THE EFFECTS OF INSTRUCTIONS, INCENTIVE, AND
FEEDBACK ON A COMMUNITY PROBLEM:
DORMITORY NOISE¹

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A reinforcement system utilizing instructions, modelling, feedback, and group reinforcement was employed in an attempt to reduce disruptive noise on three university residence halls. A fourth hall received the same treatment program without the reinforcement component. Noise scores were determined by recording the number of discrete noise occurrences over a criterion decibel level. On all four residential floors, noise scores during treatment conditions were lower than initial and final baseline levels. Additionally, periods of noise reduction corresponded to the changing criterion multiple-baseline and reversal designs utilized. Pre- and posttreatment questionnaire responses from the three reinforcement floors paralleled changes in objective noise data. At posttreatment, residents reported less noise disturbance of study and sleep and more control over the noise situation and floor problems in general. These results indicated that a comprehensive behavior-modification treatment package was effective in reducing disruptive noise in university residence halls. Difficulties in data collection and anomalies in the data are discussed. Future directions for field-based behavior-modification research are outlined.

DESCRIPTORS: community based treatment, education, group contingencies, instructions, modelling, feedback, reinforcement, response rate, noise reduction, university dormitory

Behavior-modification research has recently expanded beyond educational and clinical settings to problems of environmental and cultural design (*cf.* Meyers, Craighead, and Meyers, 1974). Behavior-modification techniques have been used to decrease littering (Burgess, Clark, and Hendee, 1971; Clark, Burgess, and Hendee, 1972; Kohlenberg and Philipps, 1973; Powers, Osborne, and Anderson, 1973), increase the use of mass transportation (Everett, Haywood, and Meyers, 1974), improve industrial efficiency (Hermann, de Montes, Dominquez, Montes, and Hopkins, 1973; Emery Air Freight Corporation, Note 1), promote racial integration (Hauserman, Walen, and Behling, 1973), increase paper recycling (Geller, Chaffee, and Ingram, *in press*)

and operate community service centers (Phillips, 1968; Turner, Note 2). These studies point toward a broad application of behavioral technology in environmental design.

The target of the present study was the environmental problem of disruptive noise, a common concern in classrooms (Wilson and Hopkins, 1973), industry (Baron, 1970), and urban areas (Glass and Singer, 1972). Extensive surveys taken on a college campus indicated that about one-third of students in the residential dormitories could not study in their rooms due to noise. Almost two-thirds of the students sampled reported at least occasional difficulties studying and/or sleeping due to excessive noise in the dormitories (Pennsylvania State University, Note 3).

While two behavior-modification studies had demonstrated the successful reduction of noise in classroom settings (Schmidt and Ulrich, 1969; Wilson and Hopkins, 1973), the present experiments dealt with disruptive noise in a college

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residential setting. These experiments attempted to test procedures consisting of instructions, modelling, feedback, and group reinforcement that would reduce disruptive noise in a university residence hall.

METHOD

Subjects and Setting

The experiment was conducted on four floors in three undergraduate female residence halls at the University Park campus of The Pennsylvania State University. Floors where residents both identified noise as a severe problem and expressed a willingness to modify that problem were chosen to participate in the study.

Floor A was occupied by 20 undergraduate females, one of whom served as resident advisor. The floor was a straight corridor 32.00 m long by 1.68 m wide by 2.44 m high, enclosed at one end by double doors leading to a stairway and open at the other end to a lobby containing entrances to an elevator and stairway. The floor itself contained entrances to nine double-occupancy rooms and two single-occupancy rooms. All floors involved in this study contained several wall telephones, water fountains, and entrances to bathrooms, maintenance closets, and study lounges. Floor B, on the third story of the dormitory, was identical to Floor A in population size and physical make-up.

Floor C was occupied by 49 undergraduate females,² one of whom served as resident advisor. The floor was in the shape of a "T". The base of the "T" was 41.15 m long by 1.68 m wide by 2.44 m high with double doors leading to a lobby at the closed end. The top of the "T" was 44.20 m long by 1.68 m wide by 2.44 m high with double doors leading to stairways and building exits at both ends. The floor contained

entrances to 21 double-occupancy rooms (with two vacancies), nine single-occupancy rooms, and an elevator at the intersection of the "T".

