Telemetric Longitudinal Measurement of Young Driver Behaviour

Nicola J. Starkey[1] and Robert B. Isler[2]
Traffic and Road Safety Research Group, Department of Psychology, University of Waikato, Hamilton, New Zealand
[1]nstarkey@waikato.ac.nz; [2]psyc2255@waiakto.ac.nz

New Zealand is one of the few countries that currently allows teenagers to become solo drivers at 15 ½ years of age. During their first six months of solo driving, these teenagers are 19 times more likely to crash compared to the period of supervised driving. The behaviour of these adolescent drivers represents the single largest cause of fatalities in that age group and is widely acknowledged as one of the most serious social issues facing New Zealand. This state of affairs, often referred to as 'the young driver problem,' with an over representation of young drivers in motor vehicle crashes, is not unique to New Zealand. In fact, a similar situation can be found inmost of the world's developed nations.

Contributing to this problem, traditional methods of driver education and driver training have not delivered demonstrable safety benefits. In fact, the majority of driver training evaluation studies in the last thirty years have concluded that driver education and training contributes little to reduce crash risk / involvement for road users (pre-licence, defensive, advanced, or driver improvement). In fact, some types of car handling training has been cited as leading to increased risk taking due to learners' inflated self confidence and self rated driving skills [1]. However, accurately evaluating the effects of driver training interventions is a difficult task. A particular driver training intervention can only be considered to be effective if it can show a significant reduction in the number crashes for the driver, or a significant change in driver behaviour that clearly implies safer driving. Getting accurate and comprehensive crash records is difficult and to measure post training behavioural driving changes based on self-reports (e.g., log books) may not be accurate enough to be statistically meaningful. In fact Crick and McKenna (1991) suggest that the lack of evidence for the benefits of road safety education / training may be due to a lack of methodological soundness in previous evaluations [2].

Event data recorders have been used for years in aircrafts and more recently in cars to monitor speed, seat belt use and air bag release after a crash. In addition they are used in vehicle fleets to track location and provide information on risky driving. More recently, this technology has become widely available for purchase and can be installed in cars once they have left the factory, providing information on speed, distance travelled, location and large g force changes. Such devices have the potential to be used in a variety of ways to improve driver safety and education. Firstly, the long term effects of driver education or training could be accurately evaluated. Secondly, the behaviour of young drivers could be monitored and unsafe driving practices could be highlighted. Indeed, with the addition of a video camera this provides opportunities for driver education [3]. Finally, these devices could be used to improve fuel consumption and decrease risky driving [4].

In terms of monitoring unsafe driving practices among teen drivers, several 'black box' devices are available for purchase over the internet (e.g. RS-1000 Teen Black Box – see Figure 1, Alltrackusa). Data stored on the devices can be downloaded to a PC and reviewed by parent / driver of the vehicle. In addition, audible beeps alert the driver to unsafe driving as it happens. Thus, information from these devices allows parents to monitor how their children are driving but gives little information regarding the situational factors which led to unsafe driving.

To take advantage of the educational opportunities this type of monitoring provides, McGhee et al, 2007 added an event triggered video device to the black box. The 'DriveCam' captures video continuously, providing a forward and interior view of the car. Data is only stored (20 seconds) when a preset accelerometer threshold is exceeded. Events can then be downloaded from the device and are coded in the laboratory. Each week, the parent and teen receive a CD to review (showing the recorded events) with a report card and suggestions on how to improve their driving [3].

Figure 1. *The RS1000 Teen Black Box*

Our research is focused on improving driver education and as part of this we carried out a pilot study using a telemetric data tracker to determine how well this technology measured real driving behaviour. After a driver training camp we installed telemetric data trackers in the vehicles of eight participants to pilot how well this technology measured post-training real driving behaviour over a period of 32 weeks. The tracking system consisted of a small credit card sized global positioning module (SmarTrak Lite GPRS / GPS) fitted with an accelerometer. The software for the tracking and reporting interface via the internet was developed by SmarTrak Ltd (www.smartrak.co.nz). It allowed us to monitor, in real time, the driving performance (updated every 2 seconds) of the eight participants on the computer screen (see Figure 2). The built-in accelerometer also provided g-force data from the vehicles. Daily, weekly and monthly reports of the driving measures for each participant could be produced and downloaded as a Microsoft Office EXCEL spreadsheets. For each participant we obtained d*istance driven per trip;* n*umber of trips; mean speed per trip;* m*aximum speed; speeding violation and large G-force*

We received valid telemetric driving behaviour data from six of the eight participants. Two of the participants crashed during the study and the GPS system allowed us to examine

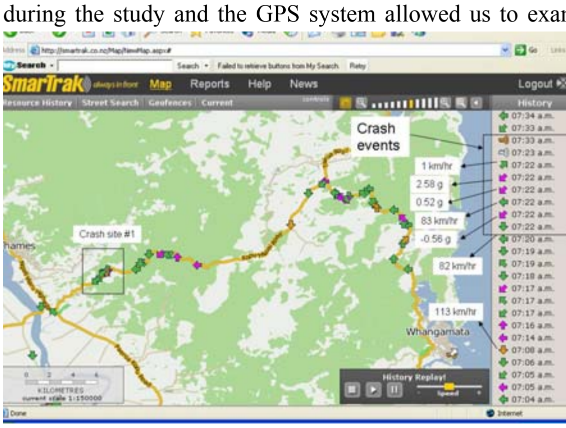

Figure 2. *The map function of the on-line monitoring system*

their driving behaviour just before (and, in one case, during and after) the crash. In addition, one participant had their car stolen. The data we received provided us with an interesting insight into the driving patterns of these teenagers and overall, the telemetric data tracking system used in this study seems to be a promising research tool for evaluating driver behaviour.

By using the map based tracking function all the recorded driver behaviour events, including crashes could be mapped, replayed and analysed in detail on the internet. It also allowed us to create daily, weekly and monthly reports of important risk-taking behaviour variables (such as speeding, average speed, large g-forces) and could also provide information on risk exposure (driving distance). In order to improve the system, an event triggered video recording system could help verify each large g-force that was created by the monitored vehicles. It would also be beneficial to record lower speeding events such as driving 60 km/h on a road with a 50 km/h speed limit, but this depends on GPS based speed limit data for all roadways being available. The difficulties associated with this technology include the huge amount of data which is obtained and also installing these devices in private cars raises ethical issue relating to privacy. Overall this technology appears to provide a sensitive and reliable means of evaluating driver behaviour for a range of purposes.

References

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