

Report No. M-CASTL-2009-04



**A New Approach to Assessing Self-Regulation by
Older Drivers: Development and Testing of a
Questionnaire Instrument**

**Lisa J. Molnar¹, David W. Eby¹,
J. Scott Roberts², Renée St. Louis¹, and Jim Langford³**

University of Michigan

¹ **University of Michigan Transportation Research Institute**

² **University of Michigan School of Public Health**

³ **Monash University Accident Research Centre**

December 2009



Disclaimer

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein, This document is disseminated under the sponsorship of the Department of University Transportation Centers Program, in the interest of information exchange. The U.S. Government assumes no liability for the contents or use thereof.

Technical Report Documentation Page

1. Report No. M-CASTL-2009-04	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle A New Approach to Assessing Self-Regulation by Older Drivers: Development and Testing of a Questionnaire Instrument		5. Report Date December 2009	
		6. Performing Organization Code	
7. Author(s) Molnar, L.J., Eby, D.W., Roberts, J.S., St. Louis, R., and Langford, J.		8. Performing Organization Report No.	
9. Performing Organization Name and Address Univeristy of Michigan Transportation Research Institute 2901 Baxter Road, Ann Arbor, MI 48109-2150		10. Work Unit no. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Michigan Center for Advancing Safe Transportation Throughout the Lifespan 2901 Baxter Rd., Room #111, Ann Arbor, MI 48109-2150 U.S.A		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract <p>Appropriate self-regulation of driving; that is, adjusting one's driving patterns by driving less or avoiding specific situations in which one feels unsafe or uncomfortable, shows considerable promise as a strategy for compensating for functional declines and enabling older drivers to extend the time period over which they can safely drive. However, there is considerable variation across studies on self-regulation, making it difficult to determine the extent of self-regulatory practices by older drivers. The purpose of this project was to improve our understanding of the process of self-regulation by older drivers and how it relates to important driver characteristics including sex, confidence in driving ability, and functional abilities by: 1) developing a computer-based questionnaire instrument for use by jurisdictions in the United States and elsewhere to measure, in a comprehensive manner, the self-regulatory practices employed by older drivers; and 2) pilot testing the instrument with a sample of older drivers comprised of individuals with clinically-determined functional impairments in vision, cognition, or psychomotor ability, as well as normally functioning older adults recruited from the general population. Feedback on the computer-based questionnaire instrument was positive, with most participants considering the questions easy to read and understand (98.5% and 89.1%, respectively) and finding the length to be reasonable (93.4%). Most (91.2%) were satisfied with the computer format, despite the fact that only 11% described their level of experience with computers as high. Older participants were less satisfied with the computer format, although satisfaction was still high (81.6%). Overall, almost three-quarters of participants reported that if given a choice, they would prefer to take the questionnaire on a computer. Results indicate that overall, participants reported few life-goals changes with the exception of buying a different vehicle in the past year. Sizable numbers of participants reported that they try to avoid a variety of specific driving circumstances (e.g., driving at night, in rush hour traffic, in bad weather, and at night in bad weather). Many planned out their trips ahead of time or reduced overall travel by combining trips. A majority tried to avoid in-vehicle distractions with the exception of changing radio stations. Very few reported having made modifications to their vehicles during the past year to make driving easier. Differences by sex, recruitment population (general versus clinic), and age group are discussed.</p>			
17. Key Words Safety, Mobility, Self-Regulatory Practices, Driving Avoidance		18. Distribution Statement Unlimited	
19. Security Classification (of this report) Unclassified	20. Security Classification (of this page) Unclassified	21. No. of Pages 51	22. Price

ACKNOWLEDGMENTS

The authors thank several individuals who were instrumental to the completion of this project. Shawn Marshall provided valuable insights on the challenges that older adults face relative to safe mobility, thereby contributing to the conceptual design for the project. Gary Bubar assisted in development of the research design and questionnaire instrument. Lisa Moran and Amanda Dallaire provided administrative support for the project. Sherry Day, Michelle Tehranisa, and Donna Wicker assisted in recruitment of participants from Kellogg Eye Center. Brian Atkinson, Nancy Barbas, Jennifer Merritt-Hackel, Judith Heidebrink, Mary Rumman, Laura Rice-Oeschger, Renee Price, Jocelyn Wiggins, Raymond Yung, and Mark Ziadeh assisted in recruitment of participants from the various clinics/programs affiliated with the U-M Turner Geriatric Clinic. Jude Charlton of Monash University Accident Research Centre provided valuable input on the study design and instrument development, as well as the analyses and interpretation of results.

This work was completed in partial satisfaction of the requirements for a doctorate degree from Monash University Accident Research Centre for the first author.