Floor D was occupied by 51 undergraduate females, one of whom served as the resident advisor. The floor was rectangular in shape with a dividing middle hall. The long sides were 53.34 m long by 1.52 m wide by 2.13 m high. The middle hall connecting the two sides was 5.18 m long by 1.75 m wide by 2.13 m high and the end halls were 5.18 m long by 2.06 m wide by 2.13 m high. The floor contained entrances to 27 double-occupancy rooms (with four vacancies) and the resident advisor's single room. The middle hall contained entrances to two elevators. Two stairway exits were at both ends of one of the long halls.

The experiment took place during the spring academic term for Floors A, B, and C; Floor D underwent treatment during the summer term. Residents on Floors A, B, and C were almost equally distributed among the four academic years; on Floor D, 26 of the 51 residents were freshmen, a proportion double that of any of the other three floors. On all floors the experiments were conducted from 7:00 p.m. to 2:00 a.m. Sunday through Thursday nights. Each such five-day period is defined as a week.

Resident advisors on all floors were treated no differently than other floor residents. During the experimental period, as under nonexperimental conditions, resident advisors continued to urge floor residents to maintain quiet.

Apparatus

The basic noise-detection unit consisted of a Wollensak Super Dynamic Microphone secured along a wall directly under the ceiling some 2 m above the floor. The microphone was connected to a Grason-Stadler, Model E7300A, voice-operated relay (VOR) set to operate whenever noise input exceeded 82 dB at the microphone on Floors A, B, and C and 84 dB on Floor D. The VOR was operated at its fastest attack and release times, which allowed accurate measurement and recording of separate syllables

²Most of these residents had participated in a very short (five-day) pilot program in which they had been rewarded (a hall party) for reducing noise using the noise feedback equipment employed in this study. The pilot study had been conducted during the prior academic term.

over the decibel criterion. The decibel level was calibrated weekly with a General Radio Audiometer Calibration Set, 1565-2, 9A type coupler. These decibel levels, identified as disruptive by floor residents in prebaseline tests, were held constant throughout the experiment.

The VOR operated a Sodeco Type TCeZ4E counter and an ordinary 6.35-cm doorbell. Each noise occurrence over the decibel criterion produced one unit increase on the counter and a bell ring. The doorbell was used for the delivery of feedback and was centrally placed in each hall. The bell ring was clearly audible throughout the hall. An AMF Paragon Model APT 15-0 Heavy Duty 24-Hour Timer was used to turn the unit on and off in those instances when the resident advisor or a research assistant was not available.

On both Floor A and Floor B, the voice-operated relay was activated by two microphones placed at regular intervals throughout the corridor. On Floor C, four microphones, placed at regular intervals throughout the corridor, were used. On Floor D, six microphones, three placed at regular intervals on each of the long halls, were used. With the exception of the microphones and bells, all equipment was locked in the resident advisor's room.

Data Collection

Objective noise data were obtained by reading the number of occurrences of noise over the decibel criterion from the counter after each experimental day. A frequency count was chosen over duration of noise or intensity of noise due to both its simplicity and relevance. An example of this meaningfulness can be seen in pilot work where in one 7-hr recording period an 85-dB criterion was transgressed 594 times. Observation revealed that all loud hall noise was of the short, sharp variety (yelling down the hall, laughter, screams, running, loud conversation, etc.) and manual timing of these loud noises during the 7-hr period resulted in an accumulated duration of loud noises of under 12 min. It appeared obvious that 12 min of loud noise in

7 hr would not appear to be overly disruptive, but 594 occurrences in 7 hr, or an average of three occurrences every 2 min, could easily disrupt study and sleep.

A questionnaire assessing subjective judgments of resident-hall noise, study, and sleep was given during the first week of baseline and the last week of treatment for all floors. Additionally, concurrent with the assessment for Floor D, the same questionnaire data were obtained for a *no-treatment control floor* identical in population size and physical make-up to Floor D.

Procedure

Floors A and B. Treatment on Floors A and B was evaluated via a multiple-baseline design across floors (Baer, Wolf, and Risley, 1968) with changing criteria (Axelrod, Hall, Weis, and Rohrer, 1974). Floor A underwent 10 days of baseline followed by 30 days of treatment. Concomitantly, Floor B had 20 days of baseline followed by 20 days of treatment. Treatment on both floors was followed by five days of noise recording without feedback or contingency.

