FOR CONSPICUITY'S SAKE, LIGHTS ON SOUTH AFRICA!

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The South African government road safety practitioners, in their desperation to alleviate trauma on the roads, commissioned UNIARC to conduct a study on motorists' understanding of daytime running lights use (DRLs). Durban, Pinetown and Pietermaritzburg Metropolitan Municipalities were chosen as areas of study. A random sample of 1050 motorists was interviewed, making use of questionnaires. The study objectives were to establish motorists' recognition of the effects of DRLs as a measure to reduce crashes, and effects on specific crashes. It was further focussed on determining motorists' support and compliance to DRL use if it were made law. The study established that motorists recognise the safety effects of daytime running lights as a measure to reduce accidents. An overwhelming reception was indicated by 69% of motorists, who reflect their willingness to drive with their lights on during the day if it was made law. Other findings indicate that DRLs use would have positive effects on specific crashes that involve unprotected road users like pedestrians and cyclists as well as intersection collisions. It was further established that motorists felt that the conspicuity of on coming vehicles would be improved, thus assisting to identify vehicles on the edges of the driver vision; making it easier for the driver to identify an object as a vehicle if it has lights on; and would assist in estimating how far away an on-coming vehicle is. This study therefore recommends that Regulation 161A under the Road Traffic Act be made mandatory to connect the DRLs to the ignition switch for them to automatically turn on, on starting a vehicle. This would assist to alleviate trauma on our roads.

KEY WORDS: DAYTIME RUNNING LIGHTS (DRLs) / GLARE / TRAUMA

1. INTRODUCTION AND BACKGROUND

Road traffic crashes, leading to fatalities or severe health losses constitute a major public health problem, not to mention the cost to the economy. Globally, approximately 650 000 persons are killed annually by the road transport system. Even in countries with a relatively high level of traffic safety, 5% of the population are either killed or permanently disabled due to road crashes (Falkmer, 2000). The cost for the society is without doubt high.

Many traffic crashes are the result of a failure by the driver to notice another vehicle. Visual contrast is an essential characteristic, which enables a driver to detect vehicles. The purpose of DRLs is to increase vehicle visibility and driver awareness, thereby reducing road trauma. The crash reduction potential of DRLs lies in the driver's ability to capture attention, especially in the peripheral visual field, thereby enhancing perceptibility (Claton *et.al.* 1972). Hills (1980) and Sekuler *et. al, (*1990) found that increasing the visual contrast of a vehicle increases the ability of other drivers to detect and monitor the vehicle.

Daytime running lights (DRLs) come in a variety of configurations. They may be upper beam headlamps at reduced intensity or low beam headlamps at full or reduced power. In some vehicles, turn signals are used [5]. International debate about DRLs has focused not only on whether they should be made mandatory, but also which of the configuration is most effective.

This study was aimed at establishing motorists' recognition of DRLs as an effective measure in reducing road trauma. Understanding of DRLs as a remedy for some types of collision could guide car manufacturers, traffic engineers and politicians towards creating a more user-friendly traffic environment. The objectives were to establish motorists' recognition on: Safety effects of DRLs as a measure to reduce crashes, effects of DRLs on specific accidents from their experiential view point, and psychological validity associated with DRLs. It further focussed to determine motorists' reception to DRLs if it were made law.

2. LITERATURE REVIEW ON DAYTIME RUNNING LIGHTS

Exploration of the literature review on daytime running lights (DRLs) reflects progression of their use by vehicles from the high to the lower latitudes. This review attempts to trace the pattern and further highlight concerns raised by different road users on the impact of DRLs use. Scandinavian countries were the first to require by law daytime use of headlights for all motor vehicles. Table 1 reflects on summary on findings on DRLs effectiveness in these countries.

Table 1-Scandinavian countries' summary of findings on DRLs effectiveness

Country	Estimated % reduction	Type of crash/collision
Finland	21-27	In rural roads multiple-vehicles, head-on
Sweden	9 -21	Dependent, multiple-vehicles, head-on
Norway	15	Summer multiple-vehicles, head-on
Denmark	Up to 37	Vehicle-pedal-cyclists, left turn in front of on coming & multiple-vehicles

Derived from, (Farmer et. al., 2000); http://www.iconnect.ch/grsp/grspdev/causes.htm, 2002; http://www.ibiblio.org/rdu/DRLs/studies.htm;, 2002; http://www.underridenetwork.org/success.html, 2002

In 1977, Sweden began requiring DRLs during all seasons and on all roads while Norway initiated the requirement of automated system, switched on by the ignition on all new cars beginning in 1985. Questions about potential effectiveness of DRLs use in other countries, especially those in southern latitudes were raised. A debate raised by evaluations of each of the Scandinavian countries' law reported reductions in multiple-vehicle crashes even though none of the reductions were statistically significant (Elvik, 1993; Anderson *et. al*., 1976 and Anderson *et. al*., 1976).

