Session: Older Road Users

Self-Regulation of Driving and its Relationship to Driving Ability among Older Adults

M.R.J. Baldock[1,2]
J.L. Mathias[1]
A.J. McLean[2]
A. Berndt[3]

[1] Department of Psychology, University of Adelaide, [2] Centre for Automotive Safety Research, [3] School of Occupational Therapy, University of South Australia

Correspondence: Matthew Baldock, Centre for Automotive Safety Research, University of Adelaide, phone (08) 83035887, fax (08) 82324995, email matthewb@casr.adelaide.edu.au

ABSTRACT

Although it is known that older drivers limit their driving, it is not known whether this self-regulation is related to actual driving ability. A sample of 104 older drivers, aged between 60 and 92, completed a questionnaire about driving habits and attitudes. Ninety of these drivers also completed a structured on-road driving test.

A measure of self-regulation was derived from drivers' self-reported avoidance of difficult driving situations. The on-road driving test involved a standard assessment used to determine fitness to drive. Of the 90 participants who completed the driving assessment, 68 passed the test, eight passed but were recommended to have driving lessons and 14 failed. Driving test scores for the study were based on the number of errors committed in the driving tests, with weightings given according to the seriousness of the errors.

The most commonly avoided difficult driving situations were parallel parking and driving at night in the rain, while the least avoided situation was driving alone. Poorer performance on the driving test was not strongly related to overall avoidance of difficult driving situations. Stronger relationships were found between driving ability and avoidance of specific difficult driving situations. These specific driving situations were the ones in which the drivers had low confidence and that the drivers were most able to avoid if they wished to. These results may reflect a tendency for those with poorer driving ability to lose confidence in their driving, and begin to avoid difficult driving situations. However, there are a number of situations that drivers find difficult to avoid.

INTRODUCTION

A great deal of attention has recently been devoted to the older driver (> 65 years), largely because older drivers have a greater crash rate per kilometre driven (Frith, 2002; Lyman, Ferguson, Braver, & Williams, 2002; Maycock, 1997; Ryan, Legge, & Rosman, 1998) and because of the substantial projected increases in the number of older drivers in the next half a century (e.g. OECD, 2001). It has been suggested that the higher crash rate of older drivers is due to high risk subgroups within the older driver population rather than to a general decline associated with ageing (Hakamies-Blomqvist, 1998).

For this reason, efforts have been directed toward developing tests that could be used to screen all drivers over a certain age in order to identify drivers with functional impairments that may adversely affect driving. However, a number of authors have claimed that screening all older drivers is not an appropriate response to the presence of at-risk drivers in the driving population. The notion that when drivers reach a certain age, they should be subjected to mandatory testing has not been viewed favourably (Charlton, 2002; Hakamies-Blomqvist, Johansson, & Lundberg, 1996; Maycock, 1997) because screening of all older drivers has not been found to produce a road safety benefit (Hakamies-Blomqvist et al., 1996; Torpey, 1986). It may also lead to many drivers surrendering their licences prematurely (Charlton, 2002), which would mean that many older adults would be subjected to an unnecessary loss of mobility. Loss of mobility for older adults has been associated with depression (e.g. Fonda, Wallace, & Herzog, 2001) and decreased out of home activities (Marottoli et al., 2000).

One means by which to reduce older driver crash risk, whilst allowing the maintenance of mobility, is to encourage older drivers to self-regulate their driving behaviour. This involves drivers evaluating their own functional abilities and adjusting their driving behaviour accordingly. This would enable older adults to remain active as drivers but reduce their exposure to conditions they find difficult (e.g. night driving) (Stalvey & Owsley, 2000). However, for self-regulation to be an effective means of reducing crash involvement without resulting in unnecessary restriction of driving, it must be related to drivers' functional and driving abilities. That is, greater self-regulation needs to be practised by those with greater deficits in driving ability. This study was designed to determine the extent of self-regulation practised by older drivers in South Australia and whether this self-regulation was related to driving ability. To this end, a sample of older drivers completed a questionnaire concerning their driving attitudes and behaviour, and also completed an on-road driving assessment.

