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PROMOTING SAFETY BELT USE WITH TRAFFIC SIGNS AND PROMPTERS

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Two studies were conducted examining the stimulus-control effects of conventional traffic signs as prompts for motor vehicle driver safety belt use. Following pilot research which suggested that a traffic sign reading "Fasten Safety Belt" posted at a parking lot exit was effective in producing small increases in safety belt use, Study I demonstrated the superiority of having human prompters display such signs compared to simply posting the signs. Study II replicated the findings of Study I and found that posted signs became more effective in prompting safety belt use if simple posting was preceded by a period involving human prompters who displayed the signs. The results bear upon the development of more effective use of traffic signs in promoting safety belt use and in viewing such use as an instance of rule-governed behavior.

DESCRIPTORS: safety, safety belt, health-related behaviors

High on the list of contemporary health problems are motor vehicle accident-related deaths and injuries. The incidence and costs of this problem are staggering: Approximately 50,000 deaths and 300,000 injuries per year are attributable, with estimates of related financial costs ranging from 48 to 70 billion dollars annually (National Highway Traffic Safety Administration, 1983). As with many social and health problems, there is a strong behavioral factor involved. The consistent use of automobile safety belts by adults and children and of car safety seats by infants has been estimated to reduce the risks of death or serious injury by over 50% (Federal Register, 1983). The situation is analogous to solving problems such as overpopulation, sexually transmitted diseases, and hunger; the solutions are well known in terms of material technology but what is lacking is an effective technology of human behavior to promote the necessary application of these technological solutions.

A considerable amount of research on safety belt promotion technology currently exists and has been recently reviewed by Streff and Geller (1986). These authors review the application of engineering methods (e.g., ignition interlocks tied into safety belts being buckled, dashboard warning lights and buzzers, airbags); legal approaches (e.g., mandatory safety belt use laws); and of persuasion by information (e.g., public mass media campaigns, advertisements, corporate programs), as well as behavior-analytic approaches.

One behavior-analytic strategy with some promise in promoting safety belt use involves the use of various stimulus-control strategies to prompt safety belt use, as opposed to actually dispensing reinforcers for such use. Among these approaches is the Geller (Geller, Bruff, & Nimmer, 1985) "flash-for-life" card, an 11 by 14 inch two-color placard which is displayed to unbuckled drivers and bears the message "Please buckle up, I care." The reverse of the card, which reads "Thank you for buckling up," is displayed when the "flashed" driver engages his or her safety belt or to drivers who are already buckled. This "flash-for-life" card is modestly effective in prompting safety belt use, at least in the situations in which it is displayed (Geller et al., 1985; Thyer, Geller, Williams, & Purcell, 1987).

Other discriminative stimuli to prompt safety belt use are small dashboard stickers that display a message such as "Safety Belt Use Required of All Vehicle Occupants." Use of such stickers alone

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in the absence of contrived reinforcement produces increases in safety belt use that rival or exceed compliance rates attained with mandatory safety belt use laws or community-based reinforcement programs (Rogers, Rogers, Bailey, Runkle, & Moore, 1988; Thyer & Geller, 1987). Dashboard stickers were also successfully used to prompt safety belt use in an experimental study by Weinstein, Grubb and Vautier (1986) in conjunction with a corporate media campaign.

Given these earlier studies indicating that safety belt use can be brought under some degree of discriminative control in the absence of contrived reinforcers, and the relative costs of contingency management programs, we conducted a series of studies on the effects of conventional traffic signs reading "Fasten Safety Belt" on safety belt use. The literature does not contain any previous studies on this topic despite the fact that such highway signs are routinely used in states with mandatory safety belt use laws.

STUDY I

Based on pilot research illustrating the efficacy of posted black-and-white traffic signs in promoting safety belt use (described in Williams, 1987) and of the previously demonstrated efficacy of pedestrian-held "flash-for-life" cards in promoting safety belt use by automobile drivers (Thyer et al., 1987), Study I evaluated these combined interventions. Specifically, Study I compared the efficacy of a posted metal traffic sign versus the same traffic sign displayed by a human prompter.