Baseline began with a meeting for each floor in which the experimental attempt to reduce noise on the floor was introduced, the purpose of the noise equipment was explained, and the residents were assured that no voice tape recording was occurring. Students who could not attend this floor meeting or the treatment-floor meeting discussed below were contacted individually or in small groups. During baseline, all noise-detection equipment was operative, but the bell, which informed the residents of transgression of the noise criterion, was disconnected. The residents were told that the noise-detection equipment was being checked out over the next few weeks and that the experiment would begin when tests were finished.

Treatment began after a second 1-hr floor meeting, during which the experiment was explained in detail.³ This floor meeting served as

³A transcript of one of the treatment floor meetings is available from the authors for \$2.50 per copy.

the treatment's instructional-modelling component. The function of the noise-detection equipment was explained and the residents were given an introduction to behavior modification. The principles of feedback and positive incentive and the concept of individuals working together to design a more pleasant environment were emphasized. This was followed by a presentation of a behavioral view of disruptive noise. Disruptive noise was described not as a response intrinsic to happiness, tension, or necessitated by "letting off steam", but as a learned behavior. Quiet behavior was discussed in terms of respect for others living and working on the floor. Residents were urged to exchange honest feedback on the noise problem. The benefit of giving feedback on disruptive noise before one "blows up in anger" was stressed, as was the ability to accept the fact that negative feedback may simply be a comment on a momentary behavior, and not a criticism of one's "personality".

Several noise scenes were then modelled by two undergraduate female research assistants. Scenes were enacted where happiness was expressed quietly, negative feedback was given and accepted easily, and positive feedback and social reinforcement were exchanged for quiet behavior.

The residents were then given a demonstration of the bell-feedback system and an explanation of the "scoreboards" posted on the bathroom doors. The scoreboard, a 21.25 by 27.5 cm sheet of paper, informed the residents of the criterion number of noise transgressions for each day of that week, the number of noise transgressions on the previous day, the total number of points earned, and the number of noise violations at approximately 11:00 p.m. each evening. This 11:00-p.m. score was termed mid-evening feedback. Residents were informed that a point would be given for each day on which the noise level did not exceed the posted criterion and that the criterion would be progressively lowered throughout the experiment.

In actuality, the weekly criteria were determined by subtracting 10% of the noise trans-

gressions from the mean of the previous week's daily noise performance. This was continued until a desirable level of quiet, as reported by hall residents and as observed during pilot experimentation, was attained. Exceptions to the 10% weekly reduction procedure occurred when the noise score for a treatment day was at least 100% above criterion. In this case, the next week's criterion was determined by dropping the exceptionally high score from the criterion computations and substituting the criterion itself. High treatment scores were dropped to prevent the next week's criterion from being unproductively high; the criterion was averaged in as a replacement to avoid having the remaining lower treatment scores produce a drastic drop in the next criterion, which hall residents might find difficult to meet.

Finally, the reinforcement system was introduced. Residents on Floor A and Floor B were informed that they could earn 30 and 20 points (one for each day of treatment) respectively and that a perfect performance would bring each hall \$100. Each point on Floor A was worth 3.33% of \$100 or \$3.33. Each point on Floor B was worth 5% of \$100 or \$5.00. Differences in daily monetary reinforcement were necessary to equalize the potential total monetary reinforcement. The session ended with questions and open discussion.

Floor C. Treatment on Floor C was evaluated via an ABA design (Baer *et al.*, 1968) with changing criteria (Axelrod *et al.*, 1974). The study included 10 days of baseline, followed by 25 days of treatment and a 10-day return to baseline.

This study was a preliminary test of an education for self-management model proposed by Meyers *et al.* (1974). A group grade-reinforcement contingency was used in an attempt to reduce dormitory noise. The majority of residents (48 of 49) on Floor C registered for a one-credit undergraduate, experimental course in psychology at The Pennsylvania State University. The resident's course grade was determined by the number of points earned for noise reduction. Ad-

ministrative officials approved the use of the group grade-reinforcement contingency on the basis that dealing cooperatively with a social problem was a valuable educational effort, that group grade contingencies were already utilized at the university (e.g., cooperative research papers and projects), and that students voluntarily participated. Student participation in the grade-reinforcement contingency program was obtained at the beginning of the academic term. The authors obtained student participation by emphasizing that noise was entirely under the residents' control. These residents had demonstrated their ability to reduce noise during prior pilot experimentation.

