

Self-Regulation of Driving by Older Persons

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SUMMARY. Physiological and neurological changes associated with aging can have a significant impact on driving ability. This study explored adaptation strategies used by older drivers to maintain independence in driving. Data was collected through a survey administered to 30 older drivers living in northern Florida. Subjects reported using self-regulation strategies including avoidance of specific driving situations, altering the time-of-day in which they drove, not driving in certain weather conditions, avoiding major highways and interstates, reducing their speed of driving, and reducing the amount of time they spent driving. This study supports previous research on elder driving and provides further evidence that many older drivers alter their driving habits and patterns so that they can continue to drive safely. [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <<http://www.HaworthPress.com>> © 2005 by The Haworth Press, Inc. All rights reserved.]

KEYWORDS. Older drivers, driving alterations

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[Haworth co-indexing entry note]: "Self-Regulation of Driving by Older Persons." Ruechel, Summer, and William C. Mann. Co-published simultaneously in *Physical & Occupational Therapy in Geriatrics* (The Haworth Press, Inc.) Vol. 23, No. 2/3, 2005, pp. 91-101; and: *Community Mobility: Driving and Transportation Alternatives for Older Persons* (ed: William C. Mann) The Haworth Press, Inc., 2005, pp. 91-101. Single or multiple copies of this article are available for a fee from The Haworth Document Delivery Service [1-800-HAWORTH, 9:00 a.m. - 5:00 p.m. (EST). E-mail address: docdelivery@haworthpress.com].

Available online at <http://www.haworthpress.com/web/POTG>

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doi:10.1300/J148v23n02_06

INTRODUCTION

The importance of being able to drive does not diminish with age. Often it increases as many elders live in rural or suburban communities where public transportation is typically very limited (Cobb, 1998). To remain independent and continue driving, elders may alter their driving patterns. An important difference between the elderly and other cohorts is that the elderly self-regulate driving. They generally avoid the most risky driving conditions, by not driving during certain times of the day, in certain weather conditions or in unfamiliar areas (Cobb, 1998). The present study sought to describe and identify successful self-regulation strategies older drivers have used to maintain safe driving.

LITERATURE REVIEW

As people age, they experience non-pathological declines in sensory efficiency that are both ongoing and insidious (Holland & Rabbitt, 1992). Principle areas of decline are vision, hearing, reaction time, and the musculoskeletal system. Dynamic acuity and static visual acuity decline with age (Holland et al., 1992). As we advance in age, more pronounced changes occur in our dynamic than static acuity. The threshold for eliciting dark-adapted vision also becomes greater as individuals age. Other age-related changes include a lower glare threshold, decreases in visual field, depth perception, and color discrimination (Holland et al., 1992).

There has been considerable study of declines in vision and its effect on driving (Owsley & Ball, 1993; Park, 1999; Wood & Mallon, 2001). Decreases in visual ability have little reliability in predicting vehicle accidents before the age of 54. Above age 54, however, declines in static and dynamic visual acuity show the most consistent and systematic relationships with accident rates (Holland et al., 1992). Often elders do not realize their vision has declined to a point where their driving is endangering themselves or others. Yet, once alerted to impairment, they are likely to make adjustments to driving habits (Holland et al., 1992). Tests that examine higher level visual functioning, rather than visual acuity alone, like visual processing speed, prove to be better predictors of automobile crashes. Since much of the information drivers process is visual, impaired visual ability might not be the primary predictor of crash involvement (Klavora & Heslegrave, 2002). If senior drivers possess good cognitive abilities and flexibility regarding their choice to

drive, they can modify their behavior and minimize their exposure to traffic hazards (Klavora et al., 2002).

