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Exploration of older drivers' speeding behaviour

Anna Chevalier [a,*], Kristy Coxon [a,b], Aran John Chevalier [c], John Wall [d], Julie Brown [e], Elizabeth Clarke [f], Rebecca Ivers [a], Lisa Keay [a]

[a] The George Institute for Global Health, Sydney Medical School, The University of Sydney, PO Box M201, Missenden Rd, Sydney NSW 2050, Australia
[b] School of Science and Health, University of Western Sydney, Australia
[c] Safer Roads Consulting, 53 Lachlan St, Thirroul NSW 2515, Australia
[d] The Centre for Road Safety, Transport for NSW, Road Safety Technology, Level 3, 84 Crown St, Wollongong NSW 2500, Australia
[e] Neuroscience Research Australia (NeuRA), Margarete Ainsworth Building, Barker St, Randwick NSW 2031, Australia
[f] Kolling Institute of Medical Research, Sydney Medical School, The University of Sydney, Level 10, Kolling Building 6, Royal North Shore Hospital, St Leonards NSW 2065, Australia

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ABSTRACT

Speeding increases crash risk and resulting injury severity. Older drivers are at increased risk of injury due to frailty, at increased risk of crashing due to slower reaction times, and have less agility judging time and distance compared to younger drivers. However, there is little objective evidence about older drivers' speeding behaviour. Cross-sectional data from older drivers living in the suburban outskirts of Sydney, Australia, were used to determine the proportion of drivers involved in speed events, and examine factors that may influence this behaviour. Driving speed was estimated in approximately one-second intervals using Global Positioning System (GPS) location. Speed events were defined as driving 1 km/h or more, with 3% tolerance, above a single speed limit, averaged over 30-s of travel. Driving data from one-week were recorded for 344 participants aged 75–94 years (median 80). The majority of participants (78%) were involved in a speed event. Speed events per participant ranged from zero to 186 (median 8). Younger participants, those living in rural areas, and those driving on familiar roads closer to home were more likely to be involved in speed events adjusted for distance driven. In addition, rural residents were more likely to be involved in speed events when they had not been a driver involved in a crash during the previous year compared to those involved in a crash. Measures of visual and cognitive function did not predict involvement with speed events per distance ($p > 0.2$). These findings are important for policy-makers and researchers addressing older drivers' speeding to reduce the incidence of crashes and resulting fatalities and injuries. As no evidence was found for speeding being associated with functional decline, countermeasures to address speeding for other drivers seem likely to be relevant to older drivers.

1. Introduction

Speeding is one of the most common driver behaviours contributing to fatal crashes (Geneva, 2008). Increases in vehicle speed lengthen stopping distance, and reduce drivers' response time in dangerous situations (Kloeden, McLean, Moore, &

* Corresponding author at: The George Institute for Global Health, Sydney Medical School, The University of Sydney, PO Box M201, Missenden Rd, Sydney NSW 2050, Australia. Tel.: +61 2 8052 4446.

E-mail addresses: achevalier@georgeinstitute.org.au (A. Chevalier), kcoxon@georgeinstitute.org.au (K. Coxon), aran.chevalier@saferroadsconsulting.com.au (A.J. Chevalier), john.wall@transport.nsw.gov.au (J. Wall), j.brown@neura.edu.au (J. Brown), elizabeth.clarke@sydney.edu.au (E. Clarke), rivers@georgeinstitute.org.au (R. Ivers), lkeay@georgeinstitute.org.au (L. Keay).

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Ponte, 1997). Even small increases in speed substantially raise the risk of crash involvement and injury severity (Aarts & van Schagen, 2006; Kloeden, Ponte, & McLean, 2001; Kloeden et al., 1997; Williams, Kyrychenko, & Retting, 2006). A study identifying speeders (at least 15 mph above the speed limit) found these drivers had a 60% higher crash history than drivers of adjacent vehicles travelling at $\leqslant$5 mph above the speed limit (Williams et al., 2006). Speeding is involved in approximately 40% of road fatalities in NSW (Centre for Road Safety Transport for NSW).