In the present study, 20 points of a possible 25 (one point for each day of treatment) earned an A, 15 points earned a B, 10 points earned a C, five points earned a D, and under five points earned an F. All other facets of the treatment program were identical to those described for Floors A and B with the following exception. The development of criteria was similar to that for Floors A and B, but the criteria for the first two weeks of treatment were determined by subtracting 25% of the noise transgressions from the mean of the previous week's performance. This strategy was adopted because of high baseline noise levels. The criteria for the last three treatment weeks were determined by taking the mean of the previous week's performance.

Floor D. The treatment on Floor D was also evaluated within an ABA design. The study consisted of 10 days of baseline, 20 days of treatment, and a five-day return to baseline.

The treatment program on Floor D was identical to that administered on the other floors except that the feedback component was more comprehensive, the reinforcement variable was absent, and the criteria were computed according to the method described below. The instructions on noise reduction were delivered during the treatment meeting. Feedback in the form of the scoreboard and bell was employed throughout the treatment condition; additionally, the counter (with the clearing mechanism jammed)

was displayed in a prominent place in the hall so that residents had continuous access to noise transgression totals. Finally, points were delivered for evenings on which the hall remained under the posted criterion. Points brought no backup reinforcement.

The criteria for the initial two weeks were determined by subtracting 25% of the noise transgressions from the mean of the previous week. The criterion for the third treatment week was determined by subtracting 10% of the noise transgressions from the mean of the previous week. The final treatment criterion was unchanged from Week 3 due to an increase in noise transgressions from Week 2 to Week 3.

RESULTS

Reliabilities

Once per week on each residential hall, daily readings of noise occurrences were independently recorded by two observers. Complete agreement was obtained on all occasions. The VORs, counters, and bells were tested each week to ensure that they operated at the designated decibel level.

Frequency Data

Floors A and B. Figure 1 presents the daily number of noise occurrences for Floors A and B in the multiple-baseline design. Floor A showed a descending baseline, with an average of 205 noise occurrences per day (all averages are rounded to the nearest whole occurrence). With a daily criterion of 144 noise occurrences, the first treatment week averaged 109 daily noise occurrences. The following five treatment weeks had criteria of 98, 84, 75, 75, and 75 noise occurrences and daily averages of 93, 83, 45, 85, and 72 noise occurrences respectively. The daily average for the final three treatment weeks (when criteria had reached low levels and noise scores had stabilized) was 67 noise occurrences, 32.7% of the initial baseline average. The daily average for the final baseline week was 385 noise occurrences, 187.8% of the initial

Fig. 1. The daily number of noise occurrences over 82 dB for baseline and treatment conditions for Floors A and B. The solid horizontal lines indicate weekly treatment criteria. The asterisks indicate floor-wide party or "streaking" incidents. The open square indicates verbal punishment delivered by dormitory personnel for the previous evening's noise.

baseline. Daily noise occurrences on Floor A were under the noise criteria on 23 of the 30 treatment days. Floor A earned \$76.59.

The four-week baseline on Floor B averaged 485 noise occurrences per day. The daily criterion for the first treatment week was 304 noise

occurrences, and the average daily floor performance was 514 noise occurrences (except for a "streaking" incident, which raised the weekly average, all days were below the criterion). The criterion for the following three treatment weeks were 175, 116, and 87 noise occurrences respectively. For the same three weeks, average daily noise scores were 129, 170, and 178 noise occurrences respectively. The daily average for these final three treatment weeks was 159 noise occurrences, 32.8% of the initial baseline average. The final baseline week showed a daily average of 429 noise occurrences, 88.5% of the initial baseline average. The daily noise occurrences on Floor B were under the noise criterion on 16 of the 20 treatment days. Floor B earned \$80.00.

Floor C. Figure 2 presents the daily number of noise occurrences for Floor C. During the two-week baseline, Floor C averaged 941 noise occurrences per day. For the five treatment weeks, criteria were 548, 216, 177, 126, and 99 noise occurrences respectively. The average daily noise scores for those five weeks were 288, 177, 126, 99, and 81 (this final score includes only those two treatment days preceding the delivery of the final reinforcer) noise occurrences respectively. The second day of the fifth treatment week was the twentieth day under criterion, and that performance earned the floor an "A" grade. The final three treatment days were essentially a no-contingency, feedback-only condition. The average noise score for these three days was 338, 35.9% of the initial baseline level.