INTRODUCTION

Background

Driving is a complex task that requires visual, cognitive, and psychomotor abilities. As people age, most will experience some loss in these abilities as a result of medical conditions, the medications used to treat them, or the aging process itself (Eby, Molnar, & Kartje, 2009; Molnar, Eby, St. Louis, & Neumeyer, 2007). At the same time, there is considerable variation in how individuals experience these declines (Department of Transport, 2001; Eby, Trombley, Molnar, & Shope, 1998; European Road Safety Observatory, 2006; Janke, 1994) and the impact of such declines on actual crash risk are not always fully known (Whelan, Langford, Oxley, Koppel, & Charlton, 2006).

Appropriate self-regulation of driving; that is, adjusting one's driving patterns by driving less or avoiding specific situations in which one feels unsafe or uncomfortable, shows considerable promise as a strategy for compensating for these declines and enabling older drivers to extend the time period over which they can safely drive (Molnar & Eby, 2009). Research in this area is important because most older drivers prefer driving as the means of maintaining mobility (Molnar & Eby, 2009) and it is considered to be essential to independence and quality of life (Carp, 1988; Kaplan, 1995). Having to stop driving because of declining abilities can be traumatic and life changing for older adults (Dickerson, Molnar, Eby, et al., 2007; Molnar, Eby, & Dobbs, 2005). Driving provides an opportunity for people to stay engaged civically and socially, and to participate in activities that enhance their well being, particularly in areas where transportation options are limited. Loss of driving can lead to increased social isolation by preventing regular contact with friends and family (Liddle, McKenna, & Broome, 2004; Ragland, Satariano, & MacLeod, 2004), and is associated with not only a loss of independence, mobility, and freedom (Adler & Rottunda, 2006; Bauer, Rottunda, & Adler, 2003; Dobbs & Dobbs, 1997) but also with feelings of diminished self-worth, reductions in self-esteem, and loss of identity (Eisenhandler, 1990). There is also evidence that driving cessation is associated with increased depressive symptoms among older adults (Fonda, Wallace, & Herzog, 2001; Marottoli, Mendes de Leon, Glass, et al., 1997; Ragland, Satariano, & MacLeod, 2005).

There is general agreement that at least some older drivers are aware of their functional declines and self-regulate their driving (see Molnar & Eby, 2008 for a review of this literature). Thus, such self-regulation of driving shows considerable promise as a strategy for compensating for functional declines and enabling older drivers to extend the time period over which they can safely drive. However, there is considerable variation across studies, making it difficult to determine the extent of self-regulation by older drivers. Rates of self-reported avoidance of night driving, for example, vary from 8 percent (Baldock, Mathias, McLean, & Berndt, 2006) to 25 percent (Charlton, Oxley, Fildes, Newstead, Koppel, & O'Hare, 2006), to 60 percent (Ruechel & Mann, 2005), to 80 percent (Ball, Owsley, Stalvey, Roenker, Sloane, & Graves, 1998).

There are also mixed results with regard to the association between self-regulation by older drivers and the functional declines they may be experiencing (see Baldock et al., 2006; Ball, et al., 1998; Charlton, Oxley, Fildes, & Les, 2001; Charlton, et al., 2006; Stalvey & Owsley, 2003), suggesting that older adults may not always self-regulate their driving appropriately. While it appears that gender (Charlton et al., 2001; Kostyniuk & Molnar, 2007, 2008; Hakamies-Blomqvist & Wahlström, 1998), self-perceptions of driving confidence (Baldock et al., 2006; Charlton et al., 2001), and awareness of and insight into functional impairments (Ball et al., 1998; Freund, Colgrove, Burke, & McLeod, 2005; Owsley, McGwin, Mays, et al., 2004; Owsley, Stalvey & Phillips, 2003; Stalvey & Owsley, 2003) are closely tied to self-regulation, these factors are not consistently examined in studies.

The lack of conclusive results in this area is due in large measure to the considerable differences across studies in terms of how self-regulation is measured, the characteristics of study subjects (e.g., sex, functional status), and the extent to and way in which studies have included measures that seem to influence the adoption of self-regulatory practices such as insight into functional declines and confidence in driving ability. In addition, most studies on self-regulation have limited their measures to a narrow set of driving situations such as driving at night, on the freeway and so forth. Important questions remain about the extent to which and the conditions under which older drivers do self-regulate their driving. There is a

need for a more comprehensive, theoretically-informed, and uniform approach to understanding self-regulation by older drivers that encompasses both how older drivers reduce the extent of their driving exposure as well as how they modify the nature of their driving exposure. That is, it is important to understand not only the extent to which older drivers drive less or avoid specific driving situations, but also the broader choices they make in compensating for functional declines such as the types of vehicles they buy, the vehicle design features they choose, and even where they choose to live.