Wide ranges in physiological changes occur from a decrease in lean muscle tone to pathologic disorders such as arthritis, diabetes, osteoporosis, and cardiovascular disease. Musculoskeletal changes impact upon driving depending upon the physical system involved. For example, women with arthritis have a higher number of driving accidents (McGwin, Sims, & Pulley, 2000). Studies suggest that changes in the consistency and structure of articular cartilage, ligaments, bone, and muscles hinder ability of the musculoskeletal system in driving (McGwin et al., 2000). Pain and discomfort may also lead to fatigue, decreased reaction time, and insufficient grip strength to perform driving tasks safely. Other associated factors, for women drivers, include a fall in the previous year, a greater orthostatic blood pressure drop, and increased foot reaction time (Margolis, Pieper Kerani, McGovern, Songer, Cauley, & Ensrud, 2002). Overall, regardless of physical condition, women age 80 or above are three times as likely as men to report driving cessation (Foley, Guralnik, Brock, & Heimovitz, 2002).

Cognitive declines in aging are more individualized and most pronounced relative to specific disease processes. These changes also produce alterations in driving ability. Important judgment processes, higher neuromotor functioning, and feedback sequences may be negatively impacted through disease. Elderly drivers with dementia and Alzheimer's disease may lack self-awareness and have impaired judgment. They often neglect to alter or adapt their habits to cope with the effects of age.

Elder drivers reduce driving exposure and cease driving for a number of different reasons. For many elders the influence and input of trusted family and friends is a critical factor (Johnson, 1998). In a recent study of driving cessation, approximately two-thirds of subjects reduced their driving range to approximately 50 miles or less prior to discontinuing driving (Dellinger, Sehgal, Sleet, & Barrett-Conor, 2001). Depression has also been linked to driving cessation (Fonda, Wallace, & Regula Herzog, 2001). Elders often report a loss of mobility, freedom, and a sense of isolation and dependency upon others. With driving reduction or alteration the occurrence of depression depends largely on how the elder views the changes. Some may view the changes as another step closer to dependency and a possible driving cessation. Others, however, may view the decision as empowering, allowing a sense of continued independence (Fonda et al., 2001). One study found a relationship between time spent driving and depression. The longer subjects drove with self-imposed driving restrictions, the greater their risk for depres-

sive symptoms. For drivers who recently restricted their distances, the risk of depression was not significant (Fonda et al., 2001). From these findings Fonda et al. (2001, S349) conclude, "Modification of driving, at least for shorter durations, is one way that older people can achieve their transportation goals and maintain affective well-being."

METHODS

This study explored the driving habits and behaviors of older people. The question addressed was: "What self-regulation strategies do older drivers use to maintain their independence in driving?"

Instrument. An interview form was developed to collect information on several areas of driving: health conditions and their self-reported effect on driving, driving habits, locations and conditions, self-rated driving abilities, and the impact of driving on quality of life.

Procedure. This study employed survey methodology with in-home or phone interviews which required 30-45 minutes to administer. Nine subjects were interviewed in their homes and 21 interviews were conducted over the phone. A structured interview form was used to collect demographic information, physical condition, and information on driving habits and self-imposed restrictions.

Initially, phone contact and permission to send a consent form were obtained. After the consent form was signed, mailed, and returned, the participant was contacted and an interview appointment scheduled.

Participants. Thirty participants from the Gainesville, Ocala, and Jacksonville areas of Central and North-Eastern Florida (10 male, 20 female) completed interviews. Ages ranged from 64 to 88 years with a mean of 79.5 and standard deviation of 6.1.

Physical Condition. The most frequently reported chronic health condition was cataracts, second was arthritis, third was hearing difficulties, and fourth was high blood pressure (Table 1).

Data Analysis. Data was analyzed using descriptive measures and frequencies.

RESULTS

Table 1 lists the chronic conditions of participants and the impact these conditions have on driving. Cataracts and arthritis were the most common chronic conditions.

