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A BEHAVIORAL ANALYSIS OF INCENTIVE PROMPTS FOR MOTIVATING SEAT BELT USE

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The seat belt usage of drivers was observed at the entrance to two campus parking lots during morning arrival times. After 11 days of baseline, fliers which prompted seat belt wearing were handed to drivers of incoming vehicles. At one parking lot all fliers offered a chance to win a prize (noncontingent rewards); while at the second lot only those fliers given to seat belt wearers included a chance to win a prize (contingent rewards). After 24 consecutive observation days, these interventions were removed for 14 days of withdrawal. The recording of vehicle license plates enabled an analysis of belt usage per individual over repeated exposures to the experimental conditions. At the lot with the contingent reward intervention, mean belt usage was 26.3% during baseline, 45.7% during treatment, and 37.9% during withdrawal. At the noncontingent reward lot, the mean percentage of belt wearing was 22.2% during baseline, 24.1% during treatment, and 21.8% during withdrawal. The analysis of repeated exposures per individual verified that only contingent rewards influenced substantial increases in belt wearing, and showed that most of the influence occurred after the initial incentive prompt.

DESCRIPTORS: behavioral community psychology, contingent vs. noncontingent rewards, transportation behavior, prompting, incentives, driver safety, seat belts, large-scale intervention

The proven life-saving and injury-reduction potential of vehicle seat belts, combined with the low usage rate of those belts, makes programs designed to increase voluntary belt wearing a high priority. The value of wearing a seat belt is supported by estimates that more than 50% of the U.S. children born in 1972 will sustain injuries sometime in their lives as a result of an automobile accident (Kahn, 1973), and that accident victims wearing the shoulder and lap harness are 56.5% less likely to sustain a moderate injury and 56.8% less apt to incur a severe injury than are those who do not wear seat belts (Highway Safety Research Center, 1976). The need for effective seat belt promotion programs is indicated by a U.S. Department of Transportation survey which included observations of more than 150,000 drivers in 19 metropolitan areas from November 1977 through November 1979, and concluded that "safety belt use by drivers in the United States is down from 14 per cent in 1978 to 10.9 per cent in 1979" ("Two-year study," 1980, p. 4).

Most of the larger countries, including Australia, Canada, England, France, Germany and Sweden (Adams, Note 1) have addressed the problem of low seat belt usage through mandatory seat belt laws (i.e., vehicle occupants are fined if observed not wearing a safety belt). The U.S. government has not resorted to such mea-

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sures yet, and is unlikely to do so in the future (Waller, 1980; Transportation Research Board, Note 2), although some states have mandated the use of child restraints. Under the Carter administration our government's answer to the problem of low belt usage was the passive restraint (i.e., the air bag or automatic seat belt), mandated for all U.S. vehicles by 1983 (Stamler, 1977). Much to the delight of the automotive industry, this legislation was rescinded under the Reagan administration, and emphasis is currently placed on the promotion of voluntary belt wearing (Bigelow, Note 3). Actually, as detailed by Geller, Casali, and Johnson (1980), the appropriate use of the standard 3-point restraint system (i.e., the combination lap and shoulder belt) is more protective than the passive restraint systems currently available. A special task force of the National Highway Traffic Safety Administration is currently involved in a nationwide effort to motivate vehicle occupants to buckle up (Bigelow, Note 3). Research from the behavioral sciences is particularly relevant for this current approach to the problem of low safety belt usage, and such is the focus of this paper.

Large-scale efforts to promote "voluntary" seat belt usage have included educational, engineering, and incentive approaches. Educational efforts have been numerous and varied, from simple television prompts to comprehensive public education campaigns involving city-wide dissemination of signs, billboards, radio and TV advertisements, school programs, films, slide shows and pamphlets (e.g., Cunliffe, DeAngelis, Foley, Lonero, Pierce, Siegel, Smutylo, & Stephen, Note 4). Unfortunately, the impact of such educational efforts on seat belt wearing has usually been negligible, whether applied throughout entire communities (Cunliffe et al., Note 4), through home television (Robertson, Kelley, O'Neill, Wixom, Eiswirth, & Haddon, 1974), or through employee safety programs (Geller, Note 5; Phillips, Note 6).

Engineering approaches to encourage the use of manual restraints have included ignition-interlock systems and buzzer or light reminders. The interlock system, requiring that front-seat belts are fastened before the car can start, was discontinued after only one year, presumably because of negative public reaction (Robertson, 1975). Instead, cars were equipped with buzzer and light reminder systems in an attempt to encourage belt usage. The only effective reminder devices are buzzers which stay on until front-seat belts are buckled; but these systems are frequently defeated, either by disconnection or by circumvention (Geller et al., 1980; Robertson, 1975).

