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Eliminating Self-injurious Behavior Through the Use of a Functional Analysis, Antecedent Interventions, Reinforcement Procedures and Data-Based Decision Making

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Steve, a 14-year old male student with a visual impairment and autism, exhibited self-injurious behavior (eye gouging) for over five years. This behavior was significantly reduced after conducting a functional analysis and employing antecedent changes and positive consequences. Precision Teaching techniques were used to monitor the intervention and make data based decisions regarding intervention phases. A micro-reversal was implemented to determine experimental control. After the occurrence of self-injurious behavior was reduced to a low frequency, a change was made from a fixed interval schedule to a variable interval schedule of reinforcement. The use of the variable reinforcement schedule reduced the behavior even further. Since only two sessions remained before school adjourned, data were collected during the summer, the extended school year program. Even with a new staff, the occurrence of the eye gouging remained low and manageable throughout the follow-up phase.

Self-injurious behavior is one of the most extreme and destructive forms of human psychopathology. The descriptions, incidence and effects of self-injury, as well as interventions applied in an effort to control it, have been thoroughly documented in the literature (Bauer, Shea, & Gaines, 1988). Bauer et.al., (1988) have contended that more time has been spent researching and refining the management of self-injury than any other behavior.

Self-injurious behavior (SIB) has been classified as repetitive, self-directed acts that result in physical harm or tissue damage (Bauer et.al., 1988). Singh and Millichamp (1985) describe SIB as any self-inflicted, repetitive action that results in lacerations, bruising or abrasions. SIB varies in severity, yet can be so potentially dangerous as to be life threatening (Bauer et.al., 1988).

Schopler, Reichler, and Lansing (1980) maintain that SIB is less common among children living at home and in the community than among institutionalized children. Schroeder, Schroeder, Smith, and Dalldorf (1978) reported that the likelihood of an individual exhibiting SIB increases with the duration of his or her institutionalization, the severity of the handicapping condition and language deficits. Ten-percent of institutionalized persons with severe disabilities and 40 percent of institutionalized persons with schizophrenia exhibit some form of SIB. Head banging is more frequent among males, self-biting among females and eye-gouging among persons with visual impairments (Bauer et.al., 1988). Face slapping, head banging, eye gouging and hand biting continue to concern those who work with persons with autism and with other developmental disabilities; in part, because of frequent failures to control SIB among persons with severe disabilities. Recent work has centered on investigating those variables involved in the maintenance of this behavior. Researchers have identified four classes of variables involved in the maintenance of SIB: social attention, tangible consequences, escape from unpleasant situations, and sensory stimulation (Durand & Crimmins, 1988a). Hopefully, a more thorough understanding of maintaining variables should lead to more effective treatment of SIB.

Intervention strategies for SIB should be based on an assessment of the individual, his or her environment and the characteristics of the behavior (Bauer et.al., 1988). Planning treatment requires careful consideration of the behavior, setting and maintaining contingencies (Bauer et.al., 1988). The importance of determining factors maintaining an individual's SIB, has led to a focus on assessment procedures. Iwata, Dorsey, Slifer, Bauman, and Richman (1982) devised a series of analogue conditions to determine the role of social attention, sensory stimulation and task demands on the SIB of nine subjects. They found considerable variability both within and between their subjects in these three conditions, suggesting that the occurrence of SIB may be a function of multiple variables. Similarly, Carr and Durand (1985) observed that low levels of adult attention and high levels of task demands were discriminative stimuli

for the occurrence of SIB in three children with developmental disabilities.

The applied behavioral literature provides extensive support for the need to assess many variables in carrying out a functional analysis of behavior (LaVigna, Donnellan, & Mesaros, 1986a). A functional analysis (as discussed here) is a procedure for using assessment data to determine the purpose of behavior, so effective behavioral interventions can be programmed. A functional analysis is complete when three main outcomes are accomplished:

1. Operational definition of the undesirable behavior(s) .
2. Prediction of times and situations when the undesirable behavior(s) will and will not occur across a full range of typical daily routines.
3. Definition of the function(s) (maintaining reinforcers) that the undesirable behavior(s) produces for the individual. (O'Neill, Horner, Albin, Storey, & Sprague, 1990).

Kanfer and Saslow (1969), for example, identify a number of dimensions which should be considered in carrying out such an analysis. These include analysis of historical setting events, antecedent events, organismic variables, motivation, and skill levels.

A functional analysis can provide the practitioner with information about the ecology of the problem behavior, the environmental context, the contingency rules, and the message value of the behavior (i.e., communicative intent). With this abundance of information the practitioner can more fully consider various behavioral interventions. The selection of behavioral interventions can focus on antecedents and consequences. Some treatment programs have utilized the delivery of aversive procedures as a consequence for the occurrence of the problem behavior. Recently, approaches to the treatment of aggression and other SIB have incorporated the systematic assessment of environmental variables into the selection of a specific intervention. As a result, intervention can effectively address the antecedents preceding the problem behavior and positive consequences for using appropriate alternative behaviors. (LaVigna, Donnellan, & Mesaros, 1986b; Repp & Singh, 1990).

