Relationship of Health Status, Functional Status, and Psychosocial Status to Driving Among Elderly with Disabilities

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SUMMARY. *Objective*. To examine the relationship between driving status and demographics, health status, functional status, and mental and psychosocial status.

Methods. The Consumer Assessment Study Interview Battery (CAS-IB), administered to 697 community dwelling men and women aged 60 to

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This research was supported through funding from the National Institute on Disability and Rehabilitation Research, U.S. Department of Education and the Administration on Aging, Department of Health and Human Services.

[Haworth co-indexing entry note]: "Relationship of Health Status, Functional Status, and Psychosocial Status to Driving Among Elderly with Disabilities." Mann, William C. et al. Co-published simultaneously in *Physical & Occupational Therapy in Geriatrics* (The Haworth Press, Inc.) Vol. 23, No. 2/3, 2005, pp. 1-24; and: *Community Mobility: Driving and Transportation Alternatives for Older Persons* (ed: William C. Mann) The Haworth Press, Inc., 2005, pp. 1-24. 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

doi:10.1300/J148v23n02_01

106, included instruments to measure health, functional status, and mental and psychosocial status. These variables were compared for three groups based on driving status: those still driving, those who had ceased driving, and those who had never driven.

Results. Differences among the three groups were found for age, race, gender, income, education level, home ownership, and living situation. Differences among the three groups were found for many measures of health status and all measures of functional, mental, and psychosocial status.

Conclusions. Declines in health, functional ability, and cognition are associated with driving cessation. Availability of alternative forms of transportation, whether supplied by the community, friends, or family, may mitigate additional declines in health, function, and psychosocial status.

KEYWORDS. Driving assessment and remediation, occupational therapy, mobility

INTRODUCTION

In America, the ability to travel without depending on others ". . . has become synonymous with independence, autonomy, dignity, self-esteem, and the automobile" (Trilling, 2001, p. 339). Americans, young and old alike, depend on cars for 90% of travel needs, making driving an important activity of daily living (ADL) (Cook and Semmler, 1991; Eberhard, 2001). With aging, physical and cognitive limitations may impede an older person's ability to drive safely. The decision to cease driving, however, can lead to isolation from favorite activities and social supports and subsequently to a decrease in quality of life (Eberhard, 2001).

One of four drivers in the U.S. will be over the age of 65 in 2024 (Owsley, 2002). Insufficient and inadequate alternatives to driving, plus the negative psychosocial consequences of driving cessation, mandate the need to allow the elderly to continue driving safely as long as possible.

This study explored differences among three groups of elders: (1) those who continued to drive (D-group); (2) those who had stopped driving (CD-group); and (3) elders who had never driven an automobile (ND-group).

The following questions were addressed: (1) What are the demographic and socioeconomic differences among these groups; (2) Is health status associated with driving status; (3) Does functional ability vary among the three groups; (4) Is mental status associated with driving status; and (5) Does quality of life vary with driving status?

Review of Literature

Characteristics of the elderly driver. Physical, sensory, and cognitive changes occur during the normative aging process, affecting the performance of everyday tasks, including driving (Marottoli, Ostfeld et al., 1993; Hu, Trumble et al., 1998). When individuals recognize diminished capacities, many adjust their driving behaviors and some cease driving altogether (Marottoli, Ostfeld et al., 1993). Those who recognize diminished capacities frequently reduce their risk by reducing their exposure, limiting themselves to driving conditions in which they feel most confident (Hakamies-Blomqvist, 1994).

Compared to those under age 65, older drivers avoid the highway more frequently, make fewer trips and travel fewer miles (Chu, 1995). In a study of over 3,000 drivers, 49% of those over age 65 drove less than 100 miles per week (Stutts, 1998). Another study found that 42% of subjects still driving reported fewer miles driven compared to five years prior (Marottoli, Ostfeld et al., 1993). Other methods of self-regulation include not driving after dark, avoiding rush hour traffic or highways, and choosing not to drive during inclement weather. A recent study found that 40% of elders did not drive after dark or while it was raining, and 33% avoided rush hour traffic (Stutts, 1998).

Demographic factors and driving. Demographic factors include geographic location, availability of public transportation, age, sex, ethnicity and income. The geographic location of drivers influences their driving patterns. People living in rural areas have fewer alternatives to a personal vehicle than urban dwellers. Even when public transportation is available, the elderly seldom use it (Raymond, Knoblauch et al., 2001). Age alone has not been found to be a reliable predictor of driving ability or the likelihood of being involved in a motor vehicle crash (ODOT, 2000), as problems with visual, cognitive, and motor skills required for driving may occur at any age (Raymond, Knoblauch et al., 2001; Sarkar, Holmes et al., 2002). Males are over represented in the elderly driving population and tend to view the use of a car as more of a necessity than women (Hakamies-Blomqvist and Wahlstrom, 1998). About 20% of American women over age 65 do not drive a car (Wallace and Franc, 1999). How-

ever, future cohorts of women are more likely to have driven (Barr, 2001). Ethnicity may play a role in driving patterns. White seniors tend to travel more frequently by car, and are less likely to utilize public transportation (Raymond, Knoblauch et al., 2001). The proportion of non-white elderly drivers is expected to increase as the general population ages and minority representation increases (Raymond, Knoblauch et al., 2001). Lower income levels and non-employment status were found to be associated with driving cessation, but these factors may reflect social and economic issues rather than driving competence (Marottoli, Ostfeld et al., 1993).