METHOD

Participants

A group of 104 older drivers (aged 60 years or more) were recruited from two sources: the general community and the Driver Assessment Rehabilitation Service (DARS) at the University of South Australia. Community participants were recruited through Senior Citizens' clubs and Australian Retired Persons Association clubs in metropolitan Adelaide. The group of drivers from the DARS client pool were referred, mostly by general practitioners, for an assessment of their ability to drive and their right to hold a driver's licence.

The total sample consisted of 104 adults (65 females, 39 males), 93 of whom were recruited from the general community and 11 of whom were recruited from the DARS client pool. Their ages ranged from 60 to 92 (M = 74.2, SD = 6.3) and they had completed an average of 10.9 years of formal education (SD = 3.0).

All participants were required to be fluent in English, in possession of a full driver's licence for non-commercial motor vehicles, and to have been driving for over ten years. The latter requirement was imposed to ensure that all participants were experienced drivers. Participants were excluded if they had suffered a

cerebrovascular accident (stroke), traumatic brain injury, or other event causing a sudden loss of functioning, in the past year.

Measures

The participants were required to complete a questionnaire on driving habits and attitudes that was based on questionnaires used previously in studies of older drivers (Owsley, Stalvey, Wells, & Sloane, 1999; Stalvey & Owsley, 2000). Included in the questionnaire were items about confidence in difficult driving situations, avoidance of difficult driving situations, and regulatory self-efficacy (the ease of avoiding difficult driving situations).

For driving confidence, participants had to rate their confidence in nine difficult driving situations (e.g. driving in the rain) on a five point scale, with 1 = not at all confident and 5 = completely confident. These ratings were summed to create an overall confidence score ranging from 9 (not confident at all in any difficult driving situation) to 45 (completely confident in all driving situations). Avoidance of difficult driving situations was based on the same nine driving situations as the driving confidence measure. Participants had to report their level of avoidance for each situation on a five point scale from 1 = never avoid to 5 = always avoid. These ratings were summed to create an overall avoidance score ranging from 9 (never avoid any driving situations) to 45 (always avoid all difficult driving situations). This measure of overall avoidance was used as an index of self-regulation of driving behaviour. Regulatory self-efficacy was assessed by asking participants how hard they would find it to avoid each of eight difficult driving situations (e.g. rain). Responses of 'very hard' were given one point, 'somewhat hard' given two points and 'not hard at all' given three points. The sums of these scores gave an overall self-efficacy score ranging from 8 (low self-efficacy) to 24 (high self-efficacy).

The driving assessments consisted of standardised on-road driving tests conducted by an occupational therapist from DARS with postgraduate training in driver assessment and rehabilitation, and a professional driving instructor. The driving instructor directed the participant through the driving route and used dual brakes to maintain safety, while the occupational therapist scored the participant's driving performance. A set test route based on testing procedures used in other studies (Dobbs, 1997; Hunt et al., 1997; Parasuraman & Nestor, 1991) was designed specifically for this study. The test was broken into four sections: familiarisation, low demand, moderate demand, and high demand. The familiarisation section involved familiarising the driver with the vehicle, and assessing whether the driver could perform basic vehicle control tasks (e.g. starting a car, moving off). The low demand section was conducted on low traffic roads and mainly involved negotiating roundabouts. The moderate demand section involved driving on main roads but did not require complex manoeuvres. In this section, all intersections were negotiated by driving straight through or turning with a dedicated turning arrow. In the high demand section, drivers had to perform unprotected right turns at intersections on main roads, as well as merging manoeuvres on multi-lane roads and driving in areas featuring high pedestrian activity. The driving test, therefore, involved progressively more difficult manoeuvres completed in the presence of increasingly more complex traffic conditions. It took from 40 minutes to an hour to complete.