Geller, Johnson, and Pelton (1982) demonstrated the efficacy of a simple incentive procedure for prompting seat belt use, that involved the distribution of seat belt promotion fliers (i.e., prompts) to drivers who stopped at a pedestrian crosswalk on a university campus, with the contingency (announced on the first flier per driver) that a prize would be awarded to those who collected each of the six different fliers. Recording vehicle license plates enabled a categorization of drivers according to number of treatment experiences, and such categorization allowed for the demonstration of marked treatment effects. Of 180 drivers who received two fliers, 17.2% were wearing a lap and/or shoulder belt during the first flier receipt; whereas 42.2% of these same drivers were wearing a seat belt when given a second flier prompt. Only 25 drivers received four or more fliers, but 52% of these drivers were wearing a seat belt upon receiving a fourth flier. It is noteworthy that the rewards in this study were not contingent on seat belt wearing, but only for stopping to receive a flier which prompted seat belt use.

In a second experiment, Geller et al. (1982) demonstrated that a similar prompting and incentive strategy can be applied in a community setting (i.e., at the drive-in windows of banks), and that the beneficial impact of such techniques is not limited to university students or staff. However, several questions regarding optimal application of prompts and incentives for motivating seat belt use remained unanswered. For example, the necessity of a response-reward contingency is not clear from the Geller et al. results. Either an incentive prompt was given regardless of belt usage (Experiment 1), or a contingency was implemented without a noncontingent control condition (Experiment 2). The present study was designed to examine the relative need for a response-reward contingency in a seat belt promotion program.

When specific and polite, prompts have been effective in modifying a variety of *convenient* behaviors in community settings (e.g., see reviews by Cone & Hayes, 1980; and Geller, Winett, & Everett, 1982). Buckling one's seat belt requires minimal response cost; and thus prompting alone may be a sufficient modification strategy, especially if the prompt is associated with a noncontingent reward. On the practical side, noncontingent rewards are much easier to apply in community settings than contingent rewards. For example, a contingent reward program requires the delivery of a reward or a nonreward, depending upon reliable observations of seat belt practices; whereas with a noncontingent incentive procedure the same incentive flier can be distributed to everyone, regardless of belt wearing. In addition, it is possible that the sponsors of a program to promote seat belt wearing would not want to apply a contingency that requires differential treatment of their patrons.

METHOD

Participants and Setting

Participants consisted of staff and faculty of Virginia Polytechnic Institute and State University during the first and second summer sessions, June 15 to August 30, 1980. Drivers were observed as they entered two large staff/faculty parking lots, which served the two largest classroom/office buildings on opposite ends of the campus. The 49 observation sessions occurred from 7:00 to 9:00 a.m., Monday through Friday.

Observation Procedure

As a vehicle approached the parking lot entrance, one of two observers stationed at the lot (each wearing an orange safety jacket) displayed the back of his or her clipboard on which was boldly printed "PLEASE STOP AGAIN." When the vehicle stopped, the observer approached the driver's window and verbalized a particular statement, depending on the experimental condition. Both observers independently recorded on special data forms the sex of the driver, whether or not she or he was wearing a seat belt, and the license plate number of the vehicle.

There was no attempt to observe every vehicle that entered a particular parking lot. After completing the data recording of a particular driver, an observer held up a "stop" sign to the next driver who approached the observation area. In cases when more than one vehicle were approaching the entrance, the last vehicle in the line was approached with the stop sign. This arrangement prevented traffic congestion or slow downs from being attributed to the seat belt observers.

Experimental Conditions

Baseline. Baseline recordings occurred in both lots every morning for 11 consecutive days (excluding Saturdays and Sundays). After the vehicle stopped, one of the two observers approached the driver and said, "Just checking to see if you're wearing your seat belt."