Interventions should not simply reduce behavior problems. In choosing an intervention, the practitioner must also consider the effect of the intervention on the learner's quality of life. From an ethical point of view, interventions should teach the learner an appropriate alternative response. The effectiveness of less restrictive interventions has been enhanced by pretreatment analysis of the effects of various environmental variables on SIB. While punitive procedures may produce rapid and sharp suppression of problem behaviors, serious questions about the durability and generalization of treatment effects, side effects, and social validity have suggested that the present punishment technology has narrow utility and is of little value for true community and social integration (LaVigna, Willis, & Donnellan, 1989). Foxx and Livesay (1984) proposed that our field become less concerned with the magnitude of treatment effects and how quickly they can be produced, and become more concerned with the durability of the effects.

Nonaversive behavior management seeks alternatives to the emphasis on behavioral suppression through aversive contingencies and calls instead for a focus on positive interventions that educate and promote the development of adaptive behavioral repertoires (Horner et al., 1989). Some commonly used examples of the use of positive consequences include differential reinforcement of other behavior (DRO), differential reinforcement of incompatible behavior (DRI) and differential reinforcement of alternative behaviors (Alt-R). Two examples of antecedent changes are curricular interventions and ecological manipulations. These types of interventions have the following advantages over more aversive interventions. First, these approaches are positive and safe. Second, new behaviors that become established reduce the risk for developing new problem behaviors. Third, positive approaches typically produce long term effects. As a new repertoire is built, natural contingencies in the environment maintain the behavior. Fourth, positive approaches are efficient, using whatever limited resources may be available in a given setting while contributing to the acquisition of general educational and developmental goals. Fifth, positive approaches are socially valid. The concerns and feelings of both the learner and others in his or her environment are addressed. Finally, positive approaches contribute to the dignity of the student. This enables the student to be treated with respect and dignity by peers and staff (Donnellan, LaVigna, Negri-Shoultz, & Fassbender, 1988).

In this study, we succeeded in reducing the eye-gouging behavior of a 14 year-old male student with autism and visual impairment. We accomplished this by utilizing a functional analysis to

select nonaversive procedures, and evaluating the effects of those procedures with Precision Teaching techniques, specifically data-based decisions.

We implemented the O'Neill, Horner, Albin, Storey, & Sprague (1990) functional analysis procedure in conjunction with Durand & Crimmins' (1988) Motivational Assessment Scale. We utilized these tools and procedures because we felt they were comprehensive in nature. We intervened using sun glasses, manipulatives, and differential reinforcement of other behaviors (DRO). We also employed Precision Teaching procedures, specifically using celerations to make data-based decisions on a weekly basis. This enabled us to monitor the effects of interventions and make adjustments in the interventions as they are needed.

Method

Participant & Setting

Steve, a 14 year-old male student with visual impairment and autism, who displayed self-injurious behavior (eye gouging), participated in the study. The eye gouging was more likely to occur during times when he was left alone and during free-time activities, when his hands were not occupied. He also displayed stereotypic behavior, which consisted of hand flapping, head snapping, moving his head from side to side and moving his hands repeatedly in front of his eyes. Steve responded to simple requests and had five signs in his repertoire (i.e.,bathroom, music, please, drink, and eat). He could serve foods with assistance, he ate and drank independently, but he needed assistance with toileting and walking around the building.

This study was conducted in a regular middle school in a program for students with severe multiple disabilities. The program served four students with autism and three with severe mental retardation. Staff consisted of one full-time teacher, three full-time and one half-time paraprofessionals. Instruction included: vocational training, self-help skills (e.g., toileting, grooming, dressing self), money recognition, writing, counting, daily living (e.g., setting table, preparing meals and snacks, washing dishes, and vacuuming), language, and fine and gross motor training. Students participated in the following integration activities: volunteer work in the middle school cafeteria, home economics, and community training (e.g., ordering meals in fast food restaurants, purchasing reinforcers from the local variety store, and purchasing foods from local grocery stores).

Experimental Design

The effects of treatment on Steve's eye gouging behavior were evaluated using an ABC... design with a micro-reversal. There were two main conditions; baseline and intervention with several variations of the intervention condition. Utilizing data-based decisions throughout this study created ten phase changes during the intervention condition. They were: (1) wearing sunglasses; (2) wearing glacier sunglasses (sunglasses with side shields); (3) glacier sunglasses, using manipulatives; (4) glacier sunglasses, using manipulatives and DRO on a one minute schedule for social and primary reinforcements; (5) glacier sunglasses, using manipulatives and social reinforcement delivered every minute, while primary reinforcers (i.e., edibles) were delivered every three minutes; (6) wearing glacier sunglasses, using manipulatives and DRO, with social reinforcement delivered every minute and primary reinforcers (i.e., edibles) delivered every two minutes; (7) wearing glacier sunglasses, using manipulatives and DRO social reinforcement delivered every minute and primary reinforcers (i.e., edibles) delivered every three minutes; (8) wearing glacier sunglasses, using manipulatives and DRO on a variable one minute schedule for social reinforcers and a variable three minute schedule for primary reinforcers; (9) wearing glacier sunglasses, using manipulatives and DRO on a variable one minute schedule for social reinforcers and a five minute variable schedule for primary reinforcers. Phase 10 consisted of follow-up data during summer school with the same intervention procedures as Phase 9 but implemented by new staff members. Also, within the intervention condition a micro-reversal was conducted to document that the treatment variables were actually controlling the behavior. This reversal consisted of a 30 minute block of time during a single experimental session, when the intervention procedure and a reversal phase (i.e., no intervention) were alternately in place for six five minute periods (i.e., three periods of each condition). This process was used because it would be inappropriate to remove the intervention for long periods of time.