The on-road driving tests were all conducted in dual-controlled, medium-sized sedans (1997 Toyota Corollas), fitted with power steering and manual or automatic transmission, depending on the participant's preference. Two occupational therapists were employed for the study, and completed 57% and 43% of the assessments, respectively. The same driving instructor was available for 95% of the assessments. Assessments were conducted at 9:30am, 11:00am or 1:00pm, so that drivers were not assessed during peak hour traffic.

As is standard practice for DARS, test failure was based on agreement between the occupational therapist and driving instructor about the safety risk posed by the driver, given the types of errors they made and the level of active intervention required on the part of the driving instructor to ensure safety during the test (applying brakes, taking hold of the steering wheel, explicit verbal guidance). Errors that posed a greater safety risk, such as speeding, disregarding traffic signals and Stop or Give Way signs, drifting into other lanes, and stopping unexpectedly without reason, were most likely to lead to failure of the test.

In keeping with other studies of driving performance and aging (Dobbs, Heller, & Schopflocher, 1998; Janke & Eberhard, 1998; Staplin, Gish, Decina, Lococo, & McKnight, 1998) in which different weightings were given for different road test errors, a scoring system was developed that assigned different weightings to different errors in order to produce an overall score that more closely matched the outcomes of the assessments (i.e. pass or fail). Greater weightings were assigned to errors requiring the intervention of the driving instructor, with lesser weightings given to what were termed "hazardous" errors (exceeding the speed limit, inappropriate high speed, unsafe gap selection, unsafe positioning, disobeying Stop signs or traffic lights) and no extra weightings given for what were termed "habitual" errors (e.g. failure to check mirrors or blind spots, failure to indicate, inappropriate lane selection, poor parking ability). It was found that, using a weighting of 10 for driving instructor interventions, five for hazardous errors and one for habitual errors, it was possible to accurately predict test outcomes in 94% of cases, with 79% sensitivity (correctly identified failures) and 97% specificity (correctly identified passes). This weighted error score was used as the outcome measure for the driving assessment.

Procedure

The questionnaire was mailed out to participants who then completed it at home. All participants met with the investigator prior to their driving assessment so that any of the questionnaire items could be explained or clarified if necessary. For the general community participants, feedback on the driving assessment was given by the occupational therapist immediately following the test. Drivers recruited from the general community who failed the on-road test did not have their licence cancelled. Instead, a letter was sent to their general practitioner who would decide what, if any, action was required. Formal written consent to participate was given by all drivers.

RESULTS

The overall confidence in difficult driving situations of the participants (on a possible scale of 9 to 45) ranged from 19 to 45, with a mean of 33.1 (*SD* = 6.5), suggesting high levels of confidence among the participants. A summary of participants' confidence ratings for specific driving situations is provided in Table 1, which shows that the situation in which participants were most confident was driving alone, while

the situations in which they were least confident were reverse parallel parking and driving at night in the rain.

Table 1
Levels of confidence in difficult driving situations, percentages (N = 104)

	Level of confidence				
Driving situation	Not at all	Not very	Reasonably	Very	Completely
In the rain	1.0	3.8	51.0	27.9	16.3
When alone	0.0	0.0	16.3	33.7	50.0
Parallel parking	7.7	24.0	37.5	18.3	12.5
Right turns	1.0	3.8	32.7	31.7	30.8
Freeways	1.0	4.8	25.0	34.6	34.6
High traffic roads	0.0	2.9	31.7	37.5	27.9
Peak hour	0.0	4.8	38.5	32.7	24.0
At night	2.9	11.5	36.5	29.8	19.2
At night in the rain	6.7	17.3	45.2	20.2	10.6

Overall avoidance of difficult situations (an index of self-regulation) by the participants ranged from nine to 32, with a mean of 13.9 (*SD* = 5.6). This suggests a low level of avoidance by the participants. Table 2 shows the level of avoidance reported by the participants for each of the nine specific situations. It can be seen that only parallel parking was avoided at least rarely by over half of the participants. The most often avoided situation of the remainder was driving at night in the rain. The least avoided driving situation was driving alone.

