Older adults' safety perceptions of driving situations: Towards a new driving self-regulation scale

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Abstract

The term ‘driving self-restriction’ is used in the road safety literature to describe the behaviour of some older drivers. It includes the notion that older drivers will avoid driving in specific, usually self-identified situations, such as those in which safety is compromised. We sought to identify the situations that older drivers report avoiding; and, to determine the adequacy of a key measure of such behaviour. A sample of 75 drivers aged 65 years and older completed Baldock et al.’s modification of the Driving Habits Questionnaire avoidance items (Baldock *et al*. 2006), the Driving Behaviour Questionnaire, and open-ended items that elicited written descriptions of the most and least safe driving situation. Consistent with previous results, we found a relatively low level of driving self-restriction and infrequent episodes of aggressive violations. However, when combined with the situation descriptions, this data suggests that Driving Habits Questionnaire did not cover all of the situations that older drivers might choose avoid. We suggest that a new avoidance scale is needed and we present a new item pool that may be used for this purpose.

Keywords: Driving, older adults, driving self-restriction, Driving Habits Questionnaire, Driving Mobility Questionnaire, Driving Behaviour Questionnaire

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1.0 Introduction

Driving self-restriction has been described as a behaviour or strategy that older drivers adopt on their way to 'retiring' from driving (Anderson and Wheeler 2004, Oxley and Fildes 2004, Pickard *et al.* 2009). This strategy assumes that as driving situations become more difficult for older adults because of factors such as reduced vision, mobility, or physical health, older drivers will restrict their driving to self-identified situations in which they feel safe. It is assumed that older drivers who self-regulate will be able to continue to drive safely for longer and avoid the negative health outcomes associated with a driving cessation (e.g.,(Edwards *et al.* 2009). Whilst there is considerable debate over the safety benefits of this strategy as a mainstream response to managing older driver road safety, the need for further research into the driving behaviour of this group of road users is well established (Unsworth *et al.* 2007).

Research on older driving self-regulation has sought to identify the relationship between self-regulation and other driving factors (such as objectively-measured driving ability and driving confidence), as well as identifying predictors of driving self-regulation. Interventions to support the use of this strategy have also been reported. Prediction studies have attempted to identify the demographic characteristics of drivers who self-regulate (e.g., age, gender, health status, see Charlton *et al.* (2006)). Other studies have explored the relationship between potentially modifiable factors that may be associated with self-regulation (e.g., "self-regulation self-efficacy," (Stalvey and Owsley 2000, Baldock *et al.* 2006); barriers to self-regulation, (Baldock *et al.* 2006); and driving confidence and self-regulation, (Baldock *et al.* 2006). Studies that have attempted to evaluate the safety implications of this strategy, have included those that have used critical safety outcomes, such as reduced crash risk (Baldock *et al.* 2006), self-

reported outcomes, such as crash history (Gabaude *et al.* 2010), or used longitudinal designs to track the use of this strategy alongside increasing functional impairments (Baldock *et al.* 2008, Ross *et al.* 2009). Intervention studies have included publication of intervention resource materials and intervention evaluation studies in 'at risk' groups (Owsley *et al.* 2003, Windsor and Anstey 2006, Freund and Petrakos 2008). Clearly there is substantial international research interest in understanding older drivers' self-regulatory behaviour, and the potential of this strategy as a road safety countermeasure.

Older driver self-regulation studies typically define self-regulation using a measure of the extent to which driving in pre-defined 'dangerous' driving situations, such as driving at night, are avoided (for a discussion other definitions of this behaviour, see Donorfio *et al.* (2008), Donorfio *et al.* (2009). A scale that is commonly used for this purpose is the Driving Habits Questionnaire (Owsley *et al.* 1999). Whilst driving self-regulation may not be synonymous with avoiding driving situations, and there may be other 'self-regulatory' strategies that older drivers may use, the concept of older drivers' self-regulatory practices has frequently been operationalised using this scale.