Target Behavior, Measurement and Interobserver Reliability

The subject exhibited eye gouging which consisted of: (1) sticking the right index finger into the outside corner of the right eye and penetrating the eye socket; (2) sticking the left index finger into the outside corner of the left eye and penetrating the eye socket; (3) sticking both index fingers into the eyes penetrating both eye sockets simultaneously (i.e., right finger, right eye, and left finger, left eye); or (4) moving index finger back and forth

over the eye and under the eyelid. Steve has demonstrated this behavior over the last five years.

We chose a frequency recording procedure to measure the occurrence of eye gouging, because the study targeted only one child with one behavior problem, and because of the ease in determining when the behavior began and ended. Data were summarized as rate per minute. Experimental sessions lasted sixty minutes and were conducted in the special education classroom, once a day, five times per week.

A primary observer collected data daily. In addition, a second trained observer independently collected interobserver reliability data during 22% of the sessions (i.e., 35 sessions) while the experiment was in progress. Training was conducted until the second observer reached a criterion of 100% agreement for three consecutive experimental conditions. Ninety-seven percent agreement, with a range of 75% to 100%, occurred between the two observers using the frequency ratio method (Kazdin, 1982) .

Procedure

Functional Analysis

Before collecting baseline data, a functional analysis was conducted that consisted of: (a) describing the undesirable behavior operationally, (b) predicting the times and situations under which the eye gouging occurred or did not occur across the full range of typical daily routines, and (c) defining the functions (i.e., maintaining reinforcers) of the eye gouging (O'Neill, Horner, Albin, Storey, & Sprague, 1990).

The process of conducting the functional analysis focused on the following steps:

1. An interview with the teacher was conducted in order to obtain information about when and how the behavior occurred. This took one sixty minute session.

2. Observation data were collected to determine the pattern of eye gouging. This required sixty minutes a day for three days.

3. Possible hypotheses were derived, and the teacher conducted environmental manipulations to test the hypotheses (e.g., repeatedly presenting and withdrawing environmental conditions in order to determine if there were consistently related behavioral changes). This activity consisted of ten five minute conditions, conducted within a sixty minute session.

During the manipulation of environmental variables, we attempted to limit any negative effects on the subject which follow:

Environmental Manipulations Guidelines

1. We determined the level of potential risk involved for the student and staff.

2. We employed protective procedures for student and staff. Steve was not left alone; staff immediately stopped his eye gouging when it occurred.

3. We only conducted manipulations where it was possible to readily control the situation.

4. We considered assessment of "precursor" behaviors as an alternative strategy.

During the environmental manipulations, five conditions were presented to Steve in order to test the reinforcing properties of these conditions and determine which one initiated the least amount of eye gouging. The five conditions under which data were collected and the sequence in which they were introduced were when Steve : (1) wore sunglasses, (2) looked through a kaleidoscope, (3) listened to music, (4) viewed a light box with different color overlays, and (5) manipulated objects. Each condition lasted five minutes. After the full sequence was completed, an identical second sequence was implemented. After assessing the data on the environmental manipulations (see Chart 1), we hypothesized that Steve was engaging in this aberrant behavior for the purpose of sensory stimulation. We concluded this due to the absence of eye gouging behavior while Steve was wearing sunglasses.

The Motivation Assessment Scale (MAS)

Following the functional analysis, Steve's teacher completed the MAS to validate our original hypothesis. This scale includes 16 questions about the possible influence of social attention, escape from unpleasant situations, tangible reinforcers, and sensory feedback on challenging behaviors (Durand & Crimmins, 1988b). Respondents are asked to rate the likelihood of the target behavior occurring in various situations on a 7-point Likert-type scale.

Steve's SIB received the highest scores on the sensory category, suggesting that the SIB may have been maintained by sensory stimulation. The results of the MAS supported the data obtained from the functional analysis. Steve was engaging in this

aberrant behavior for the purpose of sensory stimulation. Results from these assessments should be viewed with caution. As with any functional analysis, the present methodology cannot be said to conclusively determine the function of this student's SIB.

Intervention
After completing the functional analysis and the MAS, we designed the initial intervention (i.e., Phase 1). We discussed the proposed intervention with Steve's teacher, parents, and other school personnel. The team decided that the intervention would begin with Steve wearing sunglasses. We made data-based decisions to maintain or modify the intervention on a regular basis (i.e., on a weekly basis and sometimes on a daily basis). All intervention procedures were administered by the classroom's paraprofessionals working in the class; they were trained by the first author.

Data-Based Decisions and Results

Phase 1: Wearing sunglasses
Throughout the various intervention phases, we interrupted each episode of eye gouging and told Steve to keep his finger out of his eyes. The behavior decreased substantially at the beginning of phase one which consisted of Steve's wearing of sunglasses. Following five days where data could not be collected, the incidence of eye gouging returned to levels that approximated baseline conditions. Following another period wherein data were not collected, eye gouging continued at levels similar to those observed during baseline; however, there was considerable reduction in performance level on the last day of this phase. This dramatic drop in performance was related to events beyond our control that effected the representativeness of the data, and therefore we did not attribute great significance to it. Overall, the celeration for this first phase of treatment was x1.05. In this phase throughout the study, the record floors varied in response to the observation and data collection opportunities. Occasionally, adjustments and observation time periods were required to accommodate early dismissals, assemblies, or circumstances such as prior activities lasting longer than anticipated.

