Persuasion or Stick?
Latest Advances in Speed Management in the UK

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Biographies

Nigel McDonald is Principal Consultant (Safety) within the Investigations and Risk Management Group of the UK's Transport Research Laboratory (TRL), operating from Sydney, Australia. Nigel has nearly 15 years experience the road safety and transportation areas of expertise.

Prior to joining TRL in 2002, he worked for the NRMA – Australia's largest motoring organisation – in a variety of roles. These involved road safety investigations and research, public education programs, transport policy development and political lobbying activities. Nigel has also worked in a local government authority.

At TRL, Nigel is engaged in a range of projects including forensic investigations, risk management advice, policy advice, and development of road safety strategies for a range of private and public sector clients in Australia, Europe and Asia.

Mike Winnett is a Senior Transport Consultant at the Transport Research Laboratory (TRL).

Mike is a leading UK expert on automated speed enforcement systems and has evaluated speed camera technology including enforcement at rail crossings. He has also developed speed management application strategies.

In the field of road safety he has: conducted an in-depth study into pedestrian accident contributory factors (applying neural processing); developed pedestrian safety measures; evaluated driver behaviour on Motorways analysing lane hogging and cruising; assessed the factors affecting vulnerable road users in particular 2-wheelers; and developed an objective measure of driver style from vehicle accelerations.

Abstract

Speed management is an issue subject to much professional and public debate, not least the success of programs focused on penalising non-compliant road users when compared to less ‘aggressive’ programs that encourage compliance.

This paper will present the latest findings and experiences of the UK’s Transport Research Laboratory (TRL) with a different method of changing speed behaviour from experiences within the UK, and consider this in the context of experiences within NSW.

This paper will discuss recent findings that road users are responding positively to information advising of inappropriate speeds linked to specific reasoning, and outline the

results of research examining speed behaviour in response to an interactive sign system that advises a change of behaviour and links it to specific and identifiable risks.

1. SPEEDING – A PROBLEM ACKNOWLEDGED

Speeding is a recognised road safety problem.

Figures from the Roads and Traffic Authority of NSW indicate that speeding was a factor in 43% of deaths and 18% of all casualties from crashes on NSW roads during 2001 – a greater proportion than for fatigue and alcohol combined.

Surveys of the community also acknowledge speeding as a problem. Community concerns related to traffic and road safety are most commonly founded on speed concerns[1] and NRMA surveys over the last decade show the public perceive speeding to be the major contributing factor to crashes, often being the top of mind, first mentioned factor in survey work.

An NRMA survey during 2000 showed that the public also was generally supportive of enforcement as a response to speeding with 88% believing that 'face to face' Police enforcement was an effective countermeasure, decreasing to 75% for speed cameras. However, public support for speed enforcement and specifically speed cameras is surveyed to be very conditional.

2. CONDITIONS ON PUBLIC SUPPORT AND AREAS FOR IMPROVEMENT

Between the NRMA's 1995 and 2000 surveys, support for speed cameras being used on all roads dropped from 46% to 13%, with motorists strongly favouring that cameras be used only at locations with identified speeding problems and, more dominantly, where there is a proven crash history. Of course, public opinion defining either of these can vary widely.

The public also expressed a number of concerns over the use of camera based enforcement compared to 'face to face' Police enforcement namely:

- lower awareness and recollection of the offence and behaviour,
- reduced impact of the 'shock' or 'guilt' effect of immediate Police action, and
- an opinion that a lack of an immediate behavioural change at the time of speeding would make it harder to affect long term behavioural change.

Anecdotally, there are also public concerns that speed cameras are having an effect only immediately at the point of the camera itself with isolated camera operations. Within the UK, this issue is being addressed with area wide camera schemes that include mobile as well as fixed site cameras. Although these address this concern and the concerns above, they still rely on the existence of an enforcement system to modify behaviour.

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[1] **McDonald, 1998.** *Claims, Crashes & Community. A Study of Crashes in Sydney Evaluating the Use of Insurance Data.* Submitted by Nigel McDonald for the degree of Bachelor of Civil Engineering, University of Technology, Sydney. 1998.

