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The Driver Behaviour Questionnaire for older drivers: Do errors, violations and lapses change over time?

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ABSTRACT

The aim of the current study was to examine how self-reported aberrant driving behaviours change across a three time-points in a group of older drivers. Two hundred and twenty-seven older drivers (males = 69.6%) from the Candrive/Ozcandrive longitudinal study completed the Driving Behaviour Questionnaire (DBQ) each yearacross three time-points (i.e., Year 1, Year 2, Year 3). At the third time-point, older drivers ranged in age from 77 to 96 years (M = 81.74 years; SD = 3.44 years). A longitudinal confirmatory factor analysis showed that a modified 21-item, 3-factor (errors, lapses and violations) DBQ was invariant across the time period, suggesting that the structure of the questionnaire was stable across each time-point. Further, multiple domain latent growth analysis on the resultant factors for errors, lapses and violations showed that the frequency of errors remained similar across the three-year period, while violations and lapses showed very marginal decreases in frequency. These changes were independent of the absolute number of these behaviours; Drivers with higher violations or lapses in Year one, showed similar decreases in frequency as those who self-reported lower frequencies of the behaviours. These results suggest that the DBQ is a reliable tool to measure older drivers' self-reported aberrant driving behaviours, and that these behaviours do not show much change across time. Future research should validate the self-reported responses from the DBQ with more objective measures such as those collected through naturalistic driving study (NDS) methodology or on-road driving tasks.

1. Introduction

It is important to understand how drivers' behaviours may change over time, particularly for older drivers who are likely to form a larger proportion of the driving fleet as the population ages (Koppel and Berecki-Gisolf, 2015; Sivak and Schoettle, 2011). Older drivers are over-represented in fatal and serious injury crash statistics (Koppel et al., 2011; Langford and Koppel, 2006). While a large part of this over-representation is due to the frailty of older drivers, with around 60 to 90 percent of fatalities in this age category resulting from driver frailty (Li et al., 2003), age-related sensory, cognitive, and physical impairments also contribute (Marshall, 2008). However, previous research has shown that many older drivers become aware of such declines and change their driving patterns accordingly by self-regulating when, where and how they drive (Baldock et al., 2006; Blanchard et al., 2010; Charlton et al., 2006; Molnar and Eby, 2008; Molnar et al., 2014). Appropriate self-regulation therefore requires recognition of age-related, and possibly driving, decline, particularly types of driving behaviours that may increase crash risk (Koppel and Charlton, 2013).

One of the main threats to road safety is aberrant driving behaviour (Singh, 2015). Aberrant driving behaviours are often defined as driving errors, lapses and violations, with common examples including: exceeding the speed limit, red-light running, and heavy braking due to poor situation awareness (De Winter and Dodou, 2010; Gabaude et al., 2010). Associations have been found between self-reported aberrant driving behaviour and crash involvement (Gras et al., 2006; Parker et al., 1995; Rimmö and Åberg, 1999), with one recent study identifying some form of aberrant driving behaviours in approximately 74 percent of crashes (Singh, 2015).

The Driving Behaviour Questionnaire (DBQ), initially developed by Reason et al. (1990), is one of the most widely used research tools to measure the frequency of self-reported aberrant driving behaviour.

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Traditionally, the DBQ represents 50 individual behaviours that fit into three broad behaviour patterns: violations, errors and lapses. Violations are defined as deliberate behaviours that directly contravene road laws, for example exceeding the speed limit or failing to obey red traffic light signals. Errors are defined as behaviours that do not contravene road laws directly but, as with violations, are considered to increase a driver's risk of crash. In contrast, lapses are defined as minor mistakes that are not considered to be associated with crash involvement (Reason, et al., 1990).

While there are now a number of versions of the DBQ, which target specific groups of drivers, few studies have used this questionnaire specifically in an older population of drivers. Indeed, the original DBQ was validated on drivers ranging in age from 20 to 56 years (Reason, et al., 1990) and has mostly been used for drivers in that age range (De Winter and Dodou, 2010). Stephens and Fitzharris (2016) have shown that a four-factor version of the DBQ, based on the findings of Parker et al. (Parker et al., 1995) and that includes a factor for aggressive violations, is appropriate for a broad range of drivers, but less so when specifically examining older drivers. In line with this, Mattsson (2012) has shown that a number of DBQ items fit within different factors for older drivers. For example, behaviours that younger drivers may interpret as a violation are considered to be an error by older drivers (e.g., drink driving). Rimmö and Hakamies-Blomqvist (2002) have also studied the relationship between driving exposure, health, and four types of self-reported aberrant driving behaviours (e.g., inattention, inexperience errors, violations and mistakes) using a Swedish version of the DBQ with Swedish drivers aged between 55 and 92 years. They reported that, even after accounting for age and gender, self-reported inattention and inexperience errors, as well as impaired health, were related to self-imposed driving limitations, whereas self-reported violations and mistakes were not.

Given the importance of understanding factors that increase crash risk in older drivers and identifying older drivers' perceived level of violations, errors and lapses, it is necessary to establish an appropriate tool to measure perceived driving behaviour in this cohort. In doing this, the number and type of changes that may occur over time can then be examined.