Fig. 2. The daily number of noise occurrences over 82 dB for baseline and treatment conditions for Floor C. The last three days of treatment after delivery of the final reinforcer are a feedback-only condition. The solid horizontal lines indicate weekly treatment criteria. The asterisks indicate a floor-wide party or "streaking" incident. The open circle indicates the delivery of a grade of "A".

The daily average for the final 12 contingency-operative treatment days was 107 noise occurrences, 11.4% of the initial baseline average. The final two weeks of baseline averaged 635 noise occurrences per day, 65.5% of the initial baseline average. Noise occurrences on Floor C were below the criterion on 20 of the 22 days that the contingency was operative. All floor residents received a grade of "A".

Floor D. Figure 3 presents the daily number of noise occurrences for Floor D. The eight-day baseline on Floor D showed an average of 1253 noise occurrences per day. The daily criterion for the first treatment week was 940 noise occurrences and the daily noise score average was 1039 noise occurrences. The remaining three treatment weeks showed criteria of 779, 572, and 572 noise occurrences respectively. Noise scores for these three weeks were 635, 699, and

463 average daily noise occurrences respectively. The daily average for the final three treatment weeks was 599 noise occurrences, 47.8% of the initial baseline average. The final baseline week showed a daily average of 1123 noise occurrences, 89.6% of the initial baseline average. The daily noise occurrences on Floor D were under the noise criteria on 12 of 19 treatment days.

Questionnaire Data

Pre- and posttreatment questionnaire data were collected on the four treatment halls and a no-treatment control floor physically identical to Floor D. The questionnaire attempted to assess subjective reports of noise disturbance of studying and sleeping, control of noise and other floor problems, academic productivity, and social satisfaction in the residence hall.

Fig. 3. The daily number of noise occurrences over 84 dB for baseline and treatment conditions for Floor D. The solid horizontal lines indicate weekly treatment criteria. The asterisk indicates a "streaking" incident.

Floor A. After treatment, floor residents reported less disturbance of sleep and study. Noise disturbed the sleep of 43.75% of the residents before treatment and of only 15.4% after treatment. Disturbance of study in the room was reported by 93.75% of the residents before treatment while only 53.7% reported noise disturbance at posttreatment. No residents felt that the noise problem was under control before treatment, but 53.7% reported the situation under control after treatment. There were essentially no pre-to-post changes in subjective reports of academic productivity or of friendship and warmth on the floor. Slightly higher percentages of residents at posttreatment agreed with statements that residents respected each other's rights and privileges, that the floor contributed to social and personal happiness, and that residents can deal effectively with floor problems. While more residents still found it easiest to study in the library at treatment's end, they reported less difficulty studying and sleeping in their rooms.

Floor B. Before treatment, noise disturbed the sleep of 41.7% of the residents; 33.3% of the residents reported this disturbance at posttreatment. Noise disturbed the study behavior of 58.3% of the residents at pretreatment; 33.3% reported posttreatment noise disturbance. The percentage of residents who agreed that the noise problem was under control increased from 8.3% at pretreatment to 44.4% at posttreatment. After treatment, more students reported that they were academically productive, respectful of each other's rights and privileges, agreeing that the floor contributed to their social and personal happiness, and agreeing that the floor could deal effectively with its problems. Slightly fewer students reported an atmosphere of friendship and warmth on the hall at posttreatment. Location of easiest study and difficulty sleeping and studying at various times of the week showed little or inconsistent change.

Floor C. As on the previous two floors, residents of Floor C reported less noise disturbance of study and sleep at posttreatment. Sleep disturbance was reported by 52.1% of the resi-

dents responding before treatment; only 16.2% reported such disturbance after treatment. Three-fourths of the residents reported pretreatment disturbance of study; at posttreatment this figure dropped to 44.2%. Residents reporting the noise problem under control increased from 18.8% at pretreatment to 48.9% after treatment. Little pre- to posttreatment change was reported in academic productivity or respect for others. Slight reductions were found at posttreatment in the percentage of residents reporting an atmosphere of friendship and warmth on the floor and that the floor contributed to the individual's social and personal happiness. Before treatment, 41.7% of the residents reported that the floor could deal effectively with its problems, but after treatment this figure increased to 53.5%. There was a small increase in the percentage of students who found it easiest to study in their rooms or the hall lounge, and there was a general decrease in reported difficulty studying and sleeping at various times of the week.

