*USE OF NORMATIVE PEER DATA AS A STANDARD
FOR EVALUATING CLASSROOM TREATMENT EFFECTS¹*

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This study illustrated the use of normative behavioral observation data as a standard for evaluating the practicality of treatment effects produced in other settings. Three groups of eight subjects each, displaying relatively low proportions of appropriate classroom behavior when compared with regular classroom peers, were selected for treatment within an experimental classroom setting. The three groups were exposed to intervention procedures designed to reinforce either direct academic performance and/or facilitative nonacademic classroom responses. The treatment was effective in changing levels of appropriate behavior (1) above baseline levels in the experimental classroom, and (2) to within normal peer-defined limits when reintegrated into the regular classroom. Further, the data reflect successful maintenance of these effects for a seven- to 12-week follow-up period. Several applications of a normative model for evaluating treatment, generalization, and maintenance effects were presented and discussed.

DESCRIPTORS: classroom behavior, maintenance, generalization, evaluation of treatment, methodology, mainstreaming of handicapped, reintegration, tokens, normative data, peers

As a rule, multiple criteria are used in evaluating procedures for changing human behavior. For example, Baer, Wolf, and Risley (1968) described effectiveness and generality criteria for assessing behavior change. The effectiveness criterion relates to the magnitude of behavior change attributable to specific treatment procedures, while the generality criterion refers to the persistence of treatment effects over time or to their generalization to untreated settings and behaviors.

These criteria can interact with each other in complex ways when used to evaluate effects of treatment. For example, some treatments may produce large-magnitude effects in the treat-

ment setting, but no or limited generalization of those effects over time or to untreated settings. Other treatments may produce relatively small-magnitude effects during treatment, which then prove durable across time and settings. In the former example, the treatment effects may be sufficiently large to be of practical significance but for unknown reasons do not generalize. In the latter case, the obtained effects may generalize but may not be of practical significance due to their small magnitude. Without an established standard or a specified criterion level for judging when a treatment has achieved its goals, it becomes difficult to reach conclusive decisions regarding the effectiveness of specific treatment procedures.

A third criterion for evaluating treatment effects consists of normative observational data recorded on a target subject's peers. Normative peer data can be used as a standard against which the effects of treatment programs can be compared. These data also can be used to define normal limits as represented by the behavior of peers and can provide a measure of uncontrolled situational variables that may affect the target

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subject's behavior during baseline, treatment or follow-up periods.

Patterson and his colleagues (Patterson, Cobb, and Ray, 1972; Patterson, Shaw, and Ebner, Note 2) were the first to employ a system of sampling the behavior of randomly selected peers in the classroom of a targeted subject to provide an additional criterion for evaluating intervention procedures. The procedure has been used in subsequent studies by Patterson (1974); Walker and Hops (1973); Walker, Hops, and Johnson (1975); Walker, Mattson, and Buckley (1971). This method makes it possible to evaluate treatments, not only in terms of their relative effectiveness and durability, but also in terms of whether they are instrumental in changing the target subject's behavioral level to within normal limits; if so, one can then judge whether the subject's behavior remains in the normal range over the long term by continuing to monitor simultaneously his/her behavior and that of peers.

The present study illustrates the use of normative behavioral observation data, based on targeted subjects' peers in the regular classroom, to evaluate treatment effects in other settings. Three different token reinforcement treatments, administered in an experimental classroom, were used for this purpose. The target subjects' levels of appropriate behavior were compared to their peers' before assignment to the experimental classroom and when they were reintegrated into the regular classroom.

METHOD

Subjects

Three groups of eight subjects each, exhibiting relatively low rates of appropriate classroom behavior, were selected from primary grades in regular classroom settings for this study. Target subjects were referred by classroom teachers in school district 4J in Eugene, Oregon. Children were identified by classroom teachers and accepted for short-term treatment in an experimental classroom setting if they dis-

played relatively low rates of behaviors that would appear to facilitate academic achievement in the regular classroom setting. These included listening to instructions, following directions, attending to task, completing assignments within specified time allowances, and so forth. Subjects in the three groups averaged 60% or less of observed time spent in appropriate classroom behavior as defined by the observation code used (see observations section). Subjects spent seven to 10 weeks in an experimental classroom setting and were then returned to the regular classrooms from which they were referred.

Of the 24 subjects, seven were female and 17 male. Group I consisted of four second graders and four third graders; Group II of one first grader, four second graders, and three third graders; and Group III of one first grader, five second graders, and two third graders.