TABLE 1. Health Conditions and Effect on Driving

Health Condition	Percent of Total Reporting	Effect of Condition on Driving		
		Percent of Those with Condition Reporting Effects		
		1-Not At All	2-A Little	3-A Great Deal
Cataracts	53.3 (16)	75 (12)	19 (3)	6 (1)
Arthritis	50 (15)	80 (12)	13 (2)	7 (1)
Hearing Condition	37 (11)	100 (11)	0	0
High Blood Pressure	33 (10)	100 (10)	0	0
Other Degenerative	30 (9)	78 (7)	22 (2)	0
Heart Condition	27 (8)	100 (8)	0	0
Diabetes	17 (5)	100 (5)	0	0
Hip Fracture	16.7 (5)	60 (3)	20 (1)	20 (1)
Macular Degeneration	13.3 (4)	75 (3)	25 (1)	0
Knee Replacement	13.3 (4)	75 (3)	25 (1)	0
TIA	13 (4)	100 (4)	0	0
Asthma	10 (3)	100 (3)	0	0
Other Lung Condition	10 (3)	100	0	0
Glaucoma	10 (3)	33 (1)	33 (1)	33 (1)
Other Visual Conditions	10 (3)	0	100 (3)	0
Effects of Stroke	10 (3)	0	0	0
Affective/Anxiety Disorder	3 (1)	100 (1)	0	0

Table 2 summarizes these results for changes in driving habits from five years ago, and difficult driving situations. Late night driving was avoided more than any other time of day, but more than half did not drive at any time of night, and a few others avoided early morning and evening. Sixty percent of participants currently drove less than they had five years ago, but only 30 percent reported driving at slower speed than five years ago. Just over half of subjects did not drive on interstates. Inclement weather also resulted in significant numbers of participants not driving, including rain, cloudy days, fog, and very hot and cold weather. Driving into the sun was also avoided by several participants. Subjects felt that the most difficult aspects of driving included heavy traffic, left turns, fatigue, and other drivers who drove fast.

Eighty-seven percent of participants reported that their driving habits had changed in some way(s) in the past five years including such changes as frequency of driving, time of day, time of year, and places driven. Sixty

TABLE 2. Conditions Impacting Driving and Changes in Driving Now versus 5 Years Past

	N	%
Time of Day Don't Drive		
Early morning	7	23
Morning & afternoon	0	0
Evening	2	7
Night	18	60
Late night	21	70
Passenger Status While Driving		
With passenger	12	40
Alone	11	37
Both alone and with passenger	7	23
Driving Amount Now vs. 5 Yrs. Ago		
More	2	7
Same	10	33
Less	18	60
Driving Speed Now vs. 5 Yrs. Ago		
Faster	2	7
Same	19	63
Slower	9	30
Avoid Driving in Specific Area(s)		
Yes	20	67
No	10	33
Type of Roads Driven		
2-lane highways	27	90
4-lane highways	17	57
Interstate highways	14	47
Environmental Conditions Avoided		
Rain	17	57
Cloudy days	2	7
Fog	8	27
Driving into the sun	10	33
Cold weather	3	10
Very hot weather	2	7

	N	%
Difficult Driving Aspects		
Heavy traffic	10	33
Left turns	6	20
Driving while tired	4	13
Other drivers driving too fast	4	13
Overall Changes in Driving Now vs. 5 yrs. Ago		
Yes	26	87
No	4	13

percent of participants currently drove less than they had five years ago, but only 30 percent reported driving at slower speed than five years ago.

The most frequently visited locations participants currently drove to included the grocery store, church, visiting friends, the bank, and other miscellaneous locations, respectively. Table 3 summarizes results for places visited.

Self-Rated Driving Abilities and Driving Impact

Self-Rated Abilities. On a scale of 1 to 5 (1 = totally unsatisfied to 5 = totally satisfied) subjects were asked to rate their ability to drive in heavy traffic, at night, in adverse weather conditions, and at speeds above 45 miles per hour. Results are summarized in Tables 4 and 5.

Self-Rated Abilities and Gender. In rating their own driving abilities men and women showed differences in their overall confidence (Table 5). While 40 percent of women rated their abilities to drive in traffic as a 3 or lower out of 5, no men rated their ability under a 5, the highest score possible. In rating their ability to drive at night, 55 percent of women reported a 3 or higher compared to 90 percent of men rating a 3 or higher. Men and women rated themselves similarly in ability to drive in adverse weather and at speeds above 45 miles per hour.