This may be an issue as drivers also report in the NRMA surveys that they are often unaware of the prevailing speed limit, and also an issue that drivers may be unaware of their own travel speed.

TRL has been involved with the development of Vehicle Activated Signs that aim to address many of these issues without the need for ongoing enforcement and as a gentle reminder that should develop public support and compliment enforcement activities.

3. VEHICLE ACTIVATED SIGNS

Many road safety engineering measures have been developed in an attempt to influence driver behaviour and cut vehicle speeds when approaching and negotiating high-risk locations where the geometry of the road network is a factor or where a high incidence of vehicle interactions can reasonably be expected. One of the latest measures is Vehicle Activated Signs (VAS), whose development has been pioneered by the Safety Group of the UK's Transport Research Laboratory (TRL), on behalf of the UK Department for Transport.

Speed that is 'inappropriate for the conditions' is often a factor in accidents. However, while speed limits are intended to bring speeds into line with the prevailing conditions, these limits are by their nature inflexible and many locations actually need drivers to travel at speeds well below this limit.

VAS technology displays a simple message relating to road condition, for example, indicating the presence of a bend, junction or speed requirements. The sign is illuminated only briefly, typically 4 seconds, and only to drivers exceeding a pre-programmed threshold speed for the location. The remainder of the time the sign remains blank.

The signs utilise fibre-optic technology or light emitting diodes to display the symbols and/or words required, so allowing different colours to be used for different parts of the message. At night, automatic dimming is used to reduce the intensity of the sign output. Activation of such signs is typically through the use of microwave detectors, although inductive loops cut into the road surface can also be used.

In the late 1990s a significant number of VAS units were installed in the UK, based upon the successful results of preliminary trials. In the latest study conducted by TRL, the effectiveness of more than 60 existing VAS installations was investigated.

The sites investigated were predominantly rural single carriageway roads in 4 counties of the UK, and 4 distinct types of VAS were considered:

- speed limit roundel, placed just within the initial speed limit sign and predominantly on the approaches to small settlements;
- bend warnings;
- junction warnings; and
- safety camera ahead repeater signs.

The study discovered that the average traffic speed at the sites reduced by between 1 and 14 mph (between 2 and 22 km/h). At some of the sites investigated the effective speed limit was cut by 10 mph (16 km/h) at the time the VAS was installed and these sites secured the highest overall reductions in vehicle speed. At locations where no adjustment had been made to the speed limit, the reduction in average speed was in the range 1 to 7 mph (2 to 11 km/h), with a mean reduction of 4 mph (6.5 km/h).

At bend and junction warning sites where VAS had been adopted, average vehicle speeds reduced by up to 7 mph (11 km/h) . An average reduction of 1 mph (2 km/h) was found at safety camera sites, with a 4 mph (6.5 km/h) reduction when the installation was associated with a change in speed limit.

Table 1 – Summary of speed reductions at warning signs

		Change in mean speed		*Change in percentage of speeders*	
Sign Type	*No. of speed measurement locations*	*Maximum (km/h)*	*Minimum (km/h)*	*Maximum % points*	*Minimum % points*
Junctions	8	-11.9	-1.3	-25	-1
Bends	2	-11.1	-3.4	-10	-1
Camera logo	3	-6.0	-0.8	-15	-0.5

The percentage of drivers exceeding the pertinent speed limit was reduced at all categories of site where VAS were utilised. A corresponding reduction in the incidence of personal injury crashes was also experienced.

For one of the counties examined, at the 21 sites were VAS had been adopted, there were found to be one third less personal injury crashes compared to the number that would have been expected without the installation of the signage, based upon trends for ‘untreated’ sites. This result displays statistical significance. A small reduction in personal injury crashes was found to occur where VAS depicting a safety camera logo had been installed, compared to the situation with the safety cameras alone, before VAS installation.

In addition to the above statistics demonstrating road safety gains, feedback from drivers has also been positive. In separate studies in 2 counties where VAS have been used, involving nearly 450 drivers in total, it was found that drivers overwhelmingly approved of the signage. The vast majority of drivers interviewed stated that they had made a connection between the speed at which they were traveling and the signs being triggered and believed that exceeding the speed limit was much more likely to trigger the speed limit roundel signs than any of the warning signs (ie. bend, junction, speed camera). Over 50% of the drivers interviewed believed that they would receive a fixed penalty notice for triggering a safety camera repeater sign.

