

The Repeat Speeders Trial: Victorian Trial of Intelligent Speed Assist Technology & the Speed Behaviour Program

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Abstract

To address speed-related crashes, VicRoads has implemented two speed interventions: *The Intelligent Speed Assist (ISA) Sub-Trial* and *Behavioural Intervention (BI) Sub-Trial*. This paper provides an overview of the trial scope, design, and a brief overview of interim data. The interventions are targeting drivers with a history of speeding offences. A minimum of 60 drivers will complete the ISA Sub-Trial and will drive with technology that provides alerts when they exceed the speed limit, and a data-logger to record any changes in speeding behaviour. Half of these drivers will be assigned to a comparison group and will only drive with a data-logger. A minimum of 500 drivers will undertake the BI Sub-Trial and will participate in a speed behaviour change program and complete self-report surveys before and after the program. Half of these drivers will be assigned to a comparison group and will only complete the self-report measures. Both sub-trials commenced in October, 2010. Early interim trends indicate that both the ISA device and program is effective in reducing speeding behaviour of drivers. Final results will be available in early 2012.

Key words

Speed, Intelligent Speed Assist/Adaptation (ISA), behaviour change, motivation, human error, road safety.

Introduction

Speed is a significant contributing factor to crashes and road fatalities. The Road Transport Authority estimates that of the 460 road fatalities that occurred in New South Wales in 2009, 46% could be attributed to speeding (Road Transport Authority, 2011). That is, fatalities involving at least one driver exceeding the legal speed limit. South Australia Police report that of the 105 crashes that occurred in South Australia in 2010, 46% were also attributed to speeding (South Australia Police, 2011). Similarly, Victoria has recognised that speeding is a key contributing factor in at least 30% of crashes (VicRoads, 2008). These trends are similar internationally. For example, in the United States in 2008, 31% of the 37,261 road fatalities that occurred were linked to speeding (United States Census Bureau, 2010).

Using the Reason (1990) Model, four broad categories can be applied to classify speeding behaviour: *slips*, *lapses*, *mistakes*, and *violations*. *Slips* occur when the individual's action is not carried out as intended. In the context of the road environment, a driver may intend to travel at 50 km/h but may unintentionally place too much pressure on the accelerator and slip over 50 km/h. *Lapses* occur when an individual forgets to initiate an action. For example, they may forget to check the posted speed limit on a road and subsequently speed. *Mistakes* occur when an

individual successfully initiates an action that is incorrect for the context. The driver may, for instance, assume a road is 60 km/h, instead of 50 km/h.

Many initiatives, such as driver education and enforcement, do not directly address slips, lapses, and mistakes because these errors are not due to lack of knowledge or motivation (Reason, 1990). Furthermore, encouraging drivers to be more vigilant and to have greater self-control is limiting. Self-control is effective in regulating behaviour in the short-term, but is not as effective for tasks that require persistence (Baumann & Kuhl, 2005), such as monitoring speed and other road hazards over an extended period. Rather, Reason (1990) argues that systems should be designed to be error tolerant. If a driver is prompted when they exceed the speed limit, for example, this should assist them with staying within the speed limit.

In contrast to unintentional errors, *violations* occur when an individual, such as a driver, intentionally ignores procedures and rules as a result of a competing motivation (Reason, 1990). For example, drivers may be motivated to speed for thrills, to reach destinations faster, or because driving dangerously aligns with their self-identity (Christie, 2009a).

Violations are commonly addressed in Australia and internationally through a combination of education, licence restrictions, and law enforcement. However, changing the motivations of these drivers, so that they are motivated to driver safely, is difficult. In one study, for instance, drivers who reported higher self-esteem from driving dangerously also reported they were more likely engage in risk taking after being presented with road accident statistics (Jessop, Albery, Rutter, & Garrod, 2008).

In short, there is a need for targeted interventions to address the different contributing factors that lead to speeding and the contribution of speeding to road trauma. Therefore, VicRoads has implemented a trial, the *Repeat Speeders Trial*, developed to test two speed interventions.