Health status related to driving. In addition to motor, sensory, and cognitive declines associated with age, the elderly are more likely to experience chronic medical conditions and use medications that could adversely affect driving abilities (Hu, Trumble et al., 1998). Fractures, heart disease, and diabetes were found to be associated with driving cessation, decline in mileage driven, and avoidance of long trips (Forrest, Bunker et al., 1997). Increased crash risk was found for those drivers with glaucoma (Owsley, Ball et al., 1998) and cardiovascular disease (1999). Older, insulin dependent diabetics had a six-fold increase in crash risk, and those who had diabetes and heart disease were eight times more likely to be involved in motor vehicle crashes (Koepsell, Wolf et al., 1994). Recent studies have reported an association between back pain and motor vehicle crashes (Foley, Wallace et al., 1995), and an elevated risk for crashes among those with medical conditions (Vernon, Diller et al., 2002). People with cataracts, the leading cause of vision impairments in older adults, tend to drive less and more slowly, venture less out of their neighborhoods, and are more likely to have received recommendations to stop or limit their driving (Owsley, Stalvey et al., 1999). Other age related visual problems, such as glaucoma, macular degeneration, and decreased acuity, may also contribute to driving cessation (Raymond, Knoblauch et al., 2001).

There are conflicting reports regarding the impact of medications on driving. Several studies have shown little correlation between crash rates, antihistamines, frequently used drug ingredients, and the use of multiple medications, all common among many older drivers (Stewart, Moore et al., 1993; Leveille, Buchner et al., 1994; Foley, Wallace et al., 1995). Benzodiazepines were found to have little effect on crash risk in one study of older drivers (Leveille, Buchner et al., 1994). Another study reported that benzodiazepine users demonstrated impaired performance on a variety of controlled driving tasks (Ray, Gurwitz et al., 1992). None of these studies included drivers over the age of 60, how-

ever. Increased risk for crashes has been associated with the use of antidepressants, opiod analgesics, and non-steroidal anti-inflammatory medication use (Leveille, Buchner et al., 1994; Foley, Wallace et al., 1995). One investigator hypothesized that increased risk may have been the result of psychiatric illnesses versus the use of antidepressants or benzodiazepines (Ray, Gurwitz et al., 1992). Another investigator speculated that the association between increased crash risk and the use of non-steroidal medications may be linked to other factors such as pain and the presence of arthritic conditions (Foley, Wallace et al., 1995).

Functional status and driving. Many of the component skills required for safe driving are evident in the performance of basic activities of daily living (ADLs). Good trunk stability, strength, endurance, and coordination are important in performing driving tasks such as holding and manipulating the steering wheel, using the pedals, and other vehicle controls (Retchin and Anapolle, 1993). An inverse relationship between driving cessation and participation in functional activities such as walking, performing household chores, climbing stairs, and exercising was reported by Marottoli, Ostfeld et al. 1993. Maneuvering a motor vehicle becomes more difficult for older drivers with loss of muscle strength and decreased bone density and joint flexibility (Staplin, Lococo et al., 1998). Difficulties with access to the automobile may prevent some elderly from driving. Common problems include difficulty entering and exiting, seating, storage for mobility devices, and seat belt use (Steinfeld, Tomita et al., 1999). Drivers with limited flexibility and range of motion in the legs, arms, and neck may be at an increased risk for crashes (ODOT, 2000). One study reported a high correlation between falls and motor vehicle crashes by older women (Forrest, Bunker et al., 1997), while another study found that a motor deficit, represented by difficulty in raising the arms above the shoulder, increased the likelihood of crashes among older women (Hu, Trumble et al., 1998).

Mental/Psychosocial status and driving. In America, driving an automobile is associated with autonomy and, therefore, driving cessation or driving reduction can lead to a loss of independence. Where few alternatives exist to personal vehicles, the loss of a driver's license can affect one's quality of life and self-esteem (Stutts, 1998). Isolation resulting from restricted mobility may act to accelerate additional declines in health and psychosocial function (Eberhard, 2001). Those isolated by decreased mobility may face social disengagement, a risk factor for cognitive impairment among the elderly (Bassuk, Glass et al., 1999). Several studies have linked driving cessation with increased depressive symptoms. Marottoli et al. found that driving cessation was in-

