Irit HOCHERMAN
and
A. Shalom HAKKERT
Transportation Research Institute
Technion-Israel Institute of Technology
Technion City, Haifa

THE USE OF DAYTIME RUNNING LIGHTS DURING THE WINTER MONTHS IN ISRAEL - EVALUATION OF A CAMPAIGN

Abstract

The paper describes an evaluation of a media publicity campaign that took place in Israel in the winter of 1989/90 to encourage drivers to travel with their running lights on during the day in conditions of reduced visibility. The evaluation consisted of 4 parts:

- An extensive critical literature survey of behavioural studies, fleet studies and nationwide experience;
- A survey of drivers' opinions and attitudes concerning DRL (Daytime Running Lights);
- Roadside observations on actual DRL use, covering urban and interurban roads, specifying levels of illumination, weather and type of vehicle;
- An analysis of accidents during the campaign period to reveal changes in relevant accidents.

Results:

Most of the drivers asked (about 90%) were exposed to the campaign. 87% were convinced that DRL are indeed effective as a campaign. 73% were not opposed to a law for obligatory DRL in winter. Almost all drivers claimed they do drive with running lights on when visibility conditions are bad.

The use of DRL during the campaign varied greatly according to weather and levels of illumination, from 5% in clear weather and good illumination (above 40,000 Lux) to 50-70% in rainy and foggy weather conditions. Before the campaign started, usage rates in inclement weather were in the range of 20-50% (see enclosed graph).

Accident analysis compared day-to-night ratio of relevant accidents during the campaign months, to the prospective ratio for previous years. The analysis did not reveal any effect of DRL on accidents, but this may be due to the limited scope of the experiment.

Introduction

During three months in the winter of 1989/90, the Safety Administration and the Israeli Ministry of Transport conducted an intensive publicity campaign, using television, radio, newspapers, car stickers and roadside billboards, to encourage drivers to travel with their running lights on during the day (DRL - Daytime Running Lights) in conditions of reduced visibility. Simultaneously, an evaluation study of the campaign was conducted by the Transportation Research Institute of the Technion.

A publicity campaign usually advocates a behaviour, in the present case - driving with lights on during the day. So the aim of the campaign can be stated in terms of success in changing behaviour. In the area of safety, most publicity campaigns have a higher level goal, which is to increase safety, or reduce accidents.

In order for a publicity campaign to achieve its goals, several prior conditions have to be fulfilled - first the campaign messages have to reach the target population; in other words, as many people as possible in the target population have to be exposed to the campaign. Second, the messages should be understood by those they are aimed at. Third, the campaign should convince, opinions and attitudes should shift toward the advocated behaviour.

Only when all these interim stages have occurred, one may hope to achieve changes in actual behaviour. A schematic presentation of the stages of a publicity campaign is shown in Figure 1.

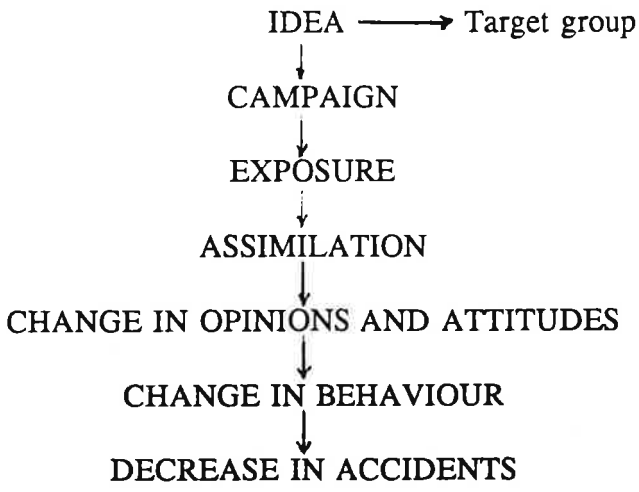

Figure 1. A schematic representation of the influence of a publicity campaign

When evaluating the present campaign, we did not only assess the impact of the campaign on driving with lights on, but also tried to evaluate the interim stages. We measured exposure to the campaign and its effect on drivers' opinions about the effectiveness of DRL and their attitudes toward using it. At the other end, we also tried to evaluate the impact of the change in behaviour on accidents.

