Accident Analysis and Prevention 40 (2008) 1576–1580

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Self-regulatory driving practices among older adults: Health, age and sex effects

Lidia P. Kostyniuk*, Lisa J. Molnar

University of Michigan Transportation Research Institute, 2901 Baxter Road, Ann Arbor, MI 48109, United States

ARTICLE INFO

Article history:
Received 29 June 2007
Received in revised form 28 January 2008
Accepted 21 April 2008

Keywords:
Driving self-regulation
Older drivers
Driving reduction

ABSTRACT

The purpose of this study was to better understand how older adults self-regulate driving, and to identify differences by age, sex, and health-related functioning. Michigan drivers over age 64 were surveyed by telephone ($n = 961$, age [$\mu = 74.2$, $\sigma = 5.8$], 56% female) about their driving-related behaviors, physical functioning, and health. Respondents were presented with scenarios involving driving to an important appointment under adverse conditions (rainy stormy weather, on alternate route in heavy freeway traffic, 200-mile trip on unfamiliar roads). Generalized logit models examined outcomes for each scenario: driving as usual, driving with modifications, and not driving. Results indicate that the effect of sex on self-regulation was significant and greater than that of age and physical functioning. Women were more likely to self-regulate by not driving. Odds ratios and 95% confidence limits for each scenario for women vs. men are 6.8 (3.8–2.0), 6.5 (3.6–12.0), and 17.7 (11.0–28.6). The effect of sex on self-regulation by modifying driving was smaller and significant only in scenarios 2 and 3. Women were more likely then men to modify driving for scenario 2 (odds ratio, 3.0 (2.0–4.5)) and scenario 3 (odds ratio 4.4 (3.1–0.1)). Overall, the study finds the relative effect of sex on self-regulation greater than that of age and physical functioning for conditions examined.

1. Background

The aging of the population in the United States (US) and elsewhere has focused increasing attention on the issue of older adult safety and mobility. It is clear that people are living longer than in the past. In the US, the proportion of people 65 years of age or older has grown from less than 10% in 1950 to the current rate of about 13%. By 2030, the percentage of the US population over 65 years of age is projected to reach nearly 20% (US Census Bureau, 2006). In terms of absolute numbers, those over 65 years of age will increase from about 35 million currently to about 70 million in 30 years (US Department of Commerce, 2001). As described by Hakamies-Blomqvist (2004), it is less clear whether older drivers are at a higher risk of crash than younger drivers. The basis of this issue is that the typical measures of exposure (population, licensed drivers, and vehicle-miles-traveled) are either potentially biased or are difficult to determine accurately. Nonetheless, there is strong evidence that for a crash of given dimensions, an older driver is more likely to be injured than a younger driver, due, presumably, to increased frailty (e.g., Massie and Campbell, 1993). As such, older drivers are likely to be overrepresented in fatal and serious crashes (Hauer, 1988; Maycock, 1997).

Older drivers as a group are involved in different types of crashes than younger drivers. For example, when compared with younger drivers, drivers age 65 and older, and particularly drivers age 75 and older, have more vehicle-to-vehicle collisions, more intersection crashes, and fewer alcohol-involved crashes (e.g., Dulisse, 1997; Eby, 1995; Hakamies-Blomqvist, 1998, 2004; Hauer, 1988). However, older drivers tend to self-regulate their driving to reduce the demands of the driving task (Gallo et al., 1999; Kostyniuk et al., 2000). Self-regulation includes reducing driving in general as well as avoiding specific driving situations (e.g., driving at night, in bad weather, on the highway, or in heavy traffic).

Several studies have shown that at least some older drivers do self-regulate their driving by reducing their driving exposure (e.g., taking fewer trips and/or driving shorter distances; e.g., Benekohal et al., 1994; Charlton et al., 2006; Klavora and Heslegrave, 2002; Marottoli et al., 1993; Raitanen et al., 2003; Ruechel and Mann, 2005) or by avoiding specific driving situations such as driving at night, in bad weather, in heavy traffic or during rush hour, and making left turns (e.g., Baldock et al., 2006; Benekohal et al., 1994; Charlton et al., 2006; Hakamies-Blomqvist and Wahlstrom,

* Corresponding author. Tel.: +1 734 763 2466; fax: +1 734 936 1076.
E-mail addresses: lidakost@umich.edu (L.P. Kostyniuk), ljmolnar@umich.edu (L.J. Molnar).

0001-4575/$ – see front matter © 2008 Elsevier Ltd. All rights reserved.
doi:10.1016/j.aap.2008.04.005

1998; Klavora and Heslegrave, 2002; Kostyniuk and Molnar, 2005; Ruechel and Mann, 2005; Stalvey and Owsley, 2000).

However, the amount and type of self-regulation varies across studies. For example, self-reported rates of avoidance of night driving range from 8% (Baldock et al., 2006) to 80% (Ball et al., 1998), with many rates falling somewhere in between (e.g., Charlton et al., 2006, 25%; Ruechel and Mann, 2005, 60%). At the same time, some findings relative to self-regulation are relatively consistent. Women appear to self-regulate their driving more than men (e.g., Charlton et al., 2006; Hakamies-Blomqvist and Wahlstrom, 1998). In addition, individual's perceptions of confidence and insight into their functional impairments appeal to plan an important role in their adoption of self-regulatory practices (e.g., Owsley et al., 2003). Further research is needed to better delineate older drivers characteristics and other factors influencing self-regulation. The purpose of the research reported here was to better understand the process of self-regulation among older drivers by examining the effects of health-related functioning, age, and particularly sex, on self-regulation of driving.