dependently associated with increased depression when accounting for cognitive impairment, vision and hearing difficulties, chronic medical conditions, and limitations in ADL performance (Marottoli, Mendes de Leon et al., 1997). Even restricting one's driving or having a spouse available to provide rides for former drivers poses an increased risk for depressive symptoms (Fonda, Wallace et al., 2001). Cognitive functioning is essential for safe operation of a motor vehicle. Staplin (1998) describes the cognitive tasks required: (1) access and retrieval of information to navigate and maintain vehicle control; (2) visual search and scanning with the ability to discern the most relevant information for safe motor vehicle operation; and (3) divided attention, or the ability to process and respond to the most important stimuli. The aging process may affect the performance of all three of these cognitive tasks. Some reports indicate that the Mini-Mental Status Examination (MMSE) may be used to assess the cognitive tasks required of driving (Gallo, Rebok et al., 1999; Brayne, Dufouil et al., 2000). The National Highway Traffic Safety Administration (NHTSA) reported that, although cognitive screening may be useful for identifying older drivers with cognitive decline, behind-the-wheel tests better measure the abilities required of safe driving (1999).

METHODS

This report is based on the Rehabilitation Engineering Research Center on Aging, Consumer Assessments Study (CAS), a longitudinal study of the coping strategies of elders with disabilities, defined as having difficulty with at least one activity of daily living (ADL) or instrumental activity of daily living (IADL). From 1991 to 2001, 26 senior service agencies and hospital rehabilitation programs referred to the CAS individuals they currently served, or in the case of hospital rehabilitation programs, individuals discharged home. A comparison of initial interviews of the CAS sample with the 1986 National Health Interview Survey (2002) and the 1987 National Medical Expenditure Survey (Leon and Lair, 1990) reported that the CAS sample closely resembled the approximately 8- to 12% of the elder population who have difficulty with at least one ADL or IADL (Mann, Hurren et al., 1997). The CAS was initiated in Western New York (WNY) where 789 elders were interviewed. In the final two years, the CAS was replicated with 314 study participants in Northern Florida (NFl). For the present report, we combined the NFl and WNY samples (n = 1,103). However, the Transporta-

tion Section of the interview battery was not developed and administered until the fourth year of the study. To answer research questions that did not consider changes over time, we selected subjects at the year in which they completed the Transportation Section: this included all 314 NFl subjects, and 383 WNY subjects. Of the total cohort, 697 subjects completed the Transportation Section; 282 were still driving, 307 had stopped driving, and 108 had never driven.

Instruments

The CAS used a battery of instruments to measure multiple dimensions including instruments developed by other investigators, and instruments developed to meet the unique requirements of this study. The Consumer Assessments Study Interview Battery (CAS-IB) contains several parts from the Older Americans Research and Service Center Instrument (OARS) including: Physical Health Scales, Instrumental Activities of Daily Living Scale, and Social Resources Scale (Fillenbaum, 1988).

Health Status Instruments

The Physical Health Scales on the OARS include number of physician visits in the past six months; number of in-patient hospital days; number of medications taken; and number and types of chronic illnesses. Study participants are asked which of 38 illnesses they have, and the extent to which each illness interferes with activities. The Jette Functional Status Index consists of 10 items within three sections (gross mobility, hand activities, and personal care) scored on a four point scale from 1 = no pain to 4 = severe pain (Jette, 1980). The item scores are summed for a total score. The minimum possible score is 10; the maximum score (severe pain on every item) is 40. The reliability and validity of the Jette Functional Status Index have been examined and found to be adequate (Fillenbaum, 1988).

Functional Status Instruments

Three instruments were used to measure functional status: the IADL section of the OARS, the Sickness Impact Profile (SIP), and the Functional Independence Measure (FIM). These instruments are moderately correlated with each other and there is some overlap in content such as mobility. However, there are substantial differences in these measures, conceptual and structural.

OARS IADL Instrument. The total IADL score is calculated by summing together the scores on the seven items from the IADL section of the OARS (Fillenbaum, 1988). The seven items ask whether or not the study participant can use the telephone, get to places out of walking distance, go shopping, prepare meals, do housework, take medicine, and handle money. Responses are scored: 2 = without help, 1 = some help, 0 = completely unable or no answer. The IADL score can range from 14, totally independent, to 0, totally dependent.

Sickness Impact Profile (SIP)-Physical Dysfunction Section, was used to determine percent of physical disability for study participants (Gilson, Gilson et al., 1975). Three sections of the SIP, with a total of 45 separate items, are used to calculate the percent of physical disability score; these sections are Body Care and Movement, Mobility, and Ambulation. A checklist is used to indicate agreement about statements regarding the participant's health.

Functional Independence Measure (FIM). The FIM was developed as an instrument to determine the severity of disability (1990). The FIM consists of 18 items, each with a maximum score of 7 and a minimum score of 1. Thus, the highest possible total score is 126, and the lowest, 18. Each level of scoring (1 through 7) is defined; for example 7 = "Complete Independence," 3 = "Moderate Assistance." The FIM measures the following areas: Self-Care, Sphincter Control, Transfers, Locomotion, Communication, and Social Cognition. The FIM has been found to be reliable and valid, even with subjects over age 80 (Pollak, Rheult et al., 1996).

