



# Prompting drivers to stop for crossing pedestrians

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## Abstract

This study used an ABA reversal design to evaluate the effectiveness of written signs with social assistance to increase the proportion of drivers stopping for pedestrians in crosswalks. In Weeks 1 and 3, observers obtained baseline data on the proportion of drivers stopping for pedestrians at two sites. In Week 2, the observers instituted the signs with social assistance, and observed stopping behavior among motorists. If the driver stopped, the pedestrian crosser held up a green “Thank you for stopping” signs to drivers. If the driver did not stop, a confederate down road held up a pink “Please stop next time”. The study also looked at the generalization of the effect by counting stops at a crosswalk (without treatment) downstream from the test crosswalk. Observers tracked the behavior of 410 drivers at the intervention site and 420 drivers downstream. The analysis revealed a significant increase in stopping behavior during the treatment condition (50.9%) from the baseline conditions (46% and 37.3%). It also showed a higher level of stopping downstream during the treatment week (44%) than in the baseline weeks (38% and 42%). The results suggest that hand-held signs may encourage drivers to stop for pedestrians.

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## 1. Introduction

A growing body of research has shown that community behavioral interventions successfully shape the behavior of large numbers of persons for community health, welfare and safety. For

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example, researchers have used the operant model to control littering, encourage recycling, conserve energy and water and to increase bus riding (Cone & Hayes, 1980; Geller, Winett, & Everett, 1982). Beyond direct reinforcement, research has shown that written prompts can also impact behavior in the community. For example, Durdan, Reeder, and Hecht (1985) used prompts to reduce littering in a cafeteria. Van Houten and Nau (1981) found that signs indicating NUMBER OF PEOPLE SPEEDING LAST WEEK:\_\_\_\_ and BEST RECORD TO DATE:\_\_\_\_ reduced drivers' speed. Two studies used prompts to encourage drivers to buckle up. One used prompts held up by children (Geller, Paterson, & Talbott, 1982), and another program mixed prompts with consequences. It had signs at mall and shopping center exits, posters and fliers on the benefits of the program urging people to buckle up and check seat belt use information posted at mall exits (Wells, Malenfant, Williams, & Van Houten, 2000). Both interventions produced increases in seatbelt usage. Rama and Kulmal (2000) found that variable message signs in slippery areas led drivers to slow down and increase headway.

One can use three kinds of written interventions—education, consequences and prompts—with or without social assistance (Berry, Geller, Calef, & Calef, 1992). Education describes what happens in the real world (e.g., “in an automobile crash, safety belt usage can protect you from injury or death”, Berry et al., 1992, p. 655). Consequences explain the awards or penalties from doing or not doing the behavior (e.g., “Wear Your Seat Belt and Receive a Chance to Win a Valuable Prize!” Berry et al., 1992, p. 655). Prompts request the target behavior, without describing the consequences (e.g., “Thank You for Buckling Up”, Berry et al., 1992). Though written consequences work more consistently across a variety of settings than do education or prompts (cf. Berry et al., 1992), socially assisted written prompts have shown consistent success (Geller, Bruff, & Nimmer, 1985; Thyer, Geller, Williams, & Purcell, 1987). For example, Berry et al. (1992) found that written prompts (“Thank You for Buckling Up”, or “Please Buckle Up, I Care”) posted at a university parking lot produced an increase in seat belt usage. Accompanied by social assistance (a person), it produced even more seat belt usage. The present study tested a similar approach (written signs with social assistance) to get drivers to stop for pedestrians entering a crosswalk.

Drivers can exhibit a range of safe and unsafe behaviors, ranging from a friendly smile to cell phone use to road “rage shootings”. In some countries and US states, most drivers stop when a pedestrian steps into the street, but in Columbus, OH, even though pedestrians have the right-of-way, drivers seldom stop. Informal observations of drivers indicated that many drivers ignored pedestrians in crosswalks, and sometimes sped up or swerved to pass them. Formal observations of 100 drivers at a campus stop sign revealed that most of them rolled through the stop sign, never coming to a complete stop; and with pedestrians in the crosswalk, 43% of the drivers did not stop. The present study sought to find whether one can encourage drivers to stop for pedestrians without resorting to punishing approaches of ticketing and speed bumps.

Following findings that a prompt with social assistance works better than a prompt alone (Berry et al., 1992; Williams, Thyer, Bailey, & Harrison, 1989), this study tested the impact of prompts with social assistance. The study had the hypothesis that a higher proportion of drivers would stop as a result of hand-held signs and that the effect would generalize downstream to other pedestrians not using the signs.

## 2. Method

### 2.1. Setting

The study took place on the main campus of the Ohio State University, in May and June 1998. The Ohio State University has an estimated student population of 50,000 and approximately 12,000 faculty and staff. Campus planners have sought to make the campus a pedestrian-friendly campus. Over the years, they have closed streets to vehicles, and moved on-campus surface-parking to parking structures on the edges of campus.

