditional probability of either preceding or following student inappropriate behavior). Specifically, three teacher responses to students' behavior consistently emerged as being significantly related to students' inappropriate behavior. First, in every classroom low rates of teacher positive statements to the students' behavior were found. Second, it was found that the teachers' responses to students' hand raise behavior was low rate. In fact, teachers were as likely to respond to students inappropriate behavior (e.g., disruption, aggression) as they were to students' hand raise response. In several cases, teachers were far more likely to respond to the students' inappropriate behavior than to the students' handraise behavior. In these cases, it appeared that the students were engaging in a chain of responses in which they raised their hand and then engaged in disruptive behavior to which the teachers would respond. Third, teachers' use of an instructional sequence or reliance on giving commands or "to do" statements was the highest rate teacher behavior for both students appropriate behavior (e.g., compliance) and student inappropriate behavior (e.g., disruptive behavior). When the students complied to the teachers' commands, the most likely teacher response was another command, or talk. Seldom was the student provided positive response from the teacher.

The results of the research strongly suggested that teachers were seldom positive with students (i.e., very low rates of teacher positive consequences), and led us to investigate the effects of increasing the teacher's praise rate on student behavior. The studies to test the effects of increasing teacher praise rates and a study to modify teacher's attention to students' hand raise



behavior employed the use of lag sequential analysis procedures in the functional analysis of behavior. A copy of this published manuscript may be found in Appendix C.

In addition to the experiments reported in Appendix C., we began several other experiments to increase teacher praise for student compliance and using a differential reinforcement of other behavior (DRO), differential reinforcement for incompatible behavior (DRI), and a point in time interval schedule for students' attention to task behavior. In all the experiments, including those found in the article in Appendix C, the targeted rate of praise was determined by the rate of the students' inappropriate behavior, particularly disruptive behavior. For example, if the students' rate of disruptive behavior was one per four minutes, then the rate of praise for engaging in appropriate behavior was set at one per three minutes. These experiments were not written for publication due to the fact that we were unable to consistently control the teacher's behavior of praising the students. Several strategies of increasing teacher praise rates were attempted including: providing teachers with a watch with a count down function to remind them to praise the students; providing daily feedback to the teachers regarding their rate of praise and the student's rate of disruptive behavior; and providing them with the data analysis on the interactions between them and their students. None of these strategies was successful in producing consistent increases in the teachers' rate of providing positive statements to the students.

Another strategy was to attempt to increase teachers' praise by asking them to praise the student on a noncontingent interval schedule. That is that the teachers were asked to praise the students at a given interval without direct reference to the student's behavior. In two of the classrooms the teachers were consistent in meeting the criteria set for praising the students for short periods of time. In one of the classrooms the teacher's praise statements reached criterion for six consecutive days. The rate of the student's disruptive behavior declined to its lowest rate by the third day and continued for the next three days. In the other classroom, the teacher met criterion for four consecutive days. On the third day of reaching criterion, the student's rate of disruptive behavior decreased to its lowest rate. In both classrooms, when the rates of teacher praise decreased, the students increased their rate of disruptive behavior. The other outcome of

these experiments was that the rate and duration of positive interactions between the teachers and students were over twice as high when criterion was met consistently than when criterion was not met. In addition, the percent of time the teachers and students were engaged in negative interactions decreased from approximately 20% during a time that the teachers failed to meet criterion for giving positive statements to less than 5% of the time during the days when the criterion was reached.

From the first naturalistic direct observation study, we found that the most often interaction sequence was: the teacher giving a mand to do an academic task or answer an academic question; the child complied by engaging in the task or providing an answer to the question, then the teacher gave another mand or provided feedback to the student. We have stated that this type of instructional interaction maybe considered as an aversive interaction in that the students were not being provided positive consequences for compliance but only another mand or neutral feedback. One hypothesis was that the students may not have the skills to perform the task mandated by the teacher. Drawing on the literature regarding effective instruction (as advocated by Council for Exceptional Children, 1987) and Direct Instruction (e.g., Carnine & Silbert, 1979; Engelman & Carnine, 1982) a series of studies were designed to investigate the effects of modifying teachers' instructional interactions that would more closely resemble the strategies advocated by the effective and direct instruction literature. Both of these strategies call for the teacher to provide a model of the correct performance or provide sufficient information to the student that will insure that the student will successfully complete the task prior to asking the student to perform the task. We began the research to study the function of the teachers' manding behavior with three teachers, but were able to complete the research on only one teacher. The manuscript, found Appendix D, details the method used in these studies and the results of the experiment that was completed.

#### Setting Events Experiments

In addition to the above areas of study, we also assessed the effects of classroom setting events on the behavior of students with aggressive behavior. Setting events are events or

conditions that increase or decrease the effects of antecedent and consequence stimuli on behavior. The studies that were planned included the effects of teacher movement and proximity, classroom organization (seating arrangement), and the development and implementation of classroom rules. Most classrooms had components of each of these setting event strategies, but no classroom had followed the guidelines expressed in the literature and detailed in the Shores, Gunter and Jack manuscript (1993).

The students selected as subjects for the setting events experiments were selected using the criterion that had been used throughout the project. Students defined by the local school district as severe behavior disorders and were receiving services in special education self-contained classroom or regular education classrooms were chosen as subjects for the studies. In addition, the selected students were considered by their teachers to have displayed aggressive behavior and they scored at least one standard deviation above the mean on the aggressive subscale of the Child Behavior Checklist/Teacher Report Form (Achenbach & Edelbrock, 1988). Observations of the classrooms selected demonstrated that the teachers were not implementing control of the specific setting events. Few teachers had a plan for movement in their classrooms. In several classrooms, the teachers and aides remained at their desk without moving about the classroom. These classrooms became the focus of the studies of teacher movement and proximity as a setting event. In one classroom the teacher had posted over 20 rules and had no positive consequences for following the rules. This classroom was used to attempt to study classroom rules as a setting event for interactions. In another classroom, the teachers assigned students to study cubicles for their independent activities. The cubicles were arranged in such a way that the teachers did not have eye contact with most of the students most of the time. This classroom became the focus of the classroom arrangement study. The study of the effects of teacher movement within the classroom is reported in an article submitted for publication and may be found in Appendix E. The other two experiments were not written as research reports due to serious methodological flaws.

The classroom for the rules study proved to be so disordered that the data collected failed to reach the minimum acceptable level of reliability on the interactions of the students. With the aid of the teacher, we arrived at six rules that were stated positively and developed a freetime contingency for following the rules. In addition to the problems of reliability, the teacher was very subjective in following the agreed upon freetime contingency. Although we were able to aid in bringing better control of the students disruptive behavior (these data were reliable), the experiment was seriously flawed and was not written as a research report.

In the experiment on classroom arrangement, the data were reliable, but the effects on the students were varied. In this experiment, we aided the teacher in redesigning the placement of students' cubicles to facilitate the teachers and paraprofessional maintaining close enough proximity to each student to allow "eye contact" with the students, while at the same time screening the students from their peers. In the first five days following the rearrangement, a minor drop in the student's disruptive and inappropriate behaviors was observed, and the teacher reported that he had not engaged in aggressive behavior during this time. However, the inappropriate behavior increased to near (but slightly lower than) the original baseline in the next five days. The modification of the classroom arrangement did not appear to change the interactions between the teachers (including paraprofessionals) and the student. The teachers appeared to engage in responses to the student that were seldom positive.

### Conclusions

From the results of the research, several conclusions may be drawn.

1. Teachers seldom engage in positive interactions with students who have a history of aggressive behavior.
2. Students' physical aggressive behaviors in classroom environments occur at very low rates.
3. By increasing the positive responses by teachers to students, students' inappropriate classroom behavior decreases.

4. A tentative conclusion is that analyzing social interactions in classrooms using computer assisted systems and lag sequential analysis is an important research tool, and may allow more precision in developing hypotheses for developing clinical interventions.

## Dissemination

## Manuscripts

- Gunter, P.L., Jack, S.L., Shores, R.E., Carrell, D.E., & Flowers, J. (1993). Lag sequential analysis as a tool for functional analysis of student disruptive behavior in classrooms. Journal of Emotional and Behavioral Disorders, 1, 138-148.
- Gunter, P.L., Denny, R.K., Jack, S.L., Shores, R.E. & Nelson, C.M. (1993). Aversive stimuli in academic interactions between students with serious emotional disturbance and their teachers. Behavioral Disorders, 18, 265-274.
- Shores, R.E., Gunter, P.L., & Jack, S.L. (1993). Classroom management strategies: Are they setting events for coercion? Behavioral Disorders, 18, 92-102.
- Shores, R.E., Jack, S.L., Gunter, P.L., Ellis, D.N., DeBriere, T.J. & Wehby, J.H. (1993). Classroom interactions of children with behavior disorders. Journal of Emotional and Behavioral Disorders, 1(1), 27-39.
- Shores, R.E., Gunter, P.L., Denny, R.K., & Jack, S.L. (1993). Classroom influences on aggressive and disruptive behaviors of students with emotional and behavioral disorders. Focus on Exceptional Children, 26 (2), 1-10.
- Gunter, P.L., Shores, R.E., Jack, S.L., Rasmussen, S., & Flowers, J. (in press). Teacher/Student Proximity: A strategy for classroom control through teacher movement. Teaching Exceptional Children.
- Gunter, P.L., Denny, R.K., Shores, R.E., Reed, T.M., & Jack, S.L. (in press). Teacher escape, avoidance, and countercontrol behaviors: Potential responses to disruptive and aggressive behaviors of students with severe behavior disorders. Journal of Child and Family Studies.
- Gunter, P.L., Shores, R.E., Jack, S.L., & Denny, R.K. (1993). Proximity as a setting event for student/teacher interaction. Manuscript submitted for publication.

Gunter, P.L., Shores, R.E., Jack, S.L., & Denny, R.K. (in press). A case study of the effects of aversive stimuli in instructional interactions on the disruptive behaviors of a child identified with severe behavior disorders. Education and Treatment of Children.

#### Presentations

Shores, R. E., Jack, S. L., Ellis, D. N, & Gunter, P. L. (May, 1992). Analysis of Classroom Interactions of Children with Aggressive Behavior. Poster Session, 18th Annual Convention of the Association for Behavior Analysis, San Francisco.

Gunter, P.L., Shores, R.E., Jack, S.L., & Denny, R.K. (November, 1992). Implications of Negative Reinforcement in Classrooms for Students with Severe Behavioral Disorders. Sixteenth Annual Conference on Severe Behavior Disorders of Children and Youth (TECBD), Tempe, AZ.

Jack, S.L., Gunter, P.L., & Shores, R.E. (November, 1992). Lag Sequential Analysis as a tool for Functional Analysis of Disruptive Behavior in Special Classrooms. Sixteenth Annual Conference on Severe Behavior Disorders of Children and Youth (TECBD), Tempe, AZ.

Gunter, P.L., Jack, S.L., Shores, R.E., & Denny, R.K. (March, 1993). Coercion in Classrooms for Children and Youth with Behavior Disorders. Midwest Symposium for Leadership in Behavior Disorders, Kansas City.

Shores, R.E., Gunter, P.L., & Jack, S.L. (April, 1993). Analysis of social interactions in classrooms for children with severe behavior disorders. Council for Exceptional Children, San Antonio.

Jack, S.L., Shores, R.E., Gunter, P.L., & DeBriere, T.J. (October, 1993). Analysis of Classroom Behavior Interaction of Children with Severe Behavior Disorders. Kansas Federation of the Council for Exceptional Children, Salina, KS.



APPENDIX A

# Classroom Interactions of Children with Behavior Disorders

RICHARD E. SHORES, SUSAN L. JACK, PHILIP L. GUNTER,  
DAVID N. ELLIS, TERRY J. DEBRIERE, AND JOSEPH H. WEHBY

CHILDREN WITH SEVERE BEHAVIOR disorders (SBD) often engage in behavior that is offensive to those with whom they interact. In fact, the ways in which they interact socially often provide the motive for placement in special education programs (Bower, 1981; Kauffman, 1989). However, the rationale for placement in special education programs is generally based on a description and assessment of deviant behavior without a direct assessment of children's interaction patterns. That is, behavior disorders are often considered to be monadic phenomena rather than dyadic phenomena involving social interactions between the children with behavior disorders and others in their environment. We (Shores, Gunter, & Jack, in press) have argued that children are often referred to special programs for children with SBD due to their social interaction problems. It seems obvious that dyadic studies of social interactions of children with SBD in educational environments are needed to aid in developing appropriate programs to remediate students' negative social interaction patterns.

Patterson and Reid (1970) described interactions as dyadic social exchanges that are reciprocal. That is, the social behavior of one of the interactants is likely to be reciprocated by the social behavior of the other member of the dyad. Although a number of studies have described interaction patterns in families (e.g., Patterson, 1982; Patterson & Cobb, 1971; Reid, 1986; Snyder & Patterson, 1986), and a few studies have described certain types of interactions in classrooms (e.g., Gable, Hendrickson, Shores, & Young, 1983; Maheady & Sainato, 1984; Moore & Simpson, 1983; Simpson & Souris, 1988;

The purpose of this study was to identify significant social stimuli that were associated with prosocial and inappropriate behavior of children classified as severe behavior disorder (SBD). Two children from each of 19 classrooms—10 from integrated and 9 from segregated special classrooms (for children with SBD)—were observed. One student in each classroom was defined as aggressive and one student was defined as nonaggressive. The selection yielded four groups: integrated nonaggressive without SBD ( $n = 10$ ), integrated aggressive and SBD ( $n = 10$ ), segregated aggressive and SBD ( $n = 9$ ), and segregated nonaggressive and SBD ( $n = 9$ ). An exhaustive behavioral coding system was used to record sequentially the social responses between target students and their teachers and peers. The data from each group were pooled for analysis. Lag sequential analysis was used to identify the significant antecedent and subsequent social responses of each code for each group. The results indicated that most of the teacher/child interactions were composed of teacher mands followed by student compliance, with teacher positive consequences for prosocial behavior rarely occurring. All significant antecedent and subsequent social stimuli of students' aversive behaviors were identified. Results are discussed in relation to the reciprocal-coercive interaction hypothesis (Patterson & Reid, 1970), with implications for additional research.

Strain, Lambert, Kerr, Stagg, & Lenkner, 1983; White, 1975), we found no studies that describe, through an exhaustive observation system, the social interactions of children with SBD in classrooms. It seems evident that such an analysis of the interactions of children with SBD would facilitate the development of a functional analysis of classroom social behavior.

The analysis of the function of the behavior of one person on the behavior of another person requires that the social exchange be analyzed to identify which social behaviors of one person precede and follow the social behaviors of the other. Many authors have recommended informal observation to derive hypotheses regarding the function of inappropriate behavior in classrooms prior to developing behavior modification programs (e.g., Alberto & Troutman, 1986; Kerr & Nelson, 1983), but a more formal, empirical approach is likely to increase the probability of success in developing these programs. Lag sequential analysis (Bakeman & Gottman, 1986) is a statistical method that may be appropriate for this purpose.

Lag sequential analysis allows for the calculation of the conditional probabilities of one event preceding or following another event.

Studies have been completed using lag sequential analysis to describe the interactions of parents and children (e.g., Snyder & Patterson, 1986), and interactions of preschool children (e.g., Tremblay, Strain, Hendrickson, & Shores, 1981). In addition, Greenwood, Delquadri, Stanley, Terry, and Hall (1985) have used sequential analysis to describe classroom environments. Repp and Deitz (1990) also used sequential analysis in their studies of stereotyped responding. Only one study was found that used lag sequential analysis to study the classroom interactions between teachers and students. Simpson and Souris (1988) described teachers' interactions in classrooms with students identified with autism and mild disabilities.

The purpose of this study was similar to that of the Simpson and Souris study in that we wanted to describe the social interactions of students in classrooms to

identify social stimuli that may control the classroom behavior of students with SBD. This study differed from the Simpson and Souris study in that the description focused on identifying the antecedent and subsequent behaviors of teachers and peers that were associated with target students' aversive behaviors (i.e., those behaviors involved in coercive interactions) as well as those associated with positive behaviors (i.e., reciprocal interactions). In addition, the study explored differences between the interaction patterns of students with SBD who had a history of aggressive behavior, and stu-

dents with and without SBD who were considered nonaggressive by their teachers. An additional variable identified was the type of placement: regular, integrated classrooms or segregated, special education classrooms.

## METHOD

### Subjects

The subjects of this study were selected from segregated special education classrooms (serving only students identified as having SBD) and regular education class-

rooms (the majority of students without identified disabilities). All classrooms were located in southeast Kansas and southwest Missouri. The classroom selection criteria were as follows: (a) at least 1 student who met each state's definition for SBD and who was identified as aggressive by scoring at least 1 standard deviation above the mean on the aggressive subscale of the Child Behavior Checklist, Teacher Report Form (Achenbach & Edelbrock, 1988); (b) one student considered nonaggressive by scoring at or below the mean on the checklist; (c) permission of the students' parents and/or

TABLE 1  
Subject Description

Classification type	No. students	No. adults	Student classification	Sex	Age	Aggression score	Total days	Total minutes
1. Integrated	28-30	2	Aggressive	M	12	18	20	367.97
			Nonaggressive	M	12	0	20	351.17
2. Integrated	25-30	2	Aggressive	M	13	41	20	289.98
			Nonaggressive	F	11	0	20	278.07
3. Integrated	20-25	1-2	Aggressive	M	10	55	20	360.07
			Nonaggressive	M	10	0	20	361.53
4. Integrated	20-25	1-2	Aggressive	M	12	47	15	229.45
			Nonaggressive	M	11	0	13	256.80
5. Integrated	20-21	2	Aggressive	F	10	38	20	377.27
			Nonaggressive	F	11	0	20	356.33
6. Integrated	20-22	2	Aggressive	M	10	63	20	296.23
			Nonaggressive	M	10	2	20	285.03
7. Integrated	20-25	2	Aggressive	M	8	44	20	266.90
			Nonaggressive	F	8	3	20	275.57
8. Integrated	23-28	1	Aggressive	F	6	33	20	418.20
			Nonaggressive	M	6	0	20	380.70
9. Integrated	15-25	2	Aggressive	M	10	45	20	366.73
			Nonaggressive	F	10	0	20	379.92
10. Integrated	28-30	1	Aggressive	F	11	50	20	352.77
			Nonaggressive	F	11	0	20	354.33
11. Segregated	7-9	2	Aggressive	F	5	29	20	384.40
			Nonaggressive	M	6	7	20	367.88
12. Segregated	3-6	2	Aggressive	M	11	13	14	168.82
			Nonaggressive	F	9	1	11	182.18
13. Segregated	4-5	2	Aggressive	M	7	42	20	389.75
			Nonaggressive	M	8	32	20	353.60
14. Segregated	5-6	2	Aggressive	M	10	58	18	280.23
			Nonaggressive	M	11	9	16	278.08
15. Segregated	5-8	2	Aggressive	M	9	39	15	294.05
			Nonaggressive	F	9	2	15	275.75
16. Segregated	5-6	2-3	Aggressive	M	7	50	20	311.35
			Nonaggressive	M	9	7	20	308.38
17. Segregated	4-6	2	Aggressive	M	10	50	20	251.98
			Nonaggressive	M	11	7	20	275.17
18. Segregated	4-8	2-3	Aggressive	F	12	26	16	295.28
			Nonaggressive	F	12	2	15	262.37
19. Segregated	1-8	3-4	Aggressive	M	11	54	20	285.68
			Nonaggressive	M	13	17	20	291.73

their guardians; and (d) permission of the classroom teachers to observe in their classrooms.

Two students (one considered aggressive and one considered nonaggressive) in each of 20 classrooms—10 special education classrooms for children with SBD and 10 regular, integrated classrooms that served at least 1 student with SBD who also met the aggression definition—were originally selected. One special education class was dropped from the study due to student attrition. The results of the selection procedures yielded 10 integrated classrooms with 20 students for observation (10 aggressive and 10 nonaggressive) and nine segregated classrooms with 18 students for observation (9 aggressive and 9 nonaggressive). Table 1 describes the classrooms, the students that were observed, the number of days of observation, and the minutes of observation for each subject.

### Setting

Observations occurred in 19 classrooms (see Table 1). Classrooms were designated in one of two categories previously indicated: segregated or integrated. Segregated classrooms were identified as those in which only children with disabilities were served. The number of students present during the observations in the segregated classrooms ranged from 1 to 9, but more typically 5 to 9 students were present. In each segregated classroom, there was a teacher certified in special education and at least one paraprofessional.

Integrated classrooms were regular classrooms in which the majority of the students had no identified disabilities. However, the classrooms typically had one or two students identified as SBD. Fifteen to thirty other students were served in these classrooms by a regular education teacher and a paraprofessional assigned to the student or students with disabilities. The paraprofessional was typically located in close proximity to the student with SBD. In two of the regular integrated classrooms, only the teacher was present.

### Observation Procedures

Table 2 lists the behaviors coded during observation sessions. The data system was

TABLE 2  
Operational Definitions for Interaction Code

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*Compliance/feedback response*—An actor does what is commanded, initiates the appropriate response that is commanded, or states that he or she will do so within 10 seconds of a mand. Must immediately follow a mand. Also includes statements that provide feedback and/or clarification of a behavior without qualitative judgments.

*Noncompliance response*—An actor does not do what is commanded within 10 seconds of a mand, or argues, protests, or refuses to comply with a mand.

*Positive mand*—Verbal or physical statements that command a specific and immediate social response. Includes:

1. "To do" statements that make a demand for a response.
2. Calling a person by name to get his or her attention in an appropriate manner.

*Negative mand*—Verbal or physical statements that request the absence or termination of an immediate and specific response; includes "Don't do" and "Stop" statements.

\**Handraise*—Hand is up (a form of manding).

\**Positive physical*—Purposeful contact that displays affection and is not obviously teasing or aggressive.

\**Negative physical*—Physical interruption of an ongoing response or interaction; removal or attempt to remove materials in possession of another person.

*Physical aggression*—Physical contact that is potentially harmful to self, others, or property.

*Negative verbal/gestural*—Statements or actions (a) whose intent is to provoke, annoy, pester, mock, or make fun of a person; (b) in which physical aggression is threatened to person or property; or (c) that is an obscene gesture or verbal statement.

*Disruptive*—Nondirected negative verbal/gestural behavior.

*Positive consequence*—Verbal statement or gesture indicating approval of behavior over and above an evaluation of adequacy or a verbal statement that specifies which positive consequences will follow which behaviors. Also includes the delivery of tangible events or activities that serve as potential reinforcers, and "if . . . then" statements that establish relationship between a behavior and future positive consequences.

*Negative consequences*—Verbal statement or gesture indicating disapproval over and above an evaluation of adequacy or a verbal statement that specifies which aversive consequences will follow which behaviors. Also includes the removal of reinforcing objects or removal of concrete events/activities that may have reinforcing effects, and "if . . . then" statements that establish a relationship between a behavior and future aversive consequences.