Mental Status and Psychosocial Status Instruments

Mini Mental Status Exam (MMSE). The MMSE consists of 11 items that are summed to create a mental status score (Folstein, Folstein et al., 1975). The MMSE score ranges from a maximum score of 30 to a minimum score of 0. Scores less than 24 are considered indicative of cognitive impairment.

Rosenberg Self-Esteem Scale. This scale consists of 10 statements, such as "I am able to do things as well as most people," and "At times, I think I am no good at all." Responses for each item are measured on a four point Likert scale (1 = strongly disagree through 4 = strongly agree). The self-esteem score ranges from 40 (high self esteem) to 10 (low self esteem) (Rosenberg, 1965).

Center for Epidemiological Studies Depression Scale (CESD). The CESD includes 20 items asking study participants to describe how they

felt during the past week. For example, one item states: "I had trouble keeping my mind on what I was doing." Responses are measured on a 4-point scale (0 = less than once a day; 1 = some of the time–1-2 days a week; 2 = moderately–3-4 days a week; 3 = mostly–5-7 days a week). Scores range from 0 to 60 with the higher the score the more depressed. Typically, a score of 16 or higher is considered indicative of depression (Radloff and Locke, 1986).

Subjects were asked about their quality of life over the previous month and rated their responses on a 5-point Likert scale (1 = very well through 5 = very bad). Subjects were also asked to rate their satisfaction with their life in general (4 = very satisfied through 1 = not satisfied).

Data Collection

All data were collected in face-to face interviews in study participants' homes by nurse or occupational therapist interviewers. Interview time averaged about 2.5 hours. Appointments were scheduled at times convenient for study participants to ensure that they would be rested, comfortable, and not feel rushed.

Analysis

We compared the three driving groups on demographics, health status, functional status, and mental and psychosocial status variables, based on the Kruskal-Wallis tests (Hollander and Wolfe, 1999).

To correct for multiple comparisons, we provide permutation-adjusted p-values for each hypothesis. With this approach we measured the significance of each hypothesis by comparing the observed study result with those results derived from randomly assigning 697 subjects to the three driving-groups, taking the correlation structure between the hypotheses into account. Algorithm 4.1 in Westfall and Young was modified using Fisher's combining function for p-values (Westfall and Young, 1993). First, the individual unadjusted p-values $p_1 \leq p_2 \leq \ldots \leq p_k$ are evaluated for the K hypotheses based on the nonparametric tests. Then we randomly permute the patients for B times and calculate the corresponding p-values $p_1^b, p_2^b, \ldots, p_k^b$ for the b^{th} permutation. Using the Fisher's combining function $h(x_1,x_2, \ldots, x_n) = -2 \sum_{i=1}^{n} \log(x_i)$, the p-value for the combining statistic is estimated as $p_{(i)} = \sum_{b=1}^{B} I[h(p^b_i,p^b_{i+1}, \ldots, p^b_k) \geq h(p_i, p_{i+1}, \ldots, p_k)]/B$, where $I(.)$ is the in-

dicator function. Finally the adjusted p-value for the i^{th} hypothesis is given by $p_i^{adj} = \frac{\max p_{(j)}}{1 \le j \le i}$. The Westfall and Young's algorithm corresponds to the Tippett combining function for tests, $h(x_1, x_2,..., x_n) = \min (x_1, x_2, ... x_n)$ (Westfall and Young, 1993). Birnbaum classified and discussed different types of combinations of p-values. We chose the Fisher's combining function because it is the most sensitive (Birnbaum, 1954).

RESULTS

Driving and Community Mobility Questions

Of the 697 participants who completed the Transportation Section of the CAS, 282 (40.3%) continued to drive (D-group), 307 (44.2%) had ceased driving (CD-group), and 108 (15.5%) had never driven (ND-group) (Table 1). When asked if they had driven or ridden as a passenger in a personal vehicle within the last month, positive responses were received by 240 (98.0%) in the D-group, 226 (84.6%) in the CD-group, and 50 (73.5) in the ND-group ($p < .001$). Within the CD-group, 138 (50.0%) indicated they would like to drive again. Within the D-group, 44.1% reported they did not drive at night. Also within this group, 116 (49.2%) indicated they drove daily, 109 (46.2%) drove at least weekly, and 11 (4.7%) drove less than once per week. D-group participants traveled more miles per week (9.6 (10.2) than the CD-group (7.5 (11.7) and more than twice the distance of the ND-group (4.2 (7.5) ($p > .001$).

