JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1975, 8, 27-42 NUMBER 1 (SPRING 1975)

SOME STRUCTURAL ASPECTS OF DEVIANT CHILD BEHAVIOR[1]

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Covariation within behavior repertoires of problem children were examined. Two boys, referred for psychological help, were observed both at school and at home for about 3 yr. A coded observation system permitted scoring of 19 child-behavior categories and six social-environment categories. After a two-month baseline, behavior categories were intercorrelated, demonstrating that each child showed a group of behaviors that covaried. These groupings were specific to the home and school settings. Contingency management procedures were then applied to each child's problem behaviors in *one* setting. Next, a reversal phase was instituted, followed by resumption of the initial contingency management phase. These three phases lasted seven months, until the end of the children's public school terms. Results showed that the baseline group of covarying behaviors continued to covary over the three experimental phases. The children then entered a remedial education setting for three summer months, and then returned to schools and were observed in follow-up for 2 yr. The baseline group of behaviors continued to covary during both phases. The behavior covariations could not be accounted for on the basis of temporal relationships between the behaviors and social environment categories. Although no behavior covariations extended across either child's home and school settings, contingency management procedures produced across-setting effects.

DESCRIPTORS: behavioral covariation, children, oppositional behavior, classroom behavior, generalization, home observations, predelinquents

Early in the development of child behavior-modification procedures, it was recognized that topographically different responses might be functionally interdependent. Bijou and Baer (1967) and Lovaas (1961) argued that physically different behaviors could be controlled as a *response class* by a commonly contingent environmental event or events. For example, imitation has been shown repeatedly to constitute a class of physically different behaviors, all tied functionally to the behavior of a human model (Baer and Sherman, 1964; Steinman, 1970).

Recently, further data reflecting the interdependencies of various behaviors produced by an individual problem child have been presented. Wahler, Sperling, Teeter, Thomas, and Luper (1970) discovered that contingency management procedures that improved nonverbal problem behaviors of two boys referred for stuttered speech, also resulted in improved speaking. Experimental test probes showed that the shifts in stuttering were dependent on changes in the nonverbal behaviors, but that there were no systematic changes in measured environmental stimuli for the stuttering. Likewise, Sajwaj, Twardosz, and Burke, (1972) discovered that contingency management of a preschool boy's "nagging" reduced the frequency of this response, but also produced experimentally documented changes in other aspects of the boy's behavior. He reliably increased his verbal approaches to other children, became increasingly cooperative in his play with them, played less with girl's toys,

[1]This study was supported by MH 18516-3 from the National Institute of Mental Health, Crime and Delinquency section. Thanks are also due to Betty House for her research coordination and to Michael Johnson for his consultation on statistical aspects of the study. The author is also indebted to Donald Hartmann and Gerald Patterson for their help in the final organization of this manuscript. Reprints may be obtained from the author, The University of Tennessee, Department of Psychology, Psychology Clinic, 1303 West Cumberland, Knoxville, Tennessee 37919.

and became increasingly more aggressive with adults. These behavior covariations could not be accounted for by systematic shifts in the measured environmental stimuli.

The importance of pursuing response-class phenomena is evident from both practical and theoretical perspectives. *If a child's behavior repertoire is indeed organized into functional "clusters", it is conceivable that his or her deviant actions might be modified indirectly.* Thus, behaviors difficult to deal with directly, such as stealing, might be modified by the contingent management of behaviors more easily dealt with. In contrast, it is possible that contingent management of deviant behavior might produce undesirable changes in the child's behavioral repertoire. Both of these possibilities are of enormous practical importance.

Secondly, as Willems (1973, 1974) pointed out, we know comparatively little about the organization of behavioral repertoires and their environmental settings. It may well be that the operant model adequately describes these organizations, although previous studies (Sajway *et al.,* 1972; Wahler *et al.,* 1970) suggest otherwise. Clearly, further data reflecting on this theoretical issue are needed.

The present study was initiated to explore such "structural" features of deviant child behavior in natural environmental settings. Structural refers to regularly occurring interrelationships between deviant and other behaviors. In addition, the term refers to relationships between these behaviors and events comprising the child's social environment. Thus, such clusters would describe natural covariations among behaviors and among behaviors and environmental events.

METHOD

Subjects

Two male children referred to the author's predelinquency research project because of rule-breaking behavior in school classrooms or homes, or refusals to comply with parent and/or teacher instructions, served as subjects. One child was considered a problem at school, but not at home; the other was considered a problem in both settings. The complaints for each subject are outlined in separate sections describing findings for each child.

Environmental Settings

Behavior was observed at home and school for both subjects for three reasons: (1) one subject was considered deviant in both settings; (2) if a child's behaviors are interrelated, it would be of interest to determine if some behavior clusters extend across home-school settings; (3) it would be of interest to determine the effects of therapeutic changes of one problem behavior on other behaviors produced by that child. If a child's various behaviors are organized in clusters of some sort, to what extent will contingency management procedures affect that child's behavior both *within* and *across* environments?

It should be noted that observational studies to date argue against the notion of across-setting behavioral relationships. Extending back to the classic observational work of Hartshorne and May (1928), the real-life field work of Barker and Wright (1955), and including the more recent observational-experimental work of Wahler (1969) and Patterson (1969), a child's various behaviors appear setting-specific. However, none of these investigators has attempted the breadth of correlational and experimental analyses of within- and across-setting events reported here.

Apparatus

Because of the need to assess a broad spectrum of child behaviors and environmental events, an observational coding system that would permit reliable recording of multiple behaviors and environmental events was developed. Following a somewhat arbitrary criterion, the environmental setting was restricted to social events provided by adults and children, a class of environmental events often temporally associated with child problem behavior.

Table 1 presents a brief outline of categories

Table 1

Brief descriptions of category codes used to record direct observations of subjects and their interaction associates at school and home. These descriptions are *not* given in enough detail to permit reliable observer scoring. The complete coding system will soon be available (Wahler, House and Stambaugh, *in press*).

Adult Instruction (*Nonaversive*) (*IA*+). This category is scored for direct commands by an adult.

Adult Instruction (*Aversive*) (*IA*—). This category is scored for those direct commands by an adult that are judged to be aversive by an observer.

Adult Social Attention (*Aversive*) (*Sa*—). This category is scored for adult noninstruction contacts with the target child. The observer must also consider the contact to be aversive.

Adult Social Attention (*Nonaversive*) (*Sa*+). This category is scored for adult noninstructional contacts with the target child.

Child Social Attention (*Aversive*) (*Sc*—). This category is scored for any peer behavior directed to the target child. The observer must also consider this behavior to be aversive.