Phase 2: Wearing glacier sunglasses
In an attempt to make it more difficult for Steve to engage in eye gouging, we introduced the use of glacier glasses, sunglasses with side shields attached to the frame. Associated with this change, the occurrence of eye gouging decreased initially and then increased somewhat throughout the remainder of the phase. Overall, the celeration for this phase was x6.00, a turn up of x5.70 from the previous phase. Obviously, another change was needed in Steve's treatment program.

Phase 3: Wearing glacier glasses and using manipulatives
We determined that an addition to inconveniencing eye gouging, we needed to establish a new behavior that would be incompatible with eye gouging. We conducted a preference assessment (Dyer, 1987) to determine which manipulative activities would appeal to Steve. He chose a vibrator, thick water balloons, a thick balloon with marbles in it, a ball, plastic shapes, and a plastic tube. Opportunities to manipulate these articles were combined with the wearing of glacier glasses during Phase 3. Steve was allowed to manipulate the articles only during times when academic responses were not requested. Only one article was available at a time, but the articles were presented in a random order to limit the probability of satiation. Steve's preferred articles were the vibrator, the plastic tube, and the balloon with marbles. The eye gouging decreased considerably during this phase, resulting in a turn down of x16.50. The phase celeration was ÷2.75, which resulted in the lowest rate of eye gouging in the study.

Phase 4: Wearing glacier glasses, using manipulatives and DRO 1-M
Even though Steve's progress was acceptable, we thought we could hasten the decrease in eye gouging by presenting an edible reinforcer after each minute of time during which no instances of eye gouging were observed. The edible reinforcer (e.g., fruit, cookies, crackers, small pieces of candy, nuts) was paired with a praise statement. A beep tape was used to signal the end of each one-minute interval. When eye gouging was observed, we interrupted the behavior, and told Steve that he would not be able to receive the edible reinforcer, and reminded him that future rewards would be given him contingent upon the absence of eye gouging (e.g., "I can't give you a treat now because your finger was in your eye. Next time you will be able to earn a treat if your fingers are not in your eyes.").

The data suggest the decision to include the praise and edible reinforcer may have been unnecessary; the levels achieved during this phase may have been achieved without any change at all in the previous treatment condition. The incidence of eye gouging actually increased a little at the beginning of the phase, but then decreased through the middle part of the phase, producing the lowest rates yet of this behavior. The behavior increased

somewhat during the final portion of the phase, but the level was still lower than the ending level of the previous phase. While this phase may have been unnecessary, we did achieve a complete absence of the behavior during an experimental session for the first time in the study. This occurred three times during this phase. The overall celeration during this phase was ÷1.33, a turn up of x2.06 from the previous phase.

During Phase 4, we decided to conduct a reversal to document that treatment variables were actually controlling the behavior. The teacher was not administering treatment all day long because she had other duties to perform. Although we felt this reversal was ethical, we wanted to minimize the amount of time without treatment during our session. We instituted a modified reversal which consisted of a 30 minute block of time; the procedure consisted of five minutes of treatment, then five minutes without treatment (i.e., withdrawal), repeated three times. The results provide evidence of experimental control; that is, reduced levels of eye gouging were consistently associated with the use of glacier glasses, manipulatives, and the DRO procedure. The following is a summary of the results of these six five minute periods:

Treatment in Place

Occurrences of Eye Gouging

	Total # of Events	Rate Per Minute
(A1)	0	0
(A2)	1	1.2
(A3)	0	0

Withdrawal of Treatment

Occurrences of Eye Gouging

(B1)	6	1.2
(B2)	9	1.8
(B3)	8	1.6

Phase 5: Wearing glacier glasses, using manipulative and DRO 1-M (Social R^+) DRO 3-M (Edible R^+)

During Phase 5 we decided to thin the schedule of reinforcement. Social reinforcement was delivered every minute (similar to Phase 4), while edibles were delivered every three minutes. This was to prevent Steve from satiating on edibles. During this phase the occurrences of eye gouging accelerated by x20.

Phase 6: Wearing glacier glasses, using manipulatives and DRO 1-M (Social R^+) DRO 2 -M (Edible R^+)

It appeared that we made the reinforcement schedule too lengthy and that we needed to alter the intervention. Therefore, during our sixth intervention phase, we continued to administer the social reinforcement every minute and deliver edibles every two minutes, contingent on Steve engaging in behavior other than eye gouging. This procedure stabilized the behavior once again. Behavior decelerated by ÷2.0 (see Chart 2a).

Phase 7: Wearing glacier glasses, using manipulatives and DRO 1-M (Social R^+) DRO 3-M (Edible R^+)

During our next data-based decision meeting we decided to reinstitute our previous attempt to lengthen the reinforcement schedule for edibles. Social reinforcement was still on a one minute DRO schedule, but edibles were administered on a three minute DRO schedule. Behavior remained relatively low but was still highly variable. During the third day of this phase, an untrained paraprofessional ran the treatment program. None of the trained aides was available. Due to this change in personnel, eye gouging increased dramatically--up to 20 eye gouges in a sixty minute session (see Chart 2b, a continuation of Chart 2a).