The DHQ is described, in a 1999 study that is frequently cited as the source of this scale, as a measure that was based on prototypes used in earlier studies. However, it is difficult to determine the DHQ item generation process from this group of studies (Owsley *et al.* 1999). Owsley et al. (1999) report the 2-week test-retest reliability of 'DHQ's domain 4 items' as .60 on average, but this figure appears to be related to ratings of difficulty in specific driving situations (such as the rain or at night), rather than avoidance per se. Separate data for 'avoidance' items were not presented, and very few (if any) studies have independently generated (or reported) this psychometric data. For a range of reasons, it is possible that the content of this scale no longer adequately captures the construct of interest. Such reasons include the changing nature of older

drivers' road use behaviour (e.g., more long distance travelling/towing, grey nomads), and the changing traffic environment (e.g., increased traffic density, changing road configurations, changes to the mix of vehicles allowed on roads). Supporting this contention is the fact that recent applications of this scale have both expanded the list of 'avoidable' driving situations and removed some items (e.g., parallel parking, (Ross *et al.* 2009). Further, the results of recent focus group studies that have included questions about the driving situations that older drivers avoid (Donorfio *et al.* 2008, Myers *et al.* 2008), and studies conducted using telephone interviews (Ruechel and Mann 2005), indicate that older drivers avoid more situations than those listed on the DHQ.

The aim of this study was to reconsider the item~~s content~~ used to measure driving avoidance in a group of older drivers. Given that avoiding specific driving situations is a key component of driving self-regulation, it is important to determine the range of situations in which older drivers might apply this strategy. Thus, in addition to assessing driving self-regulation using a questionnaire with pre-defined dangerous situations as most of the previous research has done, we used an open-ended approach to elicit information regarding the situations that older drivers perceive as least and most safe respectively. This data was combined with information obtained using the Driver Behaviour Questionnaire to determine if a wider range of behaviours than is usually investigated in self-restriction studies might be relevant to the situations that older drivers avoid. It was expected that new item content for a driving avoidance scale would be generated through this process.

2.0 Methods

2.1 Participants

Participant were 75 automobile drivers (46 men) aged 65 years or old (M = 71.15, SD = 4.76).

Participants were recruited from the general community, via means such as newspaper advertisements or fliers at selected venues (e.g., senior citizens clubs). All participants had a current open driver's licence, normal or corrected-to-normal vision, and passed a screening test for cognitive impairment (all participants scored >24/30 on the Standardised Mini-Mental State Examination; Molloy et al., 1991). Full details of the sample including current employment status, education level, residential location (urban versus rural), and advanced driver training history are shown in Table 1. Two participants (2.7% of the sample) volunteered that others had asked them to restrict their driving.

Insert Table 1 about here

2.2 Materials

2.2.1 *Driving self-restriction.*

The avoidance items of Baldock and colleagues' (2006) Driver Mobility Questionnaire (DMQ) were used to assess driving self-restriction, with the exception that we shortened items and removed the requirement of reporting responses in the past 12 months (Baldock *et al.* 2006). The DMQ avoidance items (henceforth referred to as DMQ-A) were modelled on Owsley and colleagues' (1999) Driver Habits Questionnaire (DHQ). Baldock et al.'s adaptation of the DHQ avoidance items included content that was adjusted for relevance to an Australian context (e.g., instead of left turn across traffic this item was changed to right turn across traffic), a modified timeframe for ratings (from in the last three months to in the past year), and a Likert scale (rather than yes-no questions) to assess avoidance (the latter change is a DHQ modification that has been used by others (e.g., (Ross *et al.* 2009). Participants rate DMQ-A items, such as how often you avoid driving in the rain, at night, in peak hour etc. on a 5 point scale ranging from 1 (*never)* to 5 (*always*). A driving restriction score was calculated using the method described by Baldock et al. (2004); that is, by summing ratings to nine specific dangerous driving situations. Lower

scores represent a lesser situational avoidance (9 = *never avoid any situation*) and higher scores indicate increased avoidance (45 = *always avoiding difficult situations*). Individual item scores were calculated using the sample mean.