Floor D. After treatment, residents reported no change in disturbance of study and sleep. Noise disturbed the sleep of 34.0% of the residents before treatment and 36.1% at posttreatment. Fifty-six per cent found noise a disturbance to study before treatment; 60.3% of the residents reported such posttreatment disturbance. The percentage of students reporting noise under control dropped from 22% before treatment to 12.7% after treatment. There was no pre-to-post change or slight pre-to-post reductions in academic productivity, social satisfaction on the hall, and ability to deal with floor problems. There was little change in reported preference for various study locations or disturbance of study and sleep in residents' rooms during the week.

Control floor. Before treatment on Floor D, 52.2% of the residents of the control floor reported disturbance of sleep; after treatment had terminated on Floor D, 47.2% of the residents of the control floor reported disturbance of sleep. Pretreatment disturbance of studying was re-

ported by 61.3% of the residents; 70.9% reported such posttreatment disturbance. Slightly fewer residents, 11.3% before treatment and 7.8% after treatment, felt that the floor had the noise problem under control. There was a slight pre-to-post increase in reported academic productivity and decreases in social satisfaction and ability to deal with floor problems in general. Preference for various study locations and disturbance of sleep during both weekday and weekend nights showed little change.

DISCUSSION

The present results indicated that comprehensive behavior-modification treatment packages utilizing a reinforcement system with instructions, modelling, feedback, and group contingencies were effective in reducing disruptive noise in a university residence hall. This conclusion is consistent with the results of previous field-based behavior-modification research (Burgess *et al.*, 1971; Everett *et al.*, 1974; Hauserman *et al.*, 1973; Hermann *et al.*, 1973), which indicated that principles of behavior modification are applicable to community problems and environmental design. Additionally, a similar treatment package lacking the reinforcement component also reduced noise, but appeared to be less effective than the total treatment program.

While the residents' objective noise performance corresponded to the experimental designs employed here, several treatment days did not indicate a treatment effect. The noise on Floor A was above criterion on seven treatment days, but only three of these exceeded criterion by more than 19 occurrences. Of these three days, the first, Day 16, was caused by a group of "streakers" running through the dormitory halls. On Days 24 and 32, noise occurrences had already exceeded the criterion before the mid-evening feedback was posted. Most transgressions of the noise criteria appear to be caused by insufficient and inadequate feedback. Both the fluctuating population in an open-field study and the impossibility of residents maintaining

a running count of noise transgressions suggest that a constant display of the noise count, such as occurred on Floor D, should facilitate noise reduction.

Inadequate feedback and the overriding reinforcement of a floor-wide party or streaking incident also appear to account for unsuccessful treatment days on Floors B and C. However, there is evidence to support the efficacy of the treatment program even during streaking incidents. On Day 16, streakers moved throughout the dormitory complex, affecting all buildings and floors. The two floors under treatment, Floors A and C, showed noise scores of 167 and 250 occurrences respectively. Residents on Floor B, still in the initial baseline condition, tallied 1948 noise occurrences. It appears that the treatment program significantly lowered noise levels on potentially boisterous nights, even though they remained higher than typical treatment days.

Two other interesting phenomena occurred in the data. The first is found on Floor B, Day 4. After a floor-wide party on Day 3 (with 2207 noise occurrences), hall residents were reprimanded by dormitory personnel. That evening the noise score was 65, the floor's lowest score of the entire experiment. But this "instructional" effect showed no maintenance and after three days, scores were again at average baseline levels. This leads the authors to question the use of noncontingent instructional or "quiet hours" programs to reduce disruptive dormitory noise.