Phase 8: Wearing glacier glasses, using manipulatives and VDRO 1-M (Social R^+) VDRO 3-M (Edible R^+)

When behavior stabilized once again, we decided to make another phase change. The goal of intervention phase eight was to thin the schedule of reinforcement, so we changed to a variable interval schedule. We selected a variable interval schedule in an attempt to strengthen Steve's behavior and cause it to be more resistant to extinction. Intermittent reinforcement schedules typically are more successful in maintaining behavior over time. We utilized a variable three minute DRO schedule (VDRO 3-M). We continued to utilize a beep tape, but now the tape would beep on an average of every three minutes (e.g., sometimes it would beep every minute; other times it would beep every four or five minutes). This intervention modification further reduced the behavior (see Chart 2b); behavior was flat (x1.0) with a median of zero eye gouges during this phase.

Phase 9: Wearing glacier glasses, using manipulatives, VDRO 1-M (Social R^+), and VDRO 5-M (Edible R^+)

Intervention Phase 9 instituted a variable five minute DRO schedule. This phase change resulted in complete absence of eye gouging (see Chart 2b);

however, there were only two data points during this phase due school dismissing for summer recess.

Phase 10: Extended school year program - - wearing glacier glasses, using manipulatives, VDRO 1-M (Social R^+) and VDRO 5-M (Edible R^+)

Since only two data points existed during Phase 9, we continued to collect data during summer school (i.e., extended school year) even though there was an entirely new staff (i.e., a new teacher and three new paraprofessionals). The intervention was the same as Phase 9. Steve was never observed engaging in more than three eye gouges during any session throughout the summer. In just over half of the sessions, Steve did not engage in any eye gouging (see Chart 2b). The extended school year program was treated as a follow-up phase.

This study was part of the development of the *DECEL* software (Young, Macfarlane, Kemblowski, & Martin, 1991). Procedures were refined, formalized, and adapted for a computerized application. *DECEL* is an expert system that assists practioners in conducting a functional analysis of challenging problem behaviors, designing interventions which includes development of alternate behaviors, monitoring student progress during implementation, and facilitating data-based decision making. This software helps less experienced professional use these procedures efficiently and effectively.

Discussion

Steve's severe, chronic eye gouging had maintained at high levels for over five years. Steve's physician was concerned that he may damage his eye to the point of popping his eye out of the socket. The findings of the study demonstrate that the use of a functional analysis paired with antecedent interventions, positive reinforcement techniques (DRO), and data-based decision making effectively decreased Steve's eye gouging to near zero level. We believe that a major strength of this study was the use of a combination of procedures based a functional analysis and on-going data-based decisions.

Previous attempts to eliminate the eye gouging behavior were aversive in nature. For example, when Steve eye gouged or attempted to do so his fingers were taken out of his eyes, he was redirected, and told "no" sternly. The techniques we used allowed Steve to be treated in a positive and safe manner. New behaviors were taught, minimizing the risk of developing new problem behaviors. The approach was also socially validated by Steve's parents, teachers, and staff supporting the intervention.

From the early days of behavioral analysis functional analyses have been recommended as a way to understand, and reduce or eliminate aberrant behavior (Baer, Wolf, & Risley, 1968; Bijou, Peterson, & Ault, 1968; Kanfer & Saslow, 1969; Skinner, 1938; Skinner, 1953; & Sidman, 1960). However, until recently, few researchers have reported utilizing a functional analysis when attempting to eliminate or reduce self-injurious behavior or any aberrant behavior (e.g., Berkman, & Meyer, 1988; Underwood, Figueroa, Thyer, & Nzeocha, 1989). A functional analysis identifies variables that maintain behavior. Therefore, it is our opinion that chronic and severe aberrant behaviors cannot be eliminated without a full functional analysis and that no behavior change procedure should be implemented without one.

Data were analyzed at least on a weekly basis by the team and sometimes on a daily basis, if the data warranted. Due to the utilization of data-based procedures, mistakes were recognized and remedied quickly (e.g., utilizing untrained paraprofessional, and thinning the reinforcement schedule to quickly).

We had a difficult time overcoming eye gouging behavior, but the combination of a functional analysis, systematic manipulations, identification of functions, positive interventions (e. g., manipulatives, DRO), and data-based decisions resulted in reductions of eye gouging to zero or near zero levels. There were no data as to which technique had the most impact on the behavior. The results could have been due to one of the techniques, (e.g., DRO, the sunglasses, or the use of manipulatives), but most likely the combination of all three of the techniques was needed. Future research needs to consider these relationships.

The weaknesses of this study included: the absence of collecting data on the actual use of the manipulatives, not collecting data on other appropriate alternative behaviors to replace the eye gouging, and the possibility of multiple treatment interference (Kazdin, 1982). If we had collected data on Steve's use of manipulatives, we could have continually assessed the effectiveness of the different manipulatives and Steve's preference to them. Nonaversive behavior management seeks alternatives to behavioral suppression through antecedents and positive contingencies and calls for a

focus on interventions to educate and promote the development of adaptive behavioral repertoires. Teachers and practitioners need to select appropriate alternative behavior to replace aberrant behavior. Data must be collected on this alternative behavior and decisions must be made based on the acquisition of new skills, as well as on the reduction of the problem behavior.