Changes in Leaving Home. Eleven participants (37%) reported that changes in driving ability had influenced their ability to visit friends and family, go places to meet friends, and get out of the house. Sixteen participants (53%) said that they anticipate changes in their driving habits in the next five years. Half reported that changes in driving in the next five years will negatively impact their lives. No subjects claimed that changes in driving will positively impact their lives.

TABLE 3. Locations Driven and Frequency

Places	Percent report going once a week	Percent report going more than once a week
Grocery Store	57 (17)	33 (10)
Church	40 (12)	13 (4)
Visit Friends	33 (10)	3 (1)
Other 1	30 (9)	7 (2)
Bank	27 (8)	0
Restaurant	23 (7)	7 (2)
Senior Program	17 (5)	7 (2)
Doctor's Office	17 (5)	7 (2)
Other Store/Shopping	13 (4)	7 (2)
Hair/Beauty Salon	13 (4)	0
Volunteer Work	10 (3)	3 (1)
Visit Relatives	10 (3)	10 (3)
Hospital	3 (1)	0
Other 2	3 (1)	7 (2)

TABLE 4. Self-Rated Ability in Driving (1-5)

Self-Rated Ability in Driving	1	2	3	4	5
Ability to Drive in Heavy Traffic	2 (7)	1 (3)	5 (17)	11 (37)	11 (37)
Ability to Drive at Night	5 (17)	6 (20)	6 (20)	7 (23)	6 (20)
Ability to Drive in Adverse Weather	2 (7)	8 (27)	8 (27)	6 (20)	5 (17)
Ability to Drive at Increased Speeds	0	0	6 (20)	5 (17)	19 (63)

DISCUSSION

Klavora and Heslegrave (2002) state that in sensing changes in ability and capacity for driving, seniors drive shorter distances, drive more slowly, decrease their night and highway driving, and are less likely to drive during rush-hour periods. Subjects in this study, likewise, reported using self-regulation strategies based on location, time-of-day, weather, and types of roads to maintain their independence in driving. The most common adjustments included avoiding driving at night, avoiding specific areas due to traffic or road composition, avoidance of driving on interstate highways, and avoiding driving in rain. Over half of the subjects also reported decreased time spent on the road compared

TABLE 5. Self Rated Driving Ability and Gender

	1-2	Percent of Gender (1-2)	3	Percent of Gender (3)	4-5	Percent of Gender (4-5)
Ability in Traffic						
Men	0	0	0	0	10	100
Women	3	15	5	25	12	60
Ability at Night						
Men	1	10	1	10	8	80
Women	9	45	6	30	5	25
Ability in Weather						
Men	1	10	3	30	6	60
Women	10	50	5	25	5	25
Ability at Increased Speeds						
Men	0	0	1	10	9	90
Women	0	0	5	25	15	75

to five years ago, and a third reported their speed decreased in the past five years.

When reporting their physical conditions, few participants reported their diagnoses had major effects on their driving abilities. These findings concur with Foley et al. (2002) who noted that studies of driving cessation and crashes among aging drivers have revealed stronger associations with measures of physical, visual, and cognitive functioning rather than specific diagnoses of sensory or musculoskeletal conditions. As predicted, those health conditions having the greatest impact on driving ability involved a diagnosis that may limit visual or physical performance such as cataracts, hip replacements, glaucoma, and other visual conditions. Alicandri (1999) stated that changes in vision can have the most significant impact on driving.

Overall, participants in this study reported a negative view of the changes to their driving ability. One-half of participants stated they anticipated more changes in their driving habits in the next five years and that these changes will have a negative impact on their lives. No subjects responded that the changes would be positive. These findings correspond with other studies that report elders who have restricted or altered their driving behavior view driving cessation as an increasing possibility, representing a loss of independence and quality of life (Fonda et al., 2001).

The differences in self-ratings of ability in gender also correspond with recent research. The lower self-rating of ability among women may contribute to earlier rates of driving cessation. Foley et al. (2002) reported in their study of driving cessation that women in the "Oldest Old" cohort analysis were three times as likely to report driving cessation as men.

This study provided information about common self-regulatory behaviors individuals may utilize to compensate for many of the changes that occur with age or physical impairments. These findings support much of the existing research on older drivers.

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