*Withdrawal*—Actor physically removes self from a *negative interaction* (follows any negative behavior from another person).

\**Talk*—Any verbal behavior of social or academic content that does not fit into any other category. Includes social or academic lectures, or when two or more statements are issued by the same actor. This also includes reciprocal verbal interactions between two actors when more than one "talk" occurred in succession, forming a bout of talk, and ending when a stop or other, more specific code was entered.

\**Stop*—Scored when no defined behavioral event has occurred for 10 seconds. This indicated that no interaction is occurring, or that previously occurring event has ceased.

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\*Indicates that the event is not repeatable and is scored as an episode. All other behaviors are repeatable and may precede or follow the same behavior.

intended to provide an exhaustive representation of all the interactions possible within the classroom setting. The data system allowed data collectors to record by coding who emitted a behavior, the topography of the behavior, and to whom the behavior was directed. The data were coded into a laptop microcomputer (Toshiba T1000) utilizing a sequential interaction software (Moses, developed by John Tapp of Vanderbilt

University). The system allowed the collection of continuous data on the sequence of interactions between the target student and adults and peers in the classroom.

The observers were located in an area within the setting that provided constant observational access (visual and auditory) to the targeted subject. Each event code was associated with the elapsed time of observation, which was maintained by

TABLE 3  
Interobserver Agreement

Code	Agree	Disagree	Percentage agreement
Stop	1,063	187	.85
Teacher behaviors			
Compliance/feedback	655	295	.69
Noncompliance	148	20	.88
Positive mand	1,045	230	.82
Negative mand	25	17	.60
Negative gestural/verbal	1	0	1.00
Positive consequence	119	35	.77
Negative consequence	20	7	.74
Teacher talk	775	416	.65
Total	2,788	1,020	73%
Target student behavior			
Compliance to teacher	769	258	.75
Compliance to peer	32	31	.51
Noncompliance to teacher	61	40	.60
Noncompliance to peer	4	7	.36
Positive mand to teacher	270	107	.72
Positive mand to peer	45	19	.70
Handraise to teacher	218	20	.92
Negative mand to teacher	1	1	.50
Negative mand to peer	3	2	.60
Disruptive	15	0	1.00
Negative gestural/verbal to teacher	1	0	1.00
Negative gestural/verbal to peer	5	3	.63
Aggression	3	1	.75
Total	1,427	489	74%
Peer behaviors			
Compliance	30	17	.64
Noncompliance	8	1	.89
Positive mand	2	0	1.00
Negative mand	42	27	.61
Aggression	1	0	1.00
Peer talk	267	137	.66
Total	350	182	66%
Grand total	5,628	1,878	75%

the computer. A stop code (0000) was entered when there was no defined social event that could be scored for 10 seconds. The stop code remained in effect until another scoreable response was entered. By pressing the number keys on the laptop computer, data collectors coded the social responses. The code for the responder was recorded in column 1. Columns 2 and 3 contained 1 of 15 operationally defined, two-digit response codes (see Table 2). The child or adult

to whom the response was directed was recorded in column 4. Thus, if the teacher asked the target child to write a math problem on the board, the teacher (1) was the responder, the response was a positive mand (31), and the target child was the recipient (2). This code would be entered as "1312." If the child responded in 5 seconds, student compliance to the teacher was scored (2111). A data file consisted of a sequentially ordered list of behavior codes and the

elapsed times at which the codes were entered.

Data collectors were trained to observe and record the behavior identified by first memorizing the operational definitions and practicing the entry of these conditions into the microcomputer while observing videotaped segments of classroom interactions. Prior to the actual data collection in the classrooms, observers were required to spend 1 to 2 hours a day in the various classroom settings, at least three times a week (usually daily) for the first 4 to 6 weeks. This allowed for an adaptation period of the observers to the overall environment of the classrooms and enabled the subjects to become accustomed to the data collectors and their equipment. After the adaptation period, each target student was observed an average of 312 minutes over 11 to 20 days (mean number of observations = 18.7).

### Interobserver Agreement

The time spent practicing in the classroom was also used to establish interobserver agreement to a minimum average of 80% agreement across behavior codes prior to the initial observation reported in this study. To collect interobserver agreement data during the study, two observers concurrently but independently coded observation sessions. The data collectors were separated to the point that they could not observe the codes entered by the other collector, but they were close enough that they could see and hear the same classroom interactions.

The computer program (Moores) provided a conservative estimate of agreement. Agreement was defined as two independent observers scoring the same four-digit code within a 5-second window. Any deviation from the code was counted as an error. If the observers coded different responses (e.g., one coded a teacher mand and the other coded teacher talk), two disagreements were noted. A disagreement was also scored if one of the observers inserted a behavior or failed to recognize a behavior, or identified a different actor as the emitter or target of a behavior. Agreement was calculated according to the exact agreement formula:



agreements divided by agreements + disagreement x 100.

### Data Analysis

The data were transferred from laptop computers to a Zenith 386 IBM compatible computer. The data from each subject in each of the four groups were pooled to calculate the rate, unconditional probabilities of behaviors, and the lag sequential analysis for each group (which yielded one-step conditional probabilities of the antecedent and subsequent events for each behavior of each group). The lag sequential analyses were then completed on each group to provide a summary analysis of the interactions within the groups. The results of these analyses are presented below. Binomial  $z$  scores (Siegel, 1956) of the conditional probabilities were calculated to estimate the significance of the conditional probabilities in relation to the unconditional probabilities. The  $z$  scores allowed us to omit codes from the analyses that occurred as antecedent and subsequent to the responses of interest if they did not exceed chance levels (i.e.,  $\alpha < .05$ ).

## RESULTS

### Interobserver Agreement

Table 3 provides the overall interobserver agreement of each code reported. The interobserver agreement ranged from 36% to 100%, with an overall agreement of 75%. A Pearson Product-Moment correlation coefficient was calculated on the rates of the codes of each observer's records. The overall correlation coefficient between the observers was .977.

### Sequential Analyses

The data from all subjects in each group were pooled to form four pools for which unconditional and conditional probabilities were calculated. The proportion and rate for each response of the target subjects, the teachers, and peers for each group are presented in Tables 4, 5, and 6.

The following analyses concentrate on the teachers' mands, students' responses to the mands, and the subsequent responses of the teachers to the students' responses. In addition, the antecedent and subsequent responses to the students' aversive behaviors will be presented.

*Analyses of Teacher Mands, Student Responses, and Subsequent Events.* Figure 1 presents the results of the lag sequential analyses of the teachers' positive ("to do") and negative ("don't do") manding responses and the students' responses to the mands (i.e., compliance and noncompliance). As can be seen, the highest probability of student responses to the teachers' positive mands was compliance. It appears that students without disabilities in the regular classrooms were more likely to comply to the mands than were the students with SBD.

All four groups responded to teachers' mands with noncompliant behavior, although at fairly low probabilities (see Figure 1). It appears that students with SBD in both integrated and segregated classrooms were more likely to engage in noncompliance than were the students without SBD. In addition, students with SBD in self-contained classrooms were more likely to be noncompliant than the students with SBD in the integrated classrooms. The data presented in Figure 1 also indicate that non-compliance to both teacher positive and

TABLE 4  
Proportion and per Minute Rate of Responses by the Target Students

	Integrated				Segregated			
	Aggressive Proportion	Aggressive Rate	Nonaggressive Proportion	Nonaggressive Rate	Aggressive Proportion	Aggressive Rate	Nonaggressive Proportion	Nonaggressive Rate
Target to teacher								
Compliance	0.3853	0.3853	0.1264	0.0775	0.5129	0.7612	0.5406	0.6593
Noncompliance	0.0268	0.0268	0.0055	0.0034	0.0757	0.1123	0.0724	0.0882
Positive mand	0.1000	0.1000	0.0667	0.0409	0.2013	0.2987	0.2092	0.2551
Handraise	0.1049	0.1049	0.2050	0.1256	0.0433	0.0642	0.0812	0.0990
Negative mand	0.0003	0.0003	0.0005	0.0003	0.0020	0.0030	0.0022	0.0027
Negative gestural/verbal	0.0049	0.0049	0.0080	0.0049	0.0015	0.0023	0.0076	0.0092
Target to peer								
Compliance	0.0806	0.0806	0.2662	0.1631	0.0243	0.0361	0.0196	0.0239
Noncompliance	0.0143	0.0143	0.0139	0.0085	0.0086	0.0128	0.0054	0.0066
Positive mand	0.1590	0.1590	0.1572	0.0964	0.0453	0.0673	0.0291	0.0355
Negative mand	0.0043	0.0043	0.0045	0.0027	0.0048	0.0071	0.0028	0.0035
Negative gestural/verbal	0.0298	0.0298	0.0254	0.0156	0.0175	0.0259	0.0032	0.0039
Positive consequence	0.0024	0.0024	0.0005	0.0003	0.0010	0.0015	0.0000	0.0000
Negative consequence	0.0006	0.0006	0.0015	0.0009	0.0000	0.0000	0.0000	0.0000
Student disruptive	0.0401	0.0401	0.0149	0.0091	0.0316	0.0470	0.0136	0.0166
Student aggressive	0.0076	0.0076	0.0333	0.0204	0.0132	0.0195	0.0022	0.0027

TABLE 5  
Proportion and per Minute Rate of Teacher Responses to the Target Students

	Integrated				Segregated			
	Aggressive		Nonaggressive		Aggressive		Nonaggressive	
	Proportion	Rate	Proportion	Rate	Proportion	Rate	Proportion	Rate
Teacher to target								
Compliance/feedback	0.2086	0.2381	0.2257	0.0872	0.2308	0.5756	0.2771	0.6242
Noncompliance	0.0639	0.0730	0.2597	0.1003	0.0200	0.0500	0.0202	0.0455
Positive mand	0.4162	0.4750	0.2021	0.0781	0.4018	1.0020	0.3738	0.8420
Negative mand	0.0109	0.0125	0.0118	0.0046	0.0133	0.0331	0.0072	0.0162
Negative gestural/verbal	0.0008	0.0009	0.0000	0.0000	0.0003	0.0008	0.0003	0.0008
Positive consequence	0.0176	0.0201	0.0182	0.0070	0.0265	0.0661	0.0332	0.0748
Negative consequence	0.0072	0.0082	0.0032	0.0012	0.0121	0.0301	0.0051	0.0116
Talk	0.2172	0.2478	0.2589	0.1000	0.2752	0.6864	0.2650	0.5969

TABLE 6  
Proportion and per Minute Rate of Peer Responses to the Target Students

	Integrated				Segregated			
	Aggressive		Nonaggressive		Aggressive		Nonaggressive	
	Proportion	Rate	Proportion	Rate	Proportion	Rate	Proportion	Rate
Peer to target								
Compliance	0.2168	0.1232	0.1325	0.0857	0.1576	0.0481	0.1709	0.0312
Noncompliance	0.0294	0.0167	0.0099	0.0064	0.0505	0.0154	0.0422	0.0077
Positive mand	0.1461	0.0830	0.2585	0.1671	0.1638	0.0500	0.1519	0.0277
Negative mand	0.0102	0.0058	0.0019	0.0012	0.0197	0.0060	0.0084	0.0015
Negative gestural/verbal	0.0289	0.0164	0.0132	0.0085	0.0308	0.0094	0.0190	0.0035
Aggression	0.0080	0.0046	0.0033	0.0021	0.0246	0.0075	0.0021	0.0004
Negative consequence	0.0027	0.0015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Talk	0.4925	0.2798	0.5104	0.3299	0.5333	0.1627	0.5886	0.1075

negative mands was lower for all groups than compliance.

Teachers in the integrated classrooms also responded to student compliance in general at a lower rate than did teachers in the segregated classrooms (see Figure 2). However, the patterns were similar. Teachers of all four groups were likely to respond to student compliance with an additional mand (15% for the integrated nonaggressive group, 27% to 29% for the three groups of children with behavior disorders). Similarly, feedback and talk represented the next highest probabilities of teacher behavior subsequent to students' compliance responses for all four groups. However, teacher feedback was nearly twice as likely to be delivered to students with SBD ( $p = .20$  to  $p = .27$ ) than to students without SBD ( $p = .12$ ).

It is also interesting to note that teachers' positive consequences were not found

to be significantly related to compliance by the nonaggressive students in the integrated classrooms. However, the teachers' use of positive consequences in segregated classrooms was significantly related to compliance, although on a very lean schedule ( $p$  ranged from .015 to .027).

The combination of teacher responses to student compliance indicates that teachers in integrated classrooms were more likely to respond to compliance by the students with SBD than they were to the students without SBD. In the integrated settings, teachers responded to 39% of the compliance responses of the students without SBD and to 61% of the compliance responses of the students with SBD. The teachers in segregated classrooms responded even more frequently to their students' compliance (over 73%).

Figure 2 also presents the teachers' responses to students' noncompliant behaviors. The analyses presented should be viewed with caution due to the low rates of student noncompliance. In general, the teachers in all groups were likely to respond to students' noncompliant responses by giving another positive mand or talk (which may include elaborated feedback). The teachers in the segregated settings were more likely to respond to noncompliance ( $p = .62$  and  $.56$  for the nonaggressive and aggressive students, respectively) than were the teachers in integrated settings ( $p = .36$  and  $.48$  for the nonaggressive and aggressive students, respectively). It should also be noted that only the SBD students received low rates of negative responses from the teachers (i.e., negative consequences and negative mands) subsequent to their noncompliant behavior.



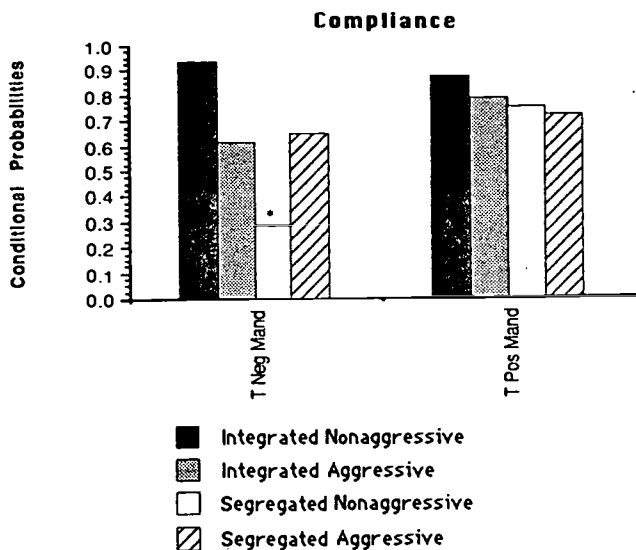


FIGURE 1. Conditional probabilities of student compliance and noncompliance to teacher positive and negative mandates. Z scores yielding significant probabilities: \*  $p \leq .05$ ; #  $p \leq .01$ ; all other Z scores,  $p \leq .001$ .

**Teachers' Use of Positive Consequences.** As previously noted, teachers used positive consequences sparingly during the observations. Figure 3 presents the significant conditional probabilities of antecedent responses of the teachers' delivery of positive consequences. Differences between the teachers in integrated and segregated classrooms, both in the rate of delivering the consequences and in the proportion of those responses, should be noted (see Table 5).

It appeared from the sequential analyses that the immediate antecedent student behavior to the teachers' positive consequences was likely to be student compliance for the three groups of students with SBD. Compliance by the students without SBD did not produce a

significant conditional probability as an antecedent event to teachers' positive consequences. The highest probability events immediately preceding teachers' delivery of positive consequences in integrated classrooms during their interactions with the students without SBD were other teacher behaviors such as talk ( $p = .22$ ) or compliance/feedback by the teacher ( $p = .35$ ). The sequential analyses of the events preceding teachers' delivery of positive consequences to the students with SBD also revealed that other teacher behaviors (i.e., teacher talk and teacher compliance/feedback) were of high probability. The combined probabilities of teacher talk and teacher compliance/feedback and positive consequences preceding the delivery of positive consequences

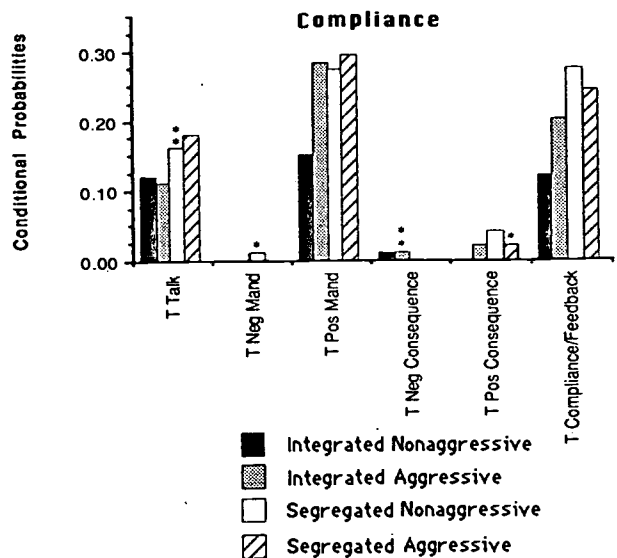


FIGURE 2. Conditional probabilities of the teacher response to student compliance and noncompliance. Z scores yielding significant probabilities: \*  $p \leq .05$ ; #  $p \leq .01$ ; all other Z scores,  $p \leq .001$ .

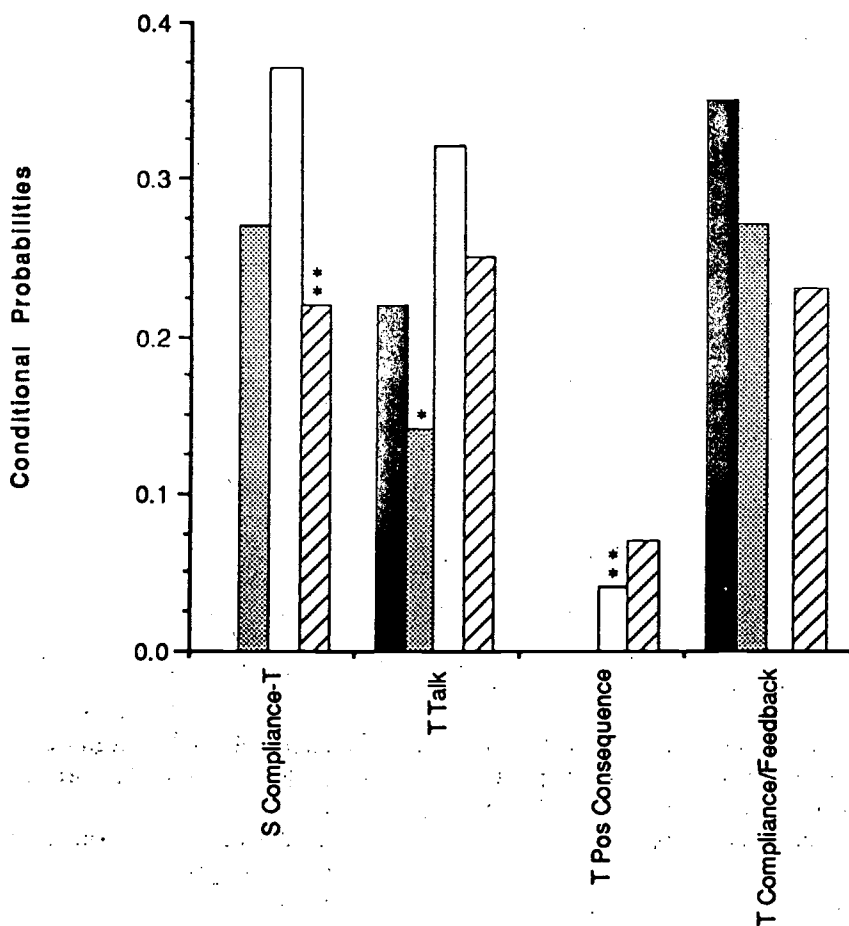
ranged from  $p = .40$  in the integrated settings to  $p = .55$  in the segregated settings.

**Teacher Negative Consequences.** The rate of the teachers' negative consequences for student behavior was also low for all groups. However, the students with SBD received negative consequences 6 to 26 times more often than did the students without SBD, with the students with aggressive behavior in segregated classrooms receiving the highest rate of negative consequences from the teachers (see Table 5).

The results of the sequential analyses of teacher negative consequences are presented in Figure 4. It should be noted that the nonaggressive integrated group received such a low rate of negative consequences (total frequency = 4) that the

### Integrated and Segregated Classrooms

- Integrated Nonaggressive
- ▨ Integrated Aggressive
- Segregated Nonaggressive
- ▧ Segregated Aggressive



**FIGURE 3.** Conditional probabilities of antecedent responses to teacher delivery of positive consequences. Z scores yielding significant probabilities: \*  $p \leq .05$ ; ‡  $p \leq .01$ ; all other Z scores,  $p \leq .001$ .

sequential analysis is suspect; therefore, only the results from the other three groups will be discussed.

It is interesting to note that teachers' negative consequences were found in the analyses to serve both as antecedent and subsequent events to the teachers' negative consequences for all three groups of

students with SBD. This indicates that teachers were likely to deliver more than one negative consequence sequentially. Significant student behaviors that preceded teachers' negative consequences were student aversive behaviors (i.e., non-compliance, negative verbal/gestural responses, and disruptive behavior).

**Students' Hand Raising.** Figure 5 presents the results of the sequential analyses of the target students' handraises for each group. As would be expected, the most probable antecedent code to student handraise was the stop code, indicating no preceding social responses. The probability that a teacher would respond or comply to a student's handraise was rather low for all groups. The teachers in the segregated classrooms were over twice as likely to comply to students' handraises than were the teachers in the integrated classrooms. The probability of teacher compliance to a student handraise ranged from .18 for the nonaggressive integrated group to .57 for the nonaggressive segregated group.

**Student Disruptive Behavior.** It should be noted that the rate of disruptive behavior (see Table 4) was substantially higher in the aggressive groups (RPM = .04 for both groups) than in the nonaggressive groups (RPM near .01). Figure 6 presents the significant conditional probabilities of the lag sequential analyses. The highest conditional probability for all groups at both antecedent and subsequent events was the stop code. That is, the highest code to precede a disruptive behavior was no scoreable social behavior, ranging from 42% for the aggressive segregated group to 57% for the nonaggressive integrated group. The conditional probabilities of the stop code for aggressive students in both integrated and segregated classrooms were somewhat lower than those for their nonaggressive peers. Similarly, the stop code was recorded as a subsequent event to the disruptive behavior of the nonaggressive students in integrated classrooms ( $p = .53$ ) and segregated classrooms ( $p = .44$ ) more often than it was recorded when the aggressive students were observed in either the integrated classrooms ( $p = .29$ ) or the segregated classrooms ( $p = .23$ ).