Table 2
Levels of avoidance of difficult driving situations, percentages (N = 104)

	Level of avoidance				
Driving situation	Never	Rarely	Sometimes	Often	Always
In the rain	67.3	19.2	11.5	1.0	1.0
When alone	95.2	4.8	0.0	0.0	0.0
Parallel parking	47.1	16.3	17.3	8.7	10.6
Right turns	71.2	15.4	10.6	1.9	1.0
Freeways	82.7	9.6	2.9	1.0	3.8
High traffic roads	76.9	12.5	9.6	1.0	0.0
Peak hour	68.3	10.6	18.3	2.9	0.0
At night	67.3	13.5	11.5	2.9	4.8
At night in the rain	57.7	18.3	11.5	5.8	6.7

The relationships between confidence and avoidance were assessed using Pearson's product-moment correlations. Correlations were calculated between overall confidence and overall avoidance, and between confidence and avoidance for each specific situation, as shown in Table 3. It can be seen that confidence and avoidance shared medium to large (Cohen, 1992) negative correlations, indicating greater avoidance with lower confidence. Only the relationship between confidence when driving alone and avoidance of driving alone was small in size (r = .28).

The mean rating of regulatory self-efficacy of the participants (on a possible scale from eight to 24) was 17.4 (*SD* = 4.4). A summary of responses for each item on the scale is provided in Table 4. The situations that were hardest to avoid, according to the participants, were driving alone (the situation most often designated as very hard to avoid) and high traffic roads (the situation least often designated as not hard at all to avoid). The situations easiest to avoid were parallel parking and peak hour.

Table 3
Correlations between confidence and avoidance scores for a variety of difficult driving situations (N = 104)

Driving situation	Correlation between confidence & avoidance	*p* value
In the rain	**-.44**	**.000**
When alone	**-.28**	**.004**
Parallel parking	**-.67**	**.000**
Right turns	**-.57**	**.000**
Freeways	**-.64**	**.000**
High traffic roads	**-.43**	**.000**
Peak hour	**-.52**	**.000**
At night	**-.67**	**.000**
At night in the rain	**-.66**	**.000**
Overall	**-.67**	**.000**

Table 4
Self-regulatory self efficacy, percentage of participants (N = 104)

Driving situation to avoid	Very hard to avoid (%)	Somewhat hard to avoid (%)	Not at all hard to avoid (%)
Rain	31.7	27.9	40.4
Alone	45.2	25.0	29.8
Parallel parking	13.5	20.2	66.3
Right turns	26.9	26.9	46.2
Freeways	26.0	30.8	43.3
High traffic roads	29.8	43.3	26.9
Peak hour	13.5	32.7	53.8
Night	25.0	31.7	43.3

Of the 104 participants, 90 completed the driving test, of whom 82 were from the general community and eight were referrals. Ten of the community participants chose not to undergo the driving assessment, while three referral participants and one community participant were not able to complete the driving test and so their results for the driving component had to be discarded. The outcomes of the 90 driving tests, in terms of recommendations by the assessor, were 68 passes (75.6%), eight passes with recommendations for lessons (8.9%) and 14 failures (15.6%).

Scores were calculated for interventions by the driving instructor, hazardous errors and habitual errors. The mean number of driving instructor interventions per test was 1.1 (*SD* = 1.7), the mean number of hazardous errors was 10.5 (*SD* = 10.9) and the mean number of habitual errors was 54.0 (*SD* = 17.5). These results show that interventions by the driving instructor were rare and that hazardous errors were a lot less common than habitual errors.

To create a continuous variable for use as the outcome measure from the driving test, a weighted error score for the test was calculated. The scores on this measure ranged between 18 and 443, with a mean of 117.6 (*SD* = 78.3).

To assess whether self-regulation was related to on-road driving ability, Pearson's product-moment correlation coefficients were calculated between self-reported avoidance of difficult driving situations and the weighted error scores on the driving tests. It was found that the correlation between overall avoidance and driving test performance was small and not statistically significant ($r = .20$, $p = .055$). The correlations between driving ability and avoidance of specific driving situations are

shown in Table 5, which shows medium-sized (Cohen, 1992) significant correlations between driving ability and avoidance of driving in the rain, driving at night, and driving at night in the rain.