Methods

Three different methods were used in the evaluation:

- Exposure to the campaign, opinions and attitudes were evaluated by interviewing a sample of drivers;
- Actual DRL use during the campaign was measured by roadside observations;
- Effect on accidents was estimated using a statistical analysis of accident data.

Interview: about 1100 drivers were interviewed in gas stations and bus depots, during the last month of the campaign. Most were car or van drivers, though a few motorcycle riders, cab and bus drivers were also interviewed. The questionnaire included questions on exposure to the campaign in the different media, opinions about the effect of DRL (Daytime Running Lights) as a safety device, attitude toward making DRL use obligatory in winter time, and stated use of DRL in different weather conditions.

Roadside observations: DRL usage rate on the road was observed by counting cars with and without lights along three predetermined routes. The routes which included both rural and urban roads, were chosen to represent all parts of the country (Figure 2.). A number of fixed observation points at crossings were assigned on each route. Observation crews travelled along the routes 2-3 times a week, and stopped at each observation point to perform the counts. At each point, vehicles with and without running lights were counted by vehicle type, for about half an hour. Illumination and weather conditions were registered every ten minutes. Observations were performed throughout the three months of the campaign, starting a week before its onset.

Accident analysis: The analysis method is based on comparing accident rates during the campaign to similar rates during a control period. Possible changes in accidents, from the control period to the test period, that are not related to DRL, are adjusted for, by using night accidents as a reference group.

Specifically, groups of "target accidents" - Di - were defined. These included all daytime accidents, urban accidents, rural accidents, head-on and right-angle collisions, pedestrian accidents, accidents in rainy weather. All target accident groups consisted of daytime accidents only. For each Di group, a corresponding group of "reference accidents" - Ni - was defined as the same accidents during night-time.

Two time periods were used in the analysis, the "test period" - T - which included the three months of the campaign, and a "control period - C - which consisted of the parallel period a year or two years prior to the campaign.

The ratio of target-to-reference accidents for the test period was compared to a similar ratio for the control period, using the Odds Ratio statistics R:

$$R = DT/NT \; / \; DC/NC$$

(Subscript i was omitted for the sake of simplicity).
If R is smaller than 1, relevant accidents have decreased from the control to the test period, relative to the trend in reference accidents. The statistic Ln(R) is asymptotically normally distributed, with a known variance, so one can test for significance.