These results indicated that few antecedent teacher or peer responses were associated with the students' disruptive behaviors. Only one teacher response (teacher noncompliance) was found to be significantly related ( $p = .05$ ) as an antecedent to disruptive behavior. Peer responses that preceded disruptions at a greater than chance level occurred only

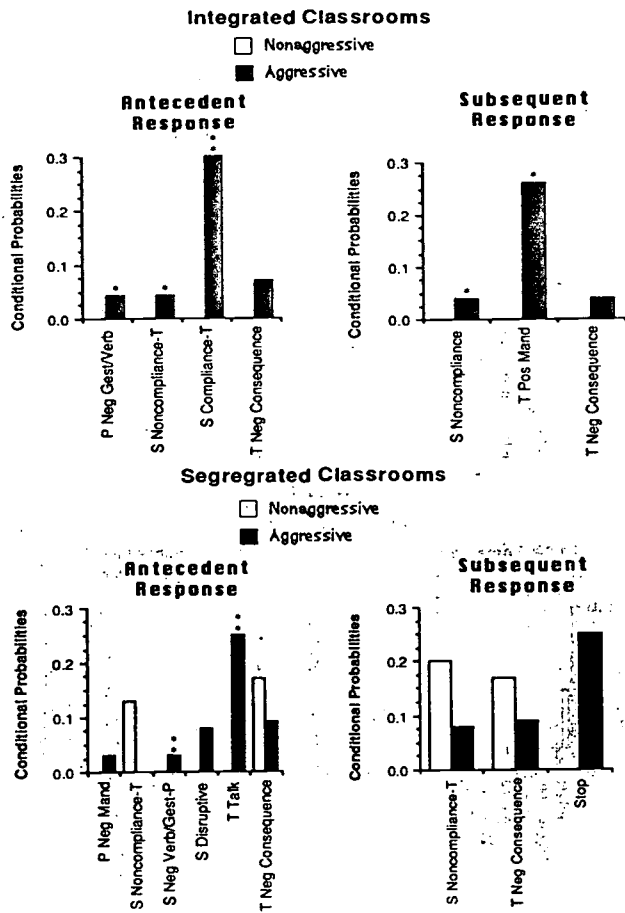


FIGURE 4. Conditional probabilities of antecedent and subsequent responses of teacher negative consequences.  $Z$  scores yielding significant probabilities: \*  $p \leq .05$ ; \*  $p \leq .01$ ; all other  $Z$  scores,  $p \leq .001$ .

in the aggressive groups. These included low rates of negative verbal/gestural, negative mands, aggression, and peer talk.

The lag sequential analyses of the subsequent events also identified low rates of teacher responses directed to the aggressive students in the segregated classrooms. These data indicate that teachers responded within the 10 seconds to 9% of the students' disruptive responses, with either a negative consequence ( $p = .05$ ) or a negative mand ( $p = .05$ ). The data indicated that peers in the integrated classrooms often responded to students' disruptive behavior by talking to the disruptive students. The probability was greater that peers would respond to the nonaggressive students ( $p = .30$ ) than to the aggressive students ( $p = .17$ ). In the segregated classrooms, there were few significant conditional probabilities found

for peer subsequent responses to the nonaggressive students' disruptive behaviors. Low, but significant, conditional probabilities were found as peers responded to the aggressive students' disruptive behaviors with negative mands ( $p = .008$ ) and aggressive behavior ( $p = .008$ ).

In all four groups the students' disruptive behaviors were preceded and followed by their own disruptive or other aversive behaviors (i.e., negative verbal/gestural or aggression). This was more evident for students with SBD than for the nonaggressive integrated group. Seven percent of the nonaggressive integrated students' disruptive behaviors was preceded by negative verbal/gestural responses while 10% of the aggressive integrated group's disruptive behaviors was preceded by their disruptive behavior; an additional 2% was preceded by other aversive be-

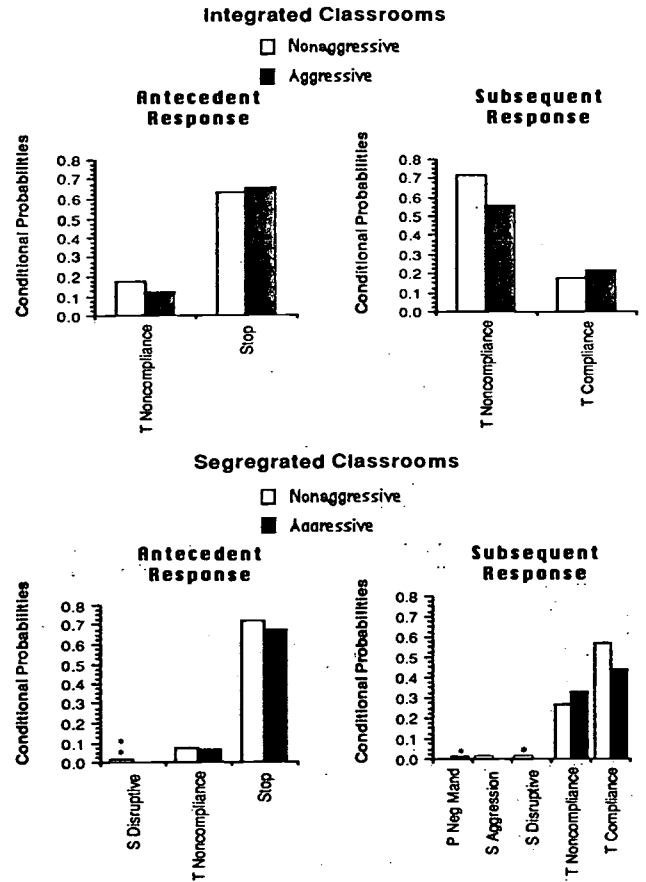


FIGURE 5. Conditional probabilities of antecedent and subsequent responses of student handraise.  $Z$  scores yielding significant probabilities: \*  $p \leq .05$ ; \*  $p \leq .01$ ; all other  $Z$  scores,  $p \leq .001$ .

haviors. In the segregated classrooms, the conditional probabilities were comparable for both the aggressive and nonaggressive students. Sixteen percent of the nonaggressive students' disruptions and 13% of the aggressive students' disruptions were preceded by their own disruptive or negative verbal/gestural responses.

The reader should note that in the lag sequential analysis when a code is scored twice in sequence, it is reflected in the analysis as both a subsequent and an antecedent response; thus the subjects' subsequent responses to disruptions were identical to the antecedent responses.

**Student Negative Verbal/Gestural Behavior to Peers.** The aggressive segregated group delivered more negative verbal/gestural responses to their peers than did the other groups (see Table 4).

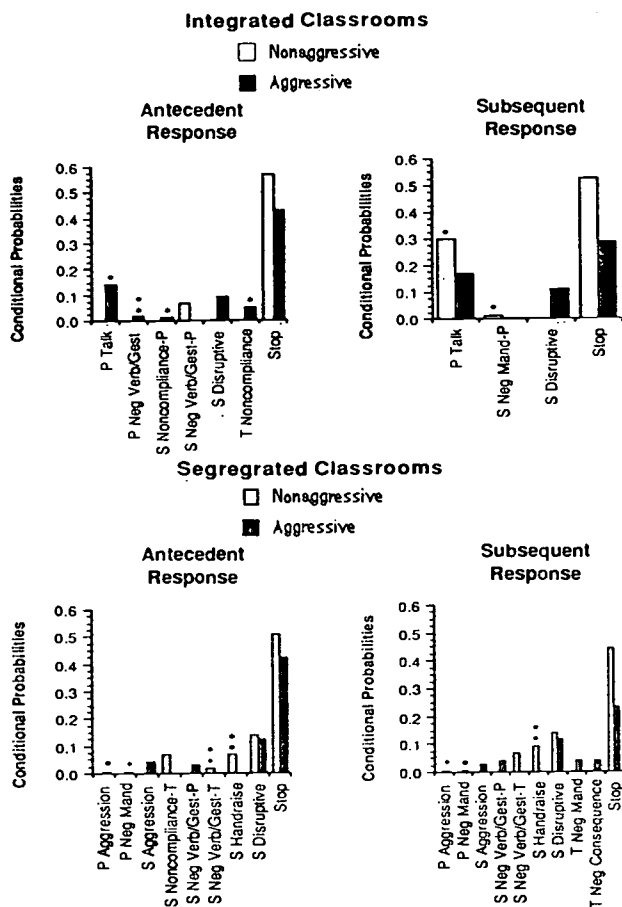


FIGURE 6. Conditional probabilities of antecedent and subsequent responses of student disruptive behavior.  $Z$  scores yielding significant probabilities: \*  $p \leq .05$ ; #  $p \leq .01$ ; all other  $Z$  scores,  $p \leq .001$ .

However, the nonaggressive integrated students (not defined as SBD) engaged in higher rates (and essentially equal to the first group) of negative verbal/gestural behavior to peers than did the students in the other two groups (i.e., aggressive integrated and nonaggressive segregated).

Figure 7 presents the sequential analyses of students' negative verbal/gestural behavior emitted to peers. The responses of teachers, either antecedent or subsequent, to the target students' negative verbal/gestural behaviors, were not often observed. The highest probability of teacher involvement was teacher negative consequence, following the students' negative verbal/gestural responses ( $p = .03$  by the aggressive segregated group). Conversely, peers were often involved in interacting with the target student when he or she emitted a negative verbal/gestural

behavior, providing both antecedent and subsequent responses. The peer response that produced the highest ranked antecedent to the students' negative verbal/gestural behaviors was talk for each of the groups. The peers in all four groups also engaged in low rates (although producing significant conditional probabilities) of aversive responses that preceded students' negative verbal/gestural behaviors.

The data presented in Figure 7 indicate that the highest ranked subsequent event was again the stop code. That is, for 20% to 60% of the negative verbal/gestural responses to the peers, the subjects did not receive a social response from either the teachers or their peers within 10 seconds.

**Student Negative Verbal/Gestural Behavior to Teachers.** The rate of stu-

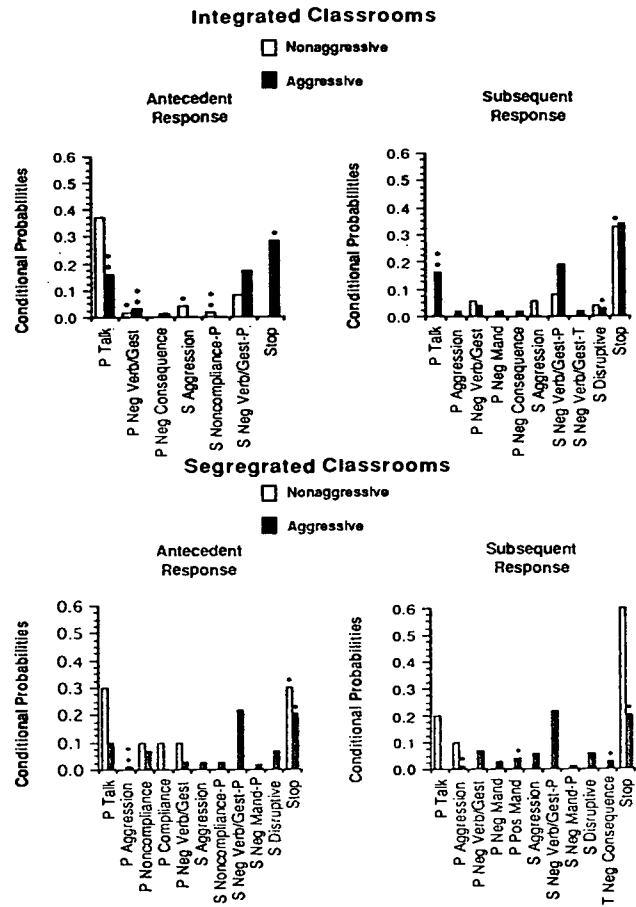


FIGURE 7. Conditional probabilities of antecedent and subsequent response of student negative verbal/gestural to peers.  $Z$  scores yielding significant probabilities: \*  $p \leq .05$ , #  $p \leq .01$ ; all other  $Z$  scores,  $p \leq .001$ .

dents' negative verbal/gestural responses emitted to teachers was very low; therefore, the results of the sequential analyses may be suspect. From Figure 8, it is obvious that few social responses were found to be antecedent or subsequent to the students' behaviors. The most frequently recorded code was stop, indicating that no interaction immediately preceded or followed the response.

**Student Aggressive Behavior.** The rate of aggressive behavior by the students was also found to be low (see Table 4), and therefore the sequential analysis should be viewed cautiously. Interestingly, the students without SBD engaged in higher rates of aggressive behavior as a group than did those students with SBD. It should be noted however, that there were qualitative differences in

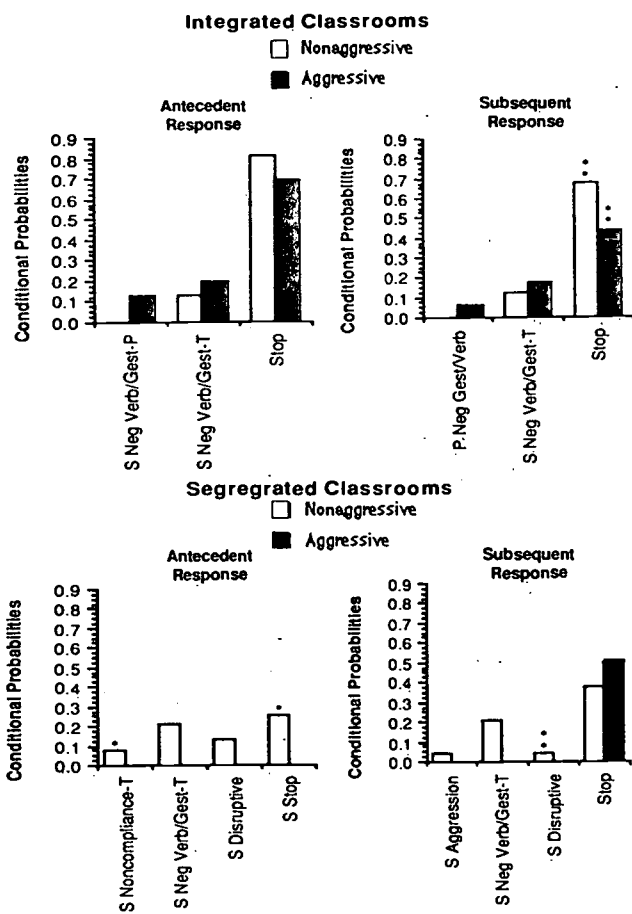


FIGURE 8. Conditional probabilities of antecedent and subsequent responses of student negative verbal/gestural responses to teachers.  $Z$  scores yielding significant probabilities: \*  $p \leq .05$ ; #  $p \leq .01$ ; all other  $Z$  scores,  $p \leq .001$ .

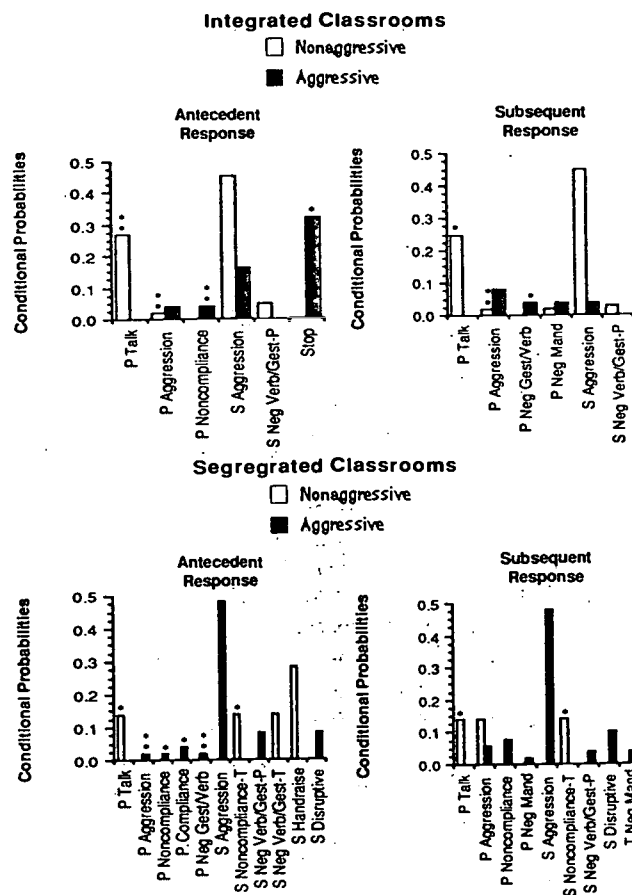


FIGURE 9. Conditional probabilities of antecedent and subsequent responses of student aggressive behavior.  $Z$  scores yielding significant probabilities:  $p \leq .05$ ; #  $p \leq .01$ ; all other  $Z$  scores,  $p \leq .001$ .

the intensity of the aggressions. The aggressive responses of the nonaggressive integrated students, although meeting the definition of aggression, seemed limited to mild responses (e.g., poking a peer in the back), whereas the responses of the students with behavior disorders were likely to be more severe (e.g., hitting or kicking peers, or property destruction).

The data presented in Figure 9 indicate that teachers were not often involved in the aggressive behavior either as antecedent or subsequent to the responses. Only one significant probability of teacher behavior was found that was associated with student aggressive behavior (negative mand as a subsequent event), and the probability was low ( $p = .04$ ). Several peer responses did emerge as low but significant conditional probabilities to student aggression as antecedent and subse-

quent events. These included aversive behaviors such as aggression, noncompliance, and negative verbal/gestural responses, as well as nonaversive behaviors such as talk and compliance to the student.

The highest conditional probabilities associated with students' aggressive behaviors as both antecedent and subsequent events were the students' own behaviors. This was particularly true for the groups with the highest rate of aggressive responses, the nonaggressive integrated group and the aggressive segregated group. Over 50% of the aggressive responses of these two groups were preceded by their own aggressive or negative verbal/gestural responses, with aggressive behavior preceding aggression as the highest single antecedent response.

## DISCUSSION

The results of this study should be interpreted with caution. The reader should carefully study the interobserver agreement statements of each code to determine the acceptability of the data system. Although the interobserver agreements were not extremely high, they are similar to other studies using complex data systems (e.g., Snyder & Patterson, 1986; for a discussion of reliability issues on sequenced observations see Bakeman & Gottman, 1986). In addition, the individual data of the subjects in each group were pooled to calculate the conditional and unconditional probabilities. Although pooling individual data to form group data is considered an acceptable procedure (Bakeman & Gottman, 1986), by pooling, the specific effect on the indi-



viduals is lost. Therefore, these results should be viewed not as indicative of the interactions of individuals but as a study of the classroom interactions of the four groups.

In general the results reported in this paper are similar to those reported by Simpson and Souris (1988) in that most of the teacher-student interactions may be classified as neither positive nor coercive, but rather, as neutral. The most probable teacher behavior during interactions with children with SBD was directing the students "to do" something (mands), constituting nearly 40% of the teacher responses for each of the three SBD groups, and 20% for the children without SBD. In addition, the teachers' next two highest probability behaviors were other neutral behavior codes, "talking" and "compliance/feedback," ranging from 22% to 28%, across the four groups for both teacher responses. The most typical teacher-student interaction sequence was: teacher mand—student compliance—teacher mand, teacher feedback, or teacher talk.

The low rates of teachers' delivery of positive consequences found in this study have been reported in several studies of teacher-student interactions (e.g., Gable, Hendrickson, Shores, & Young, 1983; Gable, Hendrickson, Young, Shores, & Stowitschek, 1983; Strain et al., 1983; Walker & Buckley, 1973; White 1975). Teachers in the segregated classrooms were nearly three times more likely to use positive consequences with their students than were the teachers of the integrated classrooms. One explanation for this difference is that the teacher-student ratio was greater in the integrated classrooms. However, paraprofessionals were available specifically for the students with behavior disorders in most of the integrated classrooms. Therefore, the differences in the rate of positive consequences between those in integrated and segregated classrooms cannot be explained completely on the basis of the difference in the teacher-student ratio.

It may be that teachers (and paraprofessionals) either were not aware of the power of positive social consequences, or they relied on other systems (e.g., token systems) rather than social responses to increase and maintain the positive behav-

ior of the students (Shores et al., in press). This is further supported by the apparent inattention of the teachers to positive classroom behaviors of the students such as handraises and compliant behaviors. Fewer than half of the students' handraises were followed by teacher acknowledgment. Likewise, teachers seldom followed a student compliance with positive consequences, although they did respond with feedback, talk, or telling them to "do" something (mand).

Coercive interactions (Patterson & Reid, 1970) between teachers and students were also seldom observed. The inappropriate behavior of the students was seldom responded to by the teachers, and the teachers did not use negative consequences often. The best predictor of the inappropriate behavior (i.e., disruptive, aggressive, and negative verbal/gestural) was the students' inappropriate behavior or the stop code (indicating that no interaction was occurring). The students' inappropriate behavior as both antecedent and subsequent to inappropriate behavior indicates that the inappropriate responses occurred in sequence. That is, they often were coded as chains of responses that resulted in other persons (i.e., teachers and peers) responding to the students on a rather thin schedule. The fact that the stop code also appeared as a significant event to the students' inappropriate behavior may further support the notion that these students' responses were maintained by low rates of attention from others in the classroom (see Alberto & Troutman, 1986; Sulzer-Azaroff & Mayer, 1977; or other general texts of applied behavior analysis for discussions of the effects of contingencies of reinforcement).

An alternative hypothesis regarding student inappropriate responses is that other factors (environmental and personal) may serve as "setting events" that increase the power of social stimuli (Hendrickson, Gable, & Shores, 1987; Kantor, 1959; Wahler & Fox, 1981), thereby increasing or decreasing the probabilities of the relationship between the social stimuli and student responses. Other classroom and personal factors need to be identified that pertain to the type of social interactions that occur in classrooms. In a recent paper (Shores et al., in press), we

proposed that some of the factors affecting the coerciveness as well as positiveness of the interactions may be the general classroom management strategies such as token economies, classroom organization, the use of rules, and so forth, that teachers use to aid in controlling student aversive behaviors, all of which may influence classroom interactions. The effects of such management strategies on the social interaction responses of children with SBD needs to be investigated.

The rate of aggressive behavior in the classrooms was low for all the students. This finding suggests that the teacher rating scale used to identify the aggressive students may not have identified aggressive students. However, a chi-square analysis comparing the total rates of disruptive, negative verbal, and aggression codes of each group revealed that the aggressive group in the integrated classrooms had significantly higher rates of those responses than did their nonaggressive classmates. No significant differences were found between the aggressive and nonaggressive students in the segregated groups. These results tend to indicate that the rating scale is not sensitive to the aggressiveness of children with SBD, but is sensitive to the differences between children without SBD and those with SBD.