Treatment. For 24 consecutive work days after baseline, the observer who approached the vehicle handed the driver an incentive flier, the front side of which is shown in Figure 1, and said, "Just checking to see if you're wearing your seat belt and here's a description of how you can win valuable prizes." The flier prompted seat belt use and described a "combination game" in which certain winning combinations of the symbols printed on the flier would result in prizes. For the contingent reward condition, the fliers given to drivers wearing their seat belt contained a contest symbol. Fliers given to drivers not wearing seat belts did not contain a contest symbol, but had a slip of paper stapled to the bottom which read, "NEXT TIME WEAR YOUR

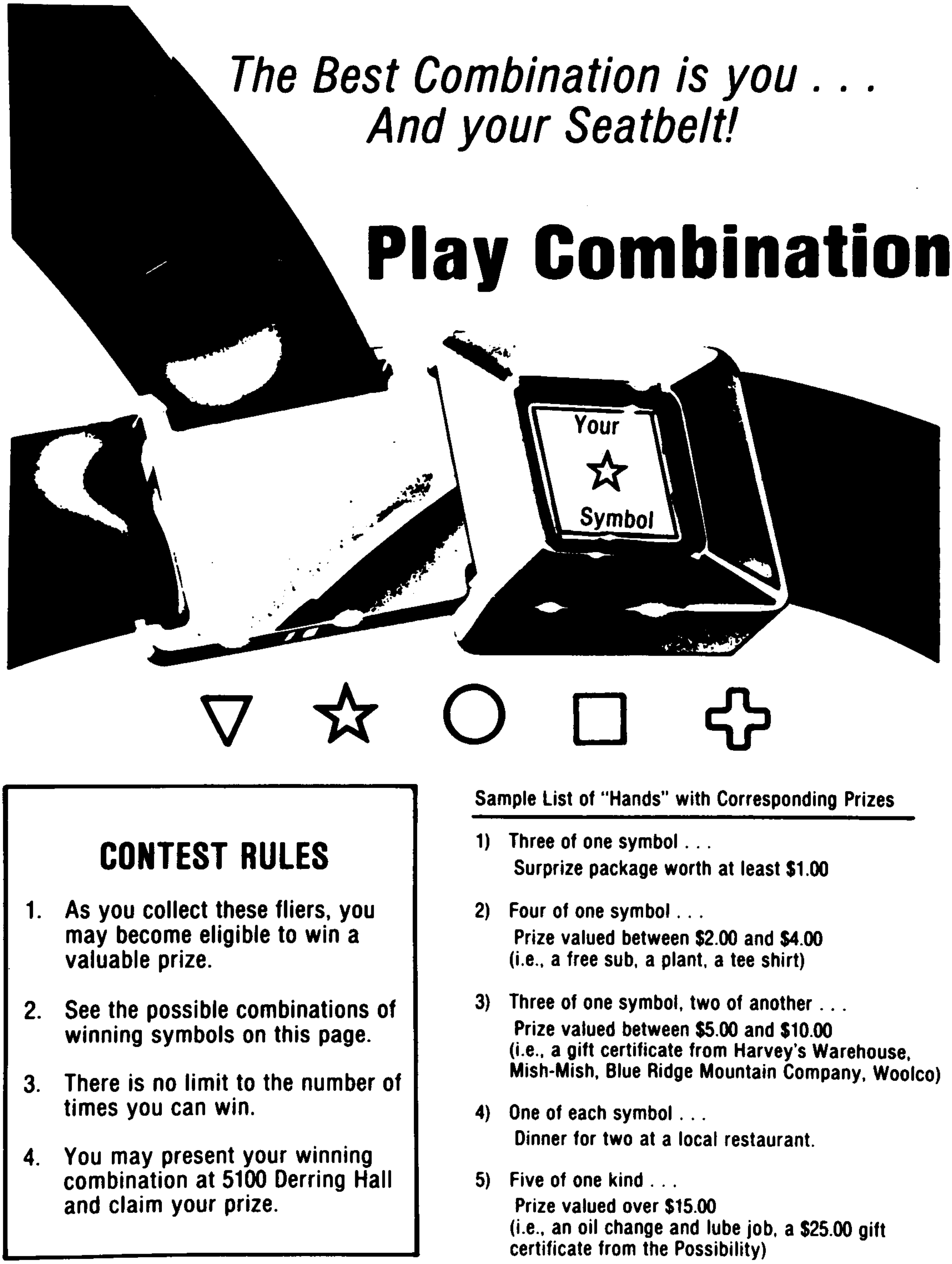

Fig. 1. The front half of the incentive flier which prompts seat belt wearing and describes the combination game. For the contingent reward condition only drivers wearing a seat belt received a valid contest symbol in the center of the belt; all drivers in the noncontingent reward condition received a flier with a valid contest symbol.