Table 5
Correlations between avoidance of difficult driving situations and on-road driving ability, (n = 90)

Avoidance measure	Correlation with driving ability	*p* value
In the rain	**.33**	**.001**
Alone	-.01	.930
Parallel parking	.05	.660
Right turns	.09	.412
Freeways	-.02	.828
High traffic roads	.00	.980
Rush hour	-.10	.359
At night	**.34**	**.001**
At night in rain	**.35**	**.001**
Overall avoidance	.20	.055

DISCUSSION

An analysis of responses to a driving attitudes and behaviour questionnaire revealed consistency between self-reported confidence in, and avoidance of, difficult driving situations, with older drivers demonstrating generally high levels of confidence in their driving ability and low levels of avoidance. There was low confidence and high avoidance for parallel parking and driving at night in the rain, and there was high confidence and low avoidance reported for driving alone. The finding that driving alone was the least avoided situation and was not viewed as very difficult (high level of confidence) is consistent with previous studies examining this set of driving situations (Ball et al., 1998; Owsley et al., 1999; Stalvey & Owsley, 2000).

When asked about the ease or difficulty of avoiding specific difficult driving situations, driving alone and high traffic roads were reported to be the most difficult to avoid, while parallel parking and peak hour were reported to be the easiest to avoid. The need to drive alone fits with the desire for independent mobility, while the difficulty of avoiding high traffic roads is likely to be due to the fact that the study participants live in the metropolitan area, a situation in which it is difficult to travel beyond one's immediate neighbourhood without encountering an arterial road featuring heavy traffic. The relative ease of avoiding parallel parking would be due to drivers being able to find parking spaces that did not require that manoeuvre. Avoidance of peak hour, on the other hand, could be related to retirement and the ability to choose when driving is done (Eberhard, 1996).

With the exception of driving alone, there were moderate to large relationships (r = -.43 to -.67) between confidence and avoidance scores for the various driving situations. This is consistent with drivers avoiding the situations in which they lose self-confidence or, alternatively, with confidence in situations declining if those situations are avoided. The lower, but still significant, correlation (-.28) between confidence when driving alone and avoidance of driving alone may be the result of very few drivers reporting ever avoiding it. This lack of avoidance of driving alone could have been partly the result of the difficulty, as expressed by the participants, of avoiding this situation. Conversely, the strong correlation (-.67) between confidence when parallel parking and avoidance of parallel parking could be related to the ease,

as expressed by the participants, of avoiding parallel parking if it was felt necessary. That is, drivers did not find it difficult to avoid parallel parking and so, if they lacked confidence in performing that manoeuvre, they were able to avoid it. Thus, the ease of avoiding a difficult driving situation could have considerable bearing on whether avoidance of that situation is related to decreased confidence in it. The relationship between low overall confidence in, and high overall avoidance of, difficult driving situations is consistent with the findings of Charlton et al. (2003).

The central question of the study was whether self-regulation occurred in accordance with deficits in driving ability. It was found that on-road driving ability was *not* significantly correlated with overall driving avoidance, suggesting that older drivers, as a group, do not appropriately self-regulate their driving. Previous studies of self-regulation (Charlton, Oxley, Fildes, & Les, 2001; Cushman, 1996; Marottoli & Richardson, 1998) have also found that self-regulation and driving ability are not related but these studies have been based on samples either of very old drivers or have included a large proportion (over 30%) of drivers who had been diagnosed with dementia. Therefore, these previous findings have now been replicated in a sample of generally healthy, community dwelling drivers aged over 60.

Another important finding was that stronger correlations between driving ability and avoidance were found for a number of specific driving situations (rain, night, night in the rain). Therefore, the apparent lack of a relationship between driving avoidance and driving ability appears to conceal significant relationships for specific situations. Older drivers *do* self-regulate in a manner consistent with driving ability *but only for a small number of specific situations*. This finding is a new one in the road safety literature, as previous research has not investigated self-regulatory practices in the same depth as the present study.