2.2.2 Driver Behaviour Questionnaire.

Driving behaviour was measured using an extended version of the Manchester Driver Behaviour Questionnaire (DBQ; Lawton et al., 1997). This version includes the original 24 DBQ items and subscales (Parker *et al.* 1995). These items assess the frequency over the past six months of lapses (8 items), errors (8 items), and driving violations (8 items). However, as per the Lawton DBQ revision, one of the original violation items (‘*disregarding the speed limits late at night or early in the morning’*) was modified to create two replacement items (‘*disregarding the speed limits on highways/freeways or residential roads respectively’*) and three violations were added ‘*sounding horn to indicate annoyance to another driver*’, ‘*staying in a lane that you know will be closed ahead until the last minute before forcing your way into another lane*’ and ‘*pulling out of a junction so far that you disrupt the flow of traffic*’). The final violations subscale item had 12 items, describing 6 ‘ordinary’ violations and 6 ‘aggressive violations’. Responses are rated on a 6-point Likert scale ranging from ‘*never*’ to ‘*almost all the time*”. As per other studies (e.g.,(Lajunen *et al.* 2004, Özkan *et al.* 2006b, Bener *et al.* 2008), DBQ subscale scores were calculated by summing subscale items, and dividing the result by the number of subscale items. Higher scores on the four subscale areas indicate greater frequency relevant behaviours (ie. lapses, errors, and so on). The DBQ has been used previously (albeit infrequently) with older adults**,** including in driving self-regulation studies (see (Parker *et al.* 2000, Gabaude *et al.* 2010). It has also been used internationally (Özkan *et al.* 2006a), including previous use in Australia (Davey *et al.* 2007); it is regarded as having ‘good cross-cultural validity’ (Özkan *et al.* 2006b); and it was shown in a recent meta-analysis to predict accidents (de Winter and Dodou in press).

The DBQ was included in this study because its item content includes situations that have been used to extend other scales.

2.2.3 Safety perceptions of driving situations

Two open-ended questions were used to assess the perceived safety of driving situations (*Describe the driving situation in which you feel safest/least safe).* Responses were reviewed by a member of the research team (KS) and 11 themes were generated to characterise the driving situations perceived as most and least safe respectively. If more than one theme was identified in a response, then each idea was coded as a separate element. For example, the following description of the 'safest' driving situation was coded under the three separate themes shown in brackets : "*familiar roads* (familiarity) *in fine clear weather* (weather) *with very little other traffic* (density)". A second member of the research team (LG) independently applied the codes to responses. Coding discrepancies were identified in less than 10% of cases. These discrepancies were resolved by discussion until 100% agreement was achieved.

2.3 Procedure

Participants completed the questionnaires as part of a larger battery of tests that included a computerized driving hazard perception task (HPT). The relevant questionnaires were presented in a booklet format, commencing with demographic information, following by avoidance items, the DBQ, and open-ended questions. The HPT was completed prior to the open-ended questions. Participants were tested individually, and testing took place in a private office with an experimenter present to provide assistance when necessary. At the completion of testing, volunteers received $20 (AUD) in return for participation.

4.0 Results

Table 2 shows the descriptive statistics for items on the avoidance scale, plus the total 'driving

self-restriction' score. The internal consistency of scale items was high (Cronbach's alpha = .88). The average driving self-restriction score of this sample was relatively low (31% of the sample (n = 23) indicated nil driving restriction), as were ratings on individual items. The highest avoidance rating for an individual item was driving in the rain at night (M = 2.08) where '2' on this scale indicates that the situation was avoided, but 'not very often'. This result is consistent with Baldock et al., where this item and one other (parallel parking) were reported as the two top situations avoided by their sample of 104 older drivers (Baldock *et al.* 2006). A repeated measures ANOVA with simple contrasts showed that the average response to the item, *driving at night in the rain*, was significantly higher than the mean response for each of the other eight situations, $F(8, 65) = 7.972$, $p = .000$.