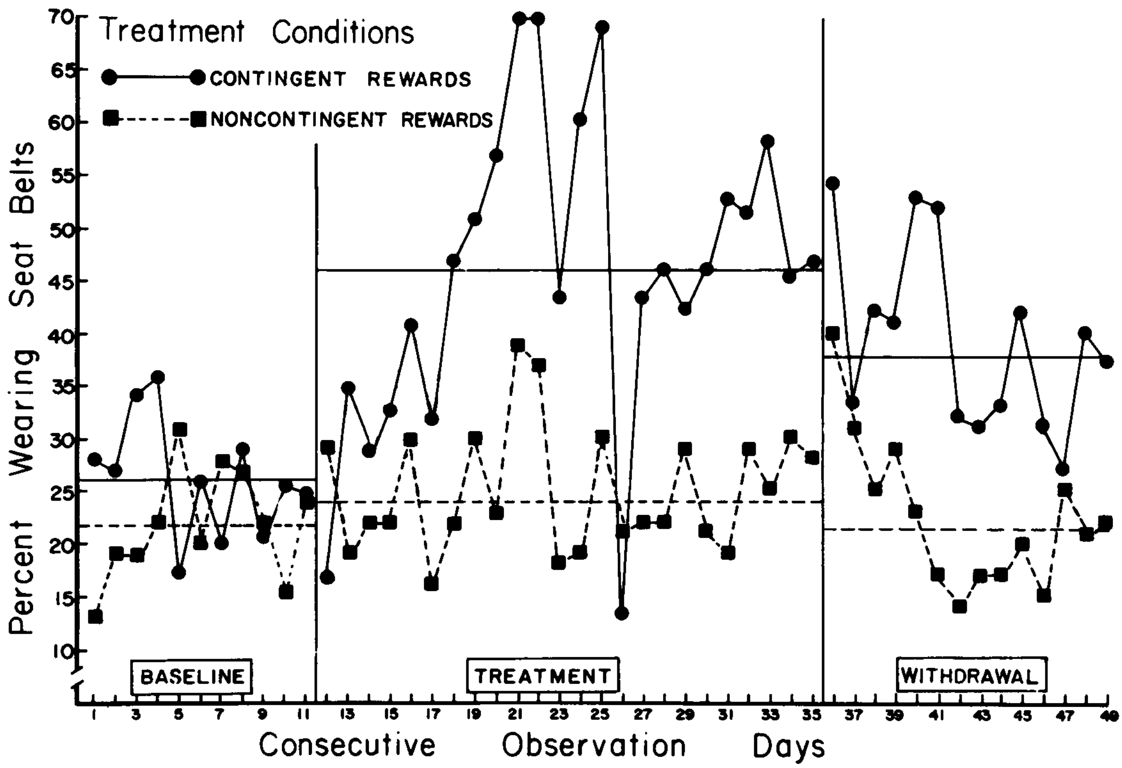

Fig. 2. Daily percentages of drivers wearing a seat belt as a function of experimental phase (baseline, treatment, and withdrawal) and treatment condition (contingent rewards vs. noncontingent rewards).

SEAT BELT AND RECEIVE A CHANCE TO WIN A VALUABLE PRIZE!" For the noncontingent reward condition, all drivers received an incentive flier with a contest symbol, irrespective of seat belt usage. The back of these handbills displayed the logos of local merchants who contributed contest prizes.

In addition to recording seat belt use and license plate numbers, the observers noted: (a) when vehicles bypassed the observer after being prompted to stop; (b) when drivers stopped and interacted with an observer without being prompted to do so (e.g., to request an incentive flier); and (c) when drivers stopped following the observer's sign display, but refused a flier.

Withdrawal. The 24 treatment days were followed immediately by 11 consecutive workdays of a withdrawal period, which was conducted exactly as baseline. The duration of this session was shortened by the end of the summer term, and a concomitant change in the subject population.

Interobserver Reliability

For 91.7% of the 5,325 vehicle observations, two researchers made independent data recordings. Observer agreement was calculated by dividing the total number of observations agreed on for a particular data category by the total number of observations, and multiplying by 100. The percentage of agreement was 99.5% for sex of driver, 97.9% for seat belt wearing, 99.8% for acceptance or rejection of a flier, and 99.3% for the recording of vehicles that did not stop for the observation.

RESULTS

A total of 2,517 observations were made of 906 different vehicles at the contingent reward lot, and 2,808 observations were made of 980 different vehicles at the noncontingent reward lot. Relatively few drivers (a) refused to stop when prompted to do so (6.3% at the contin-