Child Social Attention (*Nonaversive*) (*Sc*+). This category is defined in the same manner as Sc—. However, in this case the observer does not judge the behavior to be aversive.

Opposition (*O*). This category is scored for target child behaviors that are rule violation or noncompliances with adult instructions.

Aversive Opposition (*O*—). This category is identical to opposition (O), but also is judged by the observer to be aversive in content.

Compliance (*C*). This category is scored for target child compliance with adult instruction.

Self Stimulation (*S*). This category is scored for any instance of the target child's manipulation of his body.

Object Play (*Op*). This category is scored for any instance of the target child's simple manipulation of objects.

Sustained Noninteraction (*NI*). This category is scored for a full 10 sec of target child noninteraction with people or objects.

Sustained Schoolwork (*Ss*). This category is scored for a full 10 sec of schoolwork by the target child.

Sustained Toy Play (*St*). This category is scored for a full 10 sec of target child play with objects.

Approach Child (*Ac*). This category is scored for any spontaneous approach to peers by the target child.

Approach Adult (*Aa*). This category is scored for any spontaneous approach to adults by the target child.

Social Interaction Child (*SIc*). This category is scored for any interaction between peers and the target child.

Social Interaction Adult (*SIa*). This category is scored for any interaction between adults and the target child.

relevant to the present study. The complete, and more detailed listing of the coding system will be available shortly, (Wahler, House, and Stambaugh, *in press*).

In most cases, categories could be coded independently. However, a few categories were defined such that observer scoring of one category either precluded or required scoring of other categories (see Table 2). These artifactual relationships are discussed in the Results section. Obviously, the interpretation of any obtained response cluster or class hinges on the degree to which response-category definitions force such an outcome. For example, the noninteraction category (NI) shown in Table 2 is likely to display inverse relationships with a number of other categories.

Observer Scoring of the Categories

Each observer carried a portable tape recorder that announced by earphone consecutive 10-sec observation intervals and interspersed 5-sec recording intervals. Observers would watch the child-subject and his adult and child interaction associates for 10 sec and then record on scoring paper during the next 5 sec all categories that occurred in the preceding 10-sec interval. Since observation sessions were restricted to half-hour periods, a maximum of 120 units of category occurrences could be scored.

Observation Sessions and Scoring Procedures

Scheduling of observation sessions in the subject's home and school was determined by interviewing both parents and school teacher. These adults specified the time of day when the subject was most likely to display his *problem* behavior, or if he was not considered deviant in the setting, his most *typical* behavior. It is important to note that home and school observations were made during the same day for each subject. This requirement was established to explore the environmental boundaries of each child's behavior repertoire. If interrelationships among a child's various behaviors extend across environmental settings, it seemed that a likely means of detect-

Table 2

Forced relationships among those categories scored for subjects in this study. The "must score" column presents categories likely to display positive correlations with those scored in the left column. The "cannot score" column presents categories likely to display negative correlations with those scored in the left column.

If Scored	*Must Score*	*Cannot Score*
Noninteraction (NI)		Sustained Schoolwork (Ss) Sustained Toy Play (St) Approach Adult (Aa) Approach Child (Ac) Social Interaction Adult (SIa) Social Interaction Child (SIc)
Instruction (IA+) (IA−)	Compliance (C) or Opposition (O)	
Sustained Schoolwork (Ss)		Sustained Toy Play (St)
Sustained Toy Play (St)		Sustained Schoolwork (Ss)
Social Interaction (SIa) (SIc)	Instruction (Ia+) (Ia−) or Social Attention (Sa+) (Sa−), (Sc+), (Sc−)	

ing such covariations would entail monitoring the two settings in close temporal proximity. Efforts were made to schedule the paired home and school observations five days per week. However, because of numerous fluctuations in family and school activities, most of the daily paired observations occurred three times weekly.

Observers

Four graduate students in psychology served as observers. Each was assigned to a home or school setting such that no observer viewed the same subject in more than one setting. Once weekly during the experimental phase of this study, each observer was checked for reliability by one of his coworkers. During the 2-yr follow-up phase, these checks occurred bimonthly.

Experimental Conditions

While correlational analyses were a central feature of this study, experimental manipulations were employed to assess the stability of obtained behavioral covariation as follows:

1. Baseline. This phase was employed to assess natural covariations among each child's behaviors within and across his home and school environments. This pretreatment phase lasted at least two months for both subjects.

2. Treatment I. This phase was initiated to modify target behaviors for each subject in *one* setting. In both cases, the targeted behaviors constituted the principal complaints concerning the subjects. An identical contingency management program was thus established at school for one subject and at home for the other. In essence, the responsible adults were trained to use a combined timeout and positive reinforcement procedure. For Subject 1, timeout was contingent on behaviors (object manipulations) that distracted peers and teacher. For Subject 2, violations of parental rules or noncompliance with parental instructions led to timeout.

The positive reinforcement program consisted of adult social approval and a point system permitting the subjects' access to reinforcers naturally available in the setting. For Subject 1, these contingencies were set for production of schoolwork. Independent toy play was targeted

as the desirable behavior to be reinforced for Subject 2. Treatment I was continued until clear changes were evident in all targeted behaviors.

3. Baseline II. This phase constituted a second experimental manipulation of the targeted behavior in each subject's behavior repertoire. The contingency management program was discontinued by instructing the adult mediators to stop temporarily their use of timeout and differential reinforcement. In both cases, this phase lasted for two weeks.

4. Treatment II. This phase, representing the third experimental manipulation of target behaviors, re-instated timeout and differential reinforcement. In all cases, this phase continued until the last month of each subject's school term (from three to four months). At the end of this phase, treatment conditions were implemented in the untreated setting. For one of the subjects, whose home behavior was not considered deviant, treatment involved efforts to support the school treatment program. These efforts required parents to dispense reinforcers upon daily receipt of a teacher-completed checklist indicating the number of desirable subject behaviors in the classroom. For the second subject, whose behavior was considered deviant in both settings, the school treatment was similar to the school contingency program for the first subject. However, timeout proved unnecessary for this boy.

5. Summer treatment. Since both subjects were academically deficient, it was decided to provide them with an intensive special education experience involving a one-to-one teacher-child relationship for three months. Because of the radical difference between this condition and the previous public-school environment, a fourth experimental variation in the targeted behaviors occurred here.

6. Follow-up. Each subject returned to his public-school environment after the summer-treatment phase was concluded. For 2 yr, each was observed once monthly in his classroom and home settings. In all cases, we briefly consulted with the subjects' teachers and parents at the beginning of the school term to provide a "refresher course" in contingency management. In one case, it was necessary to provide a few additional hours of contact with the teacher later in the year. The first follow-up year is referred to as Follow-up I; the second year is designated as Follow-up II.