There were some limitations of this study that necessitate some caution when interpreting the findings. First, the confidence and avoidance measures were self-reported and it may be that some participants tried to give a 'good' or socially desirable account of themselves, reporting high perceived driving ability, high driving confidence and low driving avoidance. This may have affected the relationship between self-regulation and driving measures.

Another limitation is that the assessment of on-road driving ability did not assess performance in a number of the difficult driving situations that were the focus of questionnaire items regarding driving confidence and driving avoidance. Specifically, the driving test did not assess driving alone, on freeways, at peak hour, at night, or at night in the rain. It also did not assess reverse parallel parking. It is likely that the driving performance scores of participants who often avoided difficult driving situations would have been poorer if their driving was assessed in these situations. Therefore, the likely result of this limitation of the driving test is that the relationships reported in this study between driving ability and avoidance of difficult driving situations under-estimate the true relationships. However, the driving tests did assess performance in a wide variety of traffic conditions, ranging from quiet streets to busy main roads. Also, as noted by Lundberg et al. (1997, p34), given that some older drivers do restrict their driving in difficult driving situations, it would be "inappropriate to demand more of the elderly than they do of themselves" when assessing their on-road driving ability.

A final limitation is that the results may be affected by volunteer bias. Those volunteering for a study involving an assessment of on-road driving performance may be more likely to be confident about their driving ability. Drivers volunteering for the study who have deficits in driving ability may, therefore, mainly be those who are unaware of these deficits. This would, in turn, reduce the relationships between on-road driving ability and driving avoidance. The correlations between these variables reported in this study may again, therefore, under-estimate the strength of the real relationships. The problem of volunteer bias is difficult to control for, as random sampling in tests of on-road driving performance is impractical (Lee, Cameron, & Lee, 2003).

CONCLUSION

Older drivers tend to be confident about their driving ability and do not feel it is necessary to regularly avoid difficult driving situations. Those drivers who do lose confidence in difficult driving situations do tend to avoid those situations if it is possible to do so. There are some situations, however, like driving alone and driving on high traffic roads that are difficult to avoid if one wishes to maintain mobility. There is some evidence for self-regulation occurring in response to deficits in driving ability but only for a small number of specific difficult driving situations. If self-regulation is to be encouraged, there will need to be resources made available for older drivers to be educated about the types of impairments that can affect driving, and for older drivers to seek assessment of abilities in order to guide self-regulatory practices.

REFERENCES

Ball, K., Owsley, C., Stalvey, B., Roenker, D. L., Sloane, M. E., & Graves, M. (1998). Driving avoidance and functional impairment in older drivers. *Accident Analysis and Prevention, 30*(3), 313-322.

Charlton, J. L. (2002). Licensing issues. In *Transcript of proceedings: Mobility and safety of older people conference, Melbourne, Victoria, August 2002* (pp. 45-65). Melbourne, Victoria: Australian College of Road Safety.

Charlton, J. L., Oxley, J., Fildes, B., & Les, M. (2001). *Self-regulatory behaviour of older drivers.* Paper presented at the Road Safety Research, Policing and Education Conference, Melbourne, Victoria, Australia.

Charlton, J. L., Oxley, J., Fildes, B., Oxley, P., & Newstead, S. (2003). *Self-regulatory behaviours of older drivers.* Paper presented at the 47th Annual Proceedings: Association for the Advancement of Automotive Medicine, Lisbon, Portugal.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159.

Cushman, L. A. (1996). Cognitive capacity and concurrent driving performance in older drivers. *IATSS Research, 20*(1), 38-45.

Dobbs, A. R. (1997). Evaluating the driving competence of dementia patients. *Alzheimer Disease and Associated Disorders, 11*, 8-12.

Dobbs, A. R., Heller, R. B., & Schopflocher, D. (1998). A comparative approach to identify unsafe older drivers. *Accident Analysis and Prevention, 30*(3), 363-370.

Eberhard, J. W. (1996). Safe mobility for senior citizens. *IATSS Research, 20*(1), 29-37.