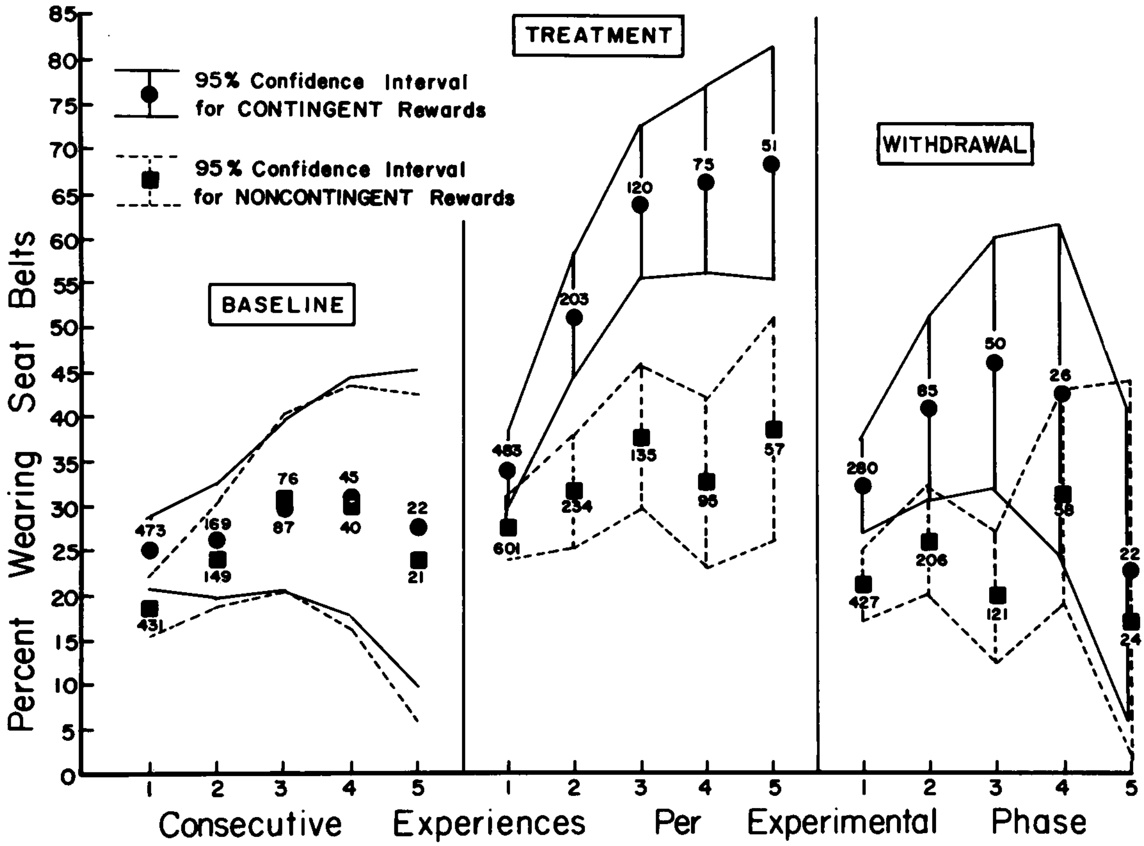

Fig. 3. Percentage of drivers wearing a seat belt as a function of number of consecutive experiences in the baseline, treatment, and withdrawal phases of the study. The number associated with each data point indicates the sample size (i.e., the number of drivers on which the percentage was based).

gent lot and 12.1% at the noncontingent lot); (b) refused an incentive flier when offered one (2.3% at the contingent lot and 2.7% at the noncontingent lot); (c) stopped without being prompted in order to receive an incentive flier (1.1% at the contingent lot and .68% at the noncontingent lot); and (d) parked in both of the target parking lots (.01%). These drivers were eliminated from the data analysis.

Figure 2 depicts the daily percentage of vehicles observed with drivers wearing their seat belts. The mean number of observations per data point was 62.7 and ranged from 25 to 139. The baseline means were 26.3% for the contingent reward lot, and 22.2% for the noncontingent reward lot. During treatment, mean belt usage increased substantially at the contingent lot (i.e., to 45.7%) and only slightly at the noncontingent lot (i.e., to 24.1%). During withdrawal, seat belt usage decreased from the levels obtained during treatment: the withdrawal means were 37.9% and 21.8% for the contingent reward and noncontingent reward conditions, respectively.

Figure 2 shows marked fluctuations in daily belt usage, which were partially due to severe changes in the driver sample. For example, days 26, 27, and 28 occurred during the break between the first and second academic sessions. The driver sample changed drastically on these days, perhaps accounting for the prominent change in daily belt usage on day 26. This confounding due to daily fluctuations of the driver sample was controlled by a sequential examination of belt usage by individual drivers under different experimental conditions. More specifically, license plate numbers and sex were used to categorize drivers and their seat belt usage according to consecutive exposures within each phase of the experiment.

