



On-road behaviour of younger and older novices during the first six months of driving

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ABSTRACT

Newly qualified drivers are known to have greater crash involvement than more experienced drivers, but does the on-road driving behaviour of young novices differ from that of older novices who might be expected to be more mature and to have different driving needs? Both younger and older novices were compared with experienced drivers in their behaviour driving an instrumented car on three occasions. The three drives were conducted within the novices' first few months of becoming qualified. All drivers, including both groups of novices, increased their average road speed over the three drives, and all increased their tendency to cut across the central lane marker on bends. The older novices showed some indications of becoming more cautious with experience, by doubling their headway after six months, and by increasing the number of times they glanced into their mirrors at critical points. This increased caution may be attributable to the driving experiences of the older novices, who had experienced twice the crash rate of the younger novices during their first six months of driving.

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1. Introduction

The vulnerability of newly qualified drivers has been well documented but the problem of how to reduce or eliminate their crash liability is yet to be solved. Even crude statistical analyses that ignore differences in road usage point to a much higher fatality rate in young drivers than in those 10 or 15 years older. For the 2009 UK casualty rates, for the younger drivers (between the ages of 16 and 24 years) there were 39.3 driver deaths per year, in comparison with 13.8 deaths per year for older drivers (30–39 years). However, if new drivers can be trained to acquire the skills of experienced drivers then this disparity might be reduced. If we knew more about the individual driving styles and preferences of experienced drivers – their choice of headway, their steering fluency, and their roadway scanning, for example – then perhaps training new drivers to emulate these styles would help to accelerate their progression towards becoming safer drivers. A possibility here is that if we train novice drivers to behave like more experienced drivers, then perhaps they will also become safer drivers.

This aim motivated our earlier comparisons of the on-road scanning behaviour of novice and experienced drivers (Crundall and Underwood, 1998; Chapman and Underwood, 1998; Underwood, 2007; Underwood et al., 2003, 2009). These studies focused on changes in the distribution of visual attention as experience is

accumulated, finding that novices characteristically direct their gaze forwards almost invariably, whereas experienced drivers are more sensitive to current traffic demands and show a greater range of gaze locations when the driving task demand increases. Novices look at the roadway ahead consistently, and scanpath analyses indicate that when they do look at their driving instruments or at some other part of the roadway, afterwards they invariably re-direct their gaze back to the roadway ahead (Underwood et al., 2003). Experienced drivers vary their direction of gaze according to what is happening around them and scan the road more extensively when in the presence of other road users. Differences between novice and experienced drivers are not necessarily restricted to choices about where to look of course, and vehicle control also offers a number of options for the driver to select their preferred speed, headway, steering and acceleration control.

The present study reports individual driver differences in vehicle control. In hierarchical models of driver behaviour this corresponds to what Michon (1985) has described as operational control and what the Turku group refer to as vehicle manoeuvring (Laapotti et al., 2001; Hatakka et al., 2002; Keskinen et al., 2004). Differences between novice and experienced drivers, in their handling of a vehicle on the roadway, were assessed on three separate occasions with an instrumented vehicle driven on range of road types. The measures used here principally involve speed, positional and direction control, and were compared against the drivers' self-reported crash history and their self-reported tendency to commit driving errors of different types.

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A number of differences between novice and experienced drivers have been previously reported, but usually these have been restricted to comparisons between young novices and older experienced drivers. Given that the vast majority of newly qualified drivers are young this is not unreasonable. Reports from the UK Driving Standards Agency indicate that more than 50% of novices attempt their first driving test before the age of 20, and more than 70% have entered the test before they are 25 years old (DSA, 2011). Two studies from Canada confirm this trend: in Ontario almost 60% of novice drivers are 19 years old or younger (Boase and Tasca, 1998), and in British Columbia approximately two thirds of newly qualified drivers are 18 years or younger (Cooper et al., 1995). Most of the newly qualified drivers on the road are young, and this is where research has been directed, to the neglect of studies of older novices. Some individuals elect to not start driving until they are considerably older than the minimum driving age, and some drivers fail to satisfy the examiners until they are older. We may choose to start driving ten years or so after we are legally entitled to do so for any number of social reasons, including migration from a large city where driving is unnecessary, to a rural area where public transport is sparse or inconvenient, or a change in personal circumstances that demand individual mobility, for example, involving the care of a family member. In some cases the late acquisition of a driving licence may be more directly the consequence of repeated failures to satisfy the driving examiners.