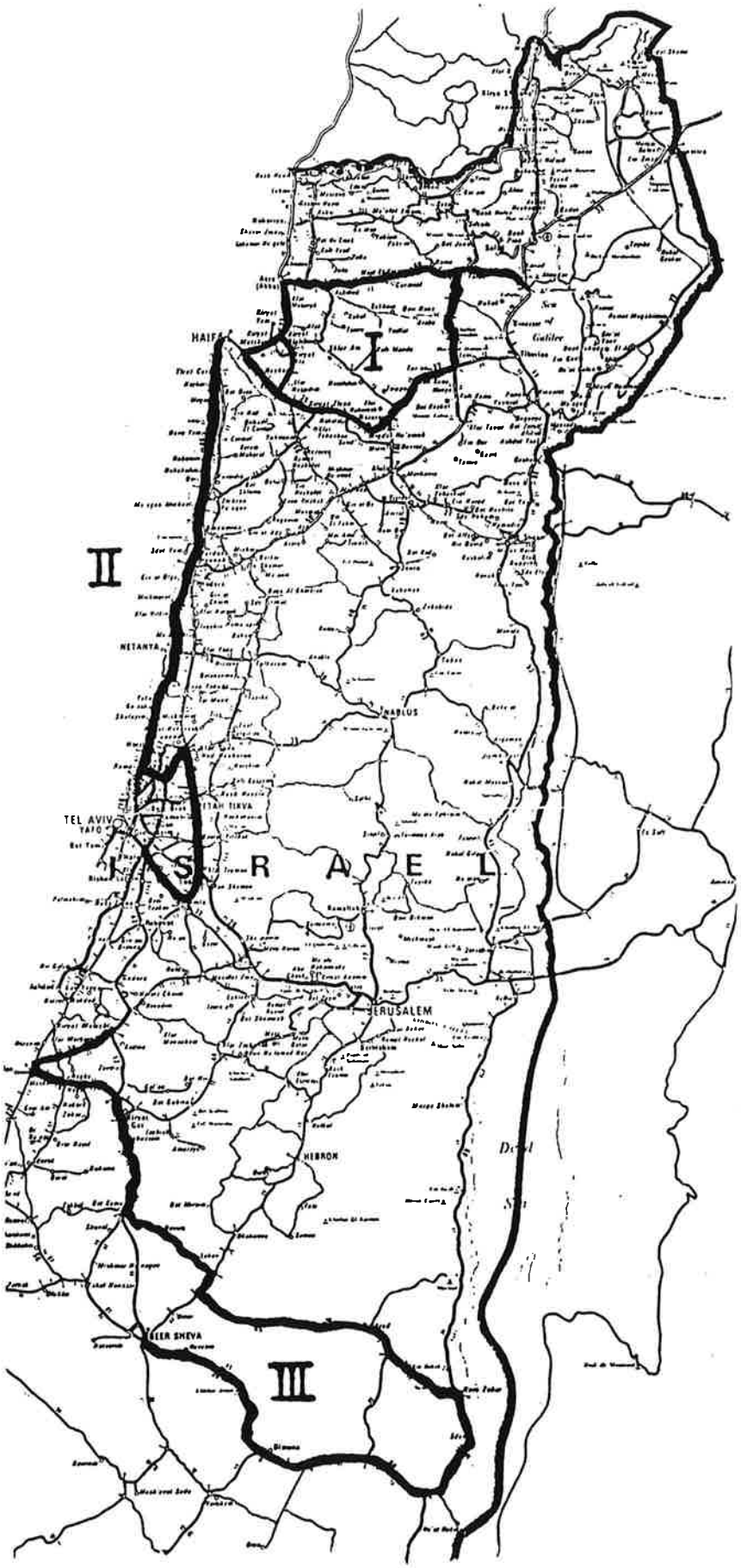

Figure 2: Roadside Observation Routes

Results

Interview: The publicity campaign succeeded in reaching its target group - the drivers. Table 1 presents the exposure rate by type of vehicle and media mode. Of the sample of 1100 interviewed drivers, more than 90% were exposed to the campaign's messages.

Table 1. Exposure to the campaign by vehicle type & media mode

Vehicle type	MEANS Radio	TV	Posts
Car	77	88	29
Van	80	81	33
Truck	73	75	27
M. bike	58	58	17
Taxi	90	70	30
Bus	100	92	66
Total	478	464	202

Most of the drivers were also convinced that DRL is a useful safety measure. Table 2 presents the distribution of opinions about DRL's effectiveness by vehicle type. Overall, only 13% believed it has low or null effect. Truck drivers were the most skeptical, but even in that group 79% believed DRL to be an effective measure.

Table 2. Drivers' opinions on the effectiveness of DRL by vehicle type

Vehicle type		Effectiveness of DRL % of drivers			
	N	High	Medium	Low	None
Car	893	65	23	7	5
Van	124	53	28	12	6
Truck	28	61	18	14	7
M. bike	12	58	25	8	8
Taxi	10	70	30	0	0
Bus	52	70	23	6	2
Total	1119	63	24	8	5

Surprisingly, most of the drivers interviewed did not object to a law that will make DRL use in the winter months obligatory. The distribution of drivers' opinions concerning a DRL law, by vehicle type, is presented in Table 3. While 73% of the

drivers favored such a law, only 50% of the motorbike riders favored it. This was probably because many motorbike riders use DRL to enhance their conspicuity year-round, and a general law may reduce their conspicuity.