Some studies have focussed on deriving an appropriate factor structure for older drivers. Obriot-Claudel and Gabaude (2004) suggest that a three-factor, 42-item version of the DBQ is appropriate for use in drivers aged between 55 and 91 years. They suggest that these items, taken from the original 50-items, explain three main types of aberrant behaviours: inattention errors, dangerous errors and dangerous violations. Likewise, Martinussen et al. (Martinussen et al., 2013) also suggest a three-factor version of the DBQ is appropriate for drivers aged 50 to 85 years, with this version using 27 of the 50-items, and explaining factors for violations, errors and lapses. Indeed, Martinussen et al. reported that this version was the best fit for older drivers (i.e., 50–85 years) compared to middle-aged (i.e., 30–49 years) and younger drivers (i.e., 18–29 years). However, the item factor loadings of these two versions (i.e., Obriot-Claudel and Gabaude, 2004; Martinussen et al., 2013) are markedly different and therefore the degree to which each is appropriate in other samples is unclear. We need to establish an appropriate tool to measure behaviours so as to understand how these change over time, particularly in a group of vulnerable drivers who are likely to monitor their perceived driving behaviour, and possible declines, in order to self-regulate driving behaviour.

To date, there is little research on how aberrant behaviours measured with the DBQ may change over time. Roman et al. (2015) investigated changes in DBQ scores for errors, slips, violations and aggressive violations across six monthly intervals in novice young drivers and found that scores for each increased across the time-points. However, despite the fact that changes in older drivers' self-reported aberrant driving behaviour could be a crucial element in maintaining their safety, no similar research has been conducted with older drivers. Consequently, the aim of the current study was twofold; first to confirm an appropriate structure of the DBQ for use in a sample of older drivers; and, second to assess the reliability (specifically, the test-retest reliability) of the newly structured DBQ.

2. Method

2.1. Participants

Data from 227 older drivers (males = 69.6%) are presented in the current paper. Each driver was an Ozcandrive participant in the Candrive/Ozcandrive study (described in Section 2.2). Ozcandrive participants completed annual assessments across five time-points in Melbourne, Australia. All participants were required to meet the following inclusion criteria: a) aged 75 years or older; b) held a valid driver's license; c) drove at least four times per week, and d) did not have an absolute contraindication to driving, as defined by the Austroads Fitness to Drive Guidelines (Austroads, 2010). Given drop-out rates across the fivetime-points (Year 1: n = 14; Year 2: n = 15; Year 3: n = 11; Year 4: n = 18; Year 5: n = 18)[1], and to maintain an appropriate sample size (e.g., n > 200), data from participants who completed the first three assessments of study are presented in the current study. At the third time-point of the study, participants ranged in age from 77 to 96 years (M = 81.74 years; SD = 3.44 years). It should be noted that participants who remained in the study in Year 3 (n = 227) were not significantly different to participants who withdrew from the study (n = 30) in terms of their gender (Male: 69.6% vs. 80.0%, respectively, $X^2(1) = 1.386$, $p > 0.1$), their Year 1 age (M = 79.66 years, SD = 3.45 vs. 80.33, SD = 3.97, respectively, $t(225) = 0.992$, $p > 0.1$), their Year 1 self-reported annual kilometres driven (< 5000 km: 15.0% vs. 20.0%; 5,001–15,000 km: 71.4% vs. 70.0%; > 15,0001 km: 13.7% vs. 10.0%, respectively, $X^2(2) = 0.704$, $p > 0.5$) or their Year 1 self-reported total number of medical conditions (M = 10.52, SD = 4.13 vs. M = 11.67, SD = 4.58, respectively, $t(255) = 1.405$, $p > 0.1$).

2.2. The Candrive/Ozcandrive study

The Candrive/Ozcandrive study is a longitudinal, multi-centre international research program with the core objective of identifying solutions to promote older drivers' safe mobility (Marshall et al., 2013). The Candrive/Ozcandrive study involves 928 drivers aged 70 years and over in Canada and 302 drivers aged 75 years and older in Australia and New Zealand (Australia: n = 257; New Zealand: n = 45). Using a longitudinal study design, the project is tracking this cohort of older drivers for five years, assessing changes in their functional abilities, driving practices (e.g. exposure and patterns), as well as crashes and citations for violations of driving regulations. The primary purpose is to develop and validate a risk stratification tool to assist clinicians in identifying potentially at-risk drivers (Marshall et al., 2013). Participants' usual (or naturalistic) driving practices (e.g., trip distance, duration, type of road, speed) are recorded through in-car recording devices (ICRD) installed in participants' own vehicles, and measures of participants' functional ability, medical conditions and self-reported driving-related abilities and practices are documented annually.

2.3. Procedure and materials

Ethical Approval was obtained from the Monash University Human Research Ethics Committee (MUHREC), and all participants provided written informed consent.

All participants underwent a baseline (Year 1) and two annual assessments (Years 2 and 3). The time between annual assessments was

[1] Note some participants withdrew from the study after completing their annual assessment.