It is quite possible that the combination of the treatments caused the decrease of Steve's eye gouging. Multiple-treatment interference may arise when a subject receives two or more treatments within the same investigation. The results of the experiment may be internally valid; however, the possibility exists that the particular sequence or order in which the treatments were administered has contributed to the results (Kazdin, 1982). Although this does not mean that the generalizability of this study is completely jeopardized, some caution should be considered when interpreting these results since it is not possible to know that a certain procedure produced the change or a combination and/or sequence of procedures are responsible. However, even with these limitations, this study contributes to the treatment of persons with challenging problem behaviors. It is our hope that more teachers, practioners, and researchers will follow the pattern of conducting a functional analysis before designing interventions to eliminate aberrant behavior and utilizing data to document success.

Future research in the area of SIB should also focus on the effects of functional curricula. Designing curriculum that meets both the student's functional needs and is incompatible with aberrant behavior may be more efficient and effective. Another aspect of our study which deserves further investigation is the functional relationship between undesirable behaviors and desirable alternative behaviors and making data-based decisions regarding those relationships. The systematic fading of the sunglasses (e.g., from glacier sunglasses to regular sunglasses, dark lenses to light lenses, and finally the removal of the glasses entirely) and the use of manipulative or sensory reinforcement procedures as an alternative to eye gouging should be investigated. Future research also needs to examine the impact of a functional analysis, antecedents, interventions, positive reinforcement techniques, Precision Teaching techniques (i.e., data-based decisions), or a combination of these approaches on eye gouging and other self-injurious behaviors.

Summary of Steps for Translating This Research Into Practice

1. Operationalize behavior (i.e., pinpoint).
2. Conduct functional analysis (see O'Neill et al., 1990).
3. Conduct motivational assessment (see Durand & Crimmins, 1988b).
4. Assess reinforcer preference.
5. Choose a recording technique.
6. Collect baseline data.
7 Select intervention (e.g., DRO, DRI, or Alt-R).
8. Select the schedule of reinforcement.
9. During intervention, a kitchen timer or beep tape is set to a predescribed time. If no SIB occurs the staff member administers social reinforcement coupled with primary reinforcement (i.e., edibles).
10. If SIB occurs during interval, the SIB is interrupted and the student is told why he or she is not going to receive reinforcement. The student is given an opportunity to receive reinforcement during the next interval, if no SIB occurs.
11. Analyze data at least on a weekly basis. Then make treatment decisions based on the data.
12. Increase the duration of the intervals through out the behavior program as the students SIBs diminishes. If behavior is occurring frequently, start with a one minute schedule. Gradually increase the length of the intervals.
13. When the desired interval length is reached, use a variable interval schedule to strengthen low rates of the behavior.

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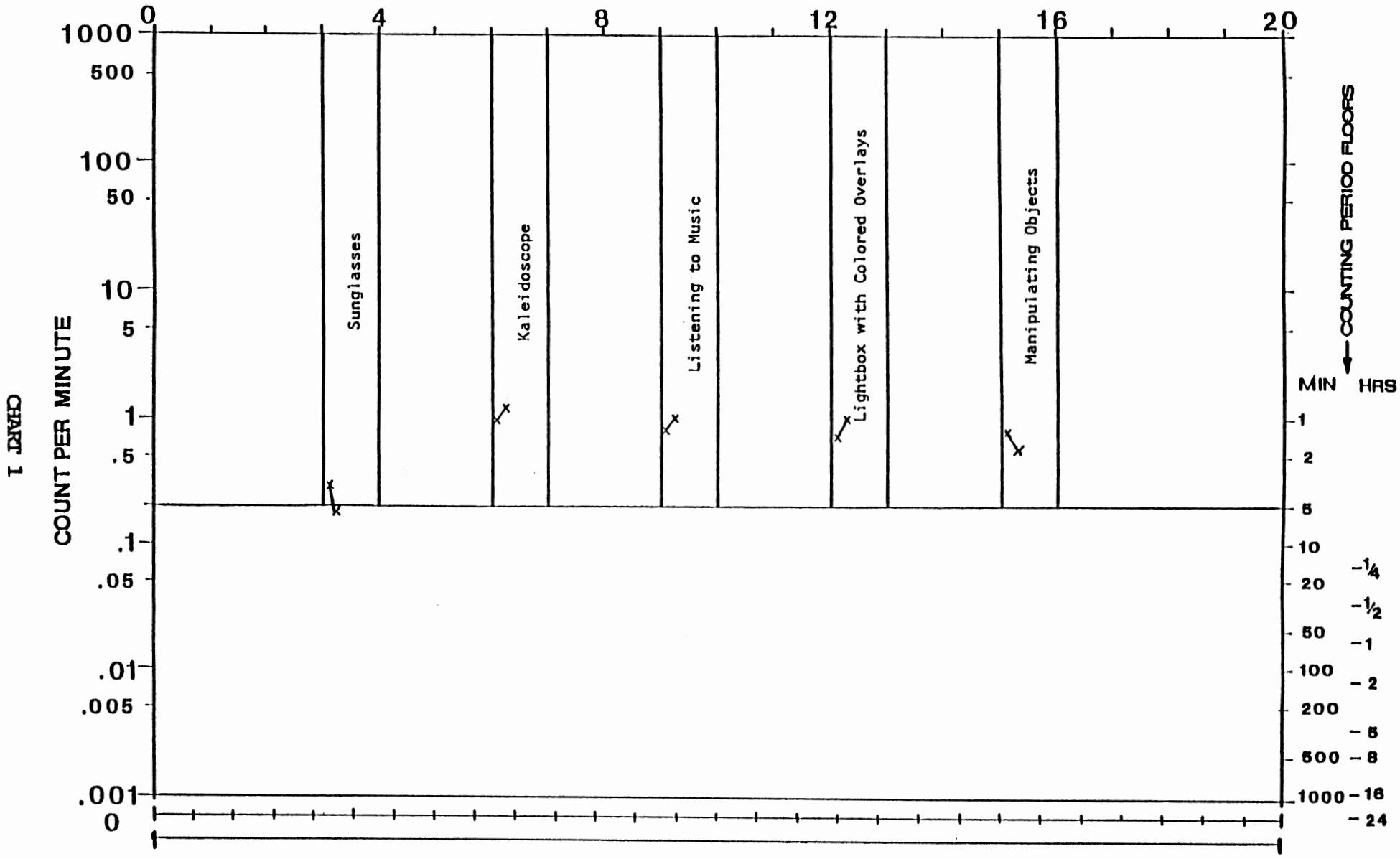