Table 3. Drivers' attitudes towards a DRL law, by vehicle type

Vehicle type	N	% of drivers For	Against	No opinion
Car	931	72	23	5
Van	125	70	26	4
Truck	28	79	21	0
M.bike	12	50	50	0
Taxi	10	80	20	0
Bus	52	96	4	0
Total	1158	68	27	5

The extent of DRL use, as stated by the interviewees, is presented in Table 4. Almost all drivers reported they use lights in conditions of reduced visibility. 70% said they drive with their lights on when the sky is cloudy. Only 10% stated they use DRL in bright weather.

Table 4. Stated DRL use

Vehicle type	N	Clear	Cloudy	Reduced visibility
Car	936	9	73	99
Van	125	8	58	99
Truck	28	7	57	100
M.bike	12	42	50	100
Taxi	10	0	40	100
Bus	52	17	83	100
Total	1163	10	71	99

About 40% of the cars had automatic switch-off of lights when the engine is turned off. 10% of the drivers reported a problem caused by DRL use, mostly a depletion of the car battery as a result of leaving the light on when the engine is switched off.

Roadside observations: The actual use of DRL throughout the campaign varied greatly according to weather conditions and illumination levels. Usage rates were about 5% in clear weather and good illumination (above 40,000 Lux), and reached 50-70% in rainy and foggy weather (Figure 3),

During the week before the campaign, usage rates in inclement weather were in the range of 20-50% (Figure 4). Usage rates went up during the campaign in all weather conditions, but the increase was most pronounced in intermediate conditions. In clear weather usage rates were low in both periods, while in conditions of impaired visibility rates were quite high even before the campaign started.

Usage rates in urban roads were lower than in rural roads, in similar weather and illumination conditions. DRL rates for cars, vans and trucks were similar. Bus drivers tended to use lights more, especially in fair conditions, but usage rates did not go above 74% even in adverse conditions. Motorcycles had markedly high usage rates - 50% in clear weather and 87% under impaired visibility conditions. (Figure 3.)

Accident analysis: Accident data and the Odds Ratio statistics for the different target groups are summarized in Table 5. None of the Odds Ratio statistics is smaller than 1, thus no effect of the campaign on accidents was demonstrated.

Table 5. Effect of DRL on accident - Nos. of accidents and Odds Ratios

Period	All accidents	Rural	Urban	Head-on + r.angle	Pedest-rian	Acc in rainy weather
Test 89-90						
day	2798	635	2163	896	730	362
night	1473	366	1107	532	299	234
Control 88-89						
day	2439	449	1990	734	725	291
night	1522	380	1142	536	365	257
Control 87-88						
day	2646	519	1945	680	753	460
night	1512	344	1168	500	421	378
Odds Ratios						
88-89	1.19	1.47	1.12	1.23	1.23	1.37
87-88	1.09	1.15	1.17	1.24	1.37	1.27