Data Analysis

The basic measurement unit for the direct observational records was the per cent occurrence of each category for each session. Percentage scores were derived by considering the proportion of time intervals that contained each category. It is thus important to point out that the term "behavior covariation" refers to covariations among behavior categories over observation sessions. Therefore, if categories A and B covary over baseline sessions, this analysis would indicate that the two behaviors occurred together (or did not occur together) over the entire observation session. The analysis would not indicate whether or not the behaviors were related on a moment-by-moment basis within a session.

The process to examine behavior covariations was begun by arranging each category as a distribution of scores across sessions. The category score distributions were then subjected to a Pearson product-moment correlational analysis in which all possible intercorrelations were computed for all distributions. This analysis was first conducted for the baseline sessions and done separately for the school setting, the home setting, and the combined school and home settings. Thus, three baseline matrices were generated, reflecting natural covariations for each child's behavior within and across two environmental settings.

Next, each correlation matrix was examined to extract groupings of correlated behavior categories. This search was conducted through use of Johnson's hierarchial clustering technique (Johnson, 1967). This technique provides formal decision rules in reducing correlation matrices to a series of clusters. In essence, the extracted clusters were considered as possible response classes within the subjects' behavior repertoires.

Since it is possible that any correlation matrix as large as those derived in this study will yield some intercorrelations by chance alone, the baseline-obtained clusters were tracked over the four experimental phases of the study and the follow-up phase. Three additional correlational analyses were conducted as follows: (1) over all sessions in Treatment I, Baseline II, and Treatment II; (2) over all summer-treatment sessions; (3) over all follow-up sessions. All three separate analyses were identical to that used with the baseline data. If the baseline clusters were indeed due to chance factors it is unlikely that they would reappear in these successive analyses. Thus, our interest in studying the clusters over treatment phases was to determine experimentally which clusters were functionally stable. It is important to note, then, that cluster stability refers to an empirical rather than statistical phenomenon.

Following the cluster analyses, *within*-session analyses of the behavior clusters were conducted. In essence, we attempted to assess temporal relationships between the behaviors in each cluster and the six social-environment categories. Here, we were guided by the operant model that would predict some consistent time relationships between all behaviors in a cluster and some environmental event or events. Such a relationship should involve relatively brief temporal spacings between the behaviors and environmental events. In essence, each behavior ought to share such a relationship with one or a set of environmental stimuli occurring as antecedent or consequential events.

To conduct the above analyses, three sets of conditional probabilities were computed for each behavior category in each cluster. These computations involved examining stimulus occurrence probabilities in the *same* time interval as that containing a relevant behavior, in the interval *before* the behavior, and, in the interval *after* the behavior.

Reliability Analyses

Observer reliability in coding the various behavior and social-environment categories was computed in two days. First, a conservative interval-by-interval comparison was conducted for each category, considering only those intervals that contained category occurrences. That is, blank interval agreements between observers were not considered in the reliability computations. This stringent calculation procedure was necessary for the fine-grain within-session analyses of temporal relationships between child-behavior categories and social-environment categories. This computational procedure is referred to as Type 1 reliability.

A second, more liberal test of observer agreement was conducted for those categories not attaining an 80% agreement over any phase of the study. Such categories were excluded from the within-session analyses, but were used in the across-session analysis if they attained the 80% cut-off point by considering both blank and filled intervals. Thus, low-rate categories (which often fail the first reliability test) may attain criterion if blank intervals are also considered as observer agreements. The reliability rationale here involves the argument that observer agreement on nonoccurrences of a category is a meaningful index of observer judgement that the category did in fact occur infrequently. This computational procedure is referred to as Type II reliability.

RESULTS

Subject 1: Fred

Fred was referred to the project by a local mental health center because of "disruptive behavior" in his fourth-grade classroom. According to his teacher, this white male, age 10, refused to do schoolwork and spent most of his time "fiddling" with objects, thus attracting the attention of other pupils. While these distractions were a constant source of irritation to the teacher, her principal concern was with Fred's lack of schoolwork efforts.

Fred lived with his mother, grandmother, younger sister, and brother. His twice-divorced mother saw no problem with Fred at home. Ac-

Table 3

Pearson product-moment correlations for those behavior categories displaying covariations over all phases of the study in the school setting. The cluster describes Fred's sustained schoolwork (Ss), self stimulation (S), Object Play (Op), and noninteraction (NI).

	Ss	*S*	*Op*	*NI*	*Observation Sessions*	*Treatment Phases*
Ss	—	0.53	−0.51	−0.35		
S	—	—	−0.34	—	12	Baseline
OP	—	—	—	0.40		
NI	—	—	—	—		
Ss	—	0.41	−0.35	−0.30		
S	—	—	−0.29	—	53	Treatment I Baseline II Treatment II
OP	—	—	—	0.58		
NI	—	—	—	—		
Ss	—	0.43	−0.60	−0.55		
S	—	—	−0.54	—	20	Summer Treatment
OP	—	—	—	0.60		
NI	—	—	—	—		
Ss	—	0.33	−0.30	−0.59		
S	—	—	−0.20	—	22	Follow-up I Follow-up II
OP	—	—	—	0.47		
NI	—	—	—	—		