CHART 1. Five-minute observations of self-injury reflecting five different environmental conditions.

SUPERVISOR	ADVISER	Kim Miske MANAGER		Steve BEHAVER	14 AGE	LABEL	Eye Gouges COUNTED
DEPOSITOR	Mount Logan Middle School AGENCY		TIMER	Ed Canclo COUNTER	CHARTER		

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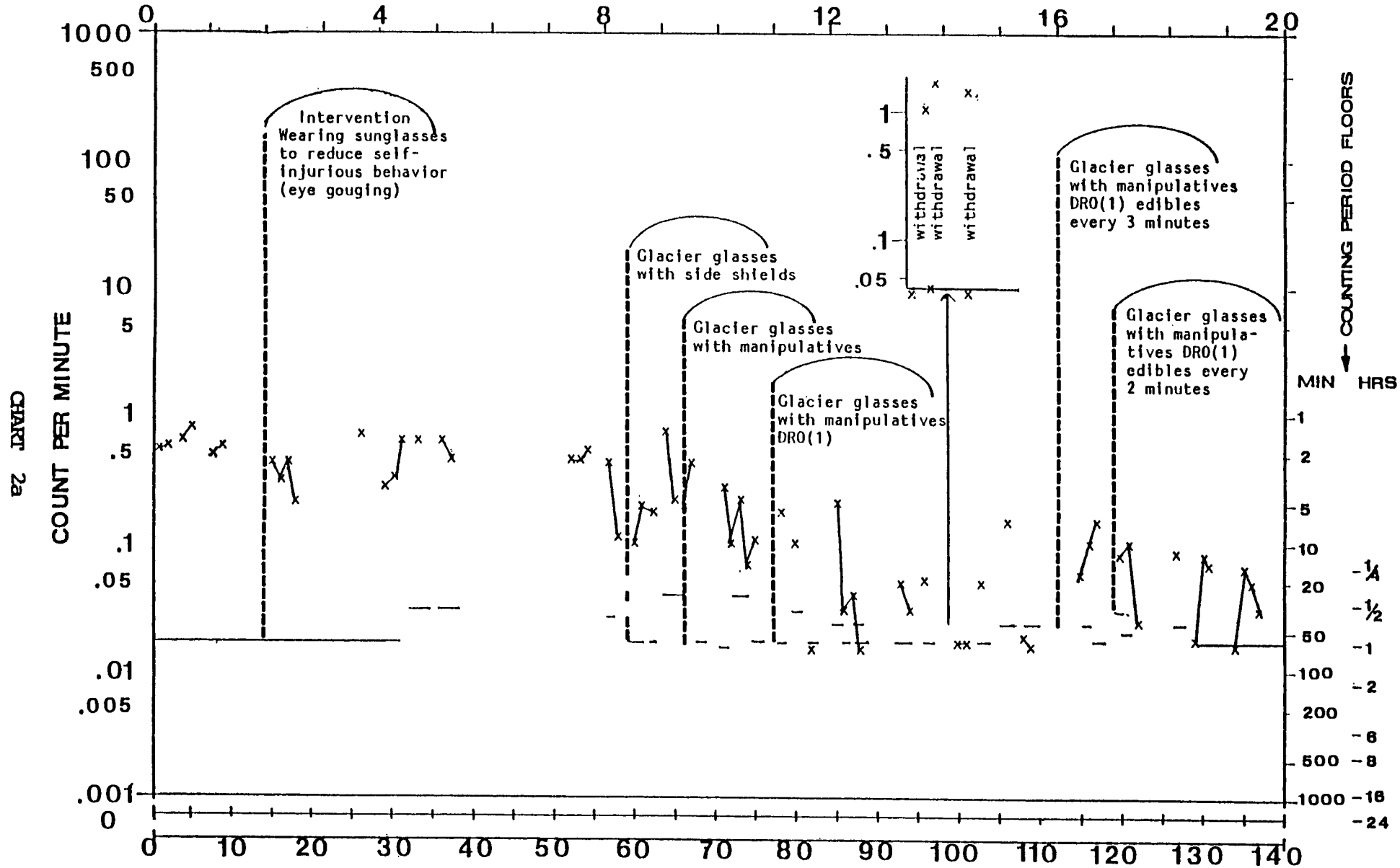

CHART 2a. Occurrences of eye gouging.