The first directly addresses drivers' speeding slips, lapses, and mistakes, by installing an ISA device into the vehicle of repeat speeders. That is, drivers who habitually exceed the speed limit and require a more direct form of assistance to assist them to reduce their speeding. This device alerts the driver when they exceed the speed limit, which helps them to reduce their speeding more quickly if they adhere to the warnings. The intervention is called the *Intelligent Speed Assist (ISA) Sub-Trial*.

The second intervention is a behaviour change program, which addresses all error types. The program motivates drivers to reduce their speeding by assisting them to reflect on the reasons why they speed and develop concrete strategies they can use to regulate their speeding behaviour (Christie, 2009b). This intervention is referred to as the *Behavioural Intervention Sub-Trial*.

The Repeat Speeders Trial commenced in October 2010. This paper provides an overview of the scope, design, and a brief overview of interim data.

Method

Design

Intelligent Speed Assist Sub-Trial

The ISA Sub-Trial involves a minimum of 60 drivers. Half of these drivers are randomly assigned into a group called the *Speed Alert Trial*, will drive with intelligent speed assist/adaptation technology for 12 weeks and will have a data-logger fitted during this period to measure any changes in speeding behaviour. The logger will remain in the vehicle for a further eight weeks after the ISA device is removed to determine if any changes in driver speeding behaviour persist. The remaining participants are being assigned to the *Speed Data Study* and will act as a comparison group. They will only have a data-logger fitted for the full 20 week period. Because some participants may withdraw during the trial, VicRoads is recruiting up to 100 drivers initially.

All participants are provided with a \$300 gift card if they complete all activities. Half of the participants in the Speed Alert Trial and Speed Data Study will also have three demerit points removed at the end of the trial. This will allow VicRoads to determine if removing demerit points is a valid incentive for any future road safety policy. In short, four groups are being compared, as is shown in Table 1.

Table 1. Number of participants required for the ISA Sub-Trial

Study group	Number of participants	
	Demerit Points Removed	No Demerit Points Removed
Speed Alert Trial	15 - 25	15 - 25
Speed Data Study	15 - 25	15 - 25

Note. Final sample will range from 15 – 25 depending on drop-out rate.

Behavioural Intervention Sub-Trial

As part of the BI Sub-Trial, a minimum of 250 drivers will undertake the *Speed Behaviour Program*, which is a group-based behaviour change program developed to help drivers reduce their speeding (Christie, 2009). The program is based on best practice behaviour change principles and requires participants to reflect on the consequences speeding, develop a personalised speed behaviour change plan, as well as a plan to manage speeding slips and lapses (Christie, 2009).

The program is run over two, two-hour sessions, separated by one week. Group size ranged from approximately five to 10 participants. Participants are also required to complete a homework activity in between the two sessions. The program is run across Melbourne, in Doncaster, Fitzroy, Dandenong and Sunshine. It was beyond the scope of the trial to provide rural venues.

Any changes in behaviour will be assessed by self-report measures before and after the intervention. Drivers will also be provided with a \$200 gift card if they complete all activities and will have three demerit points removed from their driving record. A further 250 drivers will be recruited into a comparison group, the *Speed Behaviour Survey*, and they will only complete the self-report measures and will receive the \$200 gift card. Because some participant may withdraw during the trial, VicRoads is recruiting up to 840 drivers initially (420 per group).

Due to the large sample size required to assess behaviour change using self-report measures, it was not feasible to segment the sample like the ISA Sub-Trial into

groups that have or do not have demerit points removed. In short, two groups are being compared, as is shown in Table 2.

Table 2. Number of participants required for the BI Sub-Trial

Study group	Number of participants
Speed Behaviour Program	250-410
Speed Behaviour Survey	250-410

Note. Final sample will range from 250 – 420 depending on drop-out rate. Based on current take-up, the final sample will be approximately 300 in each group.

Participants

Participants are fully licensed Victorian drivers who have recently received a three demerit point speeding infringement taking them to between 8-11 demerit points. These drivers were selected because they were close to licence suspension levels, which can occur when a driver reaches 12 or more points in Victoria. In addition, all drivers must have accumulated at least one other speeding offence in their driving history. Drivers who have reached suspension level in the past were not eligible to participate as the trial was investigating the behaviour of drivers with lower level offences. All drivers were randomly assigned to one of the six possible groups. Table 3 shows the demographics of participants recruited in the ISA Sub-Trial as of 27 April 2011.