Crash rates vary according to the age of the novice, with older novices (20–24 years) having a crash rate that was 70% that of drivers under 20 years (Boase and Tasca, 1998). The rate decreased as the age of licensure advanced, with 55+ year old novices having a crash rate that was 44% that of the young novices. Cooper et al. (1995) and Mayhew et al. (2003) also reported slightly lower crash rates for older novices (particularly culpable crashes). A comparison of the driving and crashes reported by younger and older novices by Saapotti et al. (2006) supports this distinction between the two groups of drivers. Younger drivers engaged in more leisure-time driving, used their car for fun, with passengers, and for generally social purposes, whereas middle-aged drivers used their cars mainly for commuting. Young novices were particularly at a crash risk during their increased night-time driving. Younger and older novices may have different driving characteristics in that their driving is done for different purposes. To further understand the behaviour of this group of drivers, as well as comparing young novices with older experienced drivers in the present study of on-road driving, a group of older novices was included.

Three groups of drivers were recruited – older and younger novices as they passed their driving test, and older experienced drivers through newspaper advertisements – to enable comparisons of driving experience and driver age. There is remarkably little known about the operational control or vehicle manoeuvring of older novice drivers, but their lower crash rates (Boase and Tasca, 1998) may be indicative of slower, more cautious driving relative to younger novices. The drivers were taken on a fixed route in the local area shortly after being recruited, and in the case of the novices this was within a few weeks of becoming licensed. They were taken over the route twice more, at three-month intervals. Mayhew et al. (2003) identified this period of six months after licensure as being when novices are most vulnerable, with crash rates declining rapidly in this period. The purpose of the repeated testing here was to observe the novices' progress over the first few months of being licensed, as their accident liability diminished and as they gained experience of solo driving. Repeated testing also provided a more stable estimate of their vehicle control in traffic. One advantage of simulator studies over on-road tests is that the traffic and other environmental variables can be held constant for every drive, whereas the testing here was subject to variations in traffic density, traffic type, and weather. By observing their driving on three

separate occasions it was possible to obtain an estimate of the driving measures averaged over varied, natural conditions.

On the final visit, when the novices had been driving for a little more than six months, they reported on the extent of their driving experiences (including any crashes) since gaining their driving license. They also self-reported on the types of driving errors that they anticipated committing, as assessed with a reduced version of the Manchester Driver Behaviour Questionnaire (Reason et al., 1990; Parker et al., 1995). The purpose of obtaining DBQ responses was to help identify differences in driving violations (e.g., speeding) that might be attributed to differences in recorded driving performance (e.g., the driver's selected on-road speed). Whilst slips (e.g., operating one dashboard switch when intending to use another) and mistakes (e.g., incorrect lane selection) result from poor execution of well-planned behaviour, violations are motivated by an acceptance of aberrant or otherwise risky driving (e.g., speeding and passing through traffic signals on red).

The car and route used for the study were the same for all drivers, and recordings were taken throughout the drive for speed, acceleration/braking, headway, lane deviation, steering wheel reversal rate, and the number of times the driver glanced in the mirrors. These measures were selected on the basis of their appearance in earlier investigations and suggestions.

Experienced drivers have been observed to select higher speeds and to brake harder than novices (Fisher et al., 2002) in a driving simulator, and we looked for similar patterns with on-road driving. A driver's acceleration behaviour – both increases and decreases in speed – has been suggested as being a predictor of their crash liability (Robertson et al., 1992; af Wählberg, 2008). Speed and as a consequence, braking, are clearly related, and so is headway. Close following of the vehicle ahead will necessitate severe braking should the lead vehicle itself brake. Evans and Wasielewski (1983) reported that drivers with higher crash risk factors, including histories of crashes and traffic violations, were more likely to maintain shorter headways than safer drivers, in a roadside (“naturalistic”) study that traced drivers through their vehicle number plates. On the basis of these findings the present study expected to observe safer, more confident drivers to select higher road speeds, more gentle acceleration and braking, and a greater headway to the vehicle ahead.

Steering wheel reversal rate (SRR) was used to assess the drivers' maintenance of direction. Steering reversals have been found to increase with task demand (McDonald and Hoffman, 1980), and novices have been reported as having greater steering amplitude than experienced drivers (Sturgis, 1982). A driver who needs to make more corrections to the vehicle's direction in order to maintain the vehicle's lane position will necessarily make more steering reversals than a driver who selects the appropriate change to the steering wheel when travelling through a curve. If lane deviation is a symptom of erratic steering then we might also expect novices to deviate more than experienced drivers, and so on two right-hand curves on a rural road the car's deviation across the median lane marker was recorded.

The final measure of driving performance recorded here was the use of the driving mirrors. Novices have been found to check their mirrors more frequently than experienced drivers (Duncan et al., 1991) and we have previously reported differences in the selective use of mirrors (Underwood et al., 2002), with older experienced drivers making more appropriate use of the mirrors when changing lane on a multi-lane highway.

On the basis of these observations and hypotheses it would be expected that novices in the present study would travel more slowly, brake more gently, have a greater steering wheel reversal rate, and use their mirrors less than experienced drivers. If we can assume that novices drive more cautiously than experienced drivers, then we can also predict that they will avoid close

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