The data presented in this study suggest that the current state of classroom interactions is not positive. Nor do the interactions appear to be coercive, unless the teacher mand—student compliance—teacher mand sequence is indicative of coercive interactions. If positive interactions among students and between teachers and students is a desired outcome of educating children with SBD, it seems appropriate to develop teacher training programs that emphasize the teacher's use of positive statements and training students to engage in positive behavior that would set the occasion for teacher and peer positive interactions.

The beginning analysis of classroom interactions based on naturalistic observation may be considered as a "situational analysis" (Shores, 1988). The results of this situational analysis will lead to the development of hypotheses for empirical evaluation. This, in turn, should help clarify the function of the relationship of the social stimuli (antecedent and

consequent) to the aversive behaviors of students with severe behavior disorders. Currently, we are testing some hypotheses identified by these situational analysis data through the use of single-subject research designs. The use of the lag sequential analysis for this purpose may prove to be even more appropriate for individual interventions as the conditional probabilities identified are subject specific and allow manipulation of these variables to complete a functional analysis on each individual. This final step could possibly lead to more therapeutic classroom environments for children with severe behavior disorders.

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### Authors' Note

Preparation of this manuscript was funded in part by Grant No. H023C00127-91 from the U.S. Department of Education, Office of Special Education Programs. We acknowledge the assistance of the teachers and special education cooperatives in southeast Kansas and southwest Missouri. We also acknowledge the assistance of Kerrie Scholes, Trinetta Allen, Laura Cruz, and Michael Dixon for data collection, and Kelly Spellman in manuscript preparation.

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# Classroom Management Strategies: Are They Setting Events for Coercion?

Richard E. Shores, Philip L. Gunter, and Susan L. Jack

## ABSTRACT

*The purpose of this investigation was to explore the Patterson and Reid (1970) reciprocal/coercive interaction hypothesis as related to the classroom social interactions between teachers and students identified with severe behavior disorders. Additionally, four classroom behavior management strategies are identified as potential setting events for either coercive or positive reciprocal interactions between teachers and students. The literature reviewed indicates that teachers are more likely to attend to student inappropriate behavior (an indicator of coercive interactions) than they are to use positive verbal attention for appropriate behavior (an indicator of positive reciprocal interactions). From this perspective, the authors speculate that the management strategies of posting classroom rules, classroom arrangement, teacher movement in the classroom, and external reinforcement systems (e.g., token economies) may more likely be used as setting events to enhance the effects of teacher coercion rather than potential setting events to enhance positive reciprocal interactions. Recommendations are made for research concerning this hypothesis and for teachers' use of these strategies as setting events for positive reciprocal interactions.*

Dyadic social exchanges were categorized by Patterson and Reid (1970) as reciprocal or coercive. In this article, the authors attempt to apply this conceptualization of social exchanges to the classroom interactions between teachers and students with severe behavior disorders (SBD). In addition, four management strategies that are often used in classrooms for children with SBD are explored as potential setting events (Brown, Bryson-Brockmann, & Fox, 1986; Hendrickson, Gable, & Shores, 1987; Kantor, 1959; Wahler & Fox, 1981) that may increase or decrease the probability of coercive or reciprocal interactions between teachers and students.

The reciprocal/coercive interaction hypothesis has been used primarily to describe interactions in families (e.g., Patterson, 1982; Patterson & Bank, 1986; Reid, 1986; Snyder & Patterson, 1986). Patterson and Reid (1970) indicated that coercive interactions occur when aversive behavior is emitted by one of the interactants, possibly to escape the interaction (negative reinforcement) or to gain something (positive reinforcement). If the response is successful in gaining the effect, then the interaction has produced a positive reinforcer for one interactant while producing a negative reinforcer for the other. Reciprocal interaction, on the other hand, is described as a positive, mutually reinforcing social exchange between the interactants. In this interaction pattern, the positive behavior of one reinforces the positive behavior of the other, and the probability of such interactions occurring in the future is increased.

The following vignettes provide examples of the authors' conceptualization of coercive and reciprocal interactions that may occur in schools.

Teacher: "Jimmy, you need to complete pages 5 through 10."

Jimmy: "I can't do all that! You always give me more than anyone else! I'm *not* going to do it!"

Teacher: "If you don't do your work, I'll put another check by your name on the board, and you'll miss recess."

Jimmy: Completes his work.

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Preparation for this manuscript was funded in part by Grant No. HO23C00127-91 from the U.S. Department of Education, Office of Special Education Programs. The authors wish to thank Kelly Spellman for her patient assistance in preparation of this manuscript.

The student in this scenario presented an aversive response to the teacher's command (a To Do command). This was followed by the teacher delivering an aversive response. Jimmy then complied, which may have reinforced the behavior of the teacher, increasing the probability that s/he will engage in the threat of aversive consequences the next time the student engages in noncompliant behavior. The interaction sequence as described is coercive.

Teacher: "Jimmy, you need to complete pages 5 through 10."

Jimmy: Begins to work.

Teacher: "That's great. You'll be finished in time for recess and get 5 extra minutes for having your work complete."

In this example, the teacher's positive statement and promise of a positive consequence (i.e., positive reinforcement) can potentially produce continued compliance in the future. Additionally, Jimmy's compliant behavior may be reinforcing to the teacher and result in her continuing to make positive statements under similar conditions.

The preceding vignettes represent typical classroom interactions. There are those, however, who maintain that coercive interactions are more typical than positive interactions. For example, Sidman (1989) stated that "education and coercion mean the same thing" (p. 190). Although Sidman's position may be overstated, it is also probably true that most students often engage in school-related behavior that is characteristic of the side effects of coercion: escape behavior, avoidance behavior, and countercontrol behavior (Sidman, 1989). Coercive controls, in fact, are effective in controlling behavior by increasing escape and avoidance behaviors. For example, most students comply with the rule not to run in hallways in order to avoid disciplinary action.

Sidman (1989) and Skinner (1989) have stated that one indication of the effects of the coercive nature of schools may be found in the high rate of escape from school as demonstrated by the rate of student dropout. However, if the students have a history of behavior disorders, the coerciveness of school may result in even more pronounced escape or avoidance behaviors. Edgar (1987) found that youth with severe behavior disorders in special education were far more likely to leave school early than were students with different disabilities, and the dropout rate was far higher than for students without disabilities. Although there is no direct evidence that the coerciveness of the students' interactions with teachers was the primary cause of the high dropout rate, it is logical to assume that coercive interactions were at least a contributing factor.

Students with severe behavior disorders often engage in social exchanges similar to those presented in the first vignette. In fact, their coercive social behavior often provides the motive for placement in special education (see Cullinan, Epstein, & Lloyd, 1983; Kauffman, 1985). It is possible that when students engage in coercive behavior, teachers will respond with coercive behavior as demonstrated in the vignette. If the aversive controls of the teacher are effective in controlling student behavior, then the students are more likely to comply with the next teacher demand. On the other hand, if the students are successful in gaining their desired effect (e.g., escape or avoidance or gaining some positive reinforcer), they are likely to continue to engage in their coercive behavior under similar conditions.

With continuation of coercive interactions, the aversiveness of the controls exerted by both parties often increases. Sidman (1989) referred to this escalation of the coerciveness of interactions as countercontrol. Countercontrol is exemplified by the intensification of aversive stimuli emitted by one to escape the aversive stimuli emitted by the other which often becomes a cycle of one then the other increasing the aversiveness of their social stimuli. At least one study of students with severe behavior disorders supports Sidman's description of countercontrol. Strain and Ezzell (1978) reported that noncompliant responses by adolescent students with severe behavior disorders were likely to lead to physical confrontation between teachers and students. When the students did not comply with the teachers' commands, the teachers increased the intensity of their commands. The students responded with countercontrol responses by increasing their aversive behavior which often led to physical confrontations between teachers and students. Although not stated by Strain and Ezzell, one explanation of their results is the coercion hypothesis of Patterson and Reid (1970). Both parties of the interaction are reinforced; one is positively reinforced and one is negatively reinforced by escaping the aversive stimuli emitted by the other. While such interac-

tions may be effective in getting a student to complete a task, or to comply to the teacher's demands, they may also have a long-term effect that could be detrimental to the student's education (e.g., increase the probability that students learn to avoid such stimuli by avoiding school). At the same time, coercive interactions also may be detrimental to the teacher and may very well be a contributing factor to the dropout rate of teachers of students with severe behavior disorders.

Although the effect of the children's coercive behavior on teachers has not been thoroughly studied, some data are at least suggestive that teachers tend to avoid students with high rates of coercive behavior. For example, Carr, Taylor, and Robinson (1991) found that teachers were less likely to engage children with severe behavior problems in teaching activities than they were nonproblem children in the same group. In addition, the teachers presented tasks to the children with severe behavior disorders that were less difficult and less likely to have been previously associated with the children's coercive behavior. The teachers seemed to have learned to engage in avoidance behavior.

In the following section the authors present a review of literature on teacher/student interactions and discuss this literature to support the conceptualizations presented to this point.

### Teacher/Student Interactions

The behavioral components of a positive reciprocal interaction between teachers and students are as yet unknown. However, research is available to support at least one type of teacher behavior that has been shown to be functionally related to positive interaction between teachers and students: teacher attention, and more specifically, teacher praise. Nearly 20 years ago, Shores (1972) reported that teacher attention, both positive and negative, serves as reinforcement for both the appropriate and inappropriate behavior of students in the classroom. In a review of teaching competencies, Shores, Cegelka, and Nelson (1973) indicated that contingent teacher praise is the only experimentally verified teacher competency. This conclusion was based on a review of some 15 studies demonstrating a functional relationship between student performance and contingent teacher praise. In the years since these articles were published, additional research has been completed which further verifies the Shores et al. (1973) conclusion. Teacher praise has been found to be a reinforcer to aid in the development of academic responses (e.g., Kirby & Shields, 1972; Luiselli & Downing, 1980) as well as social behavior (e.g., Brady et al., 1984; Fox et al., 1984; Gunter, Fox, Brady, Shores, & Cavanaugh, 1988; Strain, Kerr, & Ragland, 1979).

It is axiomatic that contingent teacher praise is an important behavior in developing positive interactions between teachers and students in addition to the reinforcing value of teacher praise when used contingently. Unfortunately, many studies have not found teacher praise to be a high-rate behavior in classrooms. Gable, Hendrickson, Young, Shores, and Stowitschek (1983) compared teacher approval and disapproval statements across classrooms of different exceptionalities and found that approval statements (praise) occurred only at a rate of .16 per minute. Similarly, in a study recently completed by Shores, Jack, Gunter, Ellis, DeBriere, & Wehby (in press), it was found that as little as one positive statement every hour was emitted by teachers in classrooms with students identified as displaying severe behavior disorders. Strain, Lambert, Kerr, Stagg, and Lenkner (1983) found even more startling results in a study conducted to determine the naturally occurring levels of teacher commands, student compliance, and positive and negative teacher feedback. They found that 82% of the students who had low social development ratings never received positive social behavior from the teacher, even when they complied with the teacher's request.

These studies suggesting low rates of positive interactions between teachers and students are very disappointing considering the importance of positive interactions between teachers and students in increasing appropriate student behavior. It is apparent that one of the most important teacher behaviors (praise and positive verbal behavior) that aids in establishing positive reciprocal interactions may not be employed as much as it should be.

### Teacher Disapproval

There are few studies that directly demonstrate teacher/student coercive interactions. However, there are studies that have investigated teacher behaviors that at least indicate

coercion by the teacher. One of the indications of a coercive interaction is the use of verbal behavior by the teacher that expresses disapproval of student behavior. White (1975) found that the rate of disapproval statements in regular education classrooms far exceeded the approval statements when teachers were attempting to control classroom social behavior. Walker and Buckley (1973) found that teachers were more likely to interact with a student when s/he displayed inappropriate behavior than when s/he engaged in appropriate behavior. Walker, Hops, and Fiegenbaum (1976) reported that a teacher engaged in 45 disapproval statements for inappropriate behavior per hour while the same teacher engaged in praise statements only 3 times per hour.

Another type of teacher disapproval response, teacher reprimands, has been investigated in several experimental studies. Some of the studies have demonstrated that teacher verbal reprimands are effective in decreasing children's inappropriate behavior (e.g., Jones & Miller, 1974; O'Leary, Kaufman, Kass, & Drabman, 1970; Van Houten, Nau, MacKenzie-Keating, Sameoto, & Colavecchia, 1982). On the other hand, studies have demonstrated that reprimands are not effective (Madsen, Becker, Thomas, Koser, & Plager, 1968; Thomas, Becker, & Armstrong, 1968) in decreasing children's disruptive behavior. In fact, the results of at least one study indicated that teacher reprimands actually served to increase student disruptive behavior (Madsen et al., 1968).

The effects of reprimands on social interactions have not been directly investigated. However, studies have indicated what may be residual coercive effects of avoidance or escape behavior resulting from such interactions. For example, Redd, Morris, and Martin (1975) found that children ranked teachers who used high rates of reprimands as the least preferred adults with whom they would want to interact as compared to teachers who used high rates of praise or those who were neutral.

It may be that both teacher negative and positive responses to children are necessary to maintain behavioral control in classrooms. Rosén, O'Leary, Joyce, Conway, and Pfiffner (1984), for example, found that an all-positive approach (using positive social teacher responses and no negative social teacher responses) to classroom management of children identified as hyperactive was not effective. Pfiffner, Rosén, & O'Leary (1985) found similar results in that a combination of teacher positive and negative consequences resulted in more student on-task behavior than did a positive consequence only condition. It should be noted, however, that the ratio of positive to negative consequences in this study was approximately three to one. This is considerably higher than that reported in the naturalistic studies of teacher praise. When an individual reward system was included in the all-positive approach, it was found to be as effective in maintaining student rates of on-task behavior as the combined positive and negative approach.

Cantrell, Stenner, and Katzenmeyer (1977) found that the ratio of teacher positive/negative statements may be more critical than the frequency of either in controlling student behavior. In addition, Cantrell and colleagues found that teachers' positive verbal behavior could be changed. After completing a course on the utilization of behavioral principles in classrooms, teachers switched from a negative ratio to a positive ratio of positive verbal statements. Further, they found that the teachers who had a positive ratio produced significantly higher student achievement gains than did those teachers who maintained a negative ratio.

Although it may be that teachers use a combination of positive and aversive social stimuli in their classrooms, the naturalistic studies of teacher/student interactions indicate that teachers appear more likely to utilize a coercive interaction pattern to control student behavior than positive interaction patterns. The experimental literature suggests that positive social controls may be more effective than the coercive social controls. In addition, coercive controls may lead to escape and/or avoidance behaviors by both students and teachers. The result of the coercive controls may be detrimental to the educational process.

The question is, why do teachers continue to use coercive social controls? We maintain that coercion is used because behavior is in fact reciprocal. Students with behavioral disorders are often defined as such due to their own coercive behaviors. They emit a high rate of aversive behavior which is often met by others in their environment with aversive behavior. In school settings, this has been referred to as the "criticism trap" (Sprick, 1981). The "win-



ner" of the confrontations is the one who is finally successful in obtaining positive reinforcement (gaining what is demanded) or escaping the aversive stimulation and is likewise reinforced (negatively); or they (students and/or teachers) may learn to avoid the aversiveness of the classroom by truancy or dropping out of school. As Patterson and Reid (1970) stated, coercion works, at least immediately. But the long-term effect is likely to be detrimental to both parties. To decrease the probability of coercive interactions occurring by decreasing instances of student aversive responses, the use of classroom management strategies may be utilized. The next section explores four often used strategies.

### Classroom Management Strategies as Setting Events for Teacher/Student Interactions

The highest rate of teacher/student interactions may be defined as *neutral* and carry neither positive nor negative social values. That is, these behaviors are not the major reinforcers or punishers that increase or decrease the behavior of the interactants (Shores et al., in press; Simpson & Souris, 1988). Most often, teachers appear not to use their interactions with students to increase or decrease behavior but rely on systems external to the interpersonal interactions. These *external* systems are essentially nonsocial procedures but do affect the behavior of students in classrooms and most probably their interactions with teachers. These procedures include but are not limited to posting rules of the classroom, organizing the classroom to increase the structure within the classroom, utilizing a traffic pattern for the teacher in the classroom, and utilizing reinforcement systems such as token or point systems.

The authors maintain that these classroom management strategies increase the structure of the classroom which aids in control of students' behavior. These specific procedures were chosen for discussion because they appear as recommendations in almost all texts concerning classroom instruction of children with severe behavior disorders and have extensive empirical support (e.g., Kerr & Nelson, 1983; Morgan & Jenson, 1988; Paine, Radicchi, Rosellini, Deuchman, & Darch, 1983). We hypothesize that these strategies may be viewed as setting events (Brown et al., 1986; Hendrickson et al., 1987; Kantor, 1959; Wahler & Fox, 1981) for teacher/student interactions. As setting events, these procedures have weak direct effects but may serve to increase the positive or coercive impact of the teachers' interactions with students. Although there is little empirical evidence that these classroom strategies function as setting events for interactions between teachers and students, in the following sections the authors discuss their conceptualization of this hypothesis.

*Rules.* Classroom rules serve to regulate behavior by clearly defining the expectations of students' behavior in the classroom and to clarify the consequences of the behaviors (Hendrickson et al., 1987; Kerr & Nelson, 1983; Paine et al., 1983). Hendrickson et al. (1987) further suggested that rules may serve to increase the predictability of teacher behavior while at the same time may aid in the control of student behavior. Paine et al. (1983), as well as Worell and Nelson (1974) and others (e.g., Alberto & Troutman, 1986; Kerr & Nelson, 1983; Morgan & Jenson, 1988; Sprick, 1981), have provided guidelines for designing classroom rules. The characteristics include:

1. The establishment of as few rules as possible, generally four or five;
2. Rules that are stated positively, that is, in terms of To Do rather than Don't Do;
3. Rules that are defined as observable behavior;
4. Clear statements of the positive consequences for following the rules and consequences for rule violation;
5. Rules that are developed with student input;
6. Rules that are posted so that all can see; and
7. Periodic review of the rules and consequences (that include examples and nonexamples) with the students.

Although rules alone have little control over students' behavior in isolation, when combined with contingent token reinforcement rules appear to increase the power of the token reinforcement systems (Greenwood, Hops, Delquadri, & Guild, 1974). In addition, several studies have shown that rules may also increase the reinforcing power of positive statements of the teacher. For example, Madsen, Becker, and Thomas (1968) and O'Leary,

Becker, Evans, and Saudargas (1969) found that rules combined with teacher praise and planned ignoring effectively controlled students' classroom behavior, whereas rules alone had little effect on the students.

From the brief literature review it appears obvious that rules have an effect on student performance in classrooms if the rules follow the guidelines outlined above and if "following" the rules has positive consequences. Although no data are available on the effects of rules on the teacher/student interactions, it would appear logical to assume that if positive consequences are given for following the rules, positive interactions between the teacher and the student should be increased. Conversely, if the rules are stated negatively and only negative consequences are given for breaking the rules, then one may expect high rates of coercive interactions.

*Classroom arrangement.* In early special education texts for children with *hyperactivity* (e.g., Strauss & Lehtinen, 1947) and education of children with emotional disturbance (e.g., Haring & Phillips, 1962; Hewett, 1968), the physical structure of the classroom to aid in control of student behavior was considered important due to the characteristics of the disabilities of these students. Although these early researchers disagreed as to the theoretical rationale for classroom organization, they agreed on several specific variables. For example, the use of individual study cubicles, a small group instruction area, and establishing the teacher's movement pattern during individual work time were advocated. The evaluation of these arrangements typically included data on academic performance and students' time on-task. Little data are available regarding the impact of such arrangements on the interactions between the teacher and her/his students.

It is hypothesized here that specific classroom arrangements aid in controlling students' behavior because they may function as setting events (Hendrickson et al., 1987) which increase the power of the reinforcing or aversive stimuli available to the students (as well as the teacher) in the classroom. For example, space between students has been shown to be a factor in student and teacher behavior (Axelrod, Hall, & Tams, 1979; Prescott, Jones, & Kritchevsky, 1967). Greater distance or space between students appears to decrease inappropriate behavior and increase teachers' responsiveness to students. Some researchers explain this effect by the difficulty students have in gaining each other's attention, thereby decreasing their interactions while at the same time increasing their interactions with the teacher (Adams, 1969; Adams & Biddle, 1970; Haubrich & Shores, 1976). Although teacher/student interactions are for the most part neutral, the power of the teacher's control of students' behavior may be enhanced by classroom arrangement.

*Movement patterns.* A number of authors have suggested that the teacher's movement in the classroom affects the behavior of students in that classroom (e.g., Good & Brophy, 1987; Paine et al., 1983). The teacher's movement pattern may be related to proximity control. That is, to maintain proximity control in the classroom, the teacher's movement pattern must allow the teacher to be as close to each student as often as is feasible. Fifer (1986) found that increased movement by teachers in the classrooms decreased inappropriate student behavior and increased the positive interactions of the teachers and their students. The proximity of the teacher to students has also been found to increase the power of teacher reprimands. Van Houten et al. (1982) found that teacher verbal reprimands were more effective in controlling disruptive behavior when the teacher was one meter from the student than when at seven meters.

The literature also suggests that there may be a spread effect associated with proximity. Broden, Bruce, Mitchell, Carter, and Hall (1970) found a spread effect of teacher social reinforcement for on-task behavior. When teacher praise was delivered to one student for on-task behavior, an increase in on-task behavior of a student at an adjacent desk was observed. The authors suggested that this "spillover" effect was likely due to the teacher being in close proximity to the nontarget child when the praise statements were delivered to the target child. Similarly, teacher reprimands for disruptive behavior have also been shown to have spillover effects. Van Houten et al. (1982) found that when a teacher's verbal reprimands were delivered to one child for disruptive behavior, not only was there a decrease in the target child's disruptive behavior but there was also a concurrent decrease in disruptions by a child at an adjacent desk.

The studies presented support the notion that teachers' classroom movement is a setting event that aids in controlling student behavior. It appears logical that the teacher's movement allows her/him to be more responsive to the students' behavior through either positive or aversive social controls. Considering the literature that demonstrates the low rates of teachers' positive statements and rates of approval compared to disapproval, it would appear that proximity may be used more often by teachers to increase the power of their coercive responses than to aid in increasing the power of positive attention.

*Reinforcers external to social interaction.* A variety of reinforcement contingencies may be available outside those potentially available from the social interaction in the classroom between the teacher and student (e.g., peer/peer interactions, student/parent interactions, etc.). However, systems within the classroom are also available. The primary source of reinforcement external to social interactions is in the form of token economy systems. These systems have been effective across a variety of conditions, ages, behaviors taught, and students with and without disabilities (Kazdin & Bootzin, 1972). The effects of token economy systems are so strong that Sulzer-Azaroff and Meyer (1977) stated in their introduction to a chapter on token economies that "so successful have token economies been in assisting people to develop more constructive and adaptive behavioral repertoires that the literature on the topic has burgeoned; there are far too many studies to be cited here" (p. 385).