Insert Table 2 about here

The DBQ data are displayed in Table 3. For each DBQ subscale, item data are displayed in order from the most to least frequently occurring behaviours. These data show that the average item score was between 1 (*never*) and 2 (*hardly ever*). The one exception to this trend was *forgetting where the car was parked* (M = 2.01). 71.6% of the sample reported some instances of this behaviour (n = 53). The least frequently reported item (M = 1.01) was chasing another driver after being angered by them. 98.6% of the sample reported that they never engaged in this behaviour (n = 73). This particular item was also the least frequently endorsed item in the older driver DBQ study by Parker et al. (2000). The *lapses* DBQ subscale received the highest rating (M = 1.69, SD= .40), followed by violations (M = 1.44, SD = .33), and errors (M = 1.35, SD = .36). Aggressive versus ordinary violations did not uniformly cluster with one another when presented by endorsement frequency; however, four of the six least frequently occurring violations were 'aggressive' violations.

Insert Table 3 about here

4.1 *Most and least safe driving situation*

The response rate to these open-ended items was high; almost all participants offered responses to both items. There were a small number of participants whose responses could not be coded because they were too general (e.g., some respondents wrote: "*all*" or "*any*" or "*none*"). Codeable responses were identified for 67 and 61 participants for unsafe and safe driving situations respectively. Table 3 lists the themes identified in open ended responses, and provides some examples of the response type coded within each theme.

The most commonly mentioned theme in participants' description of the 'safest' driving situations was road class ($n_{mentions}$ = 33), followed by traffic density ($n_{mentions}$ = 16), followed by route/road familiarity ($n_{mentions}$ = 19). Whilst the latter two categories may be self-evident, i.e. people rated trips with less traffic and on familiar roads as safest, the first category included mixed responses. For example, the class of road regarded as safest varied and included freeways, 'secondary' roads, 'open' roads, 'suburban' roads and 'country' roads. Infrequently nominated themes included in 'safe' situations included speed ($n_{mentions}$ = 3), vehicle familiarity ($n_{mentions}$ = 3) and other driver behaviour (e.g., absence of 'bad' / 'predictable' behaviour by other drivers; $n_{mentions}$ = 4).

Insert Table 4 about here

The most commonly mentioned 'unsafe' driving themes were traffic density ($n_{mentions}$ = 20), road class ($n_{mentions}$ = 14), road characteristics ($n_{mentions}$ = 13), other driver behaviour ($n_{mentions}$ = 12), and weather ($n_{mentions}$ = 21). For example, several participants referred to heavy traffic, busy roads, gridlock, and traffic congestion in their descriptions of 'unsafe' driving situations. Infrequently described unsafe driving situations included driving amongst trucks ($n_{mentions}$ = 6), driving at specific times of day, especially at night or in combination with crowds (e.g., end of a sporting match or at school drop off/pick up times) ($n_{mentions}$ = 8), and a small number of

participants nominated specific driving tasks as part of their unsafe driving descriptions (e.g., merging, taking freeway turn-offs, and long distance driving; all of which received one mention each). Themes that are similar to DMQ-A or DBQ content are flagged in Table 4.

5.0 Discussion

The results of this study show that, on average, this sample of older adults, did not frequently avoid 'dangerous' driving situations, as defined by the DMQ-A, nor did they engage in DBQ-defined violations, errors or lapses at a frequency greater than 'hardly at all'. Compared to other DBQ studies, the item ratings in this study were typically higher than the item ratings reported in the general adult driving population in other countries (typically < 1 (Lajunen *et al.* 2004), slightly lower than Australian fleet driver ratings on a modified DBQ (Davey *et al.* 2007), and slightly lower than previous ratings in older adult samples (i.e. (Parker *et al.* 2000) identified 6 DBQ items >2, including *forgetting the location of the parked car*). The study by Parker and colleagues is perhaps the most comparable to this one because they used the DBQ in an older driver sample. Parker and colleagues had a bigger sample (n = 1989), that spanned a larger age range (49-90), but that sample was also younger, on average, than our drivers (66 years, Parker et al., cf 71 years, this study). In addition, the study by Parker et al. used a 24-item version of DBQ, rather than the 28-item version used here. Notwithstanding these methodological variations, and the relatively small differences in the magnitude of responding on some items, the trends emerging from these studies are similar. Specifically, consistent with Parker et al.'s report, we found that aggressive violations were the least frequently endorsed DBQ response type in older adults. That is, even when they experience driving situations in which they feel 'unsafe' because of other drivers' behaviour, older drivers report that they almost never respond to such situations aggressively.