Demographics

Significant differences among groups, at the $p < .001$ level, were found for gender, race, home ownership, income, education level, and living situation (alone or with someone). Age was significant at $p = .003$. A higher percentage of males was found in the D-group (30.1%) and CD-group (30.1%) compared to the ND-group (3.7%). Within the D-group, 83.9% were White, while 74.6% of the CD-group and 57.4% of the ND-group were White. Participants who were still driving were more likely to own their own homes (70.6%) than participants who ceased driving (54.3%), and those who never drove were more likely to rent their homes (58.3%). Of those reporting their income, 79.3% of the D-group and 58.9% of the CD-group reported income greater than

TABLE 1. Comparison of Demographic Variables by Driving Groups

Variables	Total (n = 697)		Drive (n = 282)		Drove (n = 307)		Never Drove (n = 108)		p-value
Age, mean (SD)	75.5	(8.5)	74.3	(7.3)	76.4	(9.3)	76.1	(9.0)	0.003
Gender, n (%)									<0.001
Male	181	(26.0)	85	(30.1)	92	(30.1)	4	(3.7)	
Female	515	(74.0)	197	(69.9)	214	(69.9)	104	(96.3)	
Race, n (%)									<0.001
Black	162	(23.3)	43	(15.4)	77	(25.1)	42	(38.9)	
White	525	(75.7)	233	(83.9)	230	(74.6)	62	(57.4)	
Hispanic	4	(0.6)	2	(0.7)	0	(0.0)	2	(1.9)	
Asian	1	(0.1)	0	(0.0)	1	(0.3)	0	(0.0)	
Other	2	(0.3)	0	(0.0)	0	(0.0)	2	(1.9)	
Home ownership, n (%)									<0.001
Own	401	(57.5)	199	(70.6)	164	(53.4)	38	(35.2)	
Rent	265	(38.0)	76	(27.0)	126	(41.0)	63	(58.3)	
Other	31	(4.5)	7	(2.5)	17	(5.5)	7	(6.5)	
How long owned home,									
mean years (SD)	17.0	(15.6)	17.6	(14.9)	16.1	(15.3)	18.4	(17.9)	0.142
Income, n (%)									<0.001
$0-$9,999	219	(36.3)	50	(20.7)	108	(41.1)	61	(62.2)	
$10,000-$14,999	142	(23.6)	49	(20.3)	68	(25.9)	25	(25.5)	
$15,000-$19,999	75	(12.5)	46	(19.0)	19	(7.2)	10	(10.2)	
$20,000-$29,999	67	(11.2)	39	(16.1)	27	(10.3)	1	(1.0)	
$30,000-$39,999	53	(8.8)	32	(13.2)	21	(8.0)	0	(0.0)	
$40,000 or more	47	(7.8)	26	(10.7)	20	(7.6)	1	(1.0)	

TABLE 1 (continued)

Variables	Total (n = 697) n (%)		Drive Now (n = 282) n (%)		Stopped Driving (n = 307) n (%)		Never Drove (n = 108) n (%)		p-value
Education level, n (%)									<0.001
Less Than High School (1-8)	144	(20.7)	35	(12.4)	63	(20.7)	46	(43.4)	
High School-Bachelor Degree	490	(70.7)	210	(74.5)	222	(72.8)	58	(54.7)	
Higher Than Bachelor Degree	59	(8.5)	37	(13.1)	20	(6.6)	2	(1.9)	
Marital Status, n (%)									0.142
Married	202	(29.0)	94	(33.3)	91	(29.6)	17	(15.9)	
Widowed	331	(47.6)	123	(43.6)	140	(45.6)	68	(63.6)	
Divorced	91	(13.1)	39	(13.8)	41	(13.4)	11	(10.3)	
Single	62	(8.9)	25	(8.9)	28	(9.1)	9	(8.4)	
Other	10	(1.4)	1	(0.4)	7	(2.3)	2	(1.9)	
Live with someone, n (%)									<0.001
Alone	387	(55.8)	165	(58.5)	150	(49.2)	72	(67.3)	
With someone	307	(44.2)	117	(41.5)	155	(50.8)	35	(32.7)	

$10,000 per year. Over 62% of the ND-group reported yearly income of less than $10,000 per year. Within the D-group, 12.4% had less than a ninth grade education, versus 20.7% of the CD-group and 43.4% of the ND-group. Participants still driving or having driven were more likely to live with someone (41.5% and 50.8%, respectively) than participants in the ND-group. No significant differences were found for length of home ownership and marital status. A summary of the comparisons on demographics variables is included in Table 1.

Health Status

Significant differences among the three groups were found for vision, ability to engage in activities due to illness, number of illnesses, pain, days spent in a nursing home or rehabilitation center within the previous six months, and number of medications ($p < .001$). Eyesight was reported as good or excellent by 78.4% of the D-group, 54.1% of the CD-group, and 49.0% of the ND-group. Fifty-seven point two percent of the D-group reported they had no illnesses that prevented them from performing their usual activities versus 48.7% and 42.7% for the CD- and ND-groups, respectively. Mean scores for pain during activities were lower for the D-group (14.3 (5.6) than the CD-group (15.2 (6.0) or the ND-group (16.4 (7.0). D-group participants had a mean of 6.3 (3.3) illnesses, the CD-group 7.0 (3.2), and the ND-group, 6.3 (2.9). Mean days spent in a nursing home or rehabilitation hospital within the previous six months were 1.6 (7.1) for the D-group, 4.3 (12.5) for the CD-group, and 2.5 (14.7) for the ND-group. The mean number of medications taken was 5.3 (3.7) for the D-group, 6.6 (4.1) for the CD-group, and 5.7 (3.7) for the ND-group. Respondents in the D-group were less likely to report a perceived need for additional medical treatment (16.7%) than either the CD-group (25.9%) or the ND-group (24.3%) ($p < .05$). No significant differences between the groups were found for hearing, the number of doctor visits within the previous six months ($p = .333$), or the number of days spent in the hospital in the previous six months. Table 2 lists health status variables by driving groups.