The second phenomenon is found in a comparison of Floor C with Floors A and B. Floor C showed the greatest drop in noise levels during treatment, and there appear to be at least three possible explanations for this. The first is Floor C residents' involvement in prior pilot experimentation, which may have given them more familiarity with the experimental paradigm and noise-reduction techniques. The second is the use of a one-credit grade as opposed to the monetary reinforcement used on Floors A and B. It seems apparent that a one-credit "A," or the possibility of a lower grade, provides more in-

centive than a potential \$5 share in a \$100 reinforcer. Third is the difference in the manner in which the back-up reinforcers were dispensed. On Floors A and B, each point was being exchanged for the cash reinforcer; under "Total Points Earned" on the Scoreboard, the amount of money and points earned were displayed. On Floor C, an increase in grade was produced by earning five points (five points for a "D", 10 for a "C", *etc.*). In this form of the experimental program, each treatment day under the noise criterion did not mean the acquisition of a small cash sum, but contributed to earning a higher grade.

The results for Floor D are somewhat difficult to compare with those on other floors because of the absence of the reinforcement component in the treatment package and the floor's high proportion of first-term freshman residents. One possible explanation for treatment days above criterion on Floor D is that noise-reduction information was utilized only when academic demands necessitated quiet. An examination of Figure 3 shows the lowest noise scores and highest correspondence with noise criteria during the second and fourth treatment weeks. These weeks correspond to hourly and mid-term examination periods. That academic pressure alone and independent of feedback was not responsible for noise reduction can be seen in the noise increase during the final baseline period immediately preceding final examinations.

Another possible explanation for the results on Floor D is that the bell, which was an integral component for obtaining reinforcers on other floors, may have served as an aversive stimulus on Floor D. This possibility is supported by the vandalism of the noise-detection equipment on Floor D. During the 27 weeks of the experiment on Floors A, B, and C only one act of equipment vandalism occurred. However, during seven weeks of experimentation on Floor D, eight acts of vandalism were recorded.⁴ Other

potentially less-aversive forms of feedback (lights, *etc.*) should be tested. This vandalism also illustrates the problem of noise-detection equipment accessibility. Whenever possible, equipment must be safely secured.

Unlike Floors A, B, and C, Floor D showed no congruence between objective noise data and questionnaire responses. Failure of the verbal reports of noise levels to show reductions may be due to the smaller magnitude of noise reduction, the absence of the informational component supplied by reinforcers on other floors, the possible aversive nature of the bell feedback, or other unknown factors. The present research indicated that a relatively simple reinforcement system employing instructions and performance feedback was effective in reducing disruptive noise in university residence halls. A similar treatment program without the reinforcement system also reduced disruptive noise on a dormitory floor. A comprehensive instruction and feedback program coupled with a small incentive component appears to be the most effective treatment package for the reduction of disruptive noise.

The experimental apparatus utilized here consisted of readily available, relatively inexpensive components. Similar systems have been constructed for under \$150.00 (Tiller, Masek, and Walker, 1974). One possibility for further reducing apparatus costs would be the use of one noise-detection system on several residential units. If disruptive dormitory noise could be reduced by running a noise-reduction program during randomly sampled hours, unknown to residents, then one noise-detection system could simultaneously service several residential units.

Another possibility for reducing program costs would be to utilize monetary deposits from dormitory residents as reinforcers. These deposits could be returned to residents contingent on desired performance. Similar damage and

condition on Floor D, during the final baseline condition on Floor D, and during the final baseline condition on Floor B. Each act of vandalism produces approximately 1 hr of equipment down time.

⁴Only three acts of vandalism interfered with data recording. These acts took place during the treatment

security deposits are already widely used in many college and private residential settings. Finally, the instructional, feedback, and reinforcement components of the treatment program utilized here must be systematically evaluated to determine the most effective, least costly noise-reduction technique.

The present studies found no generalization of behavior change to nontreatment conditions—a crucial problem for the environmental designer. Kazdin and Bootzin (1972) recommended programming of the natural environment as the most effective technique for increasing generalization. Such programming of the environment refers to the permanent institution of reinforcement contingencies designed to produce desired behavior change.

One approach to such programming in field-based research is the development of self-control programs (Thoresen and Mahoney, 1974) or here, community control programs. In this instance, the client-community would be given a working knowledge of behavioral principles and the necessary consultation services to manipulate environmental stimuli and design reinforcement contingencies to produce lasting programmed environments. This community control model could be used in conjunction with the grade contingency demonstrated on Floor C. A course in behavior modification would be given to the client-community with the course grade determined by the effectiveness of the community designed noise-reduction program. Such community controlled behavioral interventions offer the promise of lasting behavioral solutions to significant social problems.

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