Drawing together the data from the DBQ, the DMQ-A, and the open-ended descriptions

of those driving situations that older adults perceived as safe and unsafe respectively, it is clear that there was significant overlap in the content of DMQ-A items and the themes identified in responses to the open-ended questions, and to a lesser extent, there was overlap between those responses and DBQ content. Taking the overlap between avoidance items and responses to open-ended questions first, only two of the items on the avoidance scale (parallel parking and right turns) did not feature in older drivers' description of unsafe driving situations; but other specific driving tasks did (e.g., merging, using roundabouts) albeit, in some cases, infrequently. There was one avoidance item (driving alone) that, when mentioned by our study participants, appeared to be perceived as means of *increasing* the safety of driving situation, rather than a situation to be avoided. Analysis of the open-ended data yielded situations additional to those referred to DMQ-A items, such as driving in environments with heavy vehicles, weather events other than rain that may reduce driving safety (e.g., fog, sun in the eyes, storms), long distance driving, and driving on roads with specific engineering features (tunnels, roundabouts). Interestingly, several of the unsafe driving situations that our sample nominated were also identified in three recent North American interview studies (Ruechel and Mann 2005, Donorfio *et al.* 2008, Myers *et al.* 2008), which suggests that these themes are relatively robust. However, this study also identified new issues that have not been documented in other studies, such as driving on roads with roadworks and driving at those times of day when the road may become suddenly crowded (e.g., school pick up times), and such situations may also be ones that older drivers might avoid. The larger sample size of the present study compared to that of Myers et al. (2008) and Dorfino et al. (2008) could account for the identification of new themes in this study. Alternatively, compared to other international samples, older Australian drivers might perceive or experience a greater array of factors that are relevant to road safety.

Several older drivers identified the behaviour of other drivers as a part of the unsafe

driving situations that they described. The DMQ-A does not include a question to assess this factor. Thus, it cannot assess the extent to which older drivers might be avoiding driving because they perceive that other drivers' behaviour makes the road unsafe, or because they wish to avoid becoming aggravated, or even aggressive in response to the behaviour of other drivers. The DBQ items that overlap with this sentiment also convey responses that are 'aggressive' (e.g., sounding horn to indicate annoyance, or giving chase), rather than avoidant. The DBQ items include some 'procedural driving errors' such as mis-reading signage and going the wrong way on a roundabout, and both roundabouts and signage were noted by a small percentage of this sample as factors that contribute to unsafe driving situations. Whether older drivers avoid these traffic management devices is not known because DMQ-A does not assess these factors.

The results of this study suggest that the range of situations that older drivers might avoid may be greater than those that are routinely assessed by the measures that we and many other research groups have used (i.e., the DHQ and its adaptations, including the DMQ-A). Further, in the specific context in which this study was undertaken (i.e. Brisbane, Australia) new road tunnels are planned or have recently been developed. It may be timely to reconsider the item content of this scale for use in Australia, but probably elsewhere also because of changing driving environments. New items are already being added to the original DHQ avoidance questions (Ross *et al.* 2009), suggesting there is a need to modify this scale, but in many cases new items are added without articulation of the item generation process. We offer Appendix A, as a list of suggested items for a new driving avoidance scale for older adults. These items incorporate existing avoidance situations plus new items that were derived from older adults 'safe' and 'unsafe' driving descriptions. The first nine items in this list are based on those used by (Baldock *et al.* 2006) in their adaptation of Owsley et al.'s (1999) original DHQ avoidance questions.