Functional Status

Significant differences were found for all functional status measures ($p < .001$) (Table 3). The D-group demonstrated the highest functional status, as measured by FIM and the Sickness Impact Profile. The mean FIM Motor scores were 82.1 (6.2) for the D-group, 71.4 (14.9) for the

TABLE 2. Comparison of Health Status Variables by Driving Groups

Variables	Total (n = 697)		Drive (n = 282)		Drove (n = 307)		Never Drove (n = 108)		p-value
Eyesight, n. (%)									
Excellent	110	(15.8)	64	(22.7)	37	(12.1)	9	(8.3)	
Good	330	(47.4)	157	(55.7)	129	(42.0)	44	(40.7)	
Fair	172	(24.7)	48	(17.0)	89	(29.0)	35	(32.4)	<0.001
Poor	82	(11.8)	13	(4.6)	50	(16.3)	19	(17.6)	
Totally Blind	3	(0.4)	0	(0.0)	2	(0.7)	1	(0.9)	
Hearing, n. (%)									
Excellent	122	(17.6)	57	(20.3)	50	(16.4)	15	(13.9)	
Good	282	(40.6)	119	(42.4)	112	(36.7)	51	(47.2)	
Fair	180	(25.9)	66	(23.5)	88	(28.9)	26	(24.1)	0.072
Poor	94	(13.5)	30	(10.7)	50	(16.4)	14	(13.0)	
Totally Deaf	16	(2.3)	9	(3.2)	5	(1.6)	2	(1.9)	
Too ill to do usual activities, n (%)									
None	349	(51.3)	159	(57.2)	146	(48.7)	44	(42.7)	
A week or less	107	(15.7)	42	(15.1)	42	(14.0)	23	(22.3)	
More than a week but less than one month	89	(13.1)	34	(12.2)	41	(13.7)	14	(13.6)	<0.001
1-3 months	92	(13.5)	34	(12.2)	44	(14.7)	14	(13.6)	
4-6 months	44	(6.5)	9	(3.2)	27	(9.0)	8	(7.8)	
Need more medical treatment, n (%)									
Yes	149	(21.9)	46	(16.7)	78	(25.9)	25	(24.3)	0.017
No	531	(78.1)	230	(83.3)	223	(74.1)	78	(75.7)	

Variables	Total (n = 697)		Drive (n = 282)		Drove (n = 307)		Never Drove (n = 108)		p-value
Total number of illnesses, mean (SD)	6.6	(3.2)	6.3	(3.3)	7.0	(3.2)	6.3	(2.9)	<0.001
Jette Functional Status Index: Pain, mean (SD)	15.0	(6.0)	14.3	(5.6)	15.2	(6.0)	16.4	(7.0)	<0.001
Times seen a doctor, mean (SD)	6.0	(6.1)	6.5	(7.3)	5.9	(5.2)	5.2	(4.8)	0.333
Days in Hospital, mean (SD)	2.7	(7.4)	1.7	(4.7)	3.1	(8.0)	4.0	(10.5)	0.299
Days in NH/Rehab, mean (SD)	2.9	(11.1)	1.6	(7.1)	4.3	(12.5)	2.5	(14.7)	<0.001
Total number of medications, mean (SD)	6.0	(3.9)	5.3	(3.7)	6.6	(4.1)	5.7	(3.7)	<0.001

TABLE 3. Comparison of Functional Status Variables by Driving Groups

Variables	Total (n = 697)		Drive (n = 282)		Drove (n = 307)		Never Drove (n = 108)		p-value
FIM Motor,									
mean (SD)	75.9	(13.2)	82.1	(6.2)	71.4	(14.9)	72.7	(14.9)	<0.001
FIM Total,									
mean (SD)	108.3	(15.1)	115.4	(6.6)	103.2	(16.7)	104.3	(18.6)	<0.001
IADL Total,									
mean (SD)	9.8	(3.8)	12.4	(1.8)	7.8	(3.5)	8.6	(3.8)	<0.001
Sickness Impact Profile,									
mean (SD)	25.2	(14.3)	17.0	(10.2)	30.9	(13.8)	30.8	(14.8)	<0.001

CD-group, and 72.7 (14.9) for the ND-group. Mean FIM Total scores were: D-group, 115.4 (6.6); CD-group, 103.2 (16.7); and ND-group, 104.3 (18.6). Mean Sickness Impact Profile scores were 17.0 (10.2) for the D-group, 30.9 (13.8) for the CD-group, and 30.8 (14.8) for the ND-group. Mean IADL total scores were highest for the drivers, 12.4 (1.8), compared to those who had ceased driving, 7.8 (3.5), and those who never drove, 8.6 (3.8).