Tokens are typically exchangeable for tangible items such as candy, TV time, time on computer, and so forth (Kazdin & Bootzin, 1972). While the tokens obviously serve as reinforcers (i.e., increase the probability of a behavior occurring) and therefore have direct control over the behavior, the token economy systems may also serve as setting events for teacher/student interactions. The use of a token system should provide the opportunity for positive social interaction between the teacher and student with each delivery of a token. Some research evidence is available that indicates that such systems may also increase the rate of teacher praise. Iwata and Bailey (1974) reported a higher rate of teacher praise during a positive token reinforcement period than when no reinforcement system was in place. These researchers also found that the rate of teacher praise was lower during a response-cost procedure (a mildly aversive strategy) than during the token only phase. It should also be noted that teacher praise was considered by the authors to be low rate and the differences between the procedures were small.

Although the Iwata and Bailey study indicated that token systems may effect teacher behavior, how such systems may effect teacher/student interactions is still not clear. However, it appears logical to assume that token reinforcement systems when used correctly will increase prosocial behavior thereby providing greater opportunities for positive interactions. It is also true, however, that when the tokens are removed, as in a response-cost system, the system may become aversive and lead to coercive interactions.

### **Effective Use of Classroom Management Strategies**

The classroom management strategies presented seem to provide the opportunity (or are the setting events) for either coercive or reciprocal interactions between teachers and their students. Yet at this point the most that can be done is to speculate as to which occurs. Certainly, this speculation should be interpreted cautiously based on the diverse bodies of literature from which the authors have extracted their information. However, because the literature reviewed is relevant to both students in regular and special education classrooms, the potential impact seems far reaching and presents important questions for research and information for practice.

The data reviewed indicate that teachers attend to students' inappropriate behaviors more frequently than they respond to appropriate student behaviors. From this one may hypothesize that any of the above procedures may be setting events for coercion. For example, how often does one hear a teacher say, "I put Jimmy's desk by mine so I can reinforce his appropriate behavior more often"? If such a statement could be made across classrooms, we would expect the literature to indicate that ratios of teacher attention to appropriate and inappropriate behavior would be reversed.

There is ample evidence to suggest that teachers can and do learn to use positive verbal behavior to increase student performance (e.g., Cantrell et al., 1977; Kerr, Shores, &



Stowitschek, 1978; Shores, Roberts, & Nelson, 1976, Shores, Stowitschek, Salzburg, & Kerr, 1979); however, other research indicates that this behavior is soon abandoned (Shores, 1987). A primary question is "Why do teachers persist in not using positive verbal behaviors which may lead to positive reciprocal interactions with their students?" One possible explanation is the reinforcing power of coercion. That is, coercion works immediately and reinforces the teacher by a discontinuation of inappropriate behavior exhibited by students. However, as pointed out earlier in this article, the long-term effects of coercion on the student will likely be escape or avoidance of school (e.g., dropout or truancy) and/or countercontrol behavior (e.g., noncompliance, vandalism, and physical violence).

### **Increasing Positive Interactions**

As indicated throughout this article, there is little direct evidence that the general classroom strategies presented do in fact serve as setting events for positive reciprocal interactions between teachers and students. However, the potential appears strong. The authors recommend that studies are needed to investigate the effects of these strategies on classroom interactions. Until the evidence is available, they recommend that teachers use the strategies to aid in increasing their positive behavior rather than their coercive behavior. Some examples of how the strategies previously discussed may be used to increase positive reciprocal interactions between teachers and students are cited below.

Teachers should organize the classroom not only to decrease inappropriate behavior but also to facilitate the delivery of positive statements to the students. Classroom rules should be established that are stated positively (i.e., To Do) and that provide positive consequences for following the rules. Teachers need to be in close proximity to all students by establishing a movement pattern in the classroom that facilitates interaction with all students. The teacher's movement allows her/him to respond to the students' appropriate responses in close temporal proximity to the response (which may allow better contingency control). Tangible reinforcement systems (token or point systems) should not only be used to increase student behavior but should also be used as opportunities for positive interaction by pairing the tokens or points with positive social responses from the teacher. In addition, if the token system includes a response-cost program, the teacher should carefully monitor the students to identify escape, avoidance, and countercontrol behaviors that may be detrimental to the students' educational progress.

Teachers may also increase their positive behavior by establishing self-monitoring procedures. The use of audio tapes (Sprick, 1981) and videotapes (Banbury & Hebert, 1992) have been recommended for this purpose. Recorded segments of what teachers perceive to be the "worst" part of their day would be best for this activity. Recordings should be made of these time segments at least weekly in the beginning. When reviewing the recordings, teachers should monitor for potential nagging behavior (Sprick, 1981), threatening statements, and verbal teacher attention as consequent responses to students' disruptive or inappropriate behavior. Additionally, teachers should monitor their praise statements and other positive verbal behavior. Based on the review of these recordings, teachers may not only monitor their behavior but also may identify student behaviors which are possibly incompatible with inappropriate behavior. With this information teachers may determine an appropriate schedule of praise for appropriate behavior. Sprick (1981) has recommended a three to one ratio for teacher attention to appropriate versus inappropriate behavior. Such a schedule, however, should be individually determined for each student and should have the potential of increasing reciprocal social interactions between students and teachers. A rule of thumb is suggested that the amount of positive teacher attention for appropriate behavior should be directly related to a student's rate of inappropriate behavior. That is, the rate of teacher attention should be greater for the student that exhibits greater rates of inappropriate behavior than for the student with lower rates of inappropriate behavior (Sprick, 1981). Finally, teachers should monitor their own behavior to ensure that positive attention is presented to all students.

Sidman (1989) suggested that both positive and coercive events are part of living. Skinner (1969) noted that aversive events may even account for survival behavior of some species. Aversive stimulation or coercive interactions may not always be detrimental. Even

in classrooms that attempt to be *all positive*, aversive events will probably occur and the side effects may not always be detrimental to either the students or the teacher. However, with our current level of information, it appears that positive events and positive interactions have known positive effects on the behavior of all persons involved, whereas aversive events and the effects of coercive interactions are not completely understood and may produce long-term detrimental effects. A classroom in which no aversive events occur is probably impossible to obtain with our current state of information. The position of the authors is that coercive interactions between teachers and students with severe behavior disorders should be decreased and positive reciprocal interactions increased. The management strategies outlined provide for setting event controls that may aid in increasing positive interactions by increasing the power of the positive social events emitted by both teachers and students. Conversely, the strategies may increase the power of coercive events. It is the behavior of the teacher that dictates which it will be.

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Received 2 January 1992  
Initial acceptance 8 March 1992  
(Final acceptance 26 May 1992)

APPENDIX C

# Lag Sequential Analysis as a Tool for Functional Analysis of Student Disruptive Behavior in Classrooms

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A NUMBER OF researchers have explored the use of analogue probe experiments to assess the general motivation of severe deviant behavior (e.g., Carr, Robinson, & Palumbo, 1990; Iwata, Vollmer, & Zarcone, 1990; Wacker et al., 1990). Analogue probe experiments provide functional definitions of behavior which have proven to be beneficial in the determination of the motivation of response classes (e.g., self-injurious behavior).

Although analogue probe procedures appear to be effective in identifying general classes of motivational variables (i.e., to escape, avoid, or gain reinforcement) in the experimental environment, the procedures may not identify specific stimuli, particularly social stimuli, that set the occasion for or maintain inappropriate behavior in other environments, such as classrooms. Since both prosocial and antisocial behavior in classrooms may be a function of the social stimuli available (e.g., Moore & Simpson, 1983; Shores, Gunter, & Jack, 1993; Shores et al., 1993), the functional effects of these classroom social stimuli need to be investigated. To complete the functional analysis, the identification of specific social events is required.

The empirical identification of social events that occur in classrooms has been hampered by limited observation and analysis methods. Recent advances in computerized data collection procedures and subsequently more expeditious analysis procedures provide opportunities to overcome some barriers. One such procedure is lag sequential analysis applied to direct observation data (Bakeman & Gottman, 1986). Lag sequential analysis

is simply the calculation of the conditional probabilities of one event preceding or following another event. Conditional probabilities are calculated by totaling the frequency of one coded event (the condition) and then the proportions of all the events that precede or follow that event. Lag sequential analysis procedures have provided descriptive information of social interactions (e.g., Maheady & Sainato, 1984; Moore & Simpson, 1983; Reid, 1986; Simpson & Soursis, 1988; Snyder & Patterson, 1986; Tremblay, Strain, Hendrickson, & Shores, 1983). Shores et al. (1993) used laptop computers to collect data to represent the interactions of students with severe behavior disorders (SBD), their teachers, and peers. These data were then subjected to a lag sequential analysis. The results provided detailed descriptions of interactions in terms of conditional probabilities of social stimuli antecedent and subsequent to specific behaviors of interest. To assess the motivation of behaviors of interest (e.g., disruption), the descriptive analysis must be taken a step further. That is, hypotheses developed from the lag sequential analyses need to be tested

through experimental procedures (Iwata et al., 1990; Shores, 1987). The purpose of the research presented in this paper was to apply the technology of lag sequential analysis to identify the antecedent and subsequent social events of disruptive behavior of two students with SBD. Based on the identified social events either preceding or following disruptive behavior, interventions were designed by systematically controlling the identified social responses of the teacher. By controlling the specified events, the usefulness of the lag sequential analysis in the functional analysis of classroom behavior was evaluated.

## GENERAL METHODS

### Data System and Behavioral Codes

The data system allowed continuous sequential recording of the social behaviors of a target student and the social responses of others (i.e., peers and adults) in the classroom. By pressing the number keys on a laptop computer, data collectors recorded numeric representations of



who emitted a behavior, the topography of the behavior (see Table 1 for the definition of the behavior codes), and to whom the behavior was directed (see Shores et al., 1993, for a detailed description of the data entry procedures). If no defined social behavior occurred for 10 seconds, a stop code was entered. The data were coded into a laptop microcomputer using a sequential interaction software (Moose, developed by John Tapp of Vanderbilt University).

The observers were positioned in an area within each classroom setting so that they could see and hear the subject continuously. The social responses of the target subject, as well as those of the teacher and peers, were recorded sequentially.

### Interobserver Agreement

Prior to the onset of classroom observations, the data collectors were required to collect data in each classroom until interobserver agreement was at least 80% across behavior codes. To assess interobserver agreement, two observers concurrently but independently coded observation sessions. Agreement was defined as two independent observers scoring the same code within a 5-second window. Disagreements were scored for any deviation between the two observers' codes: if the observers coded different responses (e.g., one coded disruptive and the other coded aggression), if one of the observers recorded a behavior and the other did not, or if the observers identified different responders as the emitter or target of a behavior. Interobserver agreement was calculated using the exact agreement formula:  $\text{agreements} \div \text{agreements} + \text{disagreements} \times 100$ .

### Data Analysis

The data were transferred from laptop computers to a Zenith 386 IBM-compatible computer to calculate the rate of each behavioral event. In addition, the daily data were pooled across each phase, and the lag sequential analysis was performed for each of the behavioral events. The lag sequential analyses yielded conditional probabilities (cp) of the events antecedent and subsequent to the target behavior (i.e., disruptive behavior). In this manner, the events that were most likely to pre-

TABLE 1  
Description of Behavior Codes

<b>Compliance Response</b> —an actor does what is commanded, initiates the appropriate response that is commanded or states that he or she will do so within 10 seconds of a mand. Must immediately follow a mand.
<b>Positive Social Mand</b> —verbal or physical statements that command a specific and immediate social response. Includes: <ol style="list-style-type: none"> <li>1. "To do" statements that makes a demand for a student social response.</li> <li>2. Calling a person by name to get his or her attention in an appropriate manner.</li> </ol>
<b>Negative Social Mand</b> —verbal or physical statements which request the absence or termination of an immediate and specific social response without reference to academic instruction (see negative instructional mand).
<b>Positive Instructional Mand</b> —verbal or physical statements that command a specific and immediate academic response. Includes "to do" statements that make a demand for a student academic response. May include specific questions which require an immediate academic response.
<b>Negative Instructional Mand</b> —verbal or physical statements which request the absence or termination of a specific academic response.
<b>Handraise</b> —hand is up; is a form of manding.
<b>Promise of Positive Consequences</b> —"if . . . then" statements that establish a relationship between a behavior and future positive consequences. Is scored only when the consequences are clearly positive, such as extra free time, tokens, special trips, or visits to special people.
<b>Threat of Aversive Consequences</b> —"if . . . then" statements that establish a relationship between a behavior and future aversive consequences.
<b>Positive Physical</b> —purposeful contact which displays affection and is not obviously teasing or aggressive.
<b>Negative Physical</b> —physical interruption of an ongoing response or interaction; removal of or attempt to remove materials in possession of another person.
<b>Physical Aggression</b> —physical contact that is potentially harmful to self, others, or property.
<b>Negative Verbal/Gestural</b> —statements or actions whose intent is to provoke, annoy, pester, mock, or make fun of a person or in which physical aggression is threatened to person or property; obscene gestures or verbal statements; or arguing or disagreeing with another person (protest) or refusing to comply with a mand.
<b>Disruptive</b> —generally nondirected inappropriate behavior.
<b>Feedback</b> —statements which provide information and/or clarification of a behavior without qualitative judgments (see positive and negative consequences). Must refer to a response occurring immediately prior to feedback—cannot refer to behavior that occurred in the past.
<b>Positive Consequence</b> —verbal statement or gesture indicating approval of behavior over and above an evaluation of adequacy or a verbal statement that specifies which positive consequences will follow which behaviors. Also includes the delivery of tangible events or activities which serve as potential reinforcers.
<b>Negative Consequence</b> —verbal statement or gesture indicating disapproval over and above an evaluation of adequacy or a verbal statement that specifies which aversive consequences will follow which behaviors. Also includes the removal of reinforcing objects or removal of concrete events/activities that may have reinforcing effects.
<b>Withdrawal</b> —actor physically removes self from a negative interaction (follows any negative behavior from another person).
<b>Talk</b> —any verbal behavior of social or academic content that does not fit into any other category. Includes social or academic lectures, or when two or more statements are issued by the same actor. This includes the mands that cannot be immediately complied with (e.g., "When you get home, tell your mother to call me."). May include questions that do not demand an immediate response. (If an immediate response is called for, as in academic questioning, an instructional mand should be scored.)

cede or follow the target behavior were identified. Hypotheses were developed for the four experiments presented based on the conditional probabilities from the sequential analyses of the baseline data.

## EXPERIMENT 1

### METHOD

#### Subject

The subject for Experiments 1 and 2, Tim, was a 12-year-old male in a special education classroom for students with SBD. Additionally, he was identified as aggressive by his teacher's rating of more than one standard deviation above the mean on the aggression scale of the Teacher's Report Form of the Child Behavior Checklist (Achenbach & Edelbrock, 1988). Tim engaged in high rates of disruptive behavior during initial observations.

#### Setting

This study was conducted in a classroom that served only students identified as SBD located in a regular middle school in southeast Kansas. One teacher trained and certified to instruct children with SBD and two paraprofessionals were assigned to the classroom. The classroom typically had from 2-4 other students present during observation sessions.

#### Experimental Procedures

**Observation Sessions.** Observation sessions began at the same time each day during which Tim was engaged in independent work activities in written language, math, or social studies. Each observation period was scheduled for 30 minutes of continuous observation. If the subject left the room (e.g., to go to the restroom), the data collector noted this by coding on a function key to indicate when the subject left and returned to the classroom. When this occurred, the time the student wasn't available was noted and this time was subtracted from the 30-minute observation period. The mean length of the observations was 23.59 minutes.

**Experimental Design.** There were three phases of the experiment: (A) Base-

line, (B) Correction, and (C) Planned Ignoring. A withdrawal of treatment design (replication of A and C conditions) was used to evaluate the effects of the teacher's responses to Tim's disruptive behavior.

**Baseline (A).** No intervention procedures were in effect. The lag sequential analysis identified both antecedent and subsequent events related to disruptive behavior. The analysis revealed two codes that had a high probability of preceding disruptive behavior: stop ( $cp = .51$ ) and Tim's handraise ( $cp = .37$ ). Tim's handraise response was followed by disruptive behavior 72% of the time. These data indicated that 37% of Tim's disruptive behavior was a sequence of handraise/disruptive behaviors. Further, the adults (teacher and paraprofessionals) were more likely to respond to the handraise/disruptive sequence ( $cp = .38$ ) than they were to Tim's handraise alone ( $cp = .25$ ). These data led to the hypothesis that at least 37% of Tim's disruptive behavior could be eliminated by increasing the teacher's responsiveness to his handraises and ignoring him for a brief time when he raised his hand and engaged in disruptive behavior.

**Correction (B).** During the correction phase, the adults in the classroom were instructed to respond to Tim's handraise/disruptive sequence by reminding him, "You need to remember the rule, raise your hand and wait for someone to help you," contingent on the handraise/disruption sequence. This procedure was employed based on Sprick's (1981) recommendation for remediation of discipline problems. If the subject's hand was still raised after the reminder, or if Tim raised his hand without disruptive behavior, the adult immediately responded with, "Thank you for raising your hand. How can I help you?"

Daily feedback was provided to the teacher and paraprofessionals concerning the fidelity of their application of the procedures. Feedback consisted of showing the percentage of time handraise/disruptive responses were given attention.

**Planned Ignoring (C).** During the planned ignoring phase, the adults were instructed to respond to Tim's handraise as quickly as possible and to ignore any

handraises that were followed by disruptions for 10 seconds after the termination of the disruptive behavior. If Tim continued to have his hand raised without engaging in disruptive behavior, one of the classroom adults would attend to him with the praise statement, as was done in the correction procedure.

As in the correction phase, daily feedback was provided regarding the teacher's and paraprofessionals' responses to Tim's handraise/disruptive behavior.

### RESULTS

Observer agreement was conducted on 18% of the observation sessions. Agreement on disruptive behavior across the study was 97.8%. Agreement on handraises across the study was 98.3%. The interobserver agreement of the behavioral sequence of handraise/disruptive across the experiment was 99%. Agreement on teacher attention to the handraise/disruptive sequence was 78%. Overall agreement for all behavioral codes in sequence was 87% with a range across sessions from 72% to 97%.

The rate of Tim's handraise/disruptive sequence across sessions is presented in Figure 1. During the initial baseline condition, the rate of Tim's handraise/disruptive behaviors was variable, ranging from .09 to .25 per minute with a mean of .17 per minute. After 2 days of the correction procedure, the rate, although still variable, appeared to stabilize at a lower rate (approximately .09) in the last 3 days of the phase. During the planned ignoring phase the handraise/disruptive behavior stabilized in the last 8 days, with a range of 0 to 1 instance of the behavioral sequence being observed. The return to baseline condition brought a rapid return to the original base rate of the behavioral sequence. Return to planned ignoring resulted in the behavior returning to within the range of the first planned ignoring phase. It should be noted that the rate remained slightly higher during the reapplication of the planned ignoring procedure than it was during the last few days of its initial application.

Figure 2 shows the conditional probabilities of adult attention to the hand-

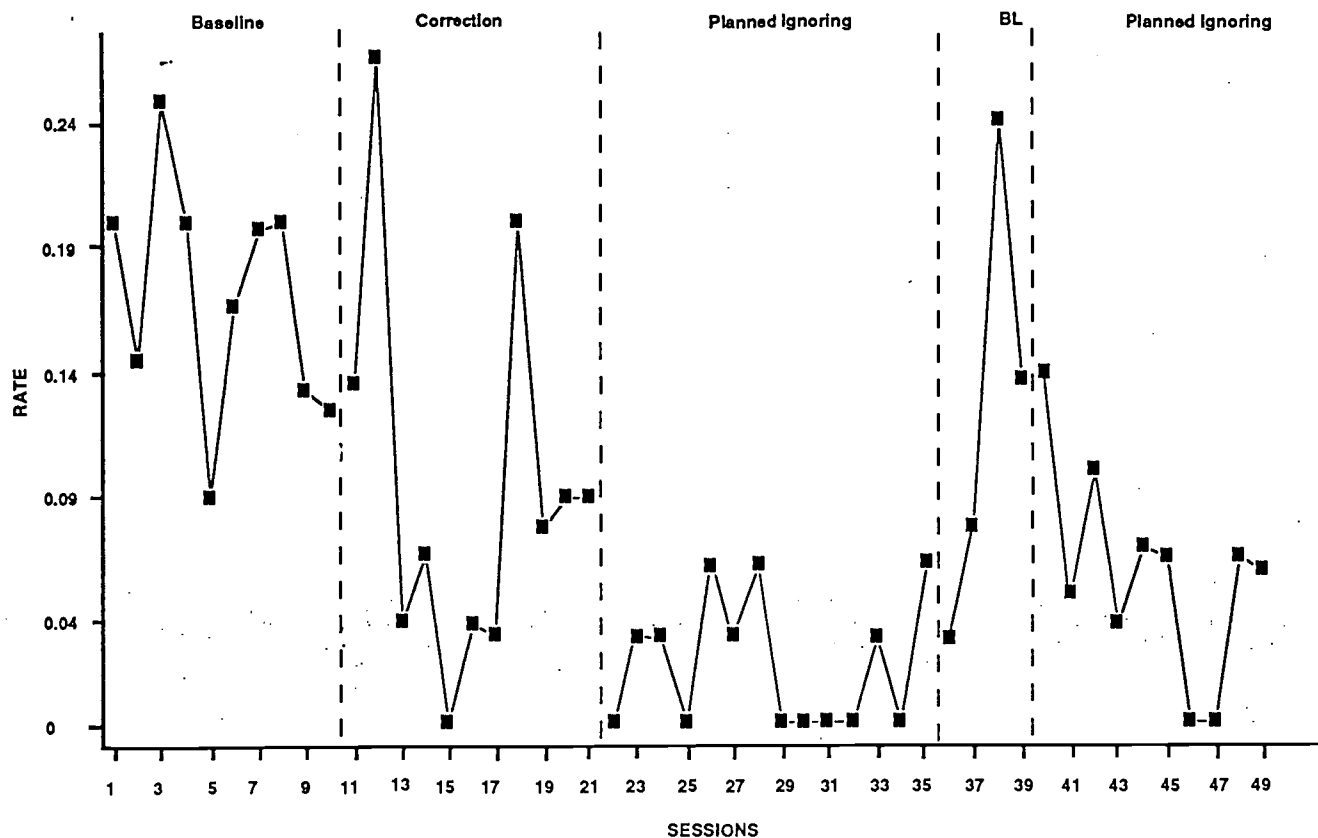


FIGURE 1. Rate of handraise/disruptions sequence across sessions of Experiment 1.

raise/disruptive sequence. These data represent the fidelity of the intervention procedures. During baseline conditions, the adults had extremely variable ratios of attention to the handraise/disruptive behavior sequence. However, during the correction procedure, they were able to correct each sequence of handraise/disruptive behavior after the first two sessions. They were very effective during the planned ignoring phases at ignoring the behavioral sequence.