In Australia, older licensed drivers are increasing at a rate greater than the ageing population (BITRE, 2014). Older drivers are healthier and continuing to drive longer than previous generations (BITRE, 2014), though at increased risk of crash injury due to fragility (Kent, Henary, & Matsuoka, 2005; Meuleners, Harding, Lee, & Legge, 2006). Despite an overall reduction in fatal crashes, those involving older drivers are increasing in Australia (BITRE, 2014; Rakotonirainy, Steinhardt, Delhomme, Darvell, & Schramm, 2012). Research has found drivers aged 80 years and over were more frequently responsible for causing casualty crashes than younger drivers (Rakotonirainy et al., 2012). Older drivers were involved in fatal and reported crashes at higher or similar rates per distance travelled compared to younger drivers (Cicchino & McCartt, 2014; Keall & Frith, 2004).

Despite the seriousness of these issues, there is a paucity of research examining the relationship between speeding behaviour and ageing. Perryman and Fitten (1996) found younger drivers undertaking a road test in an instrumented vehicle were more likely than cognitively-intact older drivers to speed, and suggested older drivers may reduce speeds to compensate for other age-related declines affecting driving ability. Older drivers may be less likely to be involved in crashes involving speed (Abdel-Aty, Chen, & Schott, 1998; Cook, Knight, Olson, Nechodom, & Dean, 2000). Using on-road driving tests of older volunteers, Broberg and Dukic Willstrand (2014) found participants drove too fast for the conditions. Another study found 21% failed an on-road test, predominately due to exceeding speed limits and failure to control speed (Selander, Lee, Johansson, & Falkmer, 2011). Interviews with participants indicated they did not regularly monitor their speedometer, and were surprised they had been speeding (Broberg & Dukic Willstrand, 2014). Compared to younger drivers, older drivers have slower reaction times (Stelmach & Nahom, 1992), delaying braking and increasing stopping distances. Older road users are less agile at judging speed and distance than younger road users (Braitman, Kirley, Ferguson, & Chaudhary, 2007; Dommes, Cavallo, Vienne, & Aillerie, 2012; Lobjois & Cavallo, 2007; Yan, Radwan, & Guo, 2007), particularly evident in the over-representation of older drivers in turning across traffic crashes (Braitman et al., 2007; Cook et al., 2000; Zhang, Lindsay, Clarke, Robbins, & Mao, 2000). However, despite this body of evidence, to our knowledge, there has been no reported research that has investigated speeding in older drivers using naturalistic driving measures.

Given the relationship between speed and crash risk, Moreno and Garcia (2013) argue, in the absence of crash data, speed can be used as a surrogate safety performance measure. While other researchers have measured the proportion of time speeding, as well as mean, maximum and standard deviation of speed (af Wahlberg, 2006; Greaves & Ellison, 2011), we elected to count speeding events, based on the concept of point-to-point speeding. This method is closer to current enforcement methods, while catering for any potential inaccuracies in high readings. The current study was undertaken to determine the proportion of older drivers involved in speed events, and to assess factors that may influence this behaviour, including demographic, extent of driving, behavioural, attitude, cognitive and visual factors.

2. Methods

2.1. Study design

Participants were involved in a randomised control trial (RCT) investigating the effectiveness of an education program encouraging safe transport (Keay et al., 2013). Driving data were collected for approximately 12 months. We investigated speeding practices in a cross-sectional analysis of a week-long period of in-vehicle monitoring before the intervention. The driving monitoring system was hard-wired into the participants' vehicle ignition by a mobile technician.

2.2. Participants

The sample size was determined to be 380 for the RCT (Keay et al., 2013), but also served the purpose of investigating speed events. Assuming an average rate of involvement in speed events between 5 and 15 per 100 km travel and an over-dispersion parameter of 2, a sample size of 380 provides 80% power to detect a 20% increase in the rate of speed events for a binary predictor with a prevalence of about 50%.

A sample of 380 participants was recruited primarily through letters sent by a local motoring association to members meeting eligibility criteria, followed by promotion through local media, community groups and medical services. Volunteers undertook a brief telephone interview to confirm eligibility. Recruitment was undertaken between July 2012 and October 2013.

Eligibility criteria included being 75 years or over, holding a current driver's licence, owning a vehicle, and residing in north-west Sydney. To ensure driving data was largely from the individual, participants were required to be the main vehicle driver (undertaking greater than 80% of driving). Volunteers were excluded who received >2 errors on the Short Portable Mental Status Questionnaire cognitive assessment (Pfeiffer, 1975).