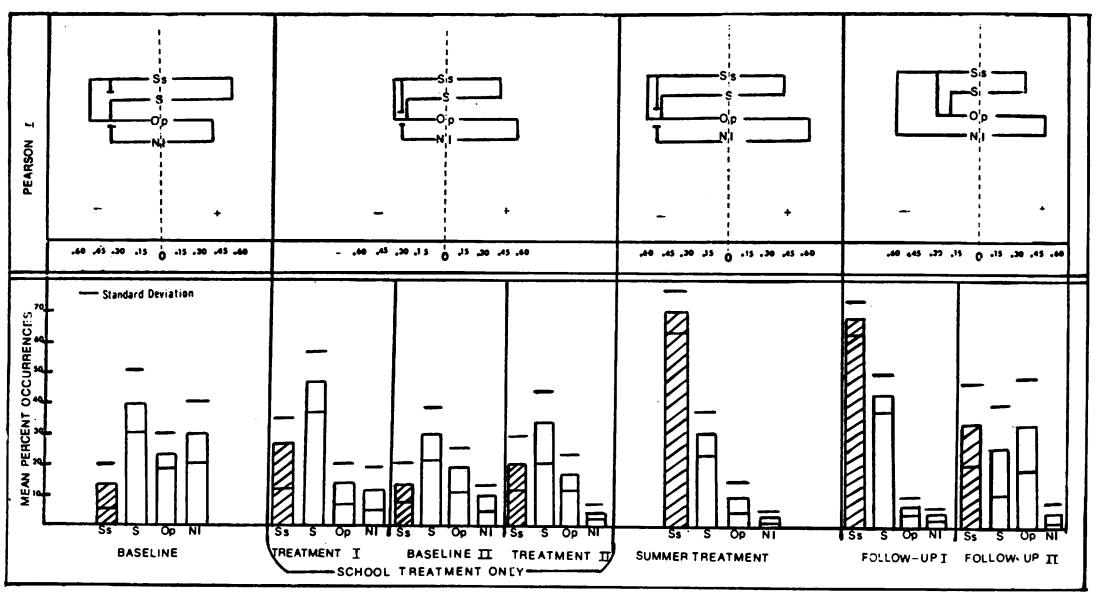

Fig. 1. Behavior covariations and mean occurrences of four categories of Fred's behavior in the school setting. The top portion portrays Pearson product-moment correlations between Fred's sustained schoolwork (Ss) and his self stimulation (S), object play (Op) and noninteraction (NI). Lines connecting categories to the right of an axis depict positive correlations; those to the left describe negative correlations. All interconnecting lines describe the magnitudes of category intercorrelations. Categories connected by vertical broken lines (⫞) should be read as correlated categories. The horizontal lines between them (⫩) are not related. The bottom portion presents means and standard deviations of these covarying categories. Hash marks ▨ describe the principal problem behavior identified by Fred's teacher.

cording to her and her mother, the school officials "had it in for Fred" and wanted him taken out of the school. Both women admitted they had few rules for Fred and allowed him usually to do as he pleased in the home.

Fred was observed under baseline conditions for 12 daily paired school-home sessions. At school, five behavior categories accounted for his behavior over these sessions. Thus, the obtained correlation matrix was made up of 10 intercorrelations. Following the hierarchial cluster analysis (Johnson, 1967) of this matrix, two clusters of behavior categories could be extracted.

Only one of the two baseline behavior clusters reappeared in all successive analyses of Fred's school behavior. Table 3 describes this cluster and Figure 1 depicts it schematically for ease of inspection across all phases of the study.

Over a period of almost 3 yr, Fred's schoolwork efforts (Ss) were likely to be associated with self stimulation (S) and inversely associated with "fiddling with objects" (OP) and "staring into space" (NI). It is of interest to note that this functional cluster appeared in four separate school settings, and thus was not a situation-specific phenomenon.

The negative correlation between Fred's schoolwork and the noninteraction category was due partly to the fact that the latter is incompatible with schoolwork. However, since other categories are also incompatible with schoolwork (*e.g.,* sustained toy play), the obtained negative correlations cannot be entirely an artifact.

Other clusters of behavior categories also appeared in the successive correlational analyses. However, none of these combinations reappeared over all experimental phases. Thus, only the combination of categories depicted in Figure 1 can be considered as a stable cluster.

Observer agreement computed within each of the six phases of the study revealed Type I reliability criteria (>80%) for all categories during the first three phases. For the final three phases, the NI category met only Type II reliability criteria of >80%.

Efforts to examine temporal relationships between the Figure 1 cluster and social stimulus events proved largely fruitless. Only shifts in the sustained schoolwork category (Ss) were reliably associated with changes in the classroom social environment. Nonaversive teacher attention (SA+) was more likely to follow and be contiguous with Fred's sustained schoolwork during treatment phases (0.20 and 0.30, Treatment I; 0.15 and 0.25, Treatment II) than baseline phases (0.00 and 0.02, Baseline I; 0.05 and 0.07, Baseline II). Further evidence that these contingency changes were due to planned modifications in teacher behavior are seen in the overall percentages of nonaversive teacher attention (SA+) across phases of the study. Mean per cent occurrences of this social-environment category during the two baseline phases were 3% (Baseline 1) and 6% (Baseline 2). During treatment phases, this category increased in mean frequency to 20% (Treatment I) and 23% (Treatment II).

Except for Fred's sustained schoolwork (Ss), no other behavior category showed across-phase relationships with any of the six social-environment categories. Thus, while three categories of Fred's behavior (S, Op, and NI), continued to covary across phases with his schoolwork (Ss), we could offer no environmental-change explanation of these behavior covariations.

In the home, 10 behavior categories accounted for Fred's behavior during the baseline. Thus, the obtained correlation matrix was composed of 45 intercorrelations. Following the cluster analysis of the matrix, three clusters of behavior categories could be extracted, only one of which reappeared in all successive analyses of Fred's home behavior. Table 4 and Figure 2 describe this cluster, made up of four behaviors, which show an inverse relationship between sustained toy play (St) and compliance with adult instructions (C), social interaction with adults (SIa), and self stimulation (S). The latter three behaviors were functionally incompatible with Fred's toy play (but not physically incompatible). That is, scoring definitions of the categories were such that all four behaviors could occur in a time

Table 4

Pearson product-moment correlations for those behavior categories displaying covariations over all phases of the study in the home setting. The cluster describes Fred's sustained toy play (St), compliance (C), social interactions with adults (SIa), and self-stimulation (S) behaviors.

	St	*C*	*SIa*	*S*	*Observation Sessions*	*Treatment Phases*
St	—	−0.46	−0.53	−0.58		
C	—	—	0.45	0.59	12	Baseline
SIa	—	—	—	0.30		
S	—	—	—	—		
St	—	−0.45	−0.48	−0.34		
C	—	—	0.34	0.58	53	Treatment I Baseline II Treatment II
SIa	—	—	—	0.43		
S	—	—	—	—		
St	—	−0.45	−0.48	−0.34		
C	—	—	0.34	0.58	20	Summer Treatment
SIa	—	—	—	0.43		
S	—	—	—	—		
St	—	−0.24	−0.49	−0.29		
C	—	—	0.33	0.53	22	Follow-up I Follow-up II
SIa	—	—	—	0.45		
S	—	—	—	—		