Figure 3 shows the rate of all disruptive behavior across the study. The overall rates of disruptive behavior covaried positively with the rate of handraise/disruptive behavior across each phase of the study. The mean rate of disruptive behavior during the baseline condition was .447. During the planned ignoring phases of the study, the mean rate of disruption decreased by 55% to .245.

The conditional probabilities of handraise as an antecedent to disruption also changed from .37 in baseline to .15 in the planned ignoring phase. When the inter-

vention was withdrawn, the probability of handraise as an antecedent to disruption increased to .52, and decreased to .21 during the replication of the planned ignoring phase.

It should be noted that Tim's handraise responses did not appreciably change during the experiment. The mean rates were .24, .33, and .25 per minute during baseline, correction, and planned ignoring phases, respectively. These data indicated that a reduction in handraises did not appear to be responsible for the reduction of the handraise/disruptive behavior sequence.

## EXPERIMENT 2

### METHOD

Approximately 3 weeks after the termination of Experiment 1, a new baseline of Tim's classroom interactions was begun. Although the teacher reported they had continued to use the procedures of Experiment 1, Tim's rate of disruptive behavior remained unacceptable. The lag se-

quential analysis of this baseline data indicated that the stop code (no defined social response occurring for 10 seconds) was the most probable code recorded prior to Tim's disruptive behaviors ( $cp = .75$ ). Teacher attention subsequent to Tim's disruptive behavior was low and variable ( $cp = .08$ ). In addition, the overall rate of teacher positive statements was low (at nearly one praise statement every 10 minutes). Based on these analyses, we hypothesized that the student's disruptive behaviors functioned to gain teacher attention on a low, variable schedule. We therefore designed a procedure to increase the teacher's rate of delivering praise statements to Tim on a differential reinforcement of other behavior schedule (DRO).

### Experimental Procedures

**Observation Sessions.** Observation sessions were conducted during the same time period as in Experiment 1. The mean length of observation time per day was 25.15 minutes.

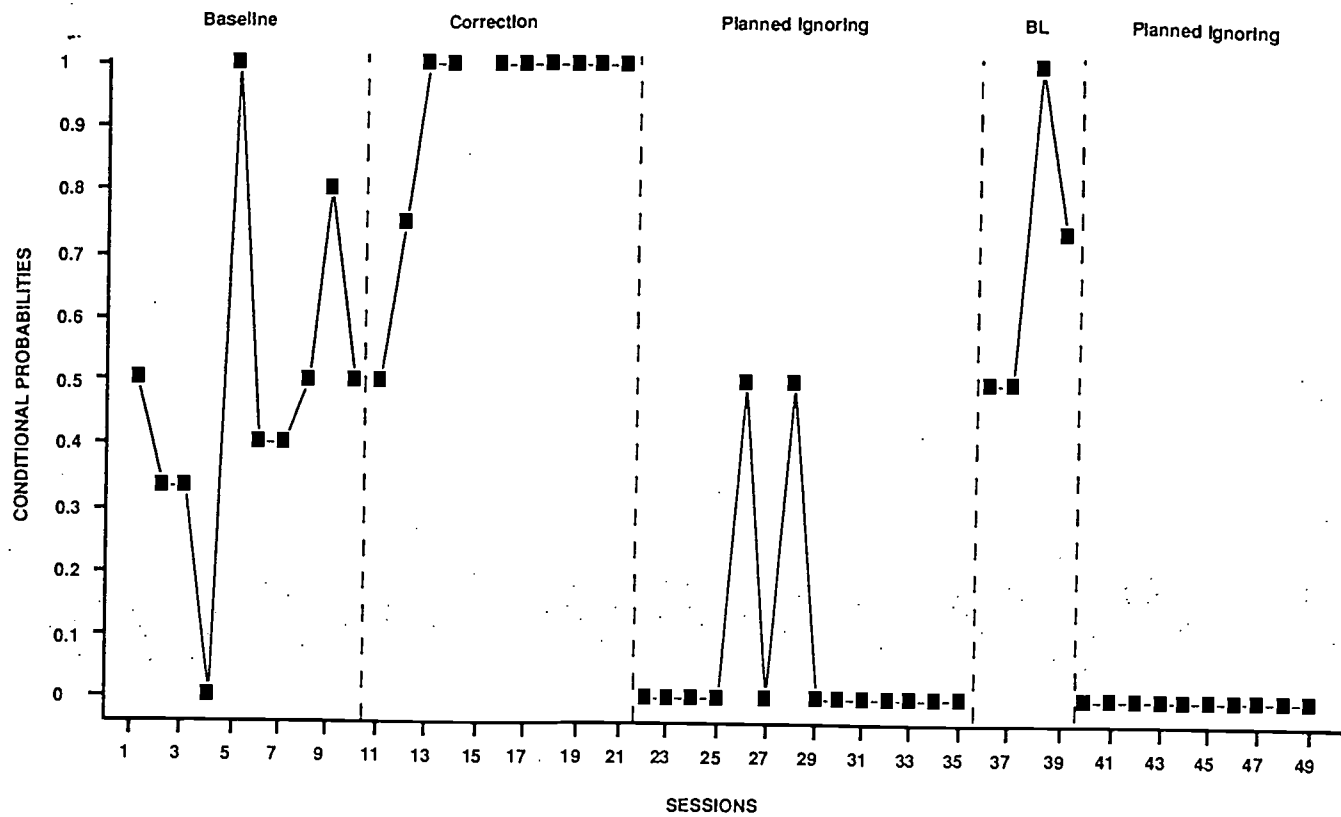


FIGURE 2. Conditional probabilities of adult attention to Tim's handraise/disruptive sequence.

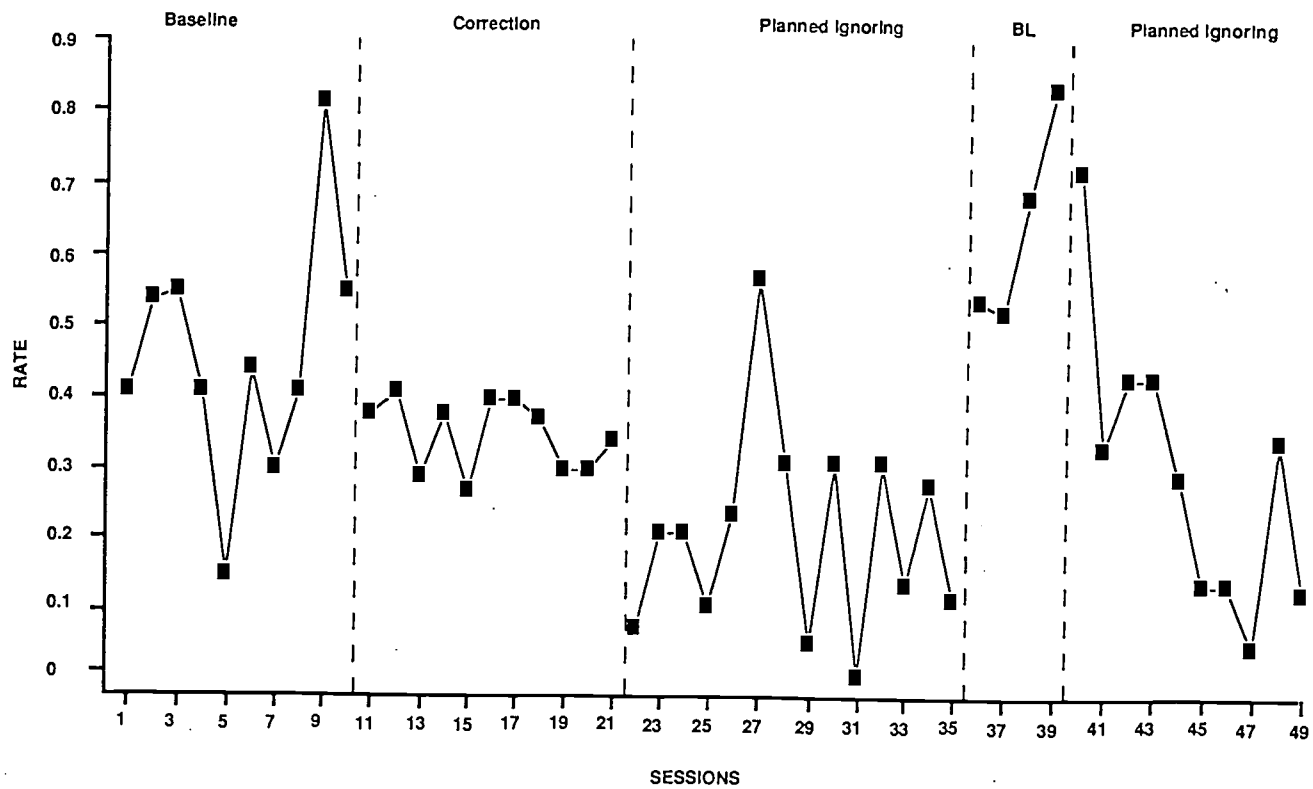


FIGURE 3. Rate of Tim's disruptive behavior for each session.

**Experimental Design.** An ABAB design was used to determine the effects of prompted teacher praise delivered every 3 minutes on the rate of Tim's disruptive behaviors.

**Baseline (A).** During baseline conditions the teacher was instructed to maintain regular classroom activities and to continue the planned ignoring procedures described in Experiment 1.

**Intervention (B).** During the intervention phases, the teacher was instructed to remain in the carpeted area in which the student's desk was located and praise the target student every 3 minutes. The teacher was cued to praise Tim by an auditory signal emitted from a wristwatch with a countdown function at 3-minute intervals. The countdown of the watch was started simultaneously with the onset of the observation period. On each auditory signal, the teacher or paraprofessional praised the student for on-task behavior or for no disruption within 10 seconds of the signal. Descriptive praise for specific on-task behaviors took precedence over praise for no disruptions.

## RESULTS

Interobserver agreement was calculated on 26% of the sessions. The mean interobserver agreement for all codes in the interactional sequence was 83% with a range of 65% to 90%. Agreement for specific codes reported in this experiment were: teacher praise, 90%; student disruptions, 83%; and stop, 90%.

Figure 4 presents the rate of teacher praise statements and subject disruptions across all phases of the experiment. Teacher praise increased from an average rate of .089 during the initial baseline to .596 during the first intervention. Tim's disruptions decreased concurrently from a mean rate of .33 during baseline to .20 in the last 2 days of intervention. During the return to baseline condition, both teacher praise and student disruptions reversed from the intervention phase; however, both remained at slightly higher rates than during the original baseline condition. The mean rate of disruption during the withdrawal of treatment was .42 and the mean rate of teacher praise was .21. During the second intervention,

the rate of disruption again decreased to a mean of .195, and teacher praise increased to a mean of .653.

Similar reductions were noted in the conditional probability of disruptions preceded by the stop code. The conditional probability of disruptions preceded by the stop code in both baseline conditions was .75. This probability decreased to .405 during the first intervention and to .55 during the second treatment condition.

## EXPERIMENT 3

### METHOD

#### Subject and Setting

The subject for Experiments 3 and 4 was Billy, a 6-year-old male identified as and placed in a classroom for students with SBD. He was rated by his teacher as aggressive (using the same criteria as for Tim in Experiments 1 and 2) and engaged in high rates of disruptive behavior. Within his classroom were 10 other children, three paraprofessionals, and one certified special education teacher. The teacher had implemented a classwide token economy system and an Assertive Discipline system (Canter & Canter, 1976). The tokens were delivered to each student for completing assignments and were given at the end of assignment periods. The tokens were exchanged for free time activities and weekly trips to the school store. The Assertive Discipline strategy used by the teacher included her placing a mark on the blackboard beside the child's name whenever the teacher observed him or her engaged in inappropriate classroom behavior. Each mark resulted in Billy losing 2 minutes of recess.

#### Experimental Procedures

**Observation Sessions.** Observations were scheduled for 30 minutes at the same time each day. The mean length of the observations was 29.99 minutes. The observations occurred when Billy was engaged in independent academic assignments.

**Experimental Design.** An ABAB design was used to evaluate the functional

relationships between the events identified and Billy's disruptive behavior.

**Baseline (A).** A lag sequential analysis of the student's baseline data indicated that disruptive behavior was followed by teacher attention (combined teacher or paraprofessional responses to Billy's disruptive behavior) 54% of the time. The stop code appeared as the most often recorded code preceding disruptive behavior ( $cp = .68$ ). Based on these analyses, the hypothesis was made that Billy's disruptive behavior was maintained by teacher attention even though nearly 50% of the attention was negative (e.g., negative consequences, negative mands).

**Intervention (B).** An extinction procedure was implemented by attempting to control the teacher's attention to disruptive behavior. Specifically, the teacher was instructed to ignore the disruptive behavior when it occurred and give positive attention to the target student when he was on task, in his seat, or raised his hand to talk. No consequences were to be given for disruptions. The token system remained the same as in baseline.

## RESULTS

Figure 5 presents the rate of Billy's disruptive behavior and the rate of teacher attention to his disruptive responses. The rate of disruptive behavior during baseline was quite variable, ranging from 0 to .65 per minute with an average of .32. Although the conditional probability of attention to disruptive behavior decreased from .54 in baseline to .16 during the extinction phase, the teacher's and paraprofessionals' complete adherence to the extinction procedure was not obtained, and teacher attention continued at a variable schedule. Little change in the rate of disruptive behavior was observed.

Figure 6 presents the rate of teacher praise and positive consequences delivered by the teacher through both phases. With the exception of Day 7, the teacher's praise and delivery of positive consequences did not change over the course of the experiment.

Due to the teacher's concern regarding the intensity of the student's disruptive behavior and the continued attention to the disruptive behavior by the



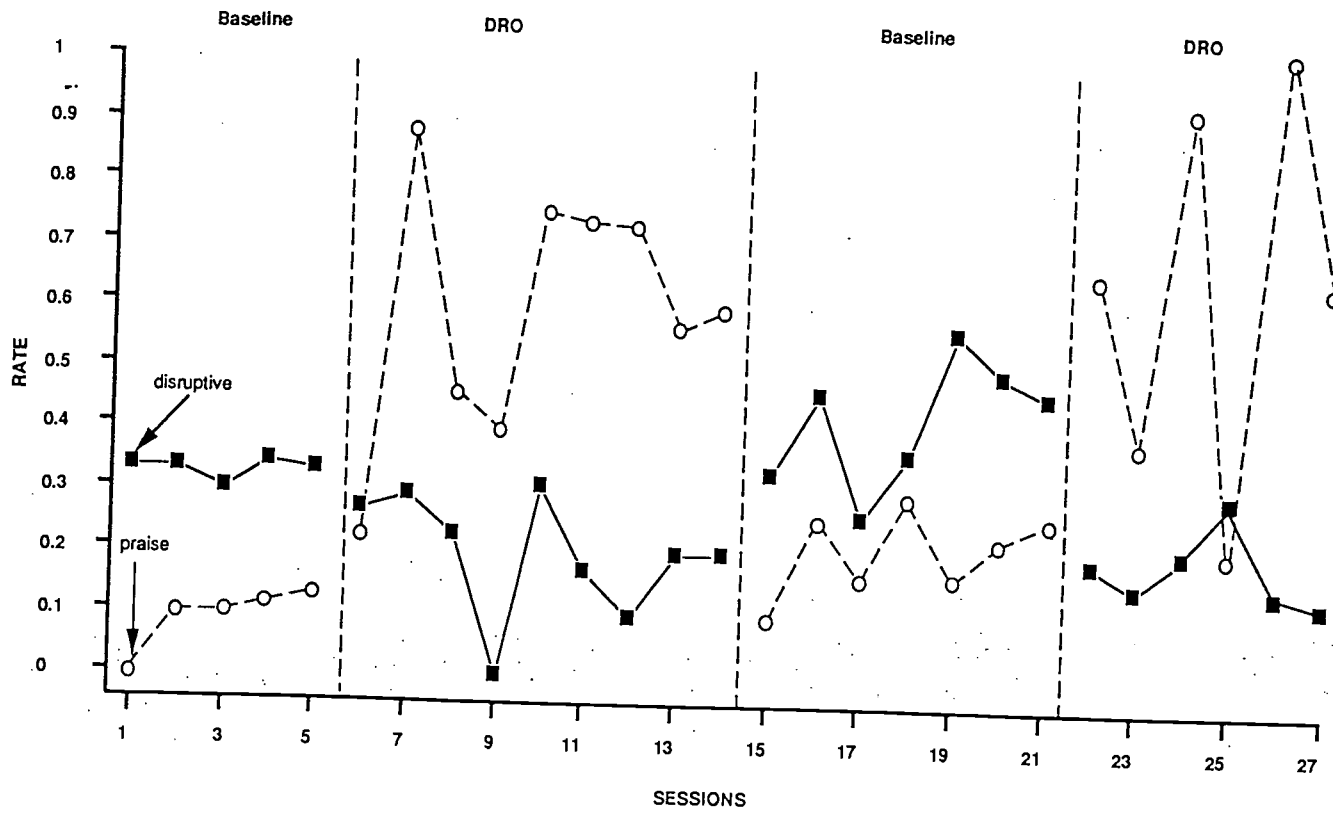


FIGURE 4. Rate of teacher praise statements and Tim's disruptions across sessions of Experiment 2.

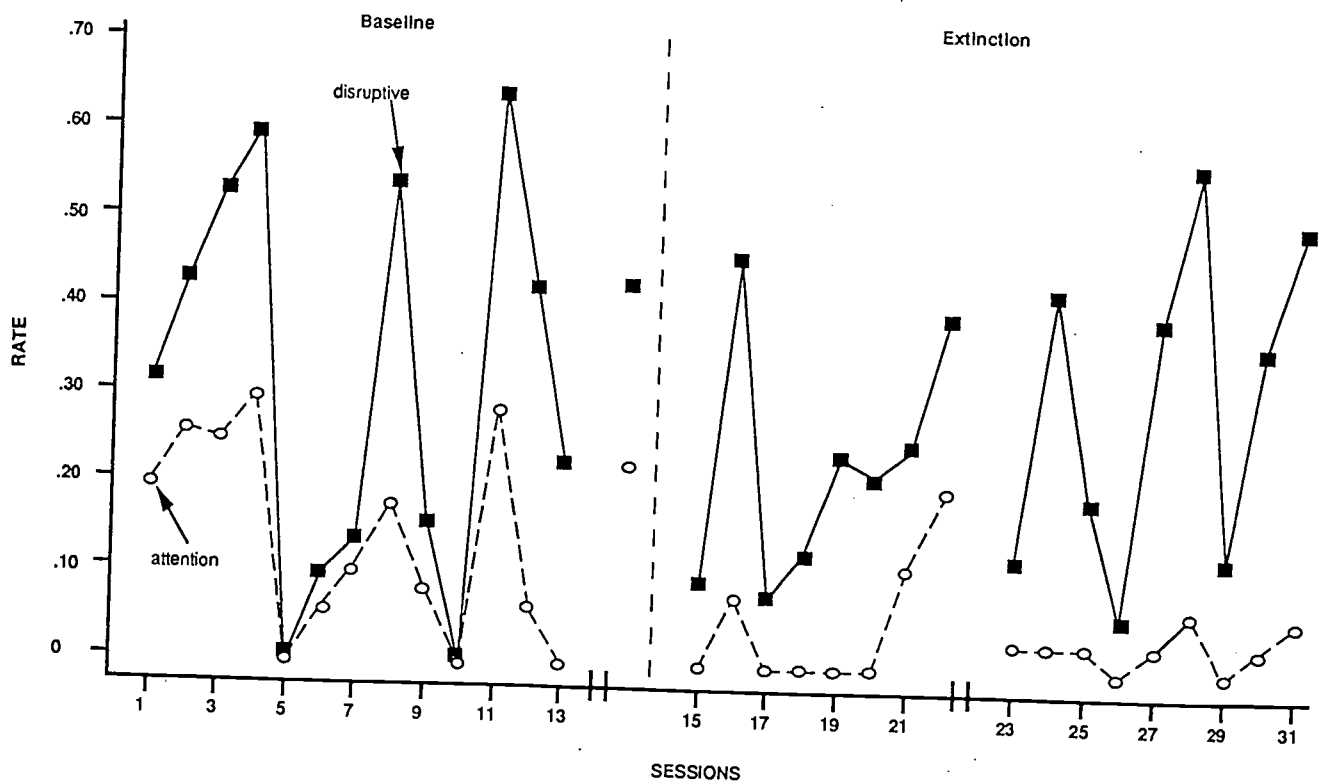


FIGURE 5. Rate of Billy's disruptions and adult attention to his disruptions.

adults in the classroom, the decision was made to return to baseline conditions.

## EXPERIMENT 4

### METHOD

#### Experimental Procedures

**Observation Sessions.** Observation sessions occurred as described in Experiment 3. The mean length of the sessions was 27.57 minutes per day.

**Experimental Design.** An ABAB design was used to determine the effects of a differential reinforcement of incompatible behaviors (DRI) procedure on Billy's disruptive behavior.

**Baseline (A).** The baseline condition for this experiment was identical to the baseline of the preceding experiment with the exception that a research assistant was assigned to serve as the paraprofessional to Billy. Lag sequential analysis was conducted on the baseline data shown in Figure 7. This analysis produced results similar to the baseline of the first experi-

ment (see Figure 5). The teacher's attention to disruption returned to the previous baseline level ( $cp = .48$ ), and the stop code remained the highest probable antecedent event ( $cp = .52$ ). Based on these analyses, the hypothesis remained unchanged from the preceding experiment.

**Intervention (B).** A modified DRI schedule of teacher praise in conjunction with planned ignoring of Billy's disruptive behavior was implemented during intervention. Specifically, the research assistant was instructed to deliver a praise statement for behaviors that were incompatible with disruptive behavior approximately every 3 minutes. The incompatible behaviors were: in seat and engaged in the academic task, raising hand to talk, out of seat only with permission, and engaged in the appropriate activity. The research assistant was cued to deliver the praise on the fixed interval schedule by an auditory signal of a countdown wristwatch. If Billy was engaged in disruptive behavior at the signal, the assistant was instructed to ignore the disruptive behavior and to wait at least 10 seconds after

the termination of the behavior before delivering a praise statement.

## RESULTS

Interobserver agreement was completed on 20% of the observations. The agreement across all codes was 83%. The agreement on the primary codes was: disruption, 93%; teacher attention to disruption, 91%; teacher praise, 73%; and positive consequences, 90%.

Figure 7 presents the rate of student disruptive behavior and rate of teacher attention to disruptive behavior. Billy's disruptive behavior ranged from 0 to 1 per minute with a mean of .32, while the conditional probability of teacher attention following disruptive behavior was .48. Following the first week of intervention, the rate of disruptive behavior decreased substantially to near 0 in the last 4 days. However, the conditional probability of teacher attention to disruptive behavior decreased only to .30.