Fonda, S. J., Wallace, R. B., & Herzog, A. R. (2001). Changes in driving patterns and worsening depressive symptoms among older adults. *Journal of Gerontology: Social Sciences, 56B*(6), S343-S351.

Frith, B. (2002). Engineering for safe mobility. In *Transcript of proceedings: Mobility and safety of older people conference, Melbourne, Victoria, August 2002.* (pp. 193-223). Melbourne, Victoria: Australian College of Road Safety.

Hakamies-Blomqvist, L. (1998). Older drivers' accident risk: Conceptual and methodological issues. *Accident Analysis and Prevention, 30*(3), 293-297.

Hakamies-Blomqvist, L., Johansson, K., & Lundberg, C. (1996). Medical screening of older drivers as a traffic safety measure - a comparative Finnish-Swedish evaluation study. *Journal of the American Geriatrics Society, 44*, 650-653.

Hunt, L. A., Murphy, C. F., Carr, D., Duchek, J. M., Buckles, V., & Morris, J. C. (1997). Reliability of the Washington University Road Test: A performance-based assessment for drivers with dementia of the Alzheimer type. *Archives of Neurology, 54*, 707-712.

Janke, M. K., & Eberhard, J. W. (1998). Assessing medically impaired older drivers in a licensing agency setting. *Accident Analysis and Prevention, 30*(3), 347-361.

Lee, H. C., Cameron, D., & Lee, A. H. (2003). Assessing the driving performance of older adult drivers: On-road versus simulated driving. *Accident Analysis and Prevention, 35*(5), 797-803.

Lundberg, C., Johansson, K., Ball, K., Bjerre, B., Blomqvist, C., Braekhus, A., et al. (1997). Dementia and driving: An attempt at consensus. *Alzheimer Disease and Associated Disorders, 11*(1), 28-37.

Lyman, S., Ferguson, S. A., Braver, E. R., & Williams, A. F. (2002). Older driver involvements in police reported crashes and fatal crashes: trends and projections. *Injury Prevention, 8*(2), 116-120.

Marottoli, R. A., Mendes de Leon, C. F., Glass, T. A., Williams, C. S., Cooney Jr, L. M., & Berkman, L. F. (2000). Consequences of driving cessation: Decreased out-of-home activity levels. *Journal of Gerontology: Social Sciences, 55B*(6), S334-S340.

Marottoli, R. A., & Richardson, E. D. (1998). Confidence in, and self rating of, driving ability among older drivers. *Accident Analysis and Prevention, 30*(3), 331-336.

Maycock, G. (1997). *The Safety of Older Car Drivers in the European Union*. Basingstoke: AA Foundation for Road Safety Research.

OECD. (2001). *Ageing and Transport: Mobility and Safety Issues*. Paris, France: Organisation for Economic Co-operation and Development.

Owsley, C., Stalvey, B., Wells, J., & Sloane, M. E. (1999). Older drivers and cataract: Driving habits and crash risk. *Journal of Gerontology: Medical Sciences, 54A*(4), M203-M211.

Parasuraman, R., & Nestor, P. G. (1991). Attention and driving skills in aging and Alzheimer's Disease. *Human Factors, 33*(5), 539-557.

Ryan, G. A., Legge, M., & Rosman, D. (1998). Age related changes in drivers' crash risk and crash type. *Accident Analysis and Prevention, 30*(3), 379-387.

Stalvey, B. T., & Owsley, C. (2000). Self perceptions and current practices of high risk older drivers: Implications for driver safety interventions. *Journal of Health Psychology, 5*(4), 441-456.

Staplin, L., Gish, K. W., Decina, L. E., Lococo, K. H., & McKnight, A. S. (1998). *Intersection negotiation problems of older drivers, Volume 1: Final technical report* (No. 1446/FR). Washington DC: National Highway Traffic Safety Administration.

Torpey, S. E. (1986). *Licence Re-testing of Older Drivers* (No. 91/21). Hawthorn, Victoria, Australia: Road Traffic Authority.