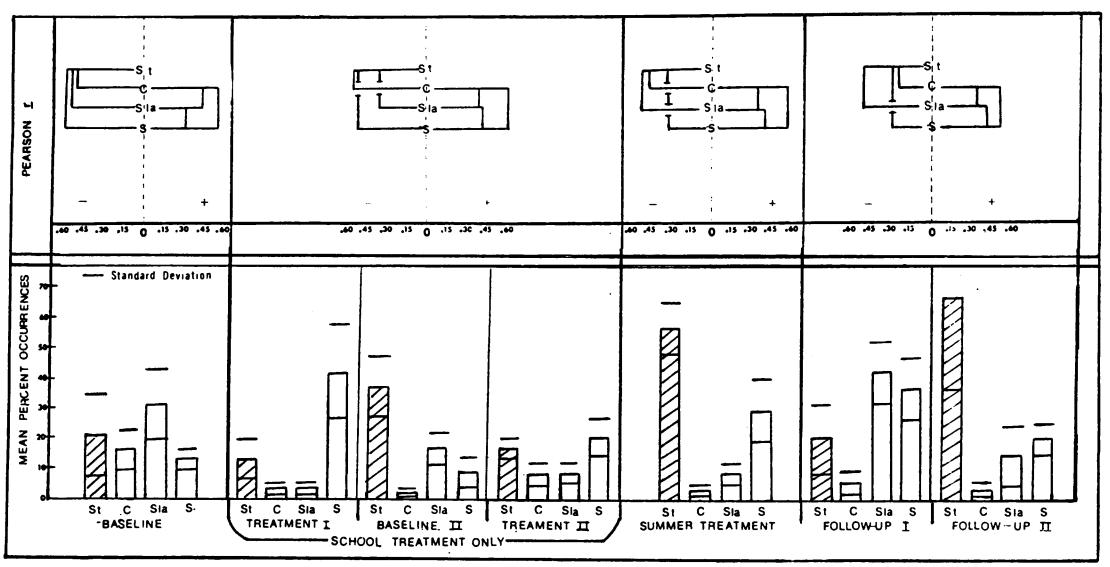

Fig. 2. Behavior covariations and mean occurrences of four categories of Fred's behavior in the home setting. The top portion portrays Pearson product-moment correlations between Fred's sustained toy play (St) and his compliance (C), adult social interactions (SIa) and self stimulation (S). Lines connecting categories to the right of an axis depict positive correlations; those to the left describe negative correlations. All interconnecting lines describe the magnitude of category intercorrelations. Categories connected by vertical broken lines (┼) should be read as correlated categories. The horizontal lines between them (╪) are not related. The bottom portion presents means and standard deviations of these covarying categories. Hash marks ▨ describe the typical behavior identified by Fred's mother.

interval. The simplest description of this home cluster is that Fred's toy play was usually of an isolate nature.

As was true at school, other behavior categories yielded high intercorrelations in each phase of the study. However, only the toy-play cluster of behaviors maintained their covariations over all phases.

Observer agreement computed within each of the six phases revealed Type I reliability criteria (>80%) for all categories except C and SIa. The C category met only Type II reliability criteria (>80%) during Phases 2, 3, and 5. The SIa category met only Type II reliability during Phase 2.

Conditional probabilities for the home-setting data revealed that only self-stimulation (S) bore any consistent relationship to the social-environment events. Both adult nonaversive instructions (IA+) and adult nonaversive social attention (SA+) were more likely to be contiguous with Fred's self stimulation during the school treatment phases than the school baseline phases. For IA+, the differences were: baselines, 0.02 and 0.04; treatments, 0.19 and 0.26. The same phase differences for SA+ were: baseline, 0.05 and 0.06; treatments, 0.10 and 0.20. Thus, increments in Fred's self stimulation were associated with increments in the likelihood of adult social contact contiguous with this behavior. However, changes in the other three behaviors in the functional cluster could not be explained on the basis of changes in Fred's social environment at home.

Fred's school-home matrix was made up of 50 intercorrelations. Only two of these approached statistical significance, and these disappeared in the successive correlational analyses.

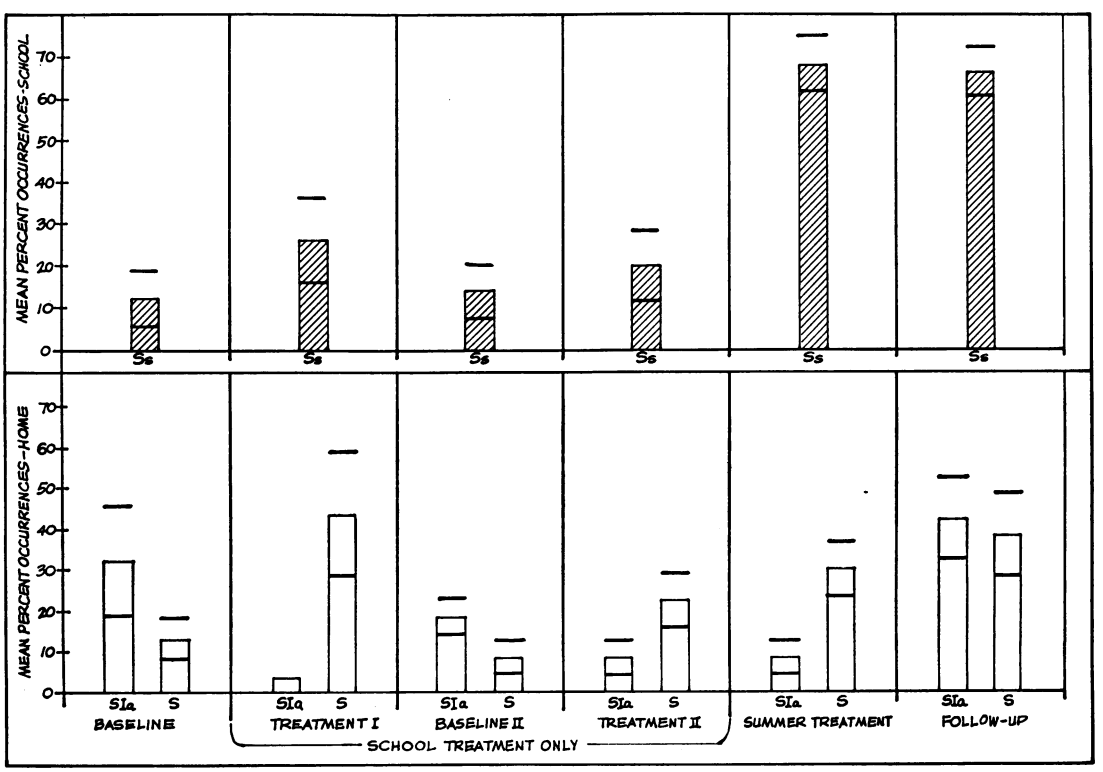

Fig. 3. Mean occurrences and standard deviations for three categories of Fred's behavior. The top portion describes Fred's sustained schoolwork (Ss) across all experimental phases in the school. In the bottom portion, Fred's adult social interactions (SIa) and self stimulation (S) are described across all phases in the home. Only the first year of follow-up is presented.

No consistent, beyond-chance relationships were apparent in any of the four analyses; most of the correlations were near zero.