Table 3. Mean (SD) age and gender of participants recruited and not recruited into the ISA groups

ISA Group	Number recruited	Number refused participation	Number not Recruited ('Other')*
Speed Alert (No Demerit Points Removed)			
<i>Mean age (SD)</i>	40.4 (14.4)	44.9 (14.1)	41.5 (13.7)
<i>Gender</i>	12 F 12 M	27 F 26 M	91 F 101 M
Speed Alert (Demerit Points Removed)			
<i>Mean age (SD)</i>	43.7 (12.1)	45.8 (14.6)	41.3 (13.7)
<i>Gender</i>	8 F 18 M	16 F 19 M	107 F 107 M
Speed Data (No Demerit Points Removed)			
<i>Mean age (SD)</i>	45.7 (13.2)	39.9 (12.8)	39.9 (13.5)
<i>Gender</i>	16 F 9 M	27 F 15 M	112 F 91 M
Speed Data (Demerit Points Removed)			
<i>Mean age (SD)</i>	45.3 (13.7)	53.3 (14.3)	41.5 (13.7)
<i>Gender</i>	15 F 13 M	22 F 14 M	84 F 119 M
Speed Behaviour Program			
<i>Mean age (SD)</i>	42.8 (14.1)	43.4 (13.9)	39.9 (13.4)
<i>Gender</i>	132 F	191 F	536 F

Note. All data presented in this report is from an interim analysis and may change when full data is analysed. The views expressed in this paper are those of the authors and not necessarily those of VicRoads or the Victorian Government.

	133 M	167 M	566 M
Speed Behaviour Survey			
<i>Mean age (SD)</i>	43.6 (14.3)	47.1 (14.7)	41.3 (13.6)
<i>Gender</i>	172 F 156 M	93 F 103 M	365 F 321 M

Source: Young, Newstead, Rudin-Brown, & Tomasevic, (2011).

*"Other" refers to reasons such as failing screening interview and language difficulties.

The mean age was similar for participants who volunteered and those who did not. There were also no gender differences. The main systematic difference that emerged was that candidates who declined the Speed Behaviour Program tended to live further away from the venue locations. There were significant differences in age for drivers not recruited for "other" reasons versus those recruited into the Survey and Program groups. These differences will be investigated in the final analysis.

Materials/Apparatus

A summary of the materials/apparatus are provided in Table 4.

Table 4. Summary of materials/apparatus

Materials/Apparatus	Description
Speed Alert Trial	
ISA Device	Determines speed and location using Global Positioning Satellite technology. Provides in-vehicle visual and audio alerts when the driver travels over the speed limit. The alerts show a red speed sign when the driver exceeds the speed limit by 1-2 km/h, single beep at 2-4 km/hr and a triple beep when the driver exceeds the speed limit by 4 km/h. The device also displays the speed limit and can be muted for one minute.
Data-logger	Records the driver's location and speed using GPS. Uses the VicRoads electronic map of Victorian speed zones and their locations. The logger is equipped with an on/off switch so that non-participants can drive the vehicle.
Pre-Intervention Survey	A hardcopy survey that measures demographics, exposure Items, awareness of road safety issues, attitudes towards driving behaviours, and contains the nine Stages-of-Change items, Driver Behaviour Questionnaire, Sensation-Seeking Scale, Propensity for Angry Driving Scale, and Social Desirability Scale.
Post-Intervention Survey	A hardcopy survey that measures awareness of road safety issues, attitudes towards driving behaviours, and contains nine Stages-of-Change items, Driver Behaviour Questionnaire, Sensation-Seeking Scale, Propensity for Angry Driving Scale, and Social Desirability Scale.
ISA Experience Interview	Qualitative experience interview to understand the human factors issues with the ISA device.
Other materials	Consent form, Participant Agreement, and Explanatory Statement.
Speed Data Study	All materials were identical except these participants did not have an ISA device or experience interview.
Speed Behaviour Program & Speed Behaviour Survey	All materials were identical except participants were not exposed to in-vehicle technology or experience interviews. There were slight differences between surveys and other materials where necessary.