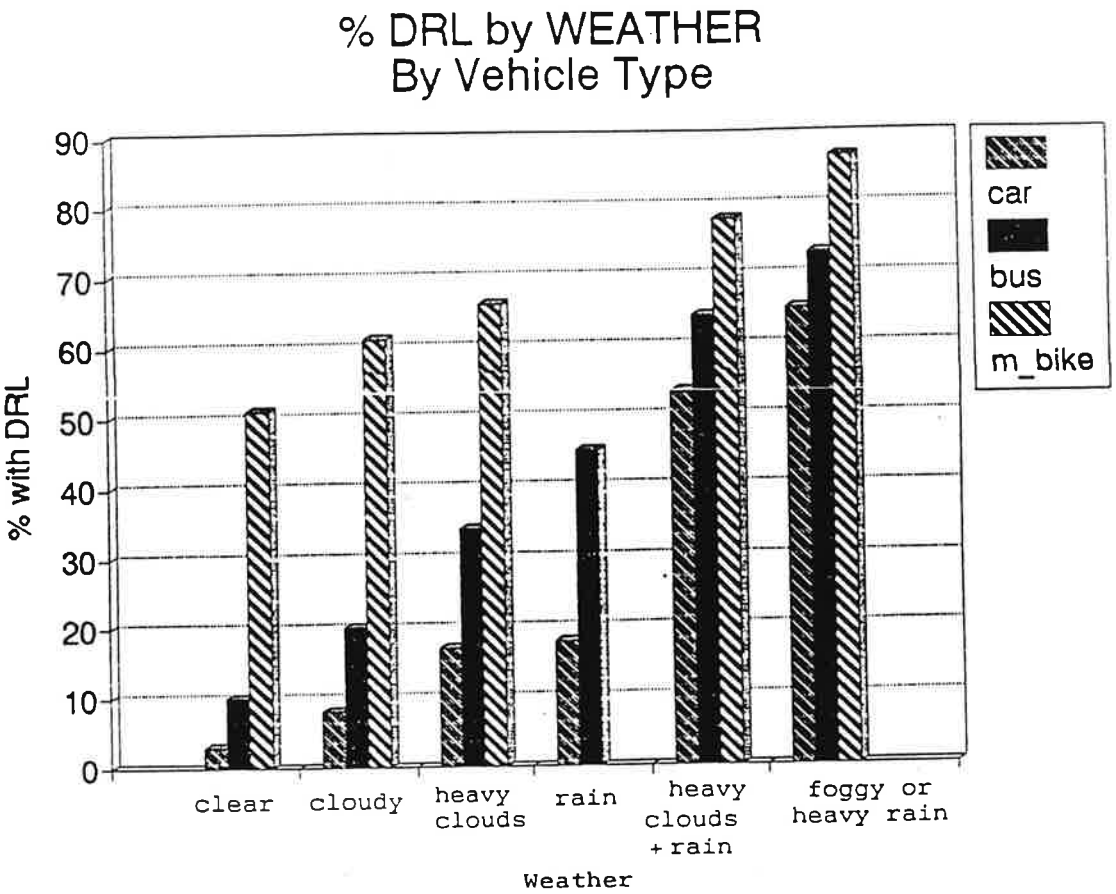

Figure 3: DRL use by weather conditions and vehicle type

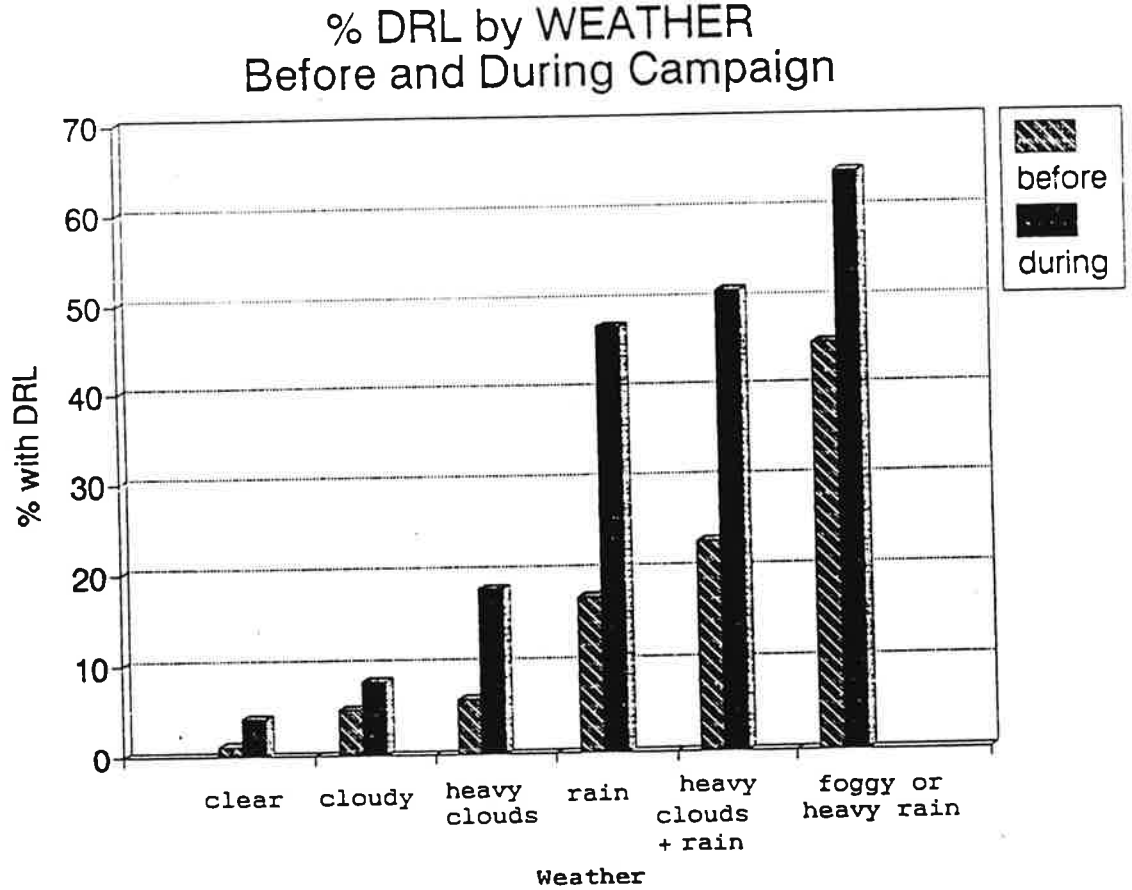

Figure 4: DRL use by weather conditions before and during the campaign

Discussion

The study demonstrated that the usage of running lights in adverse weather conditions, is an idea which is easy to communicate to the public through a publicity campaign. It is a clear and simple message, easy to follow and comprehend. Drivers were convinced to use DRL in low visibility, and even accepted the notion of an obligatory DRL law.

Stated use of DRL was very high in impaired visibility conditions, however, actual usage as observed on the road was much lower, in the range of 50-70%. This may be due to the qualitative and subjective notion of "impaired weather conditions", drivers used their judgement as to whether and when to turn on their lights.

A simpler message that advocated DRL use in the winter months, regardless of weather and visibility conditions, might increase DRL use.

A widely distributed, cheap automatic shut-off device for the running lights may reduce mechanical problems associated with DRL use, and help overcome drivers' reluctance to use their lights during the day.

Accident analysis did not reveal any impact of DRL on accidents, but this may be due to the limited nature of the experiment; the campaign lasted three months only and concentrated in using DRL during bad weather conditions. Also, there were limited media campaigns in prior years, so that some use of DRL was prevalent during the control period.

More experience with DRL is needed before we can assess its effectiveness under Israeli conditions. In the meantime, we feel there is no justification for a regulatory use of DRL. On the other hand, DRL is a cheap and easy to use safety device that has proven effective in behavioural experiments, fleet studies, and nationwide experience (for an up-to-date review see for example Helmers, 1988 and Padmos, 1988). Thus we recommend that use of lights during the daytime, in the winter months, should continue to be advocated.

References

Helmers, G. (1988) Daytime running lights - A potent traffic safety measure? VTI report No 333 A.

Padmos, P. (1988) Visual aspects of daytime running lights. TNO Institute for Perception IZF 1988 C-24.