A limitation of this study relates to the order in which we collected information. We asked participants to generate descriptions of safe and unsafe driving situations after they completed other scales, including the HPT. By so doing, we may have influenced the type of situations that older drivers reported. The breadth and variability of responses that we received, suggests that responses were not fully constrained by prior exposure to these materials, although it is possible that other situations may have been reported without this prior exposure. Further, compared to other studies (Baldock *et al.* 2006) we used a slightly modified version of the avoidance scale, by shortening items and removing the timeframe reference. These changes may have impacted our results.

The use of self-report measures to assess driving behaviour is another study limitation because we did not objectively verify responses. A recent study of the validity of older drivers' self-report and actual driving found some lack of correspondence between measures and recommended triangulating data across multiple sources (Blanchard *et al.* 2010). Although other studies have shown that self-report measures such as the DBQ are significant predictors of accidents (de Winter and Dodou in press), the approach of combining objective and self-reported driving data has merit and it is important that our self-reported findings are verified objectively.

The sampling strategy that we used (advertising for study volunteers) may mean that we sampled the behaviour of 'active' 'non-avoidant' drivers. Only two of the drivers in our study admitted that they had ever been asked by someone to restrict their driving, and whilst the actual number of people who may have been self-restricting may have been higher than this number, this factor raises questions about generalisability. Thus, if there are older drivers in the community who, in response to others' concerns about their driving regularly avoid specific situations, our data suggests that we did not sample this group's behaviour. The situations that 'avoiding drivers' perceive as dangerous may be different from those situations that non-

avoidant drivers identified. Follow-up studies should include a comparison group to ensure the generalisability of results to those drivers who admit to self-restriction. This step is particularly important to assist in the translation of this work to practice, for example, in older driver education.

A conceptual limitation of this study is that it did not assess the motivation of participants; hence, the relationship between self-reported driving behaviour assessed here, and the broader issue of self-restriction has not been specifically tested. The reasons why people avoided specific situations was explored, and it is possible that some situations were avoided for reasons other than 'self-restriction'. Although older people themselves nominate avoiding specific situations as a strategy that they may use to increase the perceived driving safety, an important caveat to the interpretation of these results is that these constructs are conceptually distinct.

Notwithstanding these limitations, one outcome from this study is that we have effectively validated the item content of the DMQ-A. The item content of this scale clearly overlaps with older drivers' descriptions of those situations that they believe are 'unsafe', and thus may avoid. However, for many reasons including, the changing road environment and, indeed the very rationale for developing the original DHQ items which appears to have been to assess driving self-regulation due to vision factors only, the items on this scale appear no longer adequately cover the content domain. We now know that a range of factors, including psychological and cognitive factors, contribute to older drivers' capacity to self-regulate their behaviour. The DBQ, whilst capturing some aspects of driving behaviour that older drivers associate with unsafe situations, does not incorporate 'avoidance' as an option that self-restricting older drivers might take to reduce perceived risk, and such situations are not included on avoidance measures. The North American focus group data from two studies suggests that

older drivers do avoid driving because of other drivers' behaviour (Donorfio *et al.* 2008, Myers *et al.* 2008) . This limitation of the DBQ is perhaps not surprising given that the DBQ was not explicitly developed for use with older adults.

5.1 Conclusion

By combining concepts drawn from the DMQ-A and DBQ, with data primarily taken from older drivers' freely generated descriptions of safe and unsafe driving situations, but also from a comprehensive literature review, a new pool of avoidance items has emerged. These items were developed using a systematic item generation process, which is preferable to approaches that involve the adding on items in the absence an articulated rationale, or in the absence of consideration of the effect of such changes on scale psychometric properties. Clearly these items will need to undergo further assessment, ideally using a process such as that described by (Myers *et al.* 2008). We regard this item pool as a useful resource for researchers to develop a richer understanding the self-regulatory practices of older drivers. This understanding is critical for many reasons, but perhaps most importantly; it should facilitate a careful examination of the effectiveness of driving self-restriction as a road safety countermeasure for older adults.