A return to baseline resulted in a mild increase in the probability of attention to disruptive behavior ( $cp = .37$ ) and an in-

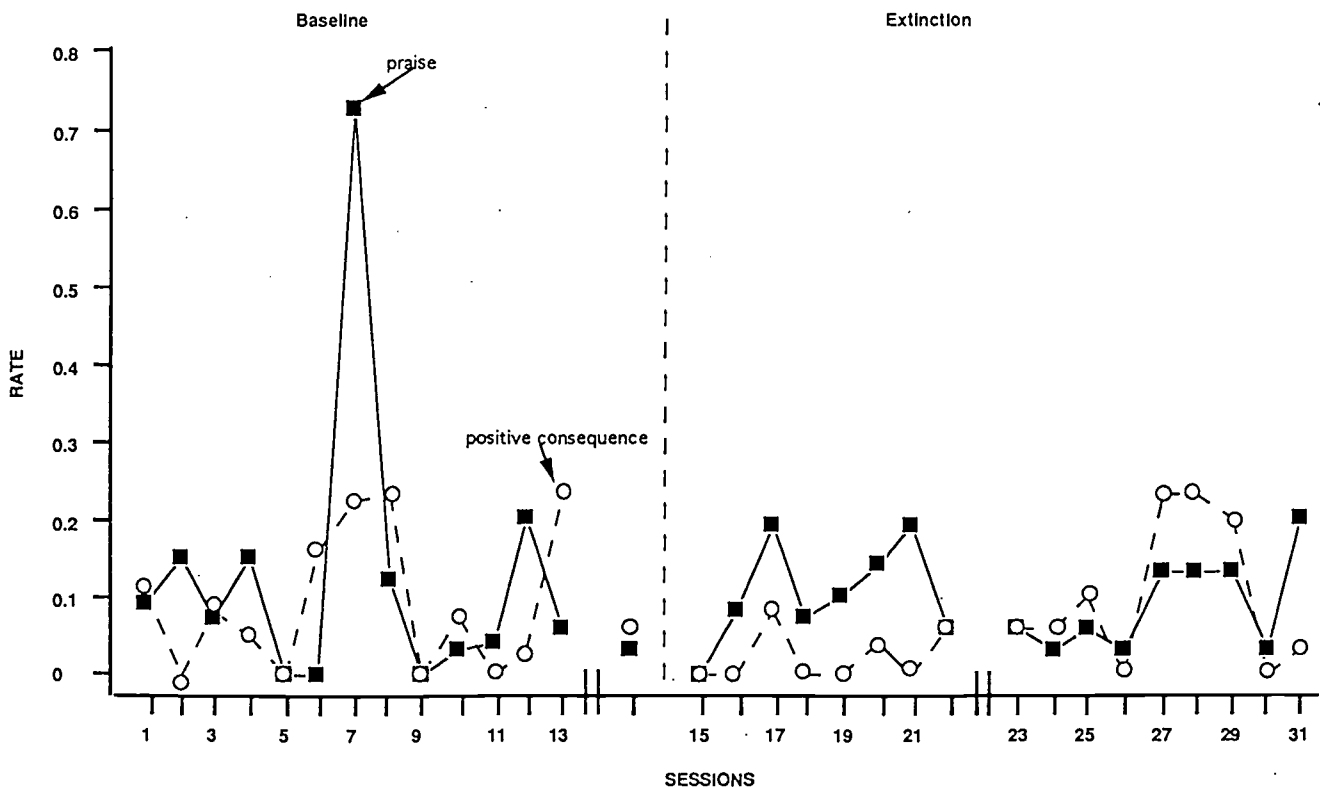


FIGURE 6. Rate of teacher praise statements and positive consequences across sessions of Experiment 3.

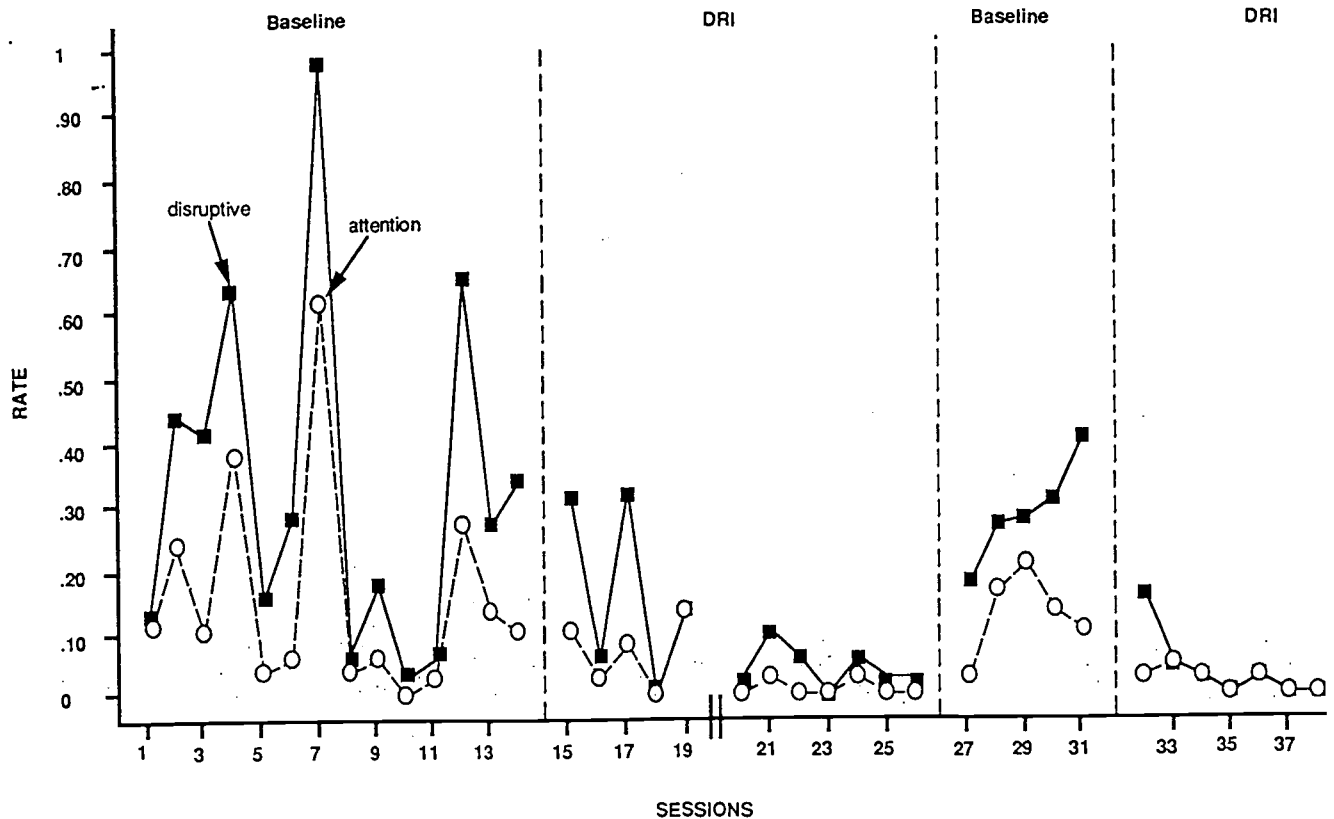


FIGURE 7. Rate of Billy's disruptions and adult attention to his disruptions.

crease in the rate ( $\bar{x} = .28$ ) of disruptive behavior. The rate and duration of disruptive behavior increased so dramatically during this phase that it was the request of the classroom teacher, not the stability of the data, that dictated a return to intervention. During the final intervention, the rate of disruptive behavior was reduced to a rate near the level of the last 4 days of the first intervention.

Figure 8 presents the rate of the teacher and paraprofessional presentation of positive consequences (tokens) and praise to Billy. The rate of the teacher's delivery of positive consequences remained low throughout the experiment. The rate of the teacher's praise was quite low during the original baseline. With the implementation of the DRI procedure the mean rate of teacher's praise increased to .38 from a base rate of .02. During the return to baseline conditions, the rate of teacher praise decreased ( $\bar{x} = .088$ ) but did not return to the low rates in the first baseline. With the reintroduction of the procedure, the rate of praise again in-

creased to the level of the first intervention ( $\bar{x} = .39$ ).

## DISCUSSION

The question of whether lag sequential analysis is a useful tool for identifying social events that control behavior was not completely answered by these experiments. However, the technology of lag sequential analysis appears to show promise for analyzing social interactions to identify social events that motivate behavior. In the experiments presented, the students' disruptive behaviors were found to be related to the responses of their teachers. By changing the teachers' behaviors, a reduction in the students' behaviors occurred.

The intent of manipulation of the teachers' responses to the students' was to decrease students' disruptive behaviors by changing the responses the teachers made to the students by using classroom behavioral control tactics (e.g., DRO and DRI) which have rich empirical histories in successfully controlling classroom be-

havior (e.g., Ayllon & Roberts, 1974; Deitz, Repp, & Deitz, 1976; Repp & Deitz, 1979; Repp, Deitz, & Deitz, 1976). The rationale for implementing the specific tactics was to increase the teachers' positive responses to the students' appropriate behavior and eliminate their responses to students' inappropriate behavior. In three of the four experiments, the teachers increased their positive responses to the students' appropriate behaviors. Although the teachers decreased their attention to the students' inappropriate behavior, they did not completely ignore the students' disruptive behavior. Even when our research assistant served as the teacher (Experiment 4), he continued to respond to Billy's disruptive behavior.

One of our hypotheses was that the social behaviors of others (teachers and peers) in the classroom environment were the primary motivators of the students' inappropriate classroom responses. The results of these experiments cast serious doubt on that hypothesis. Social behaviors did not produce the highest conditional probabilities associated with

student disruptive behavior. Rather, the stop code (coded when no social responses were observed within 10 seconds) was found to be the single highest probable code scored as both antecedent and subsequent to disruptive behavior in all initial baselines. In fact, the stop code continued as the most probable code throughout all phases of each experiment, with the exception of the last phase of Experiment 4. Even in this phase, stop maintained a high conditional probability as a subsequent event to Billy's disruptions ( $cp = .25$ ). There are many possible explanations for these results. For example, the children's disruptive behavior may not be socially motivated or at least not always socially motivated. Other events need to be included in the analysis, such as the academic activities. It has been demonstrated that disruptive and antisocial behavior in classrooms may be escape behavior motivated by the aversiveness of the academic activities (Weeks & Gaylord-Ross, 1981). It may also be that the lack of social stimuli antecedent

or subsequent to disruptive behavior (i.e., the stop code) indicates that at least some of the disruptive behavior may have been escape or avoidance motivated. Iwata et al. (1987) suggested that such escape-motivated behavior may be maintained even though termination of the aversive stimuli actually occurs infrequently. They assert that naturalistic observation of successful escape behavior may be difficult to obtain.

An alternative hypothesis is that delayed social responses may serve as reinforcers for disruptive behavior. Our analysis consisted of only a one-step lag sequential analysis of the antecedent and subsequent events. Such an analysis, although allowing simplicity in developing hypotheses regarding specific social stimuli, may have failed to identify delayed social responses that may be functionally related to the targeted behaviors. In addition, many behaviors may serve to gain reinforcement on a very lean schedule (e.g., VR-100, or a conditional probability of .01). Such schedules would

produce conditional probabilities at a statistically nonsignificant level without a large number of observed occurrences. If the consequences that reinforce the behavior are delayed or on a lean schedule, the procedure may not identify the events as being related to the behavior.

Iwata et al. (1990) suggested that naturalistic data provide little more than a descriptive analysis and advocated the use of functional assessment probes to develop hypotheses regarding the motivation of aberrant behavior, thus increasing the accuracy of behavioral modification plans. The results of the experiments presented suggest that even with the problems identified, naturalistic data analyzed by lag sequential analysis procedures show promise of increasing the predictability of behavior modification programs designed based on the observations. In two of the three experiments that were successful in reducing the students' disruptive behavior, the decrease in the rate of the disruptive behaviors from baseline to intervention was simi-

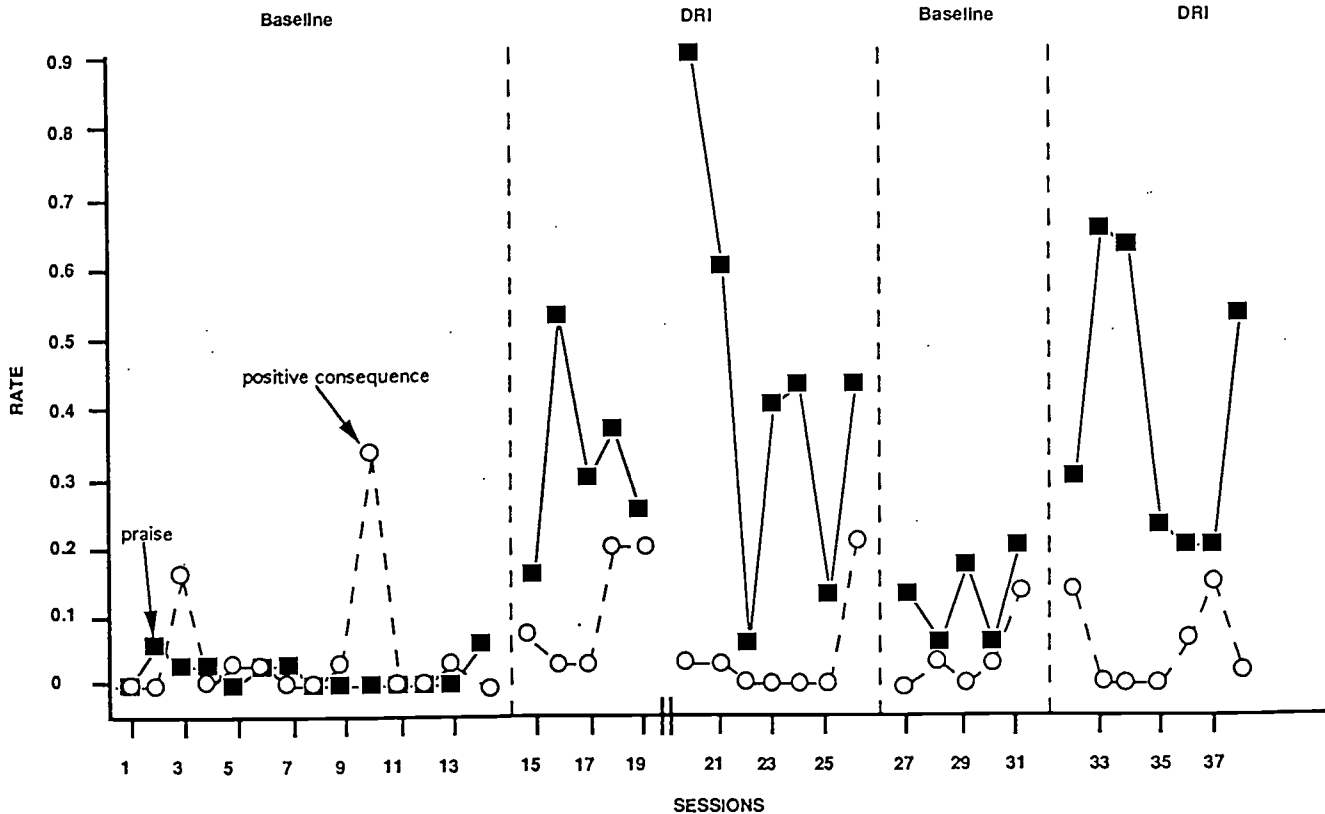


FIGURE 8. Rate of teacher praise statements and positive consequences directed to Billy.

lar to the decrease in the conditional probabilities of the coded events on which the interventions were based. In the first experiment, the mean rate of disruption decreased from .45 to .25 concurrent with a decrease in the conditional probability of handraise antecedent to disruptions from .37 to .15. This represents a 55% decrease in the rate of disruptive behavior and a 56% decrease in the conditional probability. In the second experiment the rate of disruptions decreased 45% concurrent with a 40% decrease in the conditional probability that disruptive behavior was preceded by the stop code.

In Experiment 4, the proportional changes between the rate of the disruptive behavior and the conditional probability of the code used to form the hypothesis (i.e., stop code in combination with teacher attention to disruption) were not consistent. That is, disruption decreased by 72% while the conditional probability of teacher attention to disruption decreased by only 38%. Additionally, the conditional probability of the stop code antecedent to disruption decreased by only 12%.

Several potential explanations are possible for the discrepancies in the predictions of Experiments 1 and 2 as compared to Experiment 4. However, the most likely explanation, based on the work by Bakeman and his colleagues (e.g., Bakeman, Adamson, & Strisik, 1989; Bakeman & Brownlee, 1980; Bakeman & Gottman, 1986), is that the rate of disruption during intervention in Experiment 4 was too low to provide a large enough sample for the conditional probabilities to be used in making accurate predictions (and hypotheses regarding critical stimuli associated with the behavior). How big a sample of behavior is necessary to form accurate hypotheses, is a question that needs further research.

In summary, lag sequential analysis as a functional analysis tool in clinical settings may be limited at this time. The time in collecting sequential data (including training data collectors) is currently inefficient for clinical application when compared to simple Antecedent-Behavior-Consequence observation procedures

used by an experienced behavior analyst. However, the potential for such analysis procedures to contribute to our sophistication in identifying the critical social stimuli associated with both prosocial and antisocial classroom behavior is apparent. The results of these experiments indicate that further examination of lag sequential analysis as a tool in both the study of classroom behavior and in developing classroom management programs is warranted.

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#### Authors' Notes

1. The research presented in this manuscript was supported by Grant No. HO23C00127-92 from the Department of Education, Office of Special Education.
2. The authors wish to thank the administrative and support staff of the Tri-County Special Education Cooperative and the Southeast Kansas Special Education Cooperative for their participation in this research effort. The authors also express their gratitude to the research aides of this project: Mike Dixon and Laura Cruz. Additionally, the authors wish to express their appreciation to Joseph Spradlin and Kate Saunders for their comments on earlier versions of this manuscript.

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APPENDIX D

A Case Study of the Effects of Aversive Stimuli in Instructional Interactions on the Disruptive Behaviors of a Child Identified with Severe Behavior Disorders <sup>1</sup>

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<sup>1</sup> Preparation of this manuscript was partially supported by grant HO23C00127-92 from the Department of Education, Office of Special Education.

## Abstract

The authors of this manuscript propose that the manner in which academic information is presented to students with severe behavior disorders (SBD) may present them with aversive stimuli. Aversive stimuli result in escape and avoidance behaviors which, for students with SBD, may be disruptive. A single case study was conducted to functionally assess this hypothesis using an ABAB design. The results of the study indicated that the subject's disruptive behaviors were decreased concurrent with an instructional sequence which presented the student with information to complete a task prior to asking the student to do so. The results are discussed in terms of the need for further research concerning negative reinforcement paradigms in classrooms. Additionally, the need is presented for teacher training programs to incorporate emphasis on effective instructional interactions.

## A Case Study of the Effects of Aversive Stimuli in Instructional Interactions on the Disruptive Behaviors of a Child Identified with Severe Behavior Disorders

Recently, the hypothesis has been presented that the way in which classroom instructional information is presented to students with severe behavior disorders (SBD) may provide stimuli that are aversive to them (Gunter, Denny, Jack, Shores, & Nelson, in press). Even though the aversive stimuli may be unintentional, they by definition result in escape and avoidance responses (Sidman, 1989; Skinner, 1989). For children identified as SBD their escape and avoidance responses may be disruptive (Gunter, Denny, et. al., in press; Shores, Gunter, & Jack, 1993).

The hypothesis that instructional interactions may produce aversive stimuli for students with SBD resulted from classroom observations by Shores and his colleagues (Gunter, Jack, Shores, Carrel, & Flowers, in press; Shores, Jack, et al., 1993; Shores, Gunter, Jack, et. al., 1993). They found that teachers presented children tasks to perform (mands) with the information to perform that task, at best, only about 20% of the time. Gunter, Denny, et al. (in press) concluded that this strategy might be sufficient for children without disabilities to respond with desired behaviors (i.e., correct responses). However, being asked to perform a task without the skills or information to do so may be aversive for students with SBD (Gunter, Denny, et al., in press) who are identified in part by their deficient academic skills (Ruhl, & Berlinghoff, 1992). Again, their escape from the aversive stimuli may be in the form of disruptive behaviors. Such conclusions have been drawn from studies with



children with severe developmental delays (e.g., Weeks & Gaylord-Ross, 1981) in which disruptive, aggressive, and self-injurious behaviors decreased concurrent with errorless instruction on self-care tasks.

With many of the characteristics of errorless learning, effective instructional strategies have been advocated by the Council for Exceptional Children (CEC, 1987), as well as direct instruction advocates (Carnine & Silbert, 1979; Engelmann & Carnine, 1982; Silbert, Carnine, & Stein, 1981). Both of these strategies place a strong emphasis on the teacher modeling a desired response prior to soliciting that response from students. The observations by Shores and his colleagues indicate that this sequence seldom occurs in either general education or special education classrooms for students with SBD.

The purpose of this study was to investigate the hypothesis presented by Gunter, Denny, et al. (in press) that instructional sequences may present children with SBD aversive stimuli which maintain disruptive behaviors through a negative reinforcement paradigm. It was hypothesized that by providing information that would insure correct responses to a teacher's mands, not only should compliance increase, but the student's disruptive behavior (escape and avoidance behavior) should decrease.

## Methods

### Subject

The subject for this study, Tom, was a 12 year old male identified with severe behavior disorders. His teacher indicated that he had tested within the normal range of intelligence on a WISC-R, however, his academic skills were at roughly the second grade level.

Tom had been identified as SBD due to his high rates of disruptive behavior. He was identified as aggressive by his teacher's rating of more than one standard deviation above the mean on the aggressive subscale of the Child Behavior Checklist, Teacher Report Form (Achenbach & Edelbrock, 1988).

### Setting

This study took place in a special education classroom in a regular public elementary school. The classroom was located in a wing of the school farthest from the administrative center and was of size comparable to other classrooms in the building. Throughout the study, only Tom and his teacher were present in the classroom.

### Observational Procedures

The behaviors targeted for observation were intended to represent an exhaustive exchange of social and instructional behaviors between the teacher and student. Table 1 presents the operational definitions for the behaviors coded.

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Insert Table 1 about here

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The observation codes were entered as they occurred into Toshiba T1000 laptop computers using the Multiple Option Observation System for Experimental Studies (MOOSES, developed by John Tapp of Vanderbilt University) by data collectors trained to reliable criterion of 80% agreement across all behaviors. Behaviors were entered as four digit codes indicating who emitted a behavior, the topography of the behavior, and to whom the behavior was

directed. Each observation session resulted in an event file with the sequence of behaviors recorded in real time. The MOOSES program was then used to calculate behavior rates, as well as sequential analyses that resulted in conditional probabilities (CP) of antecedent and subsequent behaviors to any behavior of interest (Bakeman & Gottman, 1986).