Procedure

Candidates are managed and invited to participate by a recruitment organisation, *Your Source*, and are currently being managed by this organisation. For the ISA Sub-

Trial, drivers completed a phone interview and are informed about all details of the study except details surrounding demerit point removal to prevent a systematic take-up bias between groups. Once a participant agrees to participate, they are informed about the demerit point removal, if in the applicable group, and are sent a participant pack containing the pre-intervention survey and consent form. After completing the required activities, participants are sent a second survey four weeks later, and are provided with their gift card and demerit point removal (where applicable).

Interim analysis and discussion

The Monash University Accident Research Centre (MUARC) conducted an interim evaluation in June 2011 (Young et al., 2011). The following are a small selection of the interim data analysis trends. Trends that are significant with the interim data are denoted with an asterisk. Results are preliminary and may change once the full data is collected and analysed.

ISA Sub-Trial Interim Analysis

As Table 5 shows, presently the ISA device appears to be of significant value in reducing speeding in 40km/h zones.

Table 5. Mean (95% confidence interval) speed across ISA groups and speed zones

Speed Zone (km/h)	ISA Group / Mean speeds and confidence intervals			
	Speed Alert (No Dem)	Speed Alert (Dem)	Speed Data (No Dem)	Speed Data (Dem)
40*	35.1 (33.3-36.9)	35.6 (34.1-37.1)	37.5 (35.9-39.1)	38.2 (36.9-39.4)
50	42.6 (41.3-43.8)	42.1 (41.3-42.9)	42.8 (41.6-44.0)	43.4 (42.5-44.3)
60	53.7 (52.6-54.9)	53.7 (52.6-54.7)	54.1 (53.0-55.2)	54.6 (53.8-55.4)
70	62.4 (60.9-63.8)	62.7 (61.7-63.7)	63.3 (62.2-64.3)	63.5 (62.7-64.3)
80	72.8 (70.9-74.8)	72.7 (71.4-74.0)	73.7 (72.1-75.4)	73.5 (72.6-74.4)
100	93.0 (91.2-94.8)	93.8 (92.3-95.4)	94.6 (93.9-95.3)	93.8 (92.4-95.3)

Table 6 shows the ISA device assists across speed zones in helping drivers to return to the speed limit when they exceeded the speed limit. The mean time taken to return to the speed limit after exceeding it was faster in the Speed Alert compared to Speed Data groups. This is consistent with the rationale that the device is useful in assisting drivers to recover from slips, lapses, and mistakes. Table 7 indicates that overall participants who had an ISA device fitted reached lower maximum speeds over the speed limit. However, these results were not significant.

Table 6. Mean (SD) time (s) taken to return to the speed limit after exceeding across ISA groups and speed zones

Speed Zone (km/h)	ISA Group / Mean (SD) time (s) taken to return to the speed limit			
	Speed Alert (No Dem)	Speed Alert (Dem)	Speed Data (No Dem)	Speed Data (Dem)
40*	5.3 (2.8)	5.4 (2.5)	8.8 (2.5)	8.8 (1.5)

Note. All data presented in this report is from an interim analysis and may change when full data is analysed. The views expressed in this paper are those of the authors and not necessarily those of VicRoads or the Victorian Government.

50*	4.8 (2.8)	4.5 (2.4)	7.7 (3.5)	7.8 (2.2)
60*	5.6 (3.1)	5.4 (4.0)	9.7 (3.0)	9.1 (2.9)
70*	4.9 (2.9)	4.7 (3.7)	9.2 (3.4)	8.7 (2.9)
80*	6.5 (4.5)	8.4 (8.2)	11.8 (5.9)	12.5 (4.9)
100*	6.3 (6.7)	5.1 (5.4)	13.3 (8.7)	12.7 (12.0)

Table 7. Maximum (95% confidence interval) speed reached over the speed limit across ISA groups and speed zones