Method

Participants and Setting

Study I was conducted on the campus of Florida State University from July 21 to October 1, 1986. At the time of Study I, Florida had a transitional mandatory safety belt use law for adults based on secondary enforcement of the law, involving only verbal warnings without actual fines. Based upon representativeness, convenience, and physical layout, the Call Street (115 parking spaces) and Dogwood Way (75 parking spaces) faculty and staff parking lots were chosen as experimental sites.

Observation Procedures and Data Collection

Study I used both primary and reliability observers. Observers were graduate students trained by the principal investigator in the practice of observing the safety belt use of drivers exiting parking lots. Training continued until observers demonstrated interrater agreements of 80% or higher. Each observer, stationed across the street from the lot's exit, independently and unobtrusively recorded whether or not an exiting driver was clearly wearing a safety belt fastened over the shoulder. Observations took place from 4:00 to 5:00 p.m. Monday through Friday, times corresponding to the high frequency of vehicles exiting the lot at the close of the working day. Observers sat on benches or on the grass, and drivers had no interaction with them. Typically, the streets and sidewalks were busy with automobile and pedestrian traffic, facilitating the unobtrusive collection of data.

Percentage of safety belt use was calculated by dividing the number of occurrences by the number of occurrences plus nonoccurrences and multiplying by 100. Interrater agreements were calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100.

Experimental Design and Intervention

Study I used a multiple baseline across two settings (parking lots), with three similar sequential conditions in each lot: baseline, sign plus prompter, and sign alone.

Baseline. During baseline, observers recorded the number of vehicles exiting each parking lot and the number of drivers wearing safety belts.

Sign plus prompter. In this condition, a standard metal black-and-white traffic sign (12 by 18 inches) reading "Fasten Safety Belt" was held by a female graduate student (prompter) who was stationed at the exit of each parking lot. Each parking lot had a permanently mounted stop sign on the passenger

side of the exit. As each exiting vehicle approached the exit, the prompter standing on the passenger's side of the parking lot exit displayed the "Fasten Seat Belt" sign to the oncoming driver. The sign was held chest high. The prompter was instructed not to attempt any other methods to encourage or reward safety belt use (e.g., verbal pleas to buckle up, or shouts of "thank you"). To control for possible gender effects, only female prompters were used.

Sign alone. This condition consisted of posting the metal traffic sign used in the sign plus prompter condition, in the absence of a human prompter holding the sign. The metal traffic sign was mounted on the existing stop signs at each parking lot exit. Observers continued to record data on a daily basis as previously described.

Results

Interrater Agreement

The number of vehicles exiting daily from the Call Street lot ranged from 15 to 69, with a mean of 45, and totaled 2,320 vehicles over 51 consecutive observation days. A reliability observer was present for 75% of the observation days. Daily interrater reliabilities ranged from 76% to 100% agreement, with a mean of 94% for safety belt use.

For the Dogwood Way lot the number of vehicles exiting daily ranged from 21 to 63, with a mean of 51, and totaled 2,589 vehicles. A reliability observer was present for 65% of the observation days. Daily interrater agreements ranged from 88% to 100% agreement, with a mean of 97% for safety belt use.

Safety Belt Use

Figure 1 shows the daily percentages of safety belt use by drivers exiting the two parking lots observed during each of the three experimental conditions. For the Call Street lot during the baseline condition, daily safety belt use ranged from 33% to 51%, with a mean of 42.8%; during the sign plus prompter condition, from 50% to 87%, with a mean of 74%; and during the sign alone condition, from 55% to 75%, with a mean of 65.3%.

A similar pattern of effects was evident in the Dogwood Way lot. During the baseline condition, driver safety belt use ranged from 40% to 59%, with a mean of 47.1%; during the sign plus prompter condition, from 60% to 70%, with a mean of 66.1%; and during the sign alone condition, from 48% to 65%, with a mean of 56.8%.

STUDY II

Study II was an attempt to replicate and extend the previous finding regarding the comparative effectiveness of the two interventions. The conditions in Study II were reversed from those in the first study and were followed by a second sign alone phase. This reversal of conditions permitted an analysis of possible sequence effects by comparing the change in safety belt use in the first sign alone condition with the change in safety belt use obtained in the second sign alone condition, when that second sign alone condition has been preceded by a sign plus prompter condition.