In the 1970s, a study on introduction of DRLs in Finland and Sweden found not only 10% reduction of daytime accidents involving more than one vehicle but also established a positive spin off. Daylight accidents between motor vehicles and unprotected road users were reduced by 15-20% (Helmers, 1991). This was unexpected since it had been feared that greater visibility of vehicles to each other might make unprotected road users less visible.

Research in the US and Canada followed Scandinavian execution. This was implemented in a variety of ways including fleets of company and military vehicles. In the US, a seven months, six-state study by Avis Incorporation showed that their DRL equipped cars averaged 69% less damage than rental vehicles without DRLs. Crash reductions estimated at 38% and associated with DRLs, were reported as early as 1964 in Allen and Clark's survey of 181 US companies that used DRLs. Among the surveyed companies were the Greyhound Bus Company and Chicago's Checker Cab Company that reported

total crash reductions of 11% and 7.2%, respectively [5]. North American research results are summarised in Table 2.

Table 2-North American summary study findings on DRLs effectiveness

Country / State	Year of Study	Estimated % reduction	Type of crash/collision
US	1960's	7.2-38	Multiple-vehicles, all crashes
US	1985	7	In selected vehicles
US	2000	3	Multiple-vehicles
Canada	1989	22	Head-on
Canada	1990s	11	Multiple-vehicles; head-on
Canada	1997	5.3	Opposite direction / angle
Connecticut & several other states in the Southwest	1980s	7	Multiple-vehicles

Derived from (NHTSA, 2000), (Farmer *et. al*., 2000)

The Netherlands institute for traffic safety research established that if all motor vehicles were driven with lights on during the day, the following results would be achieved: the number of accident fatalities Europe-wide would be reduced by 24.6% (corresponding to 5 500 lives saved based on the relevant multiple-vehicle accidents during the day), 20% fewer injuries - 155 000 people, 12.4% less economic damage, 740 000 fewer reported accidents (http://www.restena.luPort80, 2002). It further argues that the universal use of DRLs was perceived to cut fatalities on the roads by 17%. However, in some other commissioned review, it stated that the benefits were overstated because the lights would only help prevent a limited type of accident (SMMT Policy & Economics, 2002).

METHODOLOGY

This study was conducted over the month of March 2002 in the eThekwini, Pinetown and Pietermaritzburg Municipalities. Structured face-to-face survey questionnaires were the main instrument of data collection used. In selecting appropriate research techniques for this study, the nature of the study, aims and objectives, potential tactical advantages of integration and problems of generalisation were considered. The Likert scales questionnaire was considered to 'perform very well when it comes to a reliable and rough ordering of people with regard to a particular attitude' (Oppenheim, 1992)]. A total of 1050 respondents were randomly selected for survey and interviewed taking into cognisance gender, age, experience and vehicle type. On data analysis, contingency tables are used as graphic representation of relationships between variables and are verified by the chi-square (x^2) statistic at 95% confidence level represented by $p < .05$. The relationships noted are purely a case of interpretation rather than a confirmation of any form of causation.

DATA RESULTS, DISCUSSION AND CONCLUSION

Attitude on DRLs safety effects

Gathered data was analysed to understand the attitude, awareness, feelings and observations of respondents. Some of the noticed benefits of DRL use on conspicuity of vehicles are explored in Table 3.

Table 3-DRLs and lights use benefits on conspicuity of vehicles

Abridged questions asked	% Responses (**N**=1050)		
	Yes	No	Not sure
Easier to see cars on edges of ones vision if have lights on	58	30	12
Easier to identify an object as car if it has DRLs	56	32	12
Easier to tell how far a car is, if its lights are on	50	38	12

Generally respondents accept that DRLs and lights uses during the day are useful for visibility and identification of an on coming vehicle. Studies of human eyes during the 'saccades' have revealed that the person is virtually blind during the period hence the driver's comment involved in accident is 'looked but failed to see' (Falkmer, 2000). This is attributed to 'mechanical', 'perceptual' and 'cognitive' filters. Mechanical filters imply that there has been a certain obstacle or hindrance to the visual information reaching the driver.