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Table 1

Sample characteristics (n = 75).

Sample Characteristic	*Mean*	*SD*
Age (years)	71.15	4.76
Education	11.32	2.15
MMSE	29.38	0.84
Years licensed	51.47	6.41
Gender (% of sample)		
Male	61.3% (n=46)	
Female	38.7% (n=29)	
Advanced driver training (% of sample)		
No	77% (n=57)	
Yes	23% (n = 17)	
Predominant driving environment (% of sample)		
City	12.3%	
Suburban	45.2%	
Mixed	42.5%	
Residential location (% of sample)		
Inner Brisbane	25% (n = 19)	
Outer Brisbane	57.9% (n = 44)	
Outside Brisbane	3.9% (n = 3)	
Employment status (% of sample)		
Currently employed	17.8%	
Currently volunteering	50.7%	

Note: residential location was determined using the Statistical Local Area codes from the Australian Bureau of Statistics.

Table 2.

Descriptive statistics (means and standard deviations, SD) of older drivers' avoidance ratings for nine difficult driving situations (N = 74).

	Avoidance	
Driving situation	Mean	SD
In the rain	1.74	.88
When alone	1.20	.52
Parallel parking	1.46	.74
Right turns	1.16	.37
Freeways	1.43	.81
High traffic roads	1.57	.76
Peak hour	1.75	.93
At night	1.75	.97
At night in the rain	2.08	1.14
Total score	14.11	5.31

Note: Avoidance items min = 1, max = 5; total score min = 9, max = 45. Higher scores indicate greater avoidance.

Table 3.

Descriptive statistics (means and standard deviations) for DBQ items and subscales (N = 74).

DBQ items and subscales	Mean	SD
Lapses	1.69	.40
Forget where you left your car	2.01	.79
Get into the wrong lane approaching a roundabout or a junction	1.85	.73
Switch on one thing, meaning the other[73]	1.82	.69
Misread the signs, exit from a roundabout on wrong road	1.80	.74
Have no clear recollection of the road[73]	1.74	.71
Hit something when reversing[73]	1.73	.67
Intending to drive to destination A, instead drive to B[72]	1.53	.69
Attempt to drive away in third gear[72]	1.19	.60
Errors	1.35	.36
Miss “Give Way” signs[72]	1.53	.60
Underestimate the speed of an oncoming vehicle	1.46	.60
Fail to see pedestrians crossing[73]	1.41	.62
Fail to check your rear-view mirror[73]	1.37	.57
Queuing, nearly hit car in front[73]	1.33	.55
Brake too quickly on a slippery road	1.31	.52
Turning right nearly hit cyclist[73]	1.26	.53
Attempt to overtake someone turning left	1.16	.37
Violations	1.44	.33
Disregard the speed limit on a motorway* [73]	1.67	.78
Aversion, indicate hostility[73]	1.64	.77
Disregard the speed limit on a residential road*	1.62	.68
Sound horn to indicate your annoyance	1.54	.73
Overtake a slow driver on the inside*	1.54	.69

DBQ items and subscales	Mean	SD
Shooting lights[1]*	1.53	.69
Push in at last minute[73]	1.51	.60
Race from lights	1.47	.76
Drink and drive*	1.28	.61
Pull out, force your way out	1.18	.42
Close following* [73]	1.15	.43
Get angry, give chase	1.01	.12

Note: DBQ = Manchester Driver Behavior Questionnaire; [a] $p < 0.001$.; [b] $p < 0.01$.; [c] $p < 0.05$. [72] indicates n=72, [73] indicates n=73. * = 'highway' violations as per Lawton et al., 1997; non asterisked items = 'aggressive' violations. 1 = Shooting lights or shoot lights is a commonly used abbreviation of the item "Cross a junction knowing that the traffic lights have already turned against you" (for example, see Lajunen, Parker & Summala, 2004; Lawton et al., 1997; Ozkan, 2006).