Nearly all of the drivers interviewed thought that the junction warning sign VAS' primary function was to slow traffic down or to warn of the hazard.

It was previously thought that drivers would associate the microwave detection equipment mounted above a VAS with speed enforcement cameras. However, the driver interviews conducted did not find evidence to support this assumption.

Table 2 – Summary of speed reductions at roundel signs

Sign type	*No. of speed measurement locations*	*Change in mean speed Maximum (km/h)*	*Minimum (km/h)*	*Average change (km/h)*	*Av. before speed (km/h)*	*Av. after speed (km/h)*
30 mph roundel	17	-11.4	-4.2	-7.2	34.5	30.0
40 mph roundel	5	-7.1	-1.9	-5.0	38.2	35.1
30/20 mph change	6	-12.1	-7.1	-10.0	31.1	24.9
40/30 mph change	7	-22.2	-10.5	-14.3	39.7	30.8
50mph roundel*	1	-7.4	-5.8	-6.6	52	47.9

** speed measured in two lanes* *needs conversion*

It is worthy of note that the attitudes, understanding and speed behaviour of drivers in the 2 counties where the driver interviews were conducted were found to be similar, which could suggest that no regional differences exist.

The study has concluded:

- drivers can be influenced to reduce speed when they are specifically targeted, with fixed signs alone likely to have less effect;
- VAS are effective at reducing average traffic speed;
- VAS can reduce the number of drivers who exceed the speed limit and who contribute disproportionately to crash risk;
- a substantial crash reduction was found in this study;
- VAS can be operated at thresholds well below normal Police enforcement levels; and
- there is no evidence to suggest that drivers become less responsive to such signs over time, (eg. this was found even after three years of introduction).

The major benefits of VAS appear to be that they are self-enforcing and produce high compliance levels.

Although a VAS installation currently costs in the order of 5000 pounds in the UK (approximately AUD$11,500), this is a low cost when compared to the costs associated with personal injury crashes. The on-going operating costs of VAS are also reported to be low.

It should be recognized, however, that VAS technology is not the answer to all questions and should not be seen as replacement for measures that already exist to reduce traffic speed on road networks. They are merely an addition to the road safety engineer's toolkit. Solutions must be situation specific.

One objective of all speed reduction measures is to raise driver awareness of the importance of appropriate speed choice and so, over time, to contribute to an improvement in driver behaviour. With respect to VAS technology, the main aim is to alert drivers to the need to adopt a lower speed due to a particular hazard ahead, or in preparation for a lower speed limit ahead and this dictates a sparing extent of use, ie. they are not a substitute for standard or fixed signs and should only be employed when signing, road markings and road conditions are fully compliant with pertinent standards. Before a VAS is installed, the undertaking of a detailed crash investigation analysis is needed to confirm the use of a VAS as a most appropriate remedial measure. Traffic speeds and crash data must also be analysed following the introduction of a VAS.

4. CONCLUSION AND KEY POINTS

When used appropriately, it is clear that Vehicle Activated Sign (VAS) technology can deliver significant safety benefits. TRL's research has shown that drivers can be influenced to reduced speed when specifically targeted, with static fixed signs alone likely to have less effect.

VAS appear to be very effective in reducing speeds; in particular, they are capable of reducing the number of drivers who exceed the speed limit and who contribute disproportionately to crash risk, without the need for enforcement measures such as speed cameras. VAS can also be operated at thresholds well below normal Police enforcement levels and be tailored to specific risk situations with corresponding feedback to motorists.

There is no evidence that in time, drivers become less responsive to the signs, even over three years. For the TRL study, a substantial crash reduction has been demonstrated.

Operating costs are low, enhancing the relative benefit cost ratio and providing additional benefits to operating authorities.

Further results and discussion of the study can be obtained in TRL Report 548 Vehicle activated signs – a large scale evaluation. The UK Department for Transport provides

advice on the application of VAS and guidelines for installation in the UK in DfT Advisory Leaflet 1/03.

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