Table 4 and 5 also show that most of the motorists agree that 'even during the day, it is sometimes dark enough to make it difficult to see cars'. This seems to suggest that DRLs will assist to establish conspicuity of the on-coming vehicle. The plethora of different colours and shades of modern vehicles further complicate concerns reflected in Table 5.

Table 4- Dark enough during the day to see cars by experience of motorists

Statement & responses *"Even during the day, it is sometimes dark enough to make it difficult to see cars"*	Experience of motorists by years in %				Total %
	< 1	1-5	6-10	>10	
Strongly agree	32	19	14	20	19
Agree	24	32	28	35	32
Neither	10	9	15	11	11
Disagree	21	24	35	25	27
Strongly disagree	13	16	9	9	11
TOTAL (N=1050)	*62*	*278*	*258*	*452*	100

(p<.000)

Table 5-Difficulty of seeing dark coloured cars in shady roads by motorists' experience

Statement & responses *"On shady roads, it is more difficult to see dark coloured cars"*	Experience of motorists by years %				Total %
	< 1	1-5	6-10	>10	
Strongly agree	40	19	17	24	22
Agree	23	31	35	37	34
Neither	10	7	11	9	9
Disagree	9	27	28	22	24
Strongly disagree	18	16	9	8	11
TOTAL (N=1050)	*62*	*278*	*258*	*452*	100

p<.000

Motorists driving different types of vehicles like private (60%), motor cycle (72%), truck (56%), taxi (44%), bus (58%) and more than one of these (49%) respectively, 'agree' that 'failing to see another road user in time is a contributing factor for daytime intersection crashes (p<.003). It is arguably for these reasons that motorists driving the different types of vehicles feel that 'it is easier to see cars on the edges of ones vision, if they have lights on' (p<.002) as already confirmed in Table 3.

They also understood as "true" that pedestrian and cyclist crashes would be reduced by motorists' use of DRLs as demonstrated in Table 6. This seems to support the findings of a study that established a reduction by 15-20% of daylight crashes between motor vehicles and unprotected road users on introduction of DRLs in Finland and Sweden (Helmers, 1991 and Jacobs et. al., 2000). This could assist in the further reduction of pedestrian fatalities in South Africa (Haarhof, 2002).

Table 6- Feelings on reduction of crashes involving unprotected road users by drivers of different vehicle types

Statement: *"DRLs will reduce…*	Responses	Types of vehicles driven by motorists %						Total %
		Private vehicle	Motor cycle	Truck	Taxi	Bus	More-1 type	
A)pedestrian accidents" (p<.001)	True	48	56	47	34	46	41	45
	False	38	28	35	56	46	40	42
	Not sure	14	16	18	10	8	19	14
B)cyclist accidents" (p<.000)	True	49	48	50	36	46	49	46
	False	36	44	32	55	45	35	41
	Not sure	15	8	18	9	9	17	13
TOTAL (N=1050)		*593*	*25*	*34*	*206*	*89*	*103*	100

Perceived DRLs effects on intersection collisions and motorists commitment to its use

At road intersections, DRLs are noted to reduce accidents (p< .001) amongst drivers of private vehicles (43%), motor cycles (48%), trucks (53%), buses (44%) and those who drive more than one mode of transport (41%) excluding taxis (35%). This understanding is arguably due to DRLs benefits that provide an extra aid device to other vehicles drivers. This also assists especially for truck drivers, to check for on-coming vehicles before

passing on two or more lane highways or roads as they can see at a distance a vehicle with daytime running lights. In such a situation, drivers can prioritise their information processing and safely manoeuvre their vehicles. Lastly, motorists confirmed their commitment to DRLs use if made law in South Africa as shown in Table 7. There are already motorists and vehicle fleet owners whose vehicles are driven with lights on.

Table 7-Motorists commitment on DRLs and its law enforcement

Abridged questions asked	% Responses		
	Yes	No	Not sure
If it was law to drive with your lights on during the day, would you?	69	23	8
If it was law that you had to install special DRLs, would you?	60	27	12
Do you think traffic law enforcers would be in a position to enforce this law?	57	26	17

It is therefore concluded that motorist recognise the safety effects of daytime running lights (DRLs) as a measure to reduce accidents. An overwhelming reception is indicated by 69% of motorists' who reflect that they 'would drive with their lights on during the day if it was made law'. From the motorists' understanding, it is further concluded that DRLs use would have positive effects on specific accidents including those that involve unprotected road users like pedestrians and cyclists as well as intersection collisions.

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