A research team inventoried pedestrian crosswalks on campus to find a pair having similar conditions along the same road. To arrive at the target sites, they eliminated crosswalks with stop signs, traffic lights, heavy traffic volume and crosswalks lacking enough road space before them to allow approaching drivers to build speed. This was done to get crosswalks where drivers tended not to stop for the pedestrians. The team also eliminated pairs of crosswalks in site of one another. Behavioral researchers have been concerned with generalization of behavior changes in the environment (Cone & Hayes, 1980). Using a pair of crosswalks on the same road but out-of-site of one another allowed for a test of the generalization of the intervention at one crosswalk to another one downstream.

Fig. 1 shows the two crosswalks. The treatment site is referred to as “18th” and the downstream site as “Oval”. They cross the major north–south vehicular road (College Avenue) on campus. Walking east through the crosswalks (down on the map), one moves from the main campus area to the campus commercial strip, student apartments and fraternity and sorority houses.

### 2.2. Experiment design

The study used a three phase ABA design focusing on settings, in which A = baseline, and B = intervention (written signs with social assistance).

#### 2.2.1. Baseline (A)

In Weeks 1 and 3, confederates crossed at each site and for each crosswalk separately recorded the frequency that drivers stopped for them.

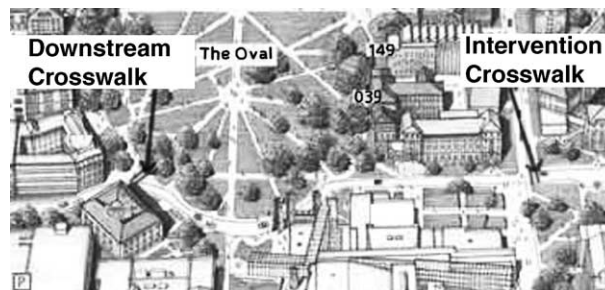


Fig. 1. Observation sites.

### 2.2.2. *Intervention (B)*

In Week 2, the confederate crossing the street or another confederate applied the signs (with social assistance) at one crosswalk. If the vehicle stopped for the crosser, the crosser held up the “Thumbs up, thank you for stopping sign” and smiled at the driver. This condition presented the driver with a consequence. If the driver did not stop, the other confederate, approximately 15 yards down the road, held the “Thumbs down, please stop next time” sign out so the driver could see it. This condition presented the driver with a consequence (thumbs down) and a prompt (please stop next time). While non-stoppers may not have seen a sign held up by the crosser, because it would have been behind them, they would see a sign held up in front of them by the second person. At the downstream crosswalk, no intervention took place. The confederates continued to cross and record the frequency that drivers stopped for them. In each site, the crosser recorded the frequency at which drivers stopped for them. The study did not check whether the vehicles at the downstream site were the same as those at the intervention site.

A separate test was run to test the reliability of the observations. This test had four confederates at one crosswalk and three at the other. At each crosswalk, each confederate crossed ten times (for 40 observations at one crosswalk and 30 at the other). The crosser and the other confederates at the site independently recorded whether the car stopped or passed. The results showed 100% agreement for the seventy crossing (36 stops and 34 no stops). The results support the reliability of the judgment of a crosser or observer as to whether or not a car stops.

### 2.3. *The signs*

The study used two sets of 8 1/2 in. × 12 in. signs with written and graphic content, shown in Fig. 2. One, on green paper, showed a large “thumbs up” sign and thanked drivers for stopping (consequence). The other, on pink paper, had two smaller “thumbs down” signs and asked drivers to please stop the next time (consequence and prompt).



Fig. 2. Stimuli used for drivers.

## *2.4. Procedure*

Ideally, the study would have observed the behavior of drivers in relation to naturally occurring pedestrian behavior at crosswalks, but this proved infeasible. Pilot data suggested that the number of pedestrians, timing of pedestrians, direction of pedestrians, and presence of other cars influenced whether or not the driver stopped. To avoid such potential biases, the study used a controlled manipulation.

The study had eight confederates serve as pedestrian crossers and observers. They first had a training procedure and testing on the experimental manipulation and data gathering. At each crosswalk, the crosser waited for an automobile approaching from the North. (They excluded buses and trucks from the study.) The crosser made sure that no other pedestrians had or would enter the crossing, and that the car had no other car immediately behind it. At the 18th avenue (intervention) site, crossers also made sure that no vehicle was about to turn onto College Avenue from 18th.

Crossers stood on the sidewalk a few paces back from the crosswalk. Gauging the speed of the approaching car on College, they walked into the crosswalk in time to have both feet in it before the automobile arrived, but allowing enough time for the driver to stop. To aid in this procedure, each crosser tested and set up observation points for cars. When cars passed the point, the crosser started walking. When they had both feet in the crosswalk, they paused to observe the driver's behavior. They looked at the front license plate of the car and avoided eye contact with the driver. Crossers only counted as observations those situations when they had both feet in the crosswalk in adequate time for the car to stop. (The reliability test on this condition also received 100% agreement among the observers at each crosswalk.) In each observation period, the crosser tested and recorded the behavior of 10 cars. If the driver stopped, the crosser proceeded across the street. If the driver did not stop, the crosser waited for a clearing, and crossed. In each case, the crosser continued walking until the car was out of sight. Then, they recorded the behavior and returned to the starting point. They waited until all drivers that could have seen them crossing had cleared, before initiating the procedure again.