Figure 3 depicts the percentages of drivers wearing a seat belt as a function of incentive condition and up to five consecutive experiences per phase. The numbers associated with each data point indicate the sample size (i.e., number of drivers) on which the percentages were based, while the boundary lines depict the 95% confidence intervals for the percentages. Significant between-group differences can be assumed whenever the interval demarcations do not overlap ($p < .05$). No group differences were apparent during baseline. During treatment, however, the percentage of seat belt wearing was significantly higher for contingent than noncontingent rewards for all but the first experience category. Indeed, the percentage of seat belt wearers increased systematically as a function of the number of response-contingent rewards received. The largest increase in belt wearing occurred from the first to the second experience of the contingent reward intervention ($p < .05$).

For the first three exposures to withdrawal the average percentage of seat belt wearing at the contingent reward lot was higher than at the noncontingent reward lot ($p < .05$), but had dropped considerably from levels obtained during treatment. After three consecutive withdrawal experiences the mean percentages of belt wearing were statistically equivalent at both parking lots and approximated baseline levels.

The percentages of belt usage during withdrawal includes drivers who had received incentive fliers (on one or more trials) and drivers who had not experienced treatment. Table 1 depicts the belt wearing percentages of these two groups of drivers at the contingent reward lot (i.e., no reward fliers versus one or more reward fliers) over consecutive exposures to withdrawal. After one withdrawal experience the number of drivers per category was rather small (especially for the no reward group); but the data do offer additional evidence for the beneficial impact of

Table 1

Seat belt usage percentages during withdrawal for recipients and nonrecipients of contingent rewards.

	Number of Contingent Reward Fliers					
	None			*One or More*		
Withdrawal Sequence	*Percent Usage*	*Sample Size*	*SD*	*Percent Usage*	*Sample Size*	*SD*
First	25.5	153	3.5	39.4	127	4.3
Second	38.5	26	9.5	42.4	59	6.4
Third	33.3	15	12.1	48.6	35	8.4
Fourth	28.6	7	17.0	47.4	19	11.5
Fifth	20.0	5	17.9	23.5	17	10.2

providing rewards contingent on seat belt wearing. With more observations during withdrawal, this particular analysis would have allowed for an examination of extinction rates as a function of differential reward experiences.

As depicted in Figure 3 and Table 1, the number of drivers per sample decreased considerably over consecutive experiences in each phase (baseline, treatment, and withdrawal). Although the confidence intervals accommodate changes in sample size, it is possible that the observed effects were partially due to some systematic difference between driver samples in the various experience categories. For example, the observed increase in belt wearing during contingent rewards would have occurred if seat belt wearers were more likely to enter the parking lot during reward distribution, or if drivers who did not wear a seat belt parked their cars elsewhere during the treatment phase. Thus, a subsequent analysis was accomplished, whereby the belt wearing percentages of each sample of drivers per experience category up to six exposures were tracked backwards over all prior experiences in a particular phase.

Figure 4 depicts the results of this sequential analysis for the treatment phase, and indicates that sampling bias was not responsible for the prominent increases in seat belt wearing following response-contingent rewards. For example, 203 drivers received two or more incentive fliers, and showed prominently higher belt usage on the second than first treatment experience. More-