6 CYCLE 20 WEEK

SUPERVISOR	ADVISOR	Kim Miske MANAGER		Steve BEHAVER	14 AGE	LABEL	Eye Gouges COUNTED	35
DEPOSITOR	Mount Logan Middle School AGENCY	TIMER	Ed Cancio COUNTER	CHARTER				

CALENDAR WEEKS

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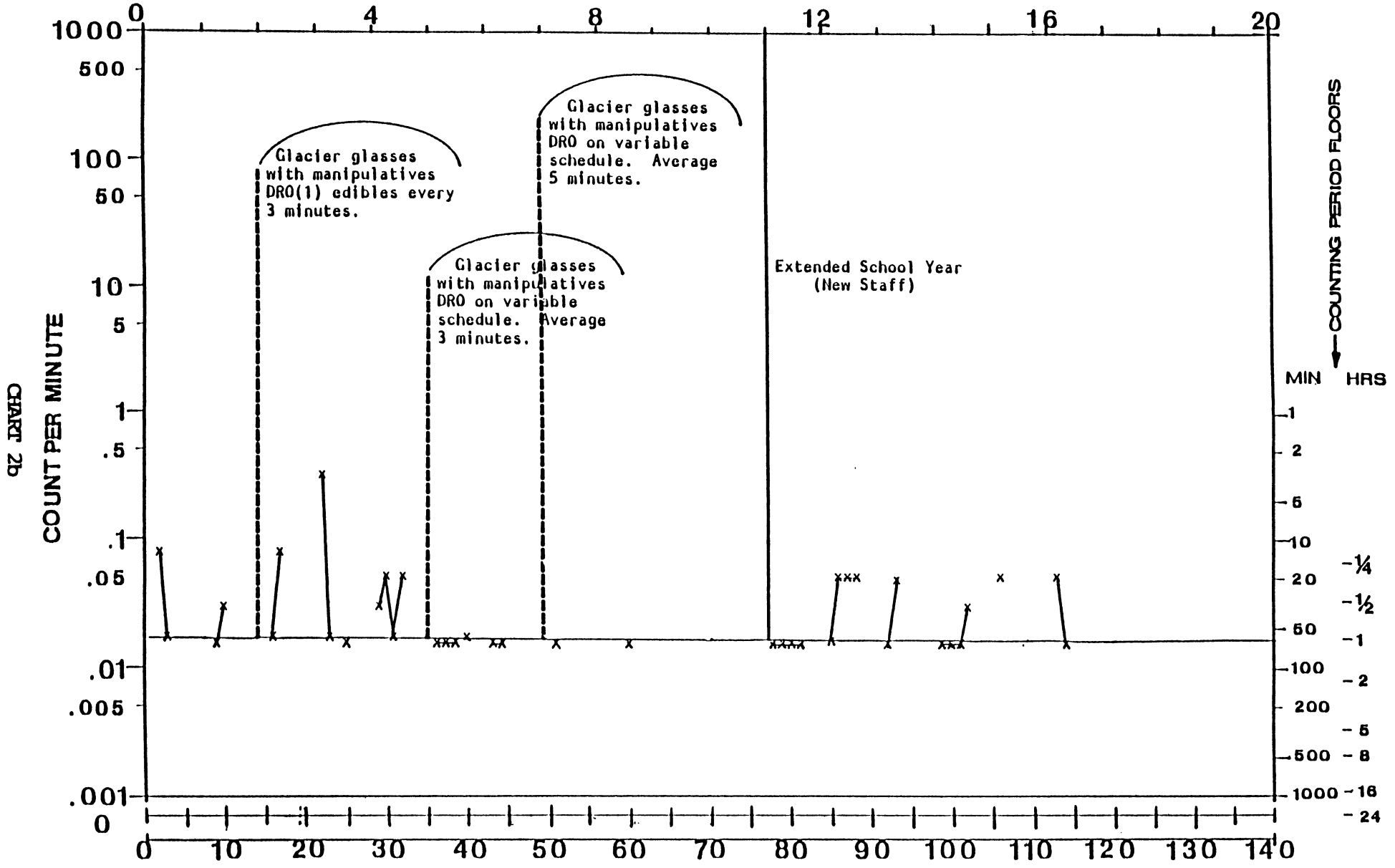

CHART 2b. Occurrences of eye gouging (continuation of data).

6 CYCLE 20 WEEK

SUPERVISOR	ADVISOR	Kim Miska MANAGER		Steve BEHAVER	14 AGE	LABEL	Eye Gouges COUNTED
DEPOSITOR	Mount Logan Middle School AGENCY		TIMER	Ed Cancio COUNTER		CHARTER	