Despite the lack of session-by-session covariations between Fred's school and home behaviors, a more molar analysis of the two settings did reveal some relationships. Figure 3 shows some fairly consistent across-phase shifts in Fred's self stimulation (S) and adult social interactions (SIa) at home. Over the four experimental manipulations of Fred's work behavior (Ss) at school (also seen in Figure 3), systematic changes occurred in two behavior categories of Fred's home cluster. Increments in classroom schoolwork were grossly associated with increments in home self stimulation (S). In addition, a negative relationship is evident between classroom work and home social interactions with adults (SIa), except during the first year of follow-up. No across-setting trends in any of these categories were evident during the second year of follow-up.

Subject 2: Carl

Carl (white male, age 11) was referred to the project by a local pediatrician because his parents and elementary school teacher were worried about different aspects of Carl's behavior. At home, Carl's parents had become increasingly concerned about his rule-breaking behavior and his refusals to obey instructions. Carl's teacher, in a classroom for educable mentally retarded children, reported that while Carl was compliant, his unusual self-stimulatory behavior and lack of peer interaction concerned her. According to the teacher, Carl often engaged in "strange rituals", such as repeatedly sniffing his hands, feet, and shoes. When asked about reasons for this behavior, Carl would respond with equally strange verbal behavior (*e.g.,* "Because a rabbit ran by the window."). He rarely showed interest in his peers, but did approach his teacher frequently.

Carl was observed under baseline conditions for 22 daily paired school-home sessions. At home, six categories accounted for his behavior. Thus, the cluster analysis of this matrix was made up of 15 intercorrelations. Following the cluster analysis of this matrix, three clusters of

Table 5

Pearson product-moment correlations for those behavior categories displaying covariations over all phases of the study in the home setting. The cluster describes Carl's opposition (O), aversive opposition (O—), social interactions with adults (SIa), and sustained toy play (St).

	O	*O—*	*SIa*	*St*	*Observation Sessions*	*Treatment Phase*
O	—	0.45	−0.31	−0.47		
O—	—	—	−0.45	−0.23	22	Baseline
SIa	—	—	—	—		
St	—	—	—	—		
O	—	0.30	−0.28	−0.48		Treatment I
O—	—	—	−0.43	−0.53	62	Baseline II
SIa	—	—	—	—		Treatment II
St	—	—	—	—		
O	—	—	−0.30	−0.27		
O—	—	—	—	—	18	Summer
SIa	—	—	—	—		Treatment
St	—	—	—	—		
O	—	0.90	−0.38	−0.33		
O—	—	—	−0.38	−0.46	30	Follow-up I
SIa	—	—	—	—		Follow-up II
St	—	—	—	—		

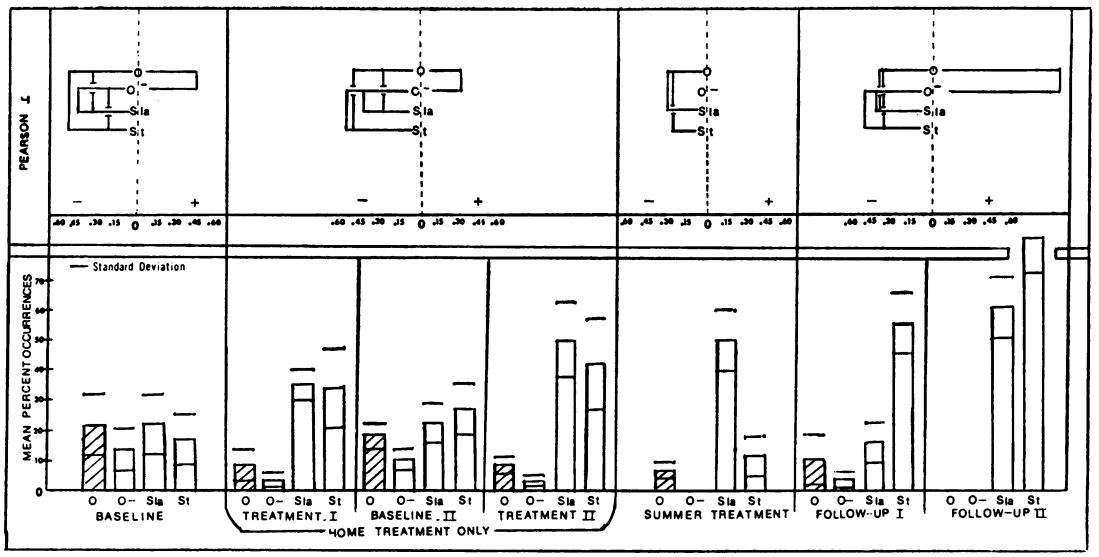

Fig. 4. Behavior covariations and mean occurrences of four categories of Carl's behavior in the home setting. The top portion portrays Pearson product-moment correlations between Carl's opposition (O) and his aversive opposition (O—), parent social interactions (SIa) and sustained toy play (St). Lines connecting categories to the right of an axis depict positive correlations; those to the left describe negative correlations. All interconnecting lines describe the magnitude of category intercorrelations. Categories connected by vertical broken lines ($\frac{\perp}{\top}$) should be read as correlated categories. The horizontal lines between them ($\frac{\top}{\top}$) are not related. The bottom portion presents means and standard deviations of these covarying categories. Hash marks ▨ describe the principal problem behavior identified by Carl's mother.

behavior categories could be extracted, only one of which reappeared in all successive analyses of Carl's home behavior. Table 5 and Figure 3 describe this cluster, made up of four behavior categories. Over a period of 3 yr, Carl's oppositional actions were likely to be accompanied by assertive rule-breaking behaviors (O—) and reliably not accompanied by social interaction with adults (SIa) and sustained toy play (St). Only during the summer-treatment phase, when Carl's assertive rule breaking was eliminated, did the complete cluster not appear.

None of the Figure 4 covariations can be considered artifacts of the observer coding system, (*i.e.,* scoring of any of the four categories does not preclude or require scoring of any of the other three.) There is therefore little doubt that the oppositional cluster shown in Figure 4 was a functional feature of Carl's home behavior.

Observer agreement computed within each of the six phases revealed Type I reliability (>80%) for all categories except assertive rule breaking (O—). Except for the two baseline phases, this category attained Type II reliability (>80%) only.