Using the same observational code as for target subjects, normative observational data were recorded on each target subject's regular classroom peers during each phase of the study. All peers in the target subject's regular classroom were observed in each study phase; no peers were excluded from the observational procedure. Class sizes varied from 20 to 30 pupils across the 24 classrooms in which peers and target subjects were observed. The average teacher-pupil ratio in the Eugene school district was 1:24. Each target subject was at the same grade level as his respective peers.

Treatment Phases

The present study consisted of four phases: (1) baseline₁ (regular classroom), (2) baseline₂ (experimental classroom), (3) intervention (experimental classroom), and (4) follow-up (regular classroom). During baseline₁, the classroom behavior of experimental subjects and their respective peers was recorded in the regular classroom setting over a two- to three-week period.

Following baseline₁, experimental subjects were enrolled in an experimental classroom setting and assigned to a second two- to three-week baseline condition in that setting. The

purpose of baseline₂ was to obtain baseline measures of child behavior under experimental classroom stimulus conditions in order to evaluate more clearly the effects associated with the subsequent introduction of formal treatment procedures in that setting.

The three different intervention procedures used in the experimental classroom are described in detail elsewhere (Walker and Hops, *in press*). Briefly, they consisted of token systems designed to reinforce direct academic performance and/or facilitative nonacademic classroom responses (see Cobb, 1972; Cobb and Hops, 1973; Hops and Cobb, 1973). Group I subjects were awarded points (exchangeable for backup reinforcers), paired with behavior-specific praise, for engaging in such behaviors as attending to task, listening to instructions, following directions, and volunteering. Points and praise were dispensed to Group II subjects for making correct academic responses, *e.g.*, papers finished correctly, problems completed correctly, and accurate reading responses. The two contingencies were combined for Group III subjects.

The follow-up period extended over two to three months beginning immediately after subjects were reintegrated into their regular classrooms. No attempts were made to program post-treatment maintenance of appropriate behavior for any of the experimental subjects.

Group I subjects were assigned to the experimental classroom from October to December and were followed up from January to March; Group II subjects were in the classroom from January to March and were followed up until the end of the school year; Group III subjects were in the classroom from March to June and were followed up during the first three months of the next school year.

Observation and Recording Procedures

The observation system was a modified 19-category time-sampling code originally developed by Cobb (Note 1). Definitions of the code categories are contained in Appendix A. Using this code, observers recorded the behavior of

experimental subjects and their respective peers in successive 6-sec intervals.

Experimental subjects and their respective peers were observed weekly during baseline₁ and follow-up periods recorded in the regular classroom setting. Subjects were observed daily during baseline₂ and intervention phases while assigned to the experimental classroom. Table 1 contains the average number and range of minutes subjects and peers in each experimental group were observed per week during each study phase. The means reported for each experimental group are the average number of minutes observed for each experimental subject and his/her respective peers in that group.

During baseline₁ and follow-up periods, the behavior of experimental subjects and peers was recorded in alternate 6-sec intervals. The experimental subject was observed during the first 6-sec interval, a peer during the next interval, the experimental subject again during the third interval, and another peer in the fourth 6-sec interval. A new peer was observed every alternate interval until all peers had been observed once; then, the cycle began again and continued until the observation session was terminated.

While experimental subjects were assigned to the experimental classroom during baseline₂ and intervention phases, observers continued to record the behavior of peers weekly. The same rotating procedure was used as in baseline₁ and follow-up periods, except that experimental subjects were obviously excluded. Observers were free to code any of the 19 code categories during each 6-sec interval but only one instance of each category could be recorded in each 6-sec interval.

During regular classroom observations, the behavior of experimental subjects and peers was recorded across a variety of academic periods, including reading, math, social studies, science, and spelling, and during individual seatwork and teacher-led group activities. In the experimental classroom setting, observations were made during reading and mathematics periods only, where most of the academic work was individual seatwork.

Table 1

Mean weekly number of minutes observed for target subjects and their respective peers for experimental Groups I, II, and III.