Method

Participants and Setting

Study II was conducted at Florida State University from September 3 through December 1, 1986. Observers, prompters, and the state safety belt law were the same as described in Study I. Two different faculty and staff parking lots were used, the College Avenue (100 parking spaces) and Copeland Street (165 parking spaces) lots.

Observation Procedures and Experimental Design

This study used the same observation and data collection procedures described in Study I.

Study II used a multiple baseline design across two settings (parking lots) with four phases:

Baseline. During baseline, observers recorded the number of vehicles exiting each parking lot and the number of drivers wearing safety belts. The

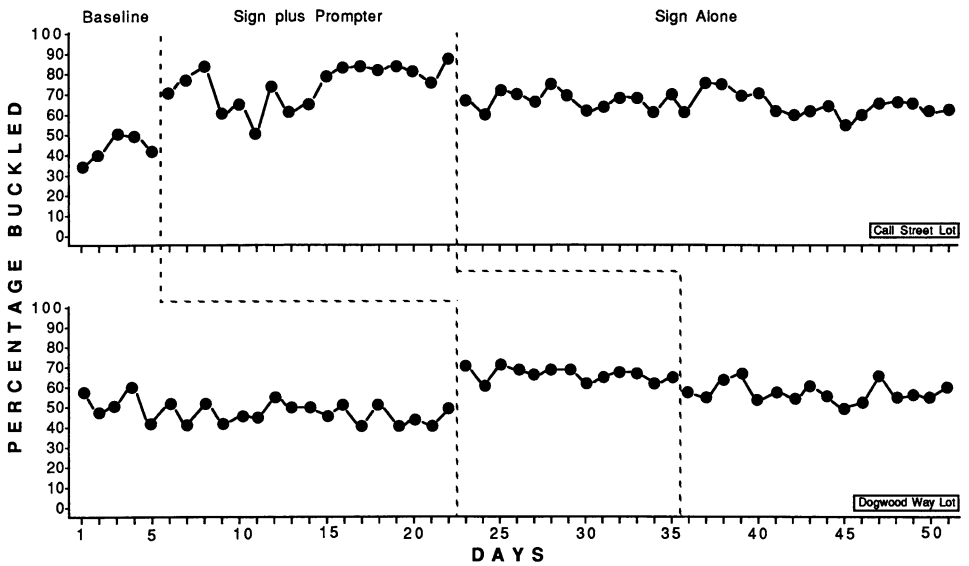

Figure 1. Daily percentages of safety belt use by drivers exiting the Call Street and Dogwood Way lots during Study I.

baseline condition was maintained for each lot until a stable rate of safety belt use was observed.

Sign alone. In this condition, the same traffic sign reading "Fasten Safety Belt" used in Study I was mounted on the existing stop sign at each parking lot exit. Observers continued to record data on a daily basis as previously described, and this condition was maintained until stability in the data was observed.

Sign plus prompter. In this condition, the traffic sign was held by a human prompter stationed at the exit of each parking lot. As each exiting vehicle approached the exit, the prompter displayed the sign to the oncoming driver, as in Study I.

Sign alone. A second sign alone condition followed the sign plus prompter condition. All phases of the study were maintained until stability in the data was observed.

Results

Interrater Agreement

The number of vehicles exiting daily from the College Avenue lot ranged from 56 to 85, with a mean of 68, and totaled 3,404 vehicles over 50 observation days. A reliability observer was present for 68% of the observation days. Daily interrater reliabilities for safety belt use ranged from 85% to 100% agreement, with a mean of 96%.

For the Copeland Street lot, the number of vehicles exiting daily ranged from 28 to 70, with a mean of 46, and totaled 2,595 vehicles. A reliability observer was present for 63% of the observation periods. Daily interrater reliabilities for safety belt use ranged from 79% to 100% agreement, with a mean of 97%.