Efforts to examine temporal relationships between the Figure 4 cluster and social-stimulus events revealed that only shifts in the oppositional category (O) were reliably associated with changes in the home social environment. Nonaversive parent attention (SA+) was less likely to be associated with this category during treatment phases than baseline phases (baselines: 0.29 and 0.63; treatments 0.08 and 0.15). Further evidence that these contingency changes were due to planned modifications in parent behavior are seen in the overall percentages of nonaversive parent attention (SA+) contiguous with and immediately following intervals containing oppositional behavior (O). Mean per cent occurrences of this social-environment category during the two baseline phases were 20% (Baseline 1) and 22% (Baseline 2). During

treatment phases, this category decreased in mean frequency to 3% (Treatment 1) and 2% (Treatment 2).

No other behavior category showed across-phase relationships with any of the six social environment categories. Thus, while three categories of Carl's behavior (O—, SIa, St) continued to covary across phases with his oppositional behavior (O), we could offer no environmental change explanation for these behavior covariations.

At school, seven behavior categories accounted for Carl's behavior over the 22 baseline sessions. Thus, the obtained correlation matrix was composed of 21 intercorrelations. Following the cluster analysis of the matrix, four clusters of behavior categories could be extracted, only one of which reappeared in all successive analyses of Carl's school behavior. Table 6 and Figure 5 describe this cluster consisting of three behaviors. The cluster describes an inverse relationship between Carl's self stimulation (S) and his sustained schoolwork (Ss) and social interactions with his teacher. (SIa). This former behavior proved functionally (but not physically) incompatible with Carl's schoolwork and teacher social interactions. That is, scoring definitions of the categories were such that all three behaviors could occur in a time interval. In summary, the self-stimulatory behavior that concerned Carl's teacher was unlikely to occur when Carl engaged in schoolwork or interactions with his teacher.

Observer agreement computed within each of the six phases revealed Type I reliability criteria for all categories except adult social interaction (SIa) and aversive adult social attention (Sa—). The SIa category attained only Type II reliability during Treatment I and Baseline II. The Sa— category met only Type II reliability criteria in all phases of the study.

Conditional probabilities showed no consistent relationships between the social environment categories and the Figure 5 behavior cluster. Thus, again we were unable to offer an environmental-change explanation for the obtained behavior covariations. It is also of interest to note that treatment efforts to alter Carl's self-stimulatory behavior were unsuccessful. The summer-treatment program was aimed at Carl's schoolwork, with the assumption that increments in this behavior would reduce self stimulation. However, while Carl's schoolwork and adult social interactions did increase, the expected changes in self stimulation did not occur. Despite the fact that the latter behavior continued its

Table 6

Pearson product-moment correlations for those behavior categories displaying covariations over all phases of the study in the school setting. The cluster describes Carl's self stimulation (S), sustained schoolwork (Ss), and social interactions with adults (SIa).

	S	*Ss*	*SIa*	*Observation Sessions*	*Treatment Phase*
S	—	−0.42	−0.40		
Ss	—	—	0.49	22	Baseline
SIa	—	—	—		
S	—	−0.28	−0.31		Treatment I
Ss	—	—	0.31	62	Baseline II
SIa	—	—	—		Treatment II
S	—	−0.25	−0.42		
Ss	—	—	0.44	18	Summer
SIa	—	—	—		Treatment
S	—	−0.46	−0.43		
Ss	—	—	0.45	30	Follow-up I
SIa	—	—	—		Follow-up II

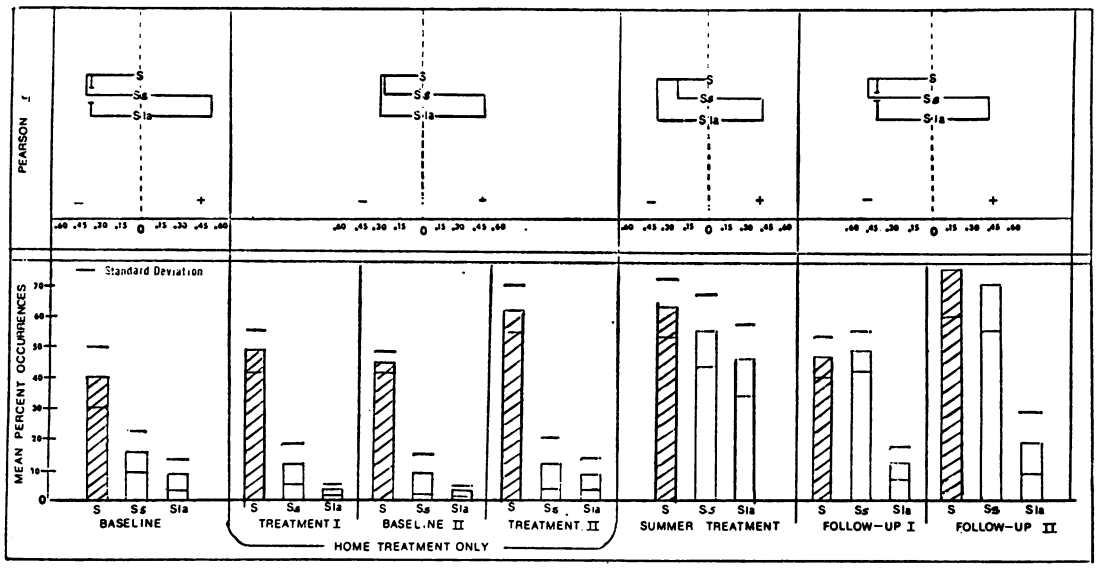

Fig. 5. Behavior covariations and mean occurrences of three categories of Carl's behavior in the school setting. The top portion portrays Pearson product-moment correlations between Carl's self stimulation (S) and his sustained schoolwork (Ss) and teacher social interactions (SIa). Lines connecting categories to the right of an axis depict positive correlations; those to the left describe negative correlations. All interconnecting lines describe the magnitudes of category intercorrelations. Categories connected by vertical broken lines (⫞) should be read as correlated categories. The horizontal lines between them (⫩) are not related. The bottom portion presents means and standard deviations of these covarying categories. Hash marks ▨ describe the principal problem behavior identified by Carl's mother.

across-session covariations with schoolwork and adult social interactions, its overall frequency of occurrence was unaffected.

Carl's school-home matrix was made up of 42 intercorrelations. Three of these reached statistical significance but disappeared in the successive correlational analyses. No consistent, beyond-chance relationships were apparent in any of the four analyses.

Despite the lack of session-by-session covariations between Carl's school and home behaviors, a more molar analysis of the two settings did reveal some relationships.