2. Methods

Questions related to health, functional status, and driving-related issues were included in a 30-min telephone interview of a random sample of 1053 adults age 65 and older with a current or recently expired driver license in the state of Michigan. The telephone survey was part of a larger research effort investigating the process of driving reduction and cessation among older drivers (Kostyniuk et al., 2000). Respondents identifying themselves as still driving (i.e., active drivers) were presented with scenarios involving driving to an important appointment under adverse conditions: in rainy, stormy weather; taking an alternate route in heavy traffic, and on a long trip on unfamiliar roads. Respondents were asked to imagine that they usually drove themselves to the type of appointment presented and asked if they would still drive themselves, modify their driving routine in some way, or not drive under the various scenarios presented.

Based on responses by subjects, logistic regression models of scenario responses as a function of health and functional status, age, sex were estimated. Logistic regression analysis was selected because it is well suited to modeling proportions, while controlling for various respondent characteristics. As part of the modeling effort, principal component factor analysis was used to examine the relationships between age and the functional status and health variables, and to select variables for the logistic regression models.

2.1. Respondent characteristics

The analysis presented here is limited to 961 respondents who were active drivers and were cognitively unimpaired, as indicated by a set of questions included in the telephone interview that had been used elsewhere to assess cognitive impairment (Herzog and Wallace, 1997). The mean age of respondents was 74.2 years ($\sigma = 5.8$) and 56% were female.

2.2. Survey questions

Respondents were asked a series of questions relative to driving to an important appointment under adverse conditions. The questions, the distribution of the responses, and the number of respondents for each question are listed below.

(I) "Let's say you must get to a very important appointment. You usually drive there by yourself, but it's a rainy stormy day. Would you:
1. Drive yourself as usual (18.2%)
2. Drive yourself but start earlier (65.0%)
3. Try to get someone to ride with you (2.4%)
4. Try to get someone else to drive you (7.7%)
5. Take a bus, van, or taxi (0.3%)
6. Cancel or change the appointment?" (6.4%)
Number of responses = 961

(II) "Again you must get to a very important appointment. You usually drive there by yourself and take a two-lane road. The road is closed due to construction and you will have to drive on a freeway in heavy traffic to get to your appointment. Would you:
1. Drive yourself on the freeway (75.3%)
2. Try to get someone to ride with you (3.3%)
3. Try to get someone else to drive you (6.7%)
4. Take a bus, van, or taxi (0.3%)
5. Cancel or change the appointment?" (3.4%)
Number of responses = 961

(III) "This time the very important appointment is about 200 miles away. The simplest way to get there would be to drive by yourself. The trip would be in an area that you are not familiar with. Would you:
1. Drive yourself (34.0%)
2. Try to get someone to share the driving with (13.1%)
3. Try to get someone to ride with you (27.3%)
4. Try to get someone else to drive you (18.4%)
5. Look for another way to get there, such as a bus, train, or plane (3.2%)
6. Cancel the appointment, not go?" (4.0%)
Number of responses = 959

Respondents were also asked a set of questions about their overall health, physical functioning with respect to their ability to walk and climb stairs, and distance and near vision. The health and physical functioning questions and distribution of responses are listed below.

1. "Would you say your overall health is... Excellent (19.8%), very good (36.7.0%), good (32.0%), fair (9.8%), poor (1.7%)?" Number of responses = 961.
2. "How good is your eyesight for seeing things at a distance, like recognizing a friend across the street? If you wear glasses assume you're wearing them. Is your eyesight for seeing things at a distance... Excellent (29.1%), very good (38.3%), good (28.6%), fair (3.2%), poor (0.7%)?" Number of responses = 961.
3. "How good is your eyesight for seeing things up close? If you wear glasses assume you're wearing them. Is your eyesight for seeing things up close... Excellent (29.9%), very good (36.3%), good (28.1%), fair (4.7%), poor (1.0%)?" Number of responses = 961.
4. "How able are you to walk a half mile... Very able (65.8%), somewhat able (18.0%), not very able (8.4%), not at all able (7.8%)?" Number of responses = 961.
5. "How able are you to climb two flights of stairs... Very able (61.1%), somewhat able (28.3%), not very able (7.3%), not at all able (3.3%)?" Number of responses = 961.

3. Analysis

Principal component analysis was used to examine the relationships between the responses to the health-related physical functioning questions and age (65–74, 75–84, 85+ years). The factor loadings are shown in Table 1.

From the factors and loadings, it can be seen that respondents' ability to walk one-half mile, climb two flights of stairs, and overall health tended to go together forming a "mobility" factor. The vision responses also tended to be correlated, forming a "vision" factor. Age category was in a factor by itself. To minimize multicollinearities in the modeling analysis, the variable with the highest factor loading in each factor was selected to be included in the model for each scenario.