Safety Belt Use

Figure 2 shows the daily percentages of safety belt use by drivers exiting the two lots during the four experimental conditions. For the College Avenue lot, daily safety belt use ranged from 31% to 44%, with a mean of 39.6%, during the baseline condition; from 41% to 53%, with a mean of 47.1%, during the first sign alone condition; from 62% to 77%, with a mean of 71%, during the sign plus prompter condition; and from 60% to 68%, with a mean of 64%, during the second sign alone condition. For the Copeland Street lot, daily safety belt use ranged from 34% to 60%, with a mean of 49.6%, during the baseline condition; from 51% to 67%, with a mean of 58.8%, during the first sign alone condition; from 68% to 84%,

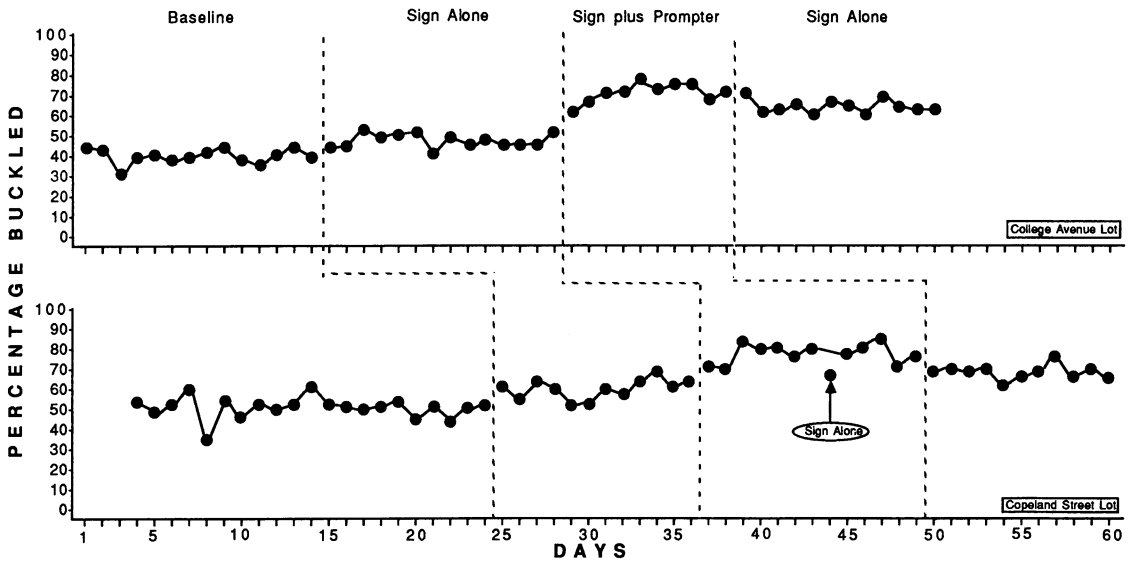

Figure 2. Daily percentages of safety belt use by drivers exiting the College Avenue and Copeland Street lots during Study II.

with a mean of 76.3%, during the sign plus prompter condition; and from 61% to 75%, with a mean of 66.9%, during the second sign alone condition.

DISCUSSION

The results of Study I demonstrated the greater effectiveness of the combined interventions. The sign plus prompter was found to be modestly effective in promoting safety belt use among drivers exiting both parking lots, relative to the baseline and to the sign alone conditions.

The results of Study II further demonstrated the effectiveness of the sign plus prompter intervention. The first sign alone condition was found to produce a small increase in safety belt use among drivers who exited both parking lots compared to the baseline condition. The sign plus prompter condition was once again found to be effective in promoting safety belt use compared to the baseline and to the first sign alone conditions. As previously demonstrated in Study I, when the sign alone condition was followed by the sign plus prompter condition, the latter condition was found to be more effective in prompting drivers to use their safety belts. However, when a sign alone phase *followed* a sign plus prompter condition, the sign alone was more effective than when it was not preceded by this condition. This suggests that the effects of traffic signs in prompting safety belt use may be enhanced by making the signs more salient to motor vehicle occupants.

These findings represent an important additional step in developing effective stimulus control over motor vehicle safety belt use and may have more practical relevance than earlier related studies using two-color cardboard "flash-for-life" placards (Geller et al., 1985; Thyer et al., 1987).