Figure 6 shows some remarkably consistent across-phase shifts in Carl's peer interactions (SIc) and opposition (O) in the classroom. Over the four experimental manipulations of Carl's opposition (O) in the home, systematic changes occurred in two categories of his school behavior. Opposition (O) and peer interactions (SIc), which were virtually nonexistent during baseline, gradually appeared in the classroom during the home treatment of Carl's oppositional behavior. Then, during the second home baseline, or reversal of the treatment program, Carl's opposition and peer interactions disappeared in the classroom. Finally, during the second home treatment phase, Carl's classroom opposition and peer interaction increased dramatically. This across-setting relationship did not occur during the first year of follow-up. Here, Carl's peer interactions continued to be evident in the classroom and his home opposition continued to be infrequent. During the second follow-up year, Carl's home opposition was no longer evident, but no appreciable change occurred in his classroom peer interactions and oppositional behavior.

DISCUSSION

This investigation produced noteworthy findings in several respects. First, in line with the response-class notion (Bijou and Baer, 1967), it

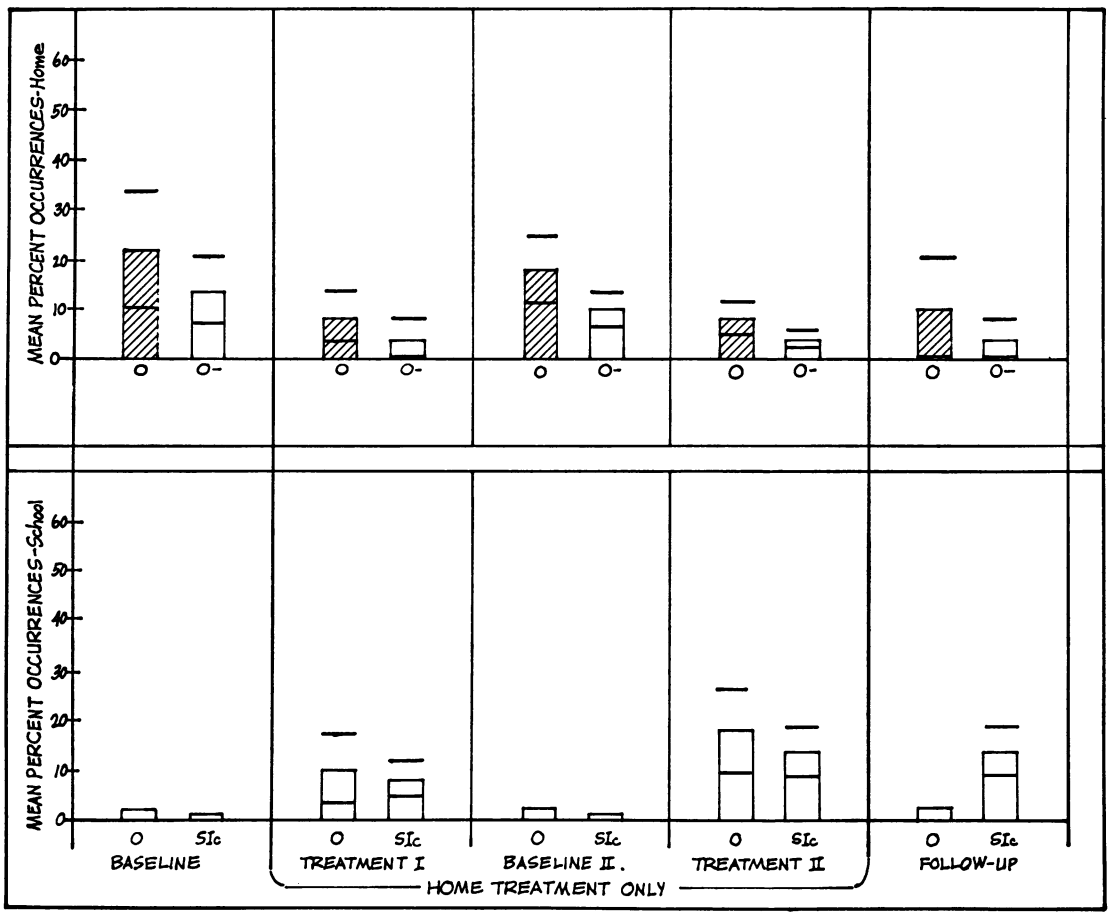

Fig. 6. Mean occurrences and standard deviations for four categories of Carl's behavior. The top portion describes Carl's opposition (O) and aversive opposition (O—) in the home. In the bottom portion, Carl's opposition (O) and peer social interactions (SIc) are described across all phases in the school. Only the first year of follow-up is presented.

was evident that each subject's behavior repertoire contained responses that covaried predictably. Each child could be characterized on the basis of his particular set of covarying behaviors. The word "characterize" seems particularly appropriate in view of the stability of these response classes. Not only were they stable over time (3 yr) but they also occurred across four different school settings.

Granted the obvious stability of the behavior clusters, it was equally evident that they were specific to the children's two general environments. In both cases, a child's behavior cluster in one environment was different from his behavior cluster in the second environment. Even Subject 2, who displayed setting similarities through his deviance classifications in two settings, showed quite different classes of deviant behavior. Thus, the situational nature of child behavior described in the early work of Hartshorne and May (1928) continues to be documented.

It is also of interest to note the importance of each child's problem behavior in terms of the organization of his behavior clusters. In every case, the child's targeted problem behavior was a component of his response class. That is, if the child was considered deviant in a setting, his problem behavior always appeared in the obtained behavior cluster. In such settings, the

stable clusters always contained a deviant behavior.

The within-session analyses of the behavior clusters yielded little information. For both subjects, the environmental determinants of the behavior clusters could not be detected. There is little more to be said in connection with this issue. The question of why the behavior clusters occurred remains unanswered. However, it should be kept in mind that the search for environmental determinants was restricted to a small number of categories (six), and only very brief temporal spacings between these events and relevant behavior categories were examined.

In both cases, the issue of setting specificity mentioned earlier must be tempered somewhat. Although natural covariations across these children's home and school settings were not shown, a puzzling treatment effect did occur across the settings. In both cases, planned changes in the children's behavior in one setting were accompanied by unplanned changes in their behaviors in the second setting. These secondary changes were neither clearly desirable nor deviant. Subject 1's mother and grandmother were concerned about his increased solitary behavior during treatment phases, but Subject 2's teacher was delighted to see his increased peer interactions, even though they were accompanied by oppositional behavior. As was true of our efforts to account for the within-setting behavior relationships, no explanation for the across-setting relationships could be offered.

Although this investigation shed little explanatory light on response-class phenomena, some practical features are evident. It is clear from these findings that problem behaviors produced by children are functionally associated with other behaviors produced by them. A next obvious research step would involve attempts to modify problem behaviors indirectly through setting contingencies for their covarying behaviors. This work is now in progress.

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Received 11 January 1974.
(Final acceptance 17 October 1974.)