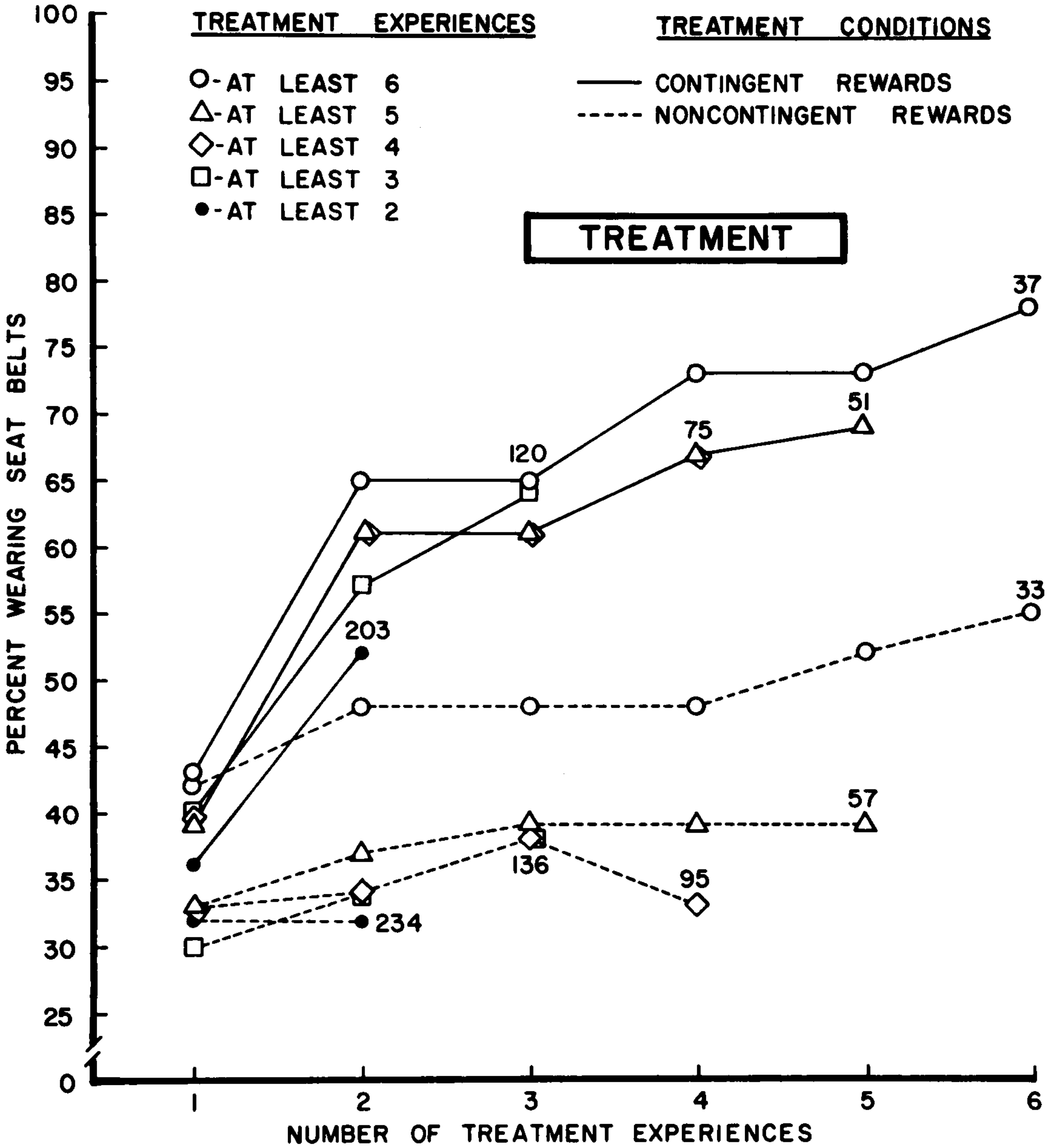

Fig. 4. Percentages of drivers wearing a seat belt during treatment as a function of intervention strategy (contingent vs. noncontingent rewards) and particular frequencies of intervention experiences. The number associated with each line represents the number of drivers in the particular experience category.

over, the 120 drivers with three or more exposures to incentive prompts showed a consistent increase in belt wearing from their first to third treatment experience, with the largest change occurring from the first to second receipt of an incentive flier. Indeed, this pattern is also shown for drivers in the other categories of treatment exposure (i.e., those who received 4, 5, and 6 incentive fliers). This sequential analysis for the baseline and withdrawal phases also indicated that the summary data in Figure 3 were not confounded by sampling bias. (Graphs of the sequential analysis for baseline and withdrawal are available upon request to the senior author.)

DISCUSSION

Previous examinations of incentive strategies for promoting seat belt usage have not determined whether a response-reward contingency is necessary to increase belt usage (Elman & Killebrew, 1978; Geller et al., 1982). In fact, the results of one study suggested that prompts and noncontingent rewards were very effective in motivating seat belt use, making community incentive programs especially easy to administer (Geller et al., 1982). The present study compared incentive prompts with contingent versus noncontingent rewards and showed clear advantages for the response-contingent procedure. Actually, seat belt usage increased significantly *only* when the rewards associated with the incentive prompt were contingent upon belt wearing. Prompting and noncontingent rewards were not sufficient to motivate seat belt use.

It is noteworthy that the interventions were generally well accepted by the university community, including faculty and staff who parked in the target lots and local merchants who contributed gift certificates for incentives. Driver acceptance was indicated by the low rejection rate of incentive fliers (i.e., less than 3% at both lots), the high number of individuals who turned in fliers at a particular office on campus to claim prizes, and the high percentage of compliance in order to receive response-contingent rewards. However, a substantial number of drivers did not stop when prompted to do so (i.e., 6% at one lot and 12% at the other). A total of 81 faculty and staff claimed prizes, 26 from the contingent reward lot and 55 from the noncontingent reward lot, for a total of $1,008 in gift certificates (69% being dinners at local restaurants). A substantial portion of the incentive expense ($350) was donated by 26 local merchants who represented 86.7% of the local businesses from which incentive donations were solicited. The number of winners could be easily reduced by distributing fewer numbers of particular symbols (which we did not do). Whether fewer winners would decrease the impact of the incentive program is an important issue, requiring further investigation.