Speed Zone (km/h)	ISA Group / Maximum (95% confidence interval) speed reached			
	Speed Alert (No Dem)	Speed Alert (Dem)	Speed Data (No Dem)	Speed Data (Dem)
40	27.7 (22.5-32.9)	27.9 (20.9-35.1)	29.4 (25.0-33.7)	33.8 (29.8-37.8)
50	27.9 (21.4-34.3)	28.1 (22.4-33.7)	32.5 (27.1-37.9)	31.9 (26.9-36.9)
60	26.4 (21.2-31.6)	26.6 (21.2-31.9)	31.5 (26.9-35.9)	26.3 (24.6-31.9)
70	17.6 (12.2-22.9)	16.8 (12.3-21.3)	16.2 (12.8-19.6)	20.3 (16.9-23.7)
80	18.2 (13.6-22.7)	20.6 (16.9-24.6)	22.2 (16.7-27.6)	22.5 (19.6-25.4)
100	9.6 (4.8-14.5)	10.4 (6.4-14.5)	17.6 (11.1-24.2)	12.5 (9.3-15.7)

Behavioural Intervention Sub-Trial Interim Results

After participants attended the Speed Behaviour Program, they were more likely to endorse negative attitudes towards speeding (Figure 1). Figure 2 shows that participants were also more likely to want to change their speeding behaviour. These findings suggest that after attending the program, participants are more likely to be motivated to drive safely.

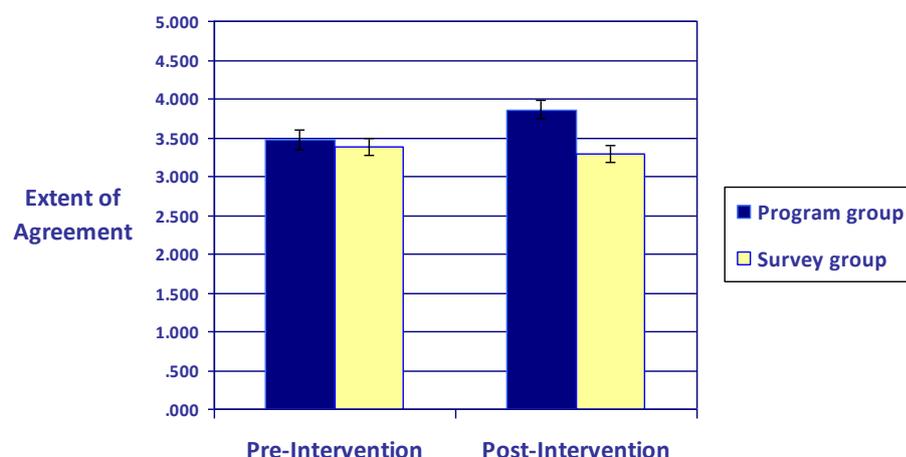


Figure 1 The extent to which participants agree with the statement "Speeding is always wrong"*

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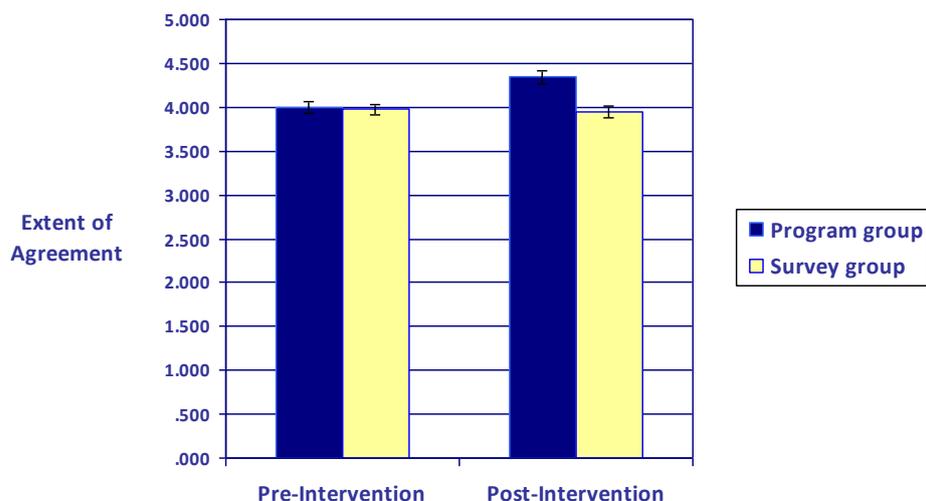


Figure 2 Scores on the action (stages-of-change) items*

As shown in Figure 3 and 4, and consistent with predictions, participants reported fewer violations after attending the program and fewer mistakes. It should be noted that all differences were independent of social desirability effects, which suggests that participants were not motivated to “fake good” on the survey measures. All changes were small in effect size.