Mental/Psychosocial Status

There were significant differences for all mental status and psychosocial status measures ($p < .001$) (Table 4). Higher levels of mental functioning were found in the group who continued to drive for both the MMSE and the Cognition section of the FIM, with less variance within the D-group than the CD- and ND-groups. For the MMSE, mean scores were 28.7 (2.2) for the D-group, 26.7 (4.2) for the CD-group, and 26.1 (5.6) for the ND-group. For FIM Cognition, the mean scores were 33.3 (1.6) for the D-group, 31.8 (3.8) for the CD-group, and 31.6 (5.4) for the ND-group. Of the D-group, 67.5% reported a good to very good quality of life, compared to 58.1% for the CD-group and 67.0% for the ND-group. Similarly, the D-group had greater life satisfaction, with 83.5% describing themselves as "fairly well satisfied" to "very satisfied" compared with 73.8% and 69.7% of the CD- and ND-groups, respectively. Members of the D-group also scored lower on depression (9.3 (7.9), than either the CD-group (13.3 (10.1), or the ND-group (15.6 (11.0), as measured by the CESD. The D-group also scored significantly higher on levels of self-esteem (33.6 (4.4), than either the CD-(30.8 (5.1) or ND-groups (31.4 (5.0).

DISCUSSION

This study investigated the relationship of driving status of frail elders to demographics, health status, functional status, and mental and psychosocial status. Many of the findings from this study are consistent with those found in the literature. The capacity to drive an automobile is ultimately linked to other activities of daily living. Difficulties with driving for the elderly usually result from diminished cognitive skills, sensory abilities, and/or physical functioning.

Overall, the participants who were still driving had better health, functional status, and mental capacities than those who had ceased driving or had never driven an automobile. Those who continued to drive

TABLE 4. Comparison of Mental/Psycho-Social Variables by Driving Groups

Variables	Total (n = 697)		Drive (n = 282)		Drove (n = 307)		Never Drove (n = 108)		p-value
Quality of Life, n (%)									
Very well: Could hardly be better	118	(17.7)	68	(24.3)	40	(14.0)	10	(10.0)	
Pretty good	304	(45.7)	121	(43.2)	126	(44.1)	57	(57.0)	
Good and bad parts about equal	183	(27.5)	74	(26.4)	87	(30.4)	22	(22.0)	<0.001
Pretty bad	45	(6.8)	14	(5.0)	24	(8.4)	7	(7.0)	
Very bad: Could hardly be worse	16	(2.4)	3	(1.1)	9	(3.2)	4	(4.0)	
Life Satisfaction, n (%)									
Not satisfied	61	(9.2)	17	(6.1)	30	(10.5)	14	(14.1)	
More satisfied than not	90	(13.6)	29	(10.4)	45	(15.7)	16	(16.2)	<0.001
Fairly well satisfied	287	(43.3)	108	(38.9)	132	(46.2)	47	(47.5)	
Very satisfied	225	(33.9)	124	(44.6)	79	(27.6)	22	(22.2)	
Mini Mental Status Exam,									
mean (SD)	27.4	(4.0)	28.7	(2.2)	26.7	(4.2)	26.1	(5.6)	<0.001
CESD Depression Scale,									
mean (SD)	11.9	(9.7)	9.3	(7.9)	13.3	(10.1)	15.6	(11.0)	<0.001
FIM Cognition,									
mean (SD)	32.4	(3.6)	33.3	(1.6)	31.8	(3.8)	31.6	(5.4)	<0.001
Rosenberg Self Esteem Scale,									
mean (SD)	32.1	(5.0)	33.6	(4.4)	30.8	(5.1)	31.4	(5.0)	<0.001

were younger, more likely to be male, had a higher level of education, and were more likely to be married compared to those who had ceased driving or had never driven.

The results of this study paralleled the findings of Marottoli et al. (1993, 1997, 2000) despite a difference in functional performance between the two study populations. Inclusion criteria for the CAS sample required the individual to be deficient in at least one activity of daily living, whereas only 4% of the Marottoli sample reported having ADL disabilities. Approximately 44% of the CAS subjects had ceased driving, which was similar to findings in Marottoli's study, where 40% of participants had ceased driving (Marottoli, Ostfeld et al., 1993). Additionally, Marottoli (2000) found that the driving group had higher cognition, fewer visual problems, and fewer ADL limitations and medical conditions. Similarly, hearing problems were not significantly associated with driving status. Women represented a substantial portion of the CAS sample who never drove (96.3%). Marottoli found similar results in his study (88% women) (Marottoli, Ostfeld et al., 1993). Those in the CAS sample who were still driving reported a higher quality of life, life satisfaction, and less depression than those who stopped driving or who never drove, a finding similar to earlier studies (Marottoli, Mendes de Leon et al., 1997; Bonnel, 1999; Marottoli, Mendes de Leon et al., 2000).