	<i>Subjects</i>		<i>Peers</i>	
	$\bar{x}$ Number of Minutes Observed per Subject per Week	Range	$\bar{x}$ Number of Minutes Observed per Set of Peers per Week	Range
GROUP I				
Baseline ₁	17.57	12.70-22.30	17.57	12.70-22.30
Baseline ₂	33.40	10.50-56.30	16.50	*
Intervention	53.60	30.00-85.50	26.22	20.30-35.10
Follow-up	19.11	16.40-23.90	19.11	16.40-23.90
GROUP II				
Baseline ₁	18.50	9.00-30.00	18.50	9.00-30.00
Baseline ₂	51.20	37.50-73.00	19.50	15.50-22.00
Intervention	73.08	34.90-100.50	18.45	13.00-22.30
Follow-up	23.82	16.30-28.50	23.82	16.30-28.50
GROUP III				
Baseline ₁	14.46	8.80-22.00	14.46	8.80-22.00
Baseline ₂	86.65	80.30-93.00	23.60	20.10-27.10
Intervention	103.26	78.40-127.30	25.37	13.30-29.10
Follow-up	20.18	14.80-25.00	20.18	14.80-25.00

*Observation data were recorded for peers of Group I subjects during the second week of baseline₂ only.

RELIABILITY

Seven observers were used throughout this study. All were graduate or undergraduate students in either education or psychology, and each was trained for about six 1-hr sessions until he/she could achieve a criterion of five consecutive, 3-min observation sessions with reliability coefficients of 0.90 or better with the observer trainer/calibrator.

During the study, observers were rotated between the experimental classroom and the regular classroom settings from which the subjects had been referred. Observers were monitored via weekly recalibration spot checks with the observer/trainer to maintain their reliability (Reid, 1970; Taplin and Reid, 1973). All observer data recorded in weekly spot checks were included in the study. The recalibration checks were part of the regular observation periods.

Observer agreement was calculated using the per cent agreement method; observers had to agree on all behaviors coded in an interval for that interval to be counted as an agreement. An observer had to agree with the observer trainer

by code category, subject, and sequence for inter-observer agreement to be coded in any 6-sec interval. Agreement was calculated by dividing the number of agreements by the total number of agreements and disagreements. Table 2 contains the average agreements per phase by experimental group for target subjects and peers throughout the study. The number of agreement checks per phase is given along with the range in agreement for both target subjects and peers

During initial training sessions, observer agreement averaged 90% across all observers and ranged from 30 to 100%. During weekly recalibration checks, agreement averaged 95% and ranged from 84 to 100%.

Dependent Measure

The dependent measure was the proportion of appropriate classroom behavior exhibited by experimental subjects and peers across phases. The following code categories were judged, on an *a priori* basis, to be appropriate to the classroom setting: Approval (AP), Compliance (CO), Appropriate Talking with Teacher (TT+), Appropriate Interaction with Peer

Table 2

Number and range of agreement checks for target subjects and peers across study phases.

	<i>Subjects</i>			<i>Peers</i>		
	<i>Number</i>	<i>Mean</i>	<i>Range</i>	<i>Number</i>	<i>Mean</i>	<i>Range</i>
GROUP I						
Baseline ₁	2	97.5	97- 98	2	97.5	97- 98
Baseline ₂	14	95.2	88-100	10	96.4	88-100
Intervention	33	92.5	84-100	13	96.1	89-100
Follow-up	10	96.4	89- 98	10	95.4	89- 97
TOTAL	59	95.9	84-100	35	96.6	88-100
GROUP II						
Baseline ₁	12	93.9	89-100	12	93.9	89-100
Baseline ₂	10	95.8	91-100	6	95.7	91- 97
Intervention	28	96.0	86-100	11	96.4	88-100
Follow-up	9	94.1	91-100	9	94.1	91-100
TOTAL	59	95.0	86-100	38	95.0	88-100
GROUP III						
Baseline ₁	6	96.9	92- 98	6	96.9	92- 98
Baseline ₂	8	97.4	93-100	4	95.7	90- 97
Intervention	25	96.1	94-100	10	94.1	89-100
Follow-up	14	95.0	91-100	14	95.0	94-100
TOTAL	53	96.4	91-100	34	95.4	89-100

(IP+), Volunteer (VO), Initiation to Teacher (IT), and Attend (AT). The proportion of appropriate behavior was computed by dividing the total number of appropriate behavior categories recorded by the total number of behaviors recorded for each data point.

RESULTS

Figures 1, 2, and 3 contain plots of the weekly means for the proportion of appropriate behavior for target subjects and their respective peers for experimental Groups I, II, and III, across the four phases of the study. The phase means are presented in Table 3.

The peer data, although represented by peers in 24 different classrooms, indicate extremely stable trend lines (see Figures 1, 2, and 3). Each group's data were collected over a 21- to 24-week period, yet 62 of 64 data points fall between 60% and 80% appropriate behavior.