The observations took place simultaneously at the two sites three times (9:00 a.m., 11:00 a.m., and 4:50 p.m.) on weekdays each week (five, five and four days). Weekends were excluded because they have negligible pedestrian and auto traffic. In Week 1, the crossers rotated through the times and sites, and they maintained the same schedule in the subsequent weeks.

## **3. Results**

Recall that during each time period at a site, each confederate crossed the street ten times. The number of times the car stopped for that confederate received a score from 0 to 10. A two way ANOVA (with two levels for condition and two levels for site) tested the main and interactive effects of the intervention vs. baseline conditions and the intervention vs. downstream site. Fig. 3 shows the proportion of drivers stopping during each week at each site, and Table 1 shows the analysis of variance statistics. As you can see a significantly higher proportion of drivers stopped during the treatment week than during the pre- and post-treatment baseline weeks. The analyses did not yield a statistically significant effect for Site or Site  $\times$  Condition. This means that rate of

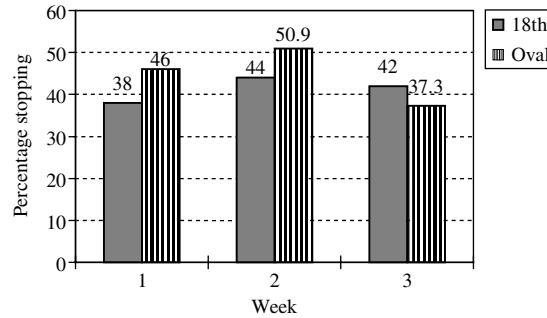


Fig. 3. Percent of drivers stopping by week and site. ((Week 1) intervention site,  $n = 150$ ; downstream,  $n = 150$ ; (Week 2) intervention site,  $n = 110$ ; downstream,  $n = 120$ ; (Week 3) intervention site,  $n = 150$ ; downstream,  $n = 150$ .)

Table 1

Analysis of variance results for condition (treatment vs. non-treatment) and site (treatment vs. downstream)

Source	SS	df	$F$	$p$
Condition	226.11	1	12.556	0.001
Site	0.02	1	0.001	0.971
Site $\times$ Condition	0.15	1	0.008	0.928
Error	1440.58	80		

stopping did not differ across the two crosswalks, nor did it differ across the two crosswalks relative to the baseline vs. treatment conditions. The results suggest that the effect of the signs with a social agent generalized to the downstream non-treatment site.

#### 4. Conclusion

The study set out to evaluate the effects of hand-held signs on the number of drivers stopping for pedestrians entering crosswalks. The results indicate that the signs led drivers to stop more often for pedestrians. In selecting which cars to treat, the observers crossed for fewer than 20% of the cars. Yet, this produced a measurable effect and it generalized to the downstream site. From a systems perspective the diffusion of the treatment represents a good thing. Social learning, which the study was not designed to test, may have mediated the effects. Although the observers counted the number of drivers receiving the treatment, they could not know how many drivers received it vicariously.

In considering the findings, recognize the potential limitations of the setting-based research design (Berry et al., 1992): it probably measured different samples of drivers across times, days and sites, thus limiting the ability to ascertain how many times a driver received the treatment. To clarify the effects, future research should track cars, through license plates.

Still, the results offer some encouraging ideas for research and intervention. The campus studied had no signs informing drivers to stop for pedestrians. Nor did it have an educational campaign

or a say-do program (cf. Geller & Lehman, 1991) to make drivers aware of the need to stop. Perhaps, a broad program which included an educational campaign and signs used by a larger number of pedestrians would achieve more driver compliance. As Geller (1995, p. 190) pointed out, “‘preaching to the choir’ is not as beneficial as enlisting the ‘choir’ to preach to others.” Perhaps, one can enlist pedestrians as the behavior change agents using hand-held signs to gain the consequence of pedestrian safe environments and to make them when driving more likely to stop for pedestrians.

The findings suggested improvements on a university campus from two kinds of signs (a consequence and a consequence with a prompt). Additional field research can tell how well the approach generalizes to other conditions. Would other kinds of cues have similar effect? Does it matter whether the pedestrian makes eye contact with the driver? Could a pedestrian simply hold up a hand and make eye contact to get drivers to stop? Will the findings generalize from a university campus to city streets? Procedures should also take place in more natural conditions, on single samples, and in different kinds of sites. Driver behavior may differ on large versus small campuses or campuses, in different regions or countries, for different size streets, traffic levels and for non-campus streets. The interventions tested here would probably be impractical for city streets, but two US cities—Salt Lake City, UT and Worthington, OH—adopted a more practical alternative, worth testing. They placed flag stands at crosswalks with flags for pedestrians to hold when crossing. With the intervention so widely available, drivers may learn to internalize the controls on behavior. Through testing and refinement, research can yield tools that can become part of a community planner’s arsenal to make streets safer for pedestrians.

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