Table 4.

Themes (and sample responses from within each theme) identified in older drivers' descriptions of 'safe' and 'unsafe' driving situations respectively.

	Sample responses	
Theme	Least-safe	Most-safe
Road type (familiarity)[a]	On unfamiliar roads	Driving in my own locality
Road characteristics (signage, traffic lights, curves, roundabouts, tunnels, 'space')	Road works, roundabouts, tunnels	Safest ..where there is room and signage
Road class (freeway, 'open', suburban, rural/country)[a]	Motorways/highways (higher speeds)	Suburban driving
Weather conditions[a]	Fog, rain, storms, sun in my eyes	Clear day
Time of travel (day/night/crowds*)[a]	Night, crowds	Daytime
Vehicle (familiarity and condition)[a]	Other people's cars	My own car/A well maintained car
Other driver behaviour (incl. tailgating)[b]	When other people drive to close, tailgate or 'drive too fast for the conditions'	No "hoons"[1]
Occupancy (alone / with others)[a]	-	Driving alone
Traffic density[a]	'congested' roads, gridlock, heavy traffic	In light / medium traffic
Traffic speed[ab]	High speed freeway	50km/hr
Other traffic type	Very large trucks overtaking me	-
Driving task (passing, merging, turning off)[a]	Merging	-
Peak traffic	Peak/rush hour	Off-peak

Note: All / most / not-applicable responses to these items were excluded from thematic analysis. *ie school pick up/drop off/sports game crowd; peak hour responses were coded as traffic density. a = similar is similar to DHQ avoidance scale content; b = theme is similar to DBQ item content. 1= "Hoons" is a term used in Australia to describe people who drive in a way that is dangerous or illegal; for example, by engaging in street racing. For a full definition of 'hooning' see Leal, Watson, Amstrong, and King (2009).

Appendix A: Driving Avoidance Item Pool	Never	Rarely	S'times	Often	Always
In the rain	1	2	3	4	5
When alone	1	2	3	4	5
Parallel parking	1	2	3	4	5
Right turns	1	2	3	4	5
Freeways	1	2	3	4	5
High traffic roads	1	2	3	4	5
Peak hour	1	2	3	4	5
At night	1	2	3	4	5
At night in the rain	1	2	3	4	5
When sun is in my eyes, glare	1	2	3	4	5
Long distance driving	1	2	3	4	5
At the start/end of school times	1	2	3	4	5
At the start/end of major events (e.g., sporting events)	1	2	3	4	5
Roundabouts	1	2	3	4	5
Tunnels	1	2	3	4	5
In foggy conditions	1	2	3	4	5
Roadworks	1	2	3	4	5
With distracting passengers	1	2	3	4	5
In other people's cars	1	2	3	4	5
If it is snowing, snow or ice on the road*	1	2	3	4	5
Making lane changes*	1	2	3	4	5
Towing*	1	2	3	4	5
If other drivers might endanger me	1	2	3	4	5
If I think other drivers will put me at risk	1	2	3	4	5

Note: The first nine items are based on Baldock *et al.*(2006)'s adaptation of Owsley *et al.* (1999)'s DHQ avoidance items. The remaining items are new. S'times = sometimes. *Towing was not nominated by participants in this sample, but this item was included based on research showing increasing numbers of older drivers using caravans and camper trailers etc., and a specific reference to long-distance driving as 'unsafe' by one participant in this sample. Ross et al., (2009) included a 'lane change' item in their questionnaire. This behaviour is similar to 'merging' and is consistent with comments about multi-lane driving situations that were made by some respondents. Therefore, a 'lane change' item was included in this item pool. Myers et al., 2008 indentified snowy driving conditions as ones that older drivers may avoid. Since this item is consistent with the broader theme identified in this research, i.e., that weather conditions other than rain are avoided by older adults, although none of our sample nominated snow specifically a 'snowy driving conditions' item was added to the pool.