The relative success of these and related stimulus-control strategies relative to contingency management programs is not surprising. Although safety belt use may be construed as a type of discriminated operant, it is almost never a truly contingency-shaped behavior. In the natural world, few individuals experience a regular pattern of reinforcement for safety belt use or of punishment for nonuse. Even experiencing one or two accidents in which serious injury was avoided would not justify labeling subsequent consistent safety belt use as contingency-shaped behavior. Because most drivers have never had such an experience, it seems much more likely that naturally occurring safety

belt use is an instance of rule-governed behavior (Zettle & Hayes, 1983). Most individuals do have a generalized history of intermittent reinforcement for compliance with verbal rules. Given such a history, the presentation of discriminative stimuli such as signs or dashboard stickers may prompt compliance with the requested behavior. Of course, the maintenance or generalization of rule-governed behavior may be weak relative to contingency-shaped behavior, and the most effective strategy to promote the consistent use of safety belts may ultimately involve both discriminative control and contingency management operations.

In these studies, we used human prompters to enhance the stimulus-control properties of a traffic sign in prompting safety belt use. Such a tactic is obviously of limited practicality in terms of widespread application but may have value as a component of community and corporate safety belt promotion campaigns or for use by public service groups, such as the Scouts, fraternities, or sororities, in encouraging motorists to buckle up. Violators of mandatory safety belt use laws could be given the option of performing several hours of community service by displaying such signs in lieu of a monetary fine.

These studies possess a number of limitations that suggest additional areas for further research. Social validity has not been demonstrated, in the sense that a clear reduction in traffic injuries and fatalities was achieved. The results were monitored only in the short term, and generalization was not assessed (e.g., by observing safety belt use of vehicle drivers as they entered the parking lots in the morning or by also recording passenger safety belt use). Further research is needed to develop and test more practical means of increasing the salience of traffic signs in promoting safety belt use. The use of eye-catching colors, logos, sign configurations, and/or flashing lights may be useful. Until such research is conducted, however, we believe that our studies provide preliminary empirical support for the immediate and widespread use of traffic signs to prompt safety belt use. Even the relatively small increases in safety belt use prompted by such signs have the potential to prevent hundreds of deaths and injuries nationwide.

REFERENCES

Federal Register. (1983, October). *Federal motor vehicle safety standards: Occupant crash protection,* Vol. 48, No. 203. Washington, DC: U.S. Department of Transportation.

Geller, E. S., Bruff, C. D., & Nimmer, J. G. (1985). "Flash-for-life": Community-based prompting for safety belt promotion. *Journal of Applied Behavior Analysis,* **18,** 309–314.

National Highway Traffic Safety Administration. (1983). *The economic cost to society of motor vehicle accidents.* Washington, DC: U.S. Department of Transportation.

Rogers, R. W., Rogers, J. S., Bailey, J. S., Runkle, W., & Moore, B. (1988). Promoting safety belt use among state employees: The effects of prompting and a stimulus-control intervention. *Journal of Applied Behavior Analysis,* **21,** 263–269.

Streff, F. M., & Geller, E. S. (1986). Strategies for motivating safety belt use: The application of applied behavior analysis. *Health Education Research,* **1,** 47–59.

Thyer, B. A., & Geller, E. S. (1987). The "buckle-up" dashboard sticker: An effective environmental intervention for safety belt promotion. *Environment & Behavior,* **19,** 484–494.

Thyer, B. A., Geller, E. S., Williams, M., & Purcell, E. (1987). Community-based "flashing" to increase safety belt use. *Journal of Experimental Education,* **55,** 155–159.

Weinstein, N. D., Grubb, P. D., & Vautier, J. S. (1986). Increasing automobile seat belt use: An intervention emphasizing risk susceptibility. *Journal of Applied Psychology,* **71,** 285–290.

Williams, M. (1987). *Behavioral social work in community practice: Promoting automobile safety belt use.* Unpublished doctoral dissertation, Florida State University.

Zettle, R. D., & Hayes, S. C. (1983). Rule-governed behavior: A potential theoretical framework for cognitive behavior therapy. In P. C. Kendall (Ed.), *Advances in cognitive behavioral research and therapy* (Vol. 1, pp. 73–118). New York: Academic Press.

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