The ND-group in the present study differed from the other groups in several ways and may represent a unique population. This group was much more likely to be female, Black, widowed, with lower levels of education and income, and living alone in rented homes. This group also scored highest on the CESD, indicating more depression. The ND-group traveled only about half the distance of the driving group. This may be reflective of the actual need to travel. Having to depend on others or on commercial vehicles for medical appointments and grocery shopping may force members of the ND-group to restrict their travel. A higher percentage of minorities was also found in the group of non-drivers. Compared to the CD-group, a significantly greater percentage of D-group participants lived alone (58.5% vs. 49.2%).

Those who continued to drive were far more mobile than their counterparts who ceased driving or never drove. The number of medical conditions was also lowest in the D-group. The differences in miles traveled for the D-group may be indicative of the freedom that a driver has in choosing where and when to travel. Not having to rely on others, or having to pay for commercial travel, allows the driver more independence when

making travel decisions. The D-group reported much better vision than the CD and ND groups.

Many older drivers have made no plans for alternatives to driving. Those who have thought about alternatives expect to rely on friends and family for transportation. Elders who live alone, have no close family, and have less money are at a disadvantage when they stop driving (Raymond, Knoblauch et al., 2001). Almost half of subjects in this study who ceased driving expressed a desire to drive again, underlying the importance we place on the automobile and the ability to drive. For those who do not drive a car, alternative transportation must be arranged. Different capabilities are needed to utilize transportation services. For example, a bus passenger must be able to get to the bus stop and board the bus. An individual's abilities determine usable transportation options.

It is essential that all therapists, regardless of practice areas, recognize driving as an instrumental activity of daily living (IADL) and ask their clients driving-related questions. Schold-Davis (2003) asserts that all occupational therapists (OT) possess the basic skill set necessary to help clients achieve and maintain community mobility, which includes driving. These skill sets range from the OT as a generalist who may evaluate driving subskills, such as strength and range of motion, to the OT with specialized training in driver rehabilitation. There is a need for more OTs with advanced and specialized training to meet the needs of America's aging population. There are currently more than 27 million licensed drivers aged 65 and over (2002) and fewer than 300 Certified Driving Rehabilitation Specialists (*www.ADED.net*).

Having the ability to acquire needed goods and services (e.g., groceries and medical appointments) is essential to living at home and the therapist must consider transportation options during discharge planning. The results of this study support earlier findings and provide the therapist with insights into identifying those clients who may not be appropriate for discharge to home.

In the case of a client whose husband recently became incapacitated, knowledge that females are more likely to have never driven, having relied on their husbands to drive, may prompt the therapist to ask questions related to transportation. Additionally, knowing that women are more likely to have ceased driving prematurely may prompt a referral to a driving rehabilitation program for a woman in similar circumstances. Knowledge of one's living situation (those who live alone may be forced to drive past their ability to safely do so), financial status (do they have the ability to purchase transportation?), and social supports (do

children live nearby and can they provide transportation?) are also important to consider during discharge planning.

Although the presence of various medical conditions is not sufficient to determine a client's ability to drive safely, the prevalence of medical conditions and the use of multiple medications is cause for concern for the therapist. Knowing that certain health conditions and medications have been shown to affect safe driving allows the therapist to make informed decisions when making recommendations to drivers or referrals to driver rehabilitation programs. Therapists may also be the first to notice diminished vision in elderly clients and make appropriate referrals.

Age-related cognitive changes that affect problem solving, attention, and decision making, all crucial to safe driving, often lead to driving cessation. In the present study, those who still drove had the highest mental status scores. Older drivers often compensate for these age-related changes by limiting their driving, avoiding situations that may be problematic. Those with cognitive deficits may not be aware of these changes and, therefore, fail to limit their driving. For clients with cognitive difficulties, it is important for therapists to assess their self-awareness and ability to recognize that their deficits may affect safe driving.

Not only does compromised mental status increase the likelihood of driving cessation, driving cessation can impact cognitive status. Bassuk et al. (1999) reported that those with fewer social contacts, which may result from driving cessation, might be at risk for cognitive decline. Driving cessation can isolate a person from activities that had once been important, and may increase the risk for depressive symptoms (Marottoli, Mendes de Leon et al., 1997; Eberhard, 2001). These findings emphasize the need for therapists to address mobility options to ensure clients' participation in life's activities.

The confirmatory results of this study illustrate an important problem associated with the elderly and our aging society: driving cessation and transportation issues. Older people who must cease driving and are not able to compensate for decreased mobility with the use of alternative transportation may be at risk for social isolation, depression, and decreased access to medical and community services. They may also have difficulty finding transportation for such basic needs as physician and pharmacy visits and grocery shopping.

Occupational therapists may be the profession best suited to address the needs of the elderly driver by providing assessment, remediation, and referral, when necessary, to enable the older driver to continue driving safely for a longer period of time. OTs may also provide education

and training in the use of alternatives to the automobile when driving is no longer a safe option.

A better understanding of the reasons why elders stop driving might help them maintain and/or regain their ability to drive safely. The patterns of use of alternative transportation by elders also need to be further examined to ensure that the elderly maintain their ability to remain transportation independent as they age within their communities.

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