Examining the data within phases, it can be seen that during baseline₁ in the regular classroom, the levels of appropriate behavior for

the target subjects, in all three groups, were well below that of their peers. A subsequent increase following their assignment to a second baseline condition in the experimental classroom eliminated this difference, although a decelerating trend was noted for experimental Group II.

With the application of the intervention procedures, all three experimental groups showed a further increase; the proportions of appropriate behavior for Groups II and III exceeding that of their respective peers, who remained in the regular classroom, for the entire phase. The follow-up data are marked by an immediate decrease in levels of appropriate behavior after the experimental groups were reintegrated into the regular classroom; the greatest decline is seen for Group III, which returned after a two-month summer holiday. Further, Groups I and II continued to show declining trends, while Group III's trend was increasing. The mean levels of appropriate behavior for the follow-up phase indicate differences between the target subjects and their peers. The trend lines show, however, that these differences are not consistent

Fig. 1. Behavioral observation data for Group I subjects during successive treatment phases.

Fig. 2. Behavioral observation data for Group II subjects during successive treatment phases.

Fig. 3. Behavioral observation data for Group III subjects during successive treatment phases.

across the entire phase and that some overlap occurs in each group.

DISCUSSION

Comparison between the behavior of target subjects and their respective peers during the two experimental classroom phases are confounded in two respects. First, stimulus conditions and treatment conditions were radically different in the two settings. Second, the target subjects' behavior was recorded during reading and math periods in the experimental classroom, while the behavior of their peers in the regular

classroom was recorded across instructional periods that included reading, math, social studies, science, and spelling. Thus, it is impossible to draw meaningful comparisons between target subjects and their respective peers during these two conditions. However, subjects and peers were observed under identical conditions both before and after assignment to the experimental classroom, thus making it possible to compare their performance during baseline₁ and follow-up phases.

These data indicate that the behavior of target subjects was changed at follow-up to within normal limits as defined by the behavior of their

Table 3

Mean proportions of appropriate behavior for target subjects and their respective peers during baseline, intervention, and follow-up phases.

	Baseline (Reg. Class)	Baseline (Exp. Class)	Intervention (Exp. Class)	Follow-up (Reg. Class)
GROUP I				
Target Subjects	32.73%	58.65%	73.42%	65.74%
Peers	75.87%	59.30%	72.90%	69.63%
GROUP II				
Target Subjects	49.64%	72.67%	82.14%	62.94%
Peers	73.25%	73.67%	71.47%	67.71%
GROUP III				
Target Subjects	27.74%	72.40%	84.86%	60.68%
Peers	68.08%	70.20%	69.94%	67.23%

peers. Further, these changes maintained within the peer-defined limits over the entire follow-up period. This was clearly not the case during the baseline₁ period recorded in the regular classroom before treatment.

A closer examination of the trends in follow-up suggests that whatever accounted for the gradual decelerating trend in Groups I and II target subjects may have produced similar trends in their peers' performance. In contrast, the divergent trend lines for subjects and peers in Group III could suggest that the influence on subjects' behavior may have been independent of classroom variables that could have affected the peers similarly.

The use of peer normative data as a standard for evaluating treatment effects has implications for treatments administered within the regular classroom as well as those administered in special settings followed by reintegration into the regular classroom. For example, the general failure to achieve generalization/maintenance of treatment effects across time and settings has been a persistent problem in the field of applied behavior analysis. This methodology has the potential for generating knowledge on parameters associated with both the achievement and nonachievement of generalization/maintenance effects. It also provides an additional source of information for judging the adequacy of post-treatment behavioral performance.

Normative peer data provides an operant measure of appropriate child behavior in any given classroom setting at any given point in time. It also provides a measure of variability and trends in this operant level over time as a function of changes in classroom stimulus conditions. These two parameters could affect placement/reintegration decisions either in the absence of or following formal treatment. For example, it may be that an individual subject's behavior would maintain better in a classroom where there is a high level of appropriate behavior with little variability over time. If this were the case, regular classrooms could be assessed along these dimensions as part of the

decision governing selection of an optimum reintegration setting for a subject receiving treatment in a special setting.

Peer data also provide a measure of stimulus conditions during follow-up periods that can make interpretation of generalization/maintenance effects more meaningful. For example, if a subject were reintegrated into the regular classroom setting following treatment and his/her behavior approached baseline levels, the treatment would probably be judged ineffective. However, if peer data recorded under the same stimulus conditions in the regular classroom showed a substantial correlated decrease in level, one could argue that the lack of a posttreatment effect for the target subject may be attributable to uncontrolled variables operating in the post-treatment setting.