A contingent reward program could be readily adapted for large-scale, community application. Indeed, there are several community locations where rewards for seat belt wearing could be offered; e.g., from parking lot entrances (at industrial firms, apartment complexes, shopping centers, and airports) to the variety of points where drivers engage in consumer transactions from their car (such as banks, fast-food restaurants, and gas stations). Costs could be minimized by incorporating the reward procedures into the daily activities of the indigenous personnel. Based on our experience, community merchants could be expected to contribute incentives in return for the goodwill associated with their advertised support of a community safety program.

The potential benefits of any community program capable of increasing seat belt wearing are remarkable at both individual and societal levels. For example, it has been estimated that 10,000 to 20,000 lives could be saved each year if all drivers consistently wore seat belts (Highway Safety Research Center, 1976), resulting in billions saved in health-care and insurance costs alone. Moreover, crash injuries and deaths entail significant employer costs (including worker compensation, expensive retraining, and reduced productivity), amounting to approximately $1.5 billion in 1978 (Transportation Research Board, Note 2). Therefore an industry-based incentive program for motivating seat belt use could be cost-effective. Jones, Franson, and Kent (Note 7) estimated that the annual nationwide costs for the nonuse of seat belts is $1.6 billion at the individual level (direct) and $8.4 billion at the societal level (indirect). Thus, if the 20% mean increase in belt wearing that was found during the contingent-reward condition of the present study could be approximated on a community-wide scale, the financial and psychological benefits would be considerable.

Prior evaluations of incentive prompts for motivating seat belt usage either did not include repeated observations of the same individuals (Elman & Killebrew, 1978), or obtained too few repeated observations per driver to enable reliable assessment of individual behavior change (Geller et al., 1982). A notable feature of the present study was that many drivers were observed on repeated occasions within the same experimental condition, and thus fluctuations in individual driver's seat belt usage could be observed over repetitions of similar intervention exposures. Indeed, the sequential analysis of individual belt usage showed clearly that individuals did increase their belt wearing over successive trials of the contingent-reward intervention. However, the consistently largest increase in belt usage was observed at the point of the second intervention (i.e., after the initial receipt of an incentive flier). This finding was suggested in the results of both experiments reported by Geller et al. (1982), and may have important implications for the design of large-scale, seat belt promotion programs. That is, a substantial number of individuals may be influenced to wear a seat belt for certain response-contingent rewards; and most of these individuals can be expected to begin wearing a seat belt after an initial awareness of the reinforcement contingency. However, repeated attempts to influence drivers who had not changed their seat belt wearing practice after their first treatment experience is likely to fail. These results suggest that large-scale applications of incentive prompts may be more cost-effective by attempting to reach many people at least once, rather than reaching fewer people on repeated occasions. This may also be the case for target behaviors other than seat belt wearing.

A critical weakness of this behavioral analysis of incentive prompting was a failure to assess treatment generality. It is entirely possible that many drivers buckled up only when entering the contingent reward parking lot, and not at other times. In fact, the rapid drop in belt usage during the withdrawal period suggests that this was the case. A lack of treatment generalization would indicate the need for communitywide incentive prompting, whereby seat belt wearers can obtain rewards at several locations (e.g., from entrances to parking lots and gas stations to customer exchange windows of banks and fast-food enterprises). In follow-up research we have been obtaining more direct measures of treatment generality by observing seat belt practices when the same drivers enter *and* exit parking areas, while implementing a treatment program at only one of these times.

Table 1 depicts seat belt usage as a function of both treatment and withdrawal exposures, and offers a model for analyzing the relative transience of program impact. However, relatively few individuals experienced three or more withdrawal trials, and a significant number of the drivers observed during withdrawal had not experienced the incentive prompts. In follow-up research we are attempting to obtain more withdrawal observations of drivers with different exposures to the incentive prompts, to assess effects of treatment variations on response maintenance. Although such a research approach has been followed many times in more structured settings, such fine-grained analysis is rare in community-based research because individual subjects are difficult to identify over repeated experiences. Thus, the research presented herein offers a strategy for evaluating the applied relevance of laboratory-based principles of extrinsic human motivation, as well as introducing a behavior change approach that may well have more potential for large-scale, cost-effective application in the U.S. than prior educational, engineering, and legal attempts to motivate seat belt use.

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