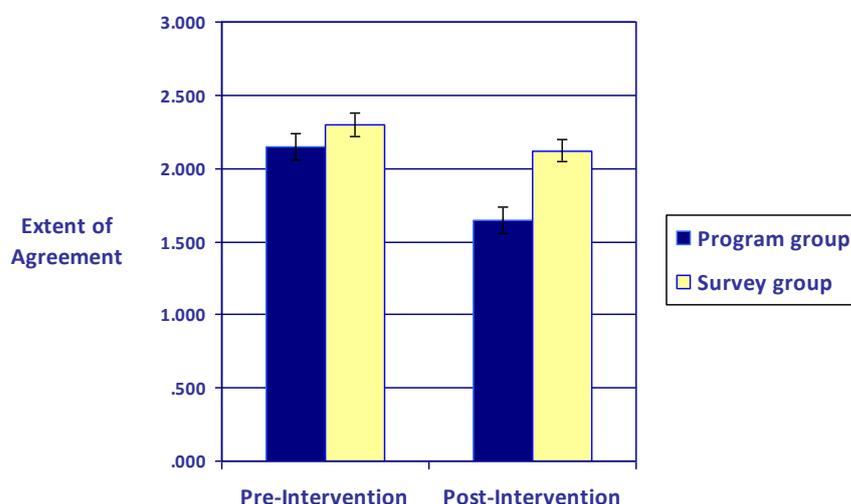


Figure 3 Average score on the Violations sub-scale of the DBQ (lower score represents fewer violations)*

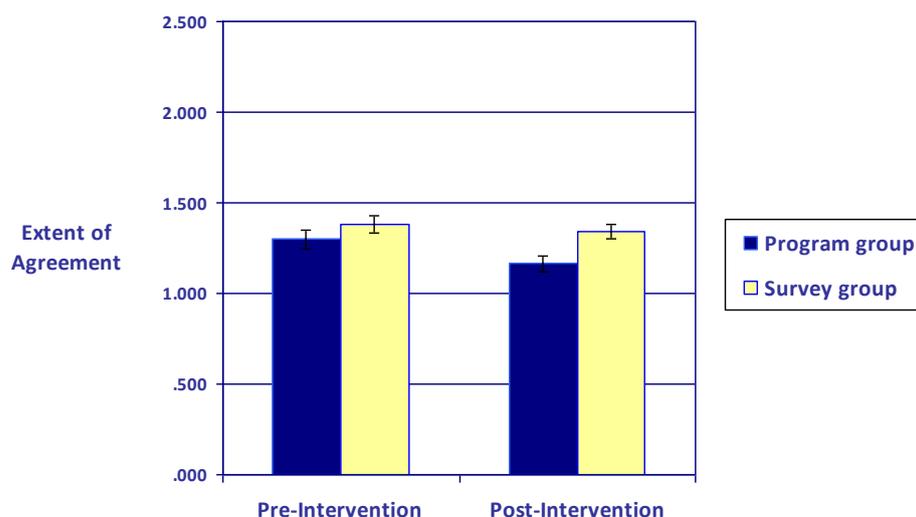


Figure 4 Average score on the Mistakes sub-scale of the DBQ (lower score represents fewer mistakes)*

Future Directions

The Repeat Speeders Trial will conclude in late 2011 with results becoming available in early 2012. Once results are finalised, MUARC will evaluate the effect of the ISA devices and the speed behaviour program to determine if they are effective. VicRoads will then examine whether there are policy implications for using advisory ISA devices and/or the Speed Behaviour Program as an ongoing initiative to reduce speeding on Victorian roads.

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