O'Leary and Drabman (1971) criticized research designs in which follow-up performance is measured by the use of occasional postchecks or probes. The limited sampling of a target subject's behavior does not provide a measure of intervening variables or events occurring between the termination of treatment and recording of follow-up measures. The simultaneous recording of target subject and peer data on a relatively continuous basis would provide considerable information for evaluating target subject performance during follow-up and in relating it to conditions occurring in the post-treatment period.

In the process of recording long-term follow-up measures on target subjects across school years, the technique offers a method for evaluating different classroom settings in which the subject is placed and relating this information to judgements about the relative durability of effects produced by a host of different treatments. Presumably, the probability of appropriate behavior being positively reinforced and maintained by either teachers and/or peers would vary considerably across classrooms.

In methodological terms, it is not intended that normative peer data would supplant any features of traditional intra- and intersubject re-

search designs used for demonstrating causal relationships, e.g., reversal, multiple baseline, and experimental/control group comparisons. Instead, peer data are seen as a potentially valuable informational supplement to each of these designs and would be used in conjunction with them. For example, the traditional features of such designs can be used to establish functional relationships between independent and dependent variables. Normative peer data can then provide a basis for evaluating the practical significance and durability of obtained treatment effects. Thus, given the addition of peer data, one is able to document causal relationships and also to evaluate the meaningfulness of changes represented by those relationships.

Some applications of the present methodology have been implemented in previous studies cited earlier. The information produced appears to be useful and relevant to the task of evaluating treatment, generalization, and maintenance effects. If the technique's potential utility is realized, many additional applications will probably be developed in the future, particularly in the area of mainstreaming the behaviorally handicapped in educational settings.

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APPENDIX A

Definitions of Codes

In the following list, code definitions are applicable to both behavior of the subject and to responses from teachers and peers unless noted otherwise.

Approval (AP): a person gives clear verbal, gestural, or physical approval to the students.

Complies (CO): the person does what another person has requested, e.g., teacher asks class to take out notebooks and pupil does.

Appropriate Talking with Teacher (TT+): the pupil talks with the teacher about academic material whether in private as in independent work situations or answers questions in other situations.

Appropriate Interaction with Peer (IP+): the pupil is interacting with peer about academic material and is not violating classroom rules.

Volunteering (VO): by verbal or nonverbal means the student exhibits behaviors associated with volunteering information of an academic nature.

Initiation to or by Teacher (IT): pupil or teacher *initiates* or *attempts* to initiate interaction with each other, but not in conjunction with volunteering.

Attending (AT): to be a subject response, the subject is looking at the teacher when the teacher is talking, looking at any materials in the classroom that have to do with the lesson, working on assignments, and engaging in other behaviors appropriate to the academic situation. To be a teacher or peer consequence, the behavior need not be in regard to academics, i.e., teacher or peer looks at the child or engages in other behaviors that indicate they are paying attention to the child.

Physical Negative (PN): use of this category is restricted to times when a person attacks or attempts to attack another person with the possibility of inflicting pain.

Destructiveness (DS): a person destroys or attempts to destroy some object.

Disapproval (DI): a person gives clear verbal, gestural, or physical disapproval of another person's behavior or characteristics.

Noisy (NY): the person talks loudly, yells, bangs books, scrapes chairs, or makes any sounds that are likely to be actually or potentially disruptive to others.

Noncompliance (NC): the person does not do what is requested.

Play (PL): a person is playing alone or with another person.

Inappropriate Talk with Teacher (TT-): used whenever content of conversation with teacher is negative or nonacademically oriented or when classroom rules do not allow interaction with teacher.

Inappropriate Interaction with Peer (IP-): peer or pupil interacts with or attempts to interact with another about nonacademic matters or when classroom rules are being violated.

Inappropriate Locale (IL): student is in classroom area that is inappropriate for academic activity that is occurring.

Self-Stimulation (SS): the person attempts to stimulate himself in such ways as swinging his feet, rubbing his nose, ears, forehead, tapping his fingers, scratching, etc., to such an extent that attention to other ongoing activities is precluded.

Look Around (LO): the subject is looking around the classroom environment or staring at something or someone that is not relevant to the current academic activity.

Not Attending (NA): the subject is in the appropriate area and is looking at other things in the immediate environment than those aspects that have to do with the current academic activity.