Interobserver agreement scores were also calculated by the MOOSES program by comparing the event files of two data collectors who simultaneously but independently observed and coded the sessions. Events were calculated as agreements if the two observers had entered the same four digit code within a 5-second window. Disagreements were indicated if any deviation of the four digit code was entered or if one observer failed to insert a code or inserted a behavior not recorded by the other. The MOOSES program then calculated interobserver reliability scores by the exact agreement formula:  $\text{agreements} / (\text{agreements} + \text{disagreements}) \times 100$ .

### Experimental Procedures

Baseline. During baseline conditions, thirty minute observations were scheduled to occur in the classroom (mean length of observations was 26.98 minutes). The observations began when the teacher presented Tom his math assignment for that day. The math assignment consisted of 5 to 15 multiplication problems the teacher had written on the blackboard. The difficulty level of the problems ranged from simple one digit by one digit calculations to four digit by one digit calculations with regrouping. Tom was told to complete the problems independently and when finished, the teacher reviewed the problems with Tom for errors and provided feedback.

Often the feedback was in the form of a mand. For example, if Tom had miscalculated  $6 \times 4$ , the teacher would ask, "What's  $6 \times 4$ ?"

Intervention. All procedures of intervention were consistent with those of baseline with the exception that prior to manding alone during the correction of errors, the teacher was asked to provide Tom with the correct information to remediate the error prior to asking for the information. This procedure will be presented as and discussed as a "Talk/Mand" procedure. For example, if Tom had miscalculated  $6 \times 4$ , the teacher would say, "Tom  $6 \times 4$  is 24. What's  $6 \times 4$ ?" Daily feedback was provided to the teacher regarding the conditional probability that talk (information) preceded mands.

#### Experimental Design

An ABAB design (Tawney & Gast, 1984) was used to determine the effects of an increased probability of teacher talk before mands (independent variable) on Tom's disruptive behaviors (dependent variable).

#### Results

Interobserver agreement observations were conducted on 30% of the sessions. The overall event agreement between two data collectors across all behaviors was 87.21% (range= 74.4 to 100).

Figure 1 presents the session by session rate of Tom's disruptive behaviors. As can be seen, his disruptive behavior decreased concurrent with the implementation of the talk/mand procedure. The mean rate of disruptive behaviors during the baseline conditions was .28. The mean rate of disruptive behaviors decreased to .09 during the two intervention phases.

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Insert Figure 1 about here

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The probability that teacher talk would precede teacher mands in baseline conditions was  $CP=.24$ . This probability increased to  $CP=.36$  during interventions. The rate of the talk/mand sequence increased from .61 during baseline conditions to .77 during interventions. However, little change was evident in the rate of mands across conditions (2.48 during baseline and 2.39 during interventions).

By utilizing lag sequential analysis and calculations of behavior frequencies from the exhaustive data codes, other behaviors which might have been responsible for the change in the rate of disruptive behaviors were also examined. The probability of Tom's compliance to academic mands increased from  $CP=.63$  during baseline conditions to  $CP=.77$  during interventions. However, the conditional probability that Tom's compliant behaviors would receive teacher verbal praise only increased slightly ( $CP=.08$  in baseline conditions to .097 during interventions). Additionally, teacher feedback following Tom's compliance decreased from  $CP=.279$  during baseline conditions to  $CP=.16$  during interventions.

#### Discussion

As a case study, this investigation lacks the scientific rigor necessary for broad generalization, however, it does provide pilot information for future investigations to more clearly identify the relationship of teacher instructional behaviors to student behaviors. First, the operational definition of the talk category used will need to



be more specific. In studies planned by the authors of this manuscript, talk related to instructional information versus social talk will be distinguished. Additionally, future studies will distinguish between correct and incorrect compliance. Second, control of the independent variable was limited in this pilot study. That is, during the intervention phases, the talk/mand instructional sequence was only applied to correction of errors which only occurred during a small portion of the thirty minute observation. Future studies should distinguish instructional strategies used during initial instruction and error correction. Additionally, the probability of talk preceding mands was only increased by twelve percent; this was a lower probability increase than was hoped for. Even though the intent of this investigation was to study instructional sequences in natural environments, highly controlled experimental conditions may be necessary to gain complete control of the independent variable (i.e., teacher behavior). Finally, the use of only a single subject makes it very difficult to generalize the findings, and because the subject left the school with only minimal data for the second intervention, it is difficult to determine the lasting effects of the procedure. Obviously, direct and systematic replications are needed.

Beyond the limitations presented, the results did indicate the potential for more effective instructional strategies to not only increase academic performance (i.e., a 14% increase in compliance to teacher academic mands), but to reduce disruptive student behaviors concurrently. It is interesting to note that while the probability of teacher talk preceding academic mands increased during intervention conditions (CP increased by 12%), the conditional

probability of Tom's compliance to mands increased in a similar manner (CP increased by 14%). Similar predictions of behavior change through the use of lag sequential analysis have been reported elsewhere (Gunter, Jack, et al., in press).

The hypothesis investigated in this study was that teacher mands may have been aversive stimuli. Tom had demonstrated that he did not know the academic information (based on his errors) for which his teacher was asking him to respond. By giving him the correct answer and then asking him to respond, the teacher presented him with an appropriate means to escape her mand (i.e., the correct answer). This form of desirable escape potentially provided Tom with an alternative to an undesirable escape behavior (i.e., disruption). Additionally, the reduced conditional probability of teacher feedback following Tom's compliance may indicate that his compliant responses were more accurate. The complexity of an adequate understanding of such negative reinforcement paradigms is in great need of further investigation (Carr, Taylor, & Robinson, 1991; Gunter, Denny, et al., in press; Iwata, 1987; Iwata, Vollmer, & Zarcone, 1990; Sidman, 1989).

The results of this investigation when incorporated with the already available literature (Carnine & Silbert, 1979; CEC, 1987; Engelmann & Carnine, 1982; Good & Brophy, 1987; Silbert, Carnine, & Stein, 1981) present strong evidence of the necessity for teachers to use more effective instructional strategies than those currently observed in most classrooms (e.g., Shores, Gunter, Jack, et al., 1993; Shores, Jack, et al., 1993). The implication is that teacher training programs should incorporate strong emphasis and practice using

effective instructional strategies. Additionally, because negative reinforcement paradigms may be the most common reinforcement paradigms in classrooms (Sidman, 1989; Skinner, 1989), there is need to ensure that teachers understand how their behavior contributes to the undesired escape and avoidance behaviors of students with SBD that may result from unintentional aversive stimuli presented to them.

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Table 1

Description of Behavior Codes

Compliance Response - an actor does what is commanded, initiates the appropriate response that is commanded or states that he or she will do so within 10 seconds of a mand. Must immediately follow a mand

Positive Social Mand - verbal or physical statements that command a specific and immediate social response. Includes:

1. "To do" statements that makes a demand for a student social response.
2. Calling a person by name to get their attention in an appropriate manner.

Negative Social Mand - verbal or physical statements which request the absence or termination of an immediate and specific social response without reference to academic instruction (see negative instructional mand)

Positive Instructional Mand - verbal or physical statements that command a specific and immediate academic response. Includes "to do" statements that make a demand for a student academic response. May include specific questions which require an immediate academic response.

Negative Instructional Mand - verbal or physical statements which request the absence or termination of a specific academic response.

Handraise - hand is up; is a form of manding.

Promise of Positive Consequences - "if...then" statements that establish a relationship between a behavior and future positive consequences. Is scored only when the consequences are clearly positive, such as extra free time, tokens, special trips or visits to special people.

Threat of Aversive Consequences - "if...then" statements that establish a relationship between a behavior and future aversive consequences.

Positive Physical - purposeful contact which displays affection and is not obviously teasing or aggressive.

Negative Physical - physical interruption of an ongoing response or interaction; removal or attempt to remove materials in possession of another person.

Physical Aggression - physical contact that is potentially harmful to self, others or property

Negative Verbal/Gestural - statements or actions whose intent is to provoke, annoy, pester, mock or make fun of a person; in which physical aggression is threatened to person or property; which is any obscene gesture or verbal statement; or which is arguing or disagreeing with another person (protest) or refusing to comply with a mand.

Disruptive - generally nondirected inappropriate behavior.

Feedback - statements which provide information and/or clarification of a behavior without qualitative judgements (see positive and negative consequences). Must refer to a response occurring immediately prior to feedback-cannot refer to behavior that occurred in the past.

Positive Consequence - verbal statement or gesture indicating approval of behavior over and above an evaluation of adequacy or a verbal statement that specifies which positive consequences will follow which behaviors. Also includes the delivery of tangible events or activities which serve as potential reinforcers.

Negative Consequences - verbal statement or gesture indicating disapproval over and above an evaluation of adequacy or a verbal statement that specifies which aversive consequences will follow which behaviors.

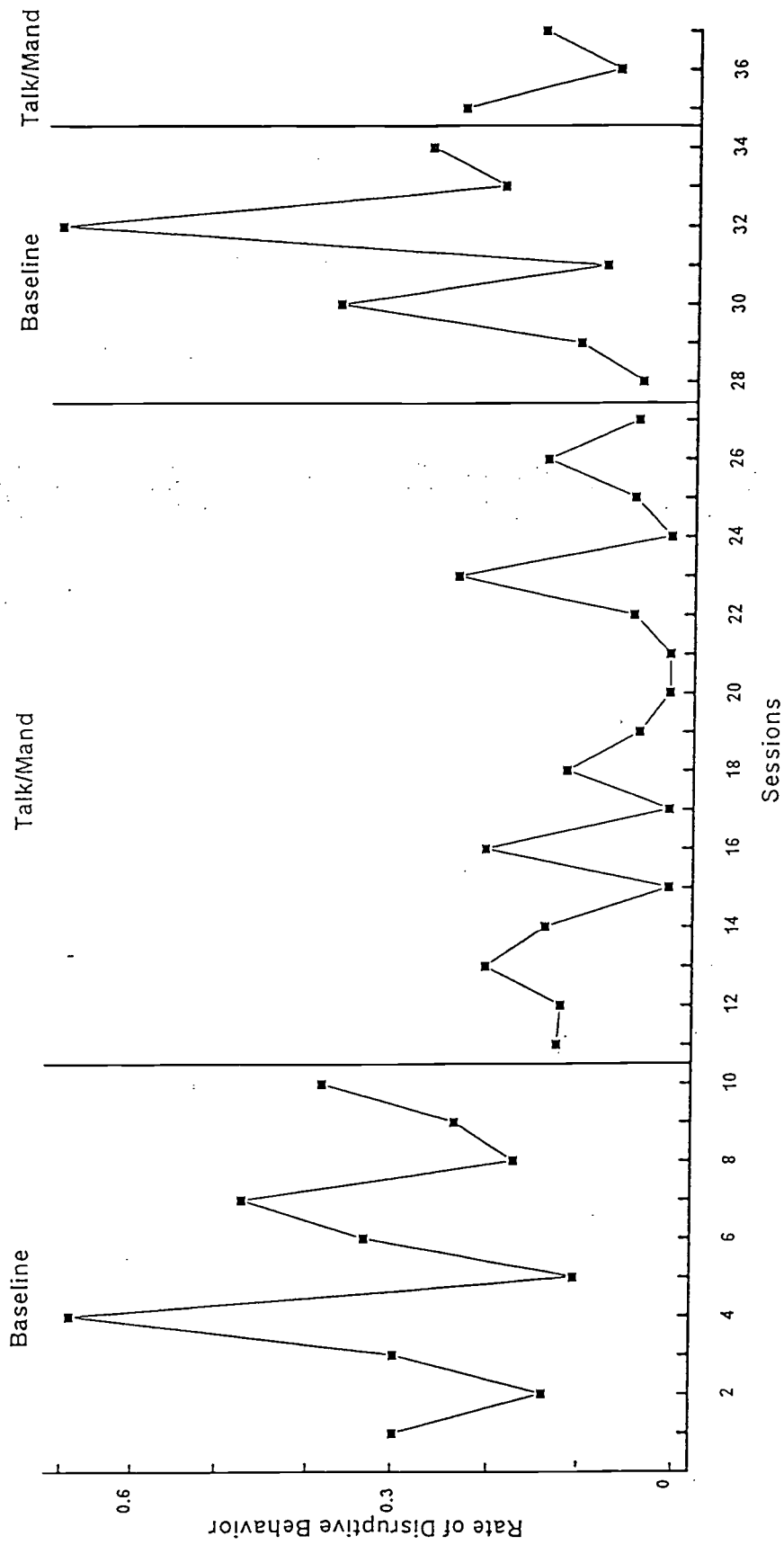
Also includes the removal of reinforcing objects or removal of concrete events/activities that may have reinforcing effects

**Withdrawal** - actor physically removes self from a negative interaction (follows any negative behavior from another person)

**Talk** - any verbal behavior of social or academic content that does not fit into any other category. Includes social or academic lectures, or when two or more statements are issued by the same actor. This includes the mands that cannot be immediately complied with, (eg. "When you get home, tell your mother to call me.") May include questions that do not demand an immediate response. (If an immediate response is called for as in academic questioning, a instructional mand should be scored.)

Figure Captions

Figure 1. Rate of Tom's disruptive behaviors during baseline and intervention conditions.



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APPENDIX E



TEACHER/STUDENT PROXIMITY: A STRATEGY FOR CLASSROOM CONTROL  
THROUGH TEACHER MOVEMENT

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Preparation of this manuscript was partially supported by grant H023C00127-92 from the Department of Education, Office of Special Education Programs. The authors wish to thank the administrative staff of the Tri-County Special Education Cooperative and the administrative and support staff of the schools in Southeast Kansas who are actively participating with us in research efforts. The authors wish to thank Dr. R. Kenton Denny for his thoughtful comments on earlier drafts of this manuscript.

*In Press: Teaching Exceptional Children*

## ABSTRACT

In this manuscript we present information from existing and ongoing research regarding the effects of teacher/student proximity as a behavior management strategy that may be related to teacher classroom movement. Recommendations are presented that should allow teachers' to monitor their own movement in classrooms to capitalize on proximity control as a behavior management strategy to enhance the positive reciprocal interactions between teachers and students.

TEACHER/STUDENT PROXIMITY: A STRATEGY FOR CLASSROOM CONTROL  
THROUGH TEACHER MOVEMENT

Teachers are continually seeking means to control students' disruptive behaviors in general education and special education classrooms (Aksamit, 1990). Addressing this concern, Shores, Gunter, and Jack (in press) completed a literature review and position paper regarding classroom management strategies found to effectively control student inappropriate behavior. One of the strategies discussed was teacher movement in the classroom. The position presented by the authors was that teacher movement in the classroom may effectively control student disruptions by bringing the teacher into closer proximity to all students, thereby increasing the effectiveness of their interactions with students. It was suggested that closer proximity might be conceptualized as a setting event (Brown, Bryson-Brockmann, & Fox, 1986; Hendrickson, Gable, & Shores, 1987; Kantor, 1959; Wahler & Fox, 1981). Proximity as a setting event may have weak direct effects in controlling student behavior, but it may function to increase the power of the teachers' positive or coercive interactions with students. This type of control of the teacher/student interaction may be one interpretation of why proximity control is effective (Shores, et al., in press).

Proximity control has been recommended as one of the most easily implemented techniques to decrease student disruptive behavior (Glass, Christiansen, & Christiansen, 1982). Proximity control may be

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exemplified by such teacher behaviors as standing near some students or placing a student's desk close to the teacher's primary work area. Etscheidt, Stainback, and Stainback (1984) suggested that proximity control works by providing "an external model of control that strengthens the student's own ability to control his or her own behavior" (p. 35). However, Shores et al. (in press) applied a more behavioral conceptualization by suggesting that teacher proximity to students may simply allow more effective social exchanges between teachers and students. Obviously, how teacher proximity works to aide in control of disruptive student behaviors is not clearly understood. However, we will present information gathered from studies currently published and from our own ongoing investigations to suggest the validity of teacher proximity to students as a behavior management strategy.

#### Demonstrated Effectiveness of Proximity Control

Certainly, there is ample support for the positive effects of teacher proximity on student behavior. For example, Fifer (1986) found that in general education classrooms where the teachers remained in the front of the classroom for presentation of materials, student disruptions occurred toward the back of the rooms and positive teacher/student instructional interactions toward the front. However, when teachers moved about in the classrooms, disruptions throughout the classrooms decreased and interactions were more evenly distributed. Van Houten, Nau, MacKenzie-Keating, Sameoto, and Colavecchia (1982)

determined that reprimands given to one elementary aged boy were more effective in the control of disruptive behavior when given from a distance of one meter than from a distance of seven. Additionally, Etscheidt et al. (1984) found that a child identified as the most disruptive of 40 students in a fourth grade was much less disruptive when the teacher was within at least a three foot radius of the student.

Some studies have indicated potential "spill over" effects of teacher/student interactions in close proximity. For example, Broden, Bruce, Mitchell, Carter, and Hall (1970) found that when one student was praised for appropriate behavior, there was a concurrent increase in appropriate behavior of the student in an adjacent seat. The authors suggested that this concurrent behavior change was due to the closer proximity of the teacher to both the target and non-target students when praise statements were delivered to the target student. Similar results were reported by Okovita and Bucher (1976). They determined that tokens awarded to one student increased attending behavior of that student and resulted in increased attending behavior of the students in seats on both sides of the student who was given the tokens. Van Houten et al. (1982) reported this same type of effect on the disruptive behaviors of a student in an adjacent seat when reprimands were given to a target subject for disruptions. Again, these authors suggested that proximity of the teacher to the non-target child was the variable responsible for the effect.

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In our own pilot studies in classrooms for children identified with severe behavior disorders, we have observed that student academic engagement during independent work seemed to increase when the adult responsible for supervision of the area in which a student sat was moving about that area (mean percentage of intervals on task =.91). When the adult remained seated at their desk, student academic engagement decreased (mean percentage of intervals on task =.76). We speculate that teacher/student interactions prompted by closer proximity may be at least partly responsible. For example, in another pilot study, we found that the rate of teacher praise statements was higher (mean rate =.69) when the teacher remained in a carpeted area within approximately 10 feet of the student than when the teacher remained outside this area (mean rate =.44). Interestingly, in both conditions, the rate of teacher praise was prompted by a wristwatch with a countdown function to produce a rate of teacher praise of .3 per minute. In the closer proximity condition, the rate of teacher praise more than doubled that which was prompted, and student disruptions were slightly lower in the closer proximity condition.

Based on these studies, we have speculated that teacher proximity to students may function as a setting event for more student academic engagement and in turn, more positive interactions. Again, as a setting event, the effect is weak, however, in the case of our studies, the effect seemed to be in terms of an increased rate of teacher praise. This concept might be further supported by such studies as the one by Travis



(1977) in which the results indicated that second graders who approached the teacher and tended to remain in proximity to the teacher received more praise and were rated as more cooperative, social, and industrious by their teachers.

Interestingly, it appears that teachers may not take advantage of this very simple technique for classroom control. Denny, Epstein, and Rose (in press) found that teachers in vocational settings spent the majority of their time in activities other than interacting with students. This finding could be related to the lack of teacher movement in the classroom. For example, the results of our observations in classrooms for students with severe behavior disorders indicate that the classroom staff may spend the majority of the time seated at their desks. In fact, in one study, we found that the paraprofessional responsible for monitoring the area of the target student was observed to remain seated 91.7 percent of the time. Again, as the time the paraprofessional was seated decreased, student academic engagement increased.

#### Recommendations

Recommendations for when and where teachers should use proximity control are unclear at this time and more research is needed. However, some recommendations can be extrapolated from the empirical evidence available. First, most research to this point has involved effective measures of proximity as within approximately three feet (Etcheidt et al., 1984; Van Houten et al., 1982). Additionally, in the Van Houten et al. study, the results indicated that the teacher did not have to constantly

remain in proximity of the student but only had to deliver consequences in proximity. Again, these findings are consistent with our own in classrooms for students with severe behavior disorders. Additionally, these findings are consistent with the recommendations of Good and Brophy (1987) in the effective schools literature. They suggested that the teacher should have brief interactions with students as they circulate to monitor independent seat work.

From the Broden et al. (1970), Okovita and Bucher (1976), and Van Houten et al. (1982) studies, it is apparent that the proximity of students to other students is also a factor that may impact on control of disruptive behavior. In each of the studies, the authors presented "spill over" effects to a non-targeted student sitting in an adjacent desk to the target student that potentially resulted from the reinforcement or reprimands of the teacher to the target student. Somewhat contrary to this however are the findings that greater distance or space between students' desks appears to decrease inappropriate student behavior. Some researchers explain this effect by the difficulty students have gaining each others attention (Adams, 1969; Adams & Biddle, 1970; Axelrod, Hall, & Tams, 1979; Haubrich & Shores, 1976). The optimal spacing of students' desks would be an arrangement to allow the greatest ease of teacher movement throughout the classroom while maintaining enough distance to decrease the potential for students' interactions with other students during independent work. At the same time, the distance should not be

so great as to prohibit the teacher from capitalizing on the potential "spill over" effect of his/her interactions with individual students.

In order for the teacher to increase movement around the classroom and potentially increase proximity to all students, the teacher should develop a way to monitor his/her current movement patterns. One of the most simple ways for the teacher to do this is to videotape segments of his/her classroom activity (Banbury & Hebert, 1992; Shores, Gunter, & Jack, in press). By reviewing these tapes the teacher should be able to determine if he/she equally distributes movement and attention to all students. After modification based on viewing these tapes, the increased teacher mobility should result in less student disruption and increase the likelihood that the teacher can reinforce appropriate student behavior. In situations where the teacher may not have access to videotape equipment, peer teachers or supervisors may be asked to monitor teacher movement and provide feedback (Good & Brophy, 1987). Fifer (1986) presented a data collection format for this purpose. Certainly, simpler formats may also be developed by the teacher to self-monitor classroom movement. For example, the teacher might place pieces of posterboard throughout the classroom and mark the poster each time he/she passes it. A frequency count at the end of the day would indicate the number of times the teacher was in each location, and adjustments could be made accordingly.

Good and Brophy (1987) indicated that students in elementary classrooms spend as much as 70% of their time assigned to independent

seatwork. The authors of this paper take the same position as that of Good and Brophy (1987) and recommend that the interactions of the teacher and student in classrooms surrounding seatwork is in great need of research because this seems to be the activity in which students are assigned most of their school day. However, until such research is conducted and disseminated, the evidence seems to indicate that closer proximity of teachers to students should at least enable teachers to more effectively use their interactions to increase student academic engagement and decrease student disruptions.

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