Project Objectives and Aims

The purpose of this project was to improve our understanding of the process of self-regulation by older drivers and how it relates to important driver characteristics including sex, confidence in driving ability, and functional abilities by: 1) developing a computer-based questionnaire instrument for use by jurisdictions in the United States (US) and elsewhere to measure, in a comprehensive manner, the self-regulatory practices employed by older drivers; and 2) pilot testing the instrument with a sample of older drivers comprised of individuals with clinically-determined functional impairments in vision, cognition, or psychomotor ability, as well as normally functioning older adults recruited from the general population. This study was intended to build on and at the same time extend the current thinking in the US and internationally, and to yield findings that will inform the development of practical efforts to enhance the safety and mobility of older adults around the world.

The specific aims of the project were to:

- 1) Develop a comprehensive self-report measure of self-regulatory practices by older drivers that conceptualizes self-regulation as both reducing the extent of driving exposure and modifying the nature of driving exposure.
- 2) Base development of the instrument on a conceptual framework derived from review of the relevant literature, consultation with selected experts outside of the US who are involved in complementary research, and analysis of data from an existing UMTRI naturalistic driving

data base that contain objective measures of driving practices, as well as data currently being collected on drivers with memory loss through instrumentation of their personal vehicles.

3) Pilot test the instrument with a sample of older drivers recruited from not only the general population, but also with known losses in vision, cognition, or psychomotor abilities.

4) Based on pilot test results, produce a final instrument that can be used by individual jurisdictions in the US and other countries for studying self-regulation, as well as in future large-scale longitudinal studies of self-regulation involving multiple sites and investigators.

Project Framework

This project conceptualized self-regulation as both reducing the extent of driving exposure and modifying the nature of driving exposure. As a framework for examining and understanding self-regulation, a model of driver behavior and decision making including four levels was used: operational, tactical, strategic, and life-goals. The first three levels are based on Michon's (1979, 1985) hierarchical model of driver behavior. The lowest level, operational, has to do with the details of driving that are largely automated (e.g., steering movements, braking; Berg, 2006). The tactical level has to do with the actual maneuvers drivers make in traffic in response to conditions in the driving environment (e.g., obstacle avoidance, gap and headway acceptance, turning, passing). Strategic behavior includes higher level decisions about trip goals, mode of transit, driving route, circumstances under which to drive (e.g., time of day, weather conditions), and evaluation of the costs and risks involved (Michon, 1985; Smiley, 2004).

The fourth level, termed "life-goals" was added (Eby, Molnar, & Kartje, 2009) to take into account the experiences and motivations of drivers, which interact with drivers' skills and therefore affect their driving performance (Keskinen, 2007). This fourth level is adapted from work by Hatakka et al. (2002), Keskinen (1996), Keskinen, Hatakka, Laapotti, Katila, and Peraaho (2004), Laapotti and Keskinene (2004), and others, and has to do with drivers' general motives and attitudes in life and how they affect driving; it is connected not only to the motives and personal development of drivers but also to the cultural norms of society

(Laapotti & Keskinen, 2004). The premise underlying this highest level is that factors related to what individuals are like and how they live their day-to-day lives also affect approaches to driving and specific driving behaviors (Berg, 2006). Among these factors are personality traits such as self-control, as well as lifestyle, social background, gender, age, and group affiliation (Gregersen & Berg, 1994; Hatakka, 1998; Jessor, 1987; Schulze, 1990).

Although the life-goals level was developed to address the elevated crash risk of young drivers (Gregersen & Berg, 1994), it has direct applicability to older drivers and the decisions they make. The greatest opportunity for self-regulation of driving is at the highest levels of decision making. For example, many older drivers make changes at the strategic level in terms of how much they drive and under what circumstances (e.g., time of day, weather conditions, type of road). These changes may be in response to the recognition that functional abilities have declined or they may result from changes in social needs, often due to changing social roles brought about by major life changes such as retirement or the death of a spouse (Smiley, 2004). For these latter changes, the fourth level of skills (life-goals) is particularly salient. For example, it is at this highest level that lifestyle decisions are made such as what kind of motor vehicle to drive, with safety-conscious consumers tending to buy larger cars (Summala, 1996). Thus, extending Michon's three-levels to include the "life goals" level provides a valuable framework for thinking about the decisions that older adults make that affect their driving safety.

METHODS

This study took place in two phases: the first phase involved developing the questionnaire instrument and the second phase involved pilot testing the questionnaire instrument with a sample of older drivers. Prior to commencing study tasks, approval for working with human subjects was obtained from the University of Michigan (U-M) Institutional Review Board.

Phase 1: Development of Questionnaire Instrument

Development of the questionnaire was based on review of the relevant literature on older driver self-regulation, consultation with experts in the field, and analysis of data from an existing UMTRI database of naturalistic driving. The existing UMTRI database contains driving data for 26 drivers age 60-70 at the time of data collection.

Several databases were searched as part of the literature review, using key words identified by members of the study team. Databases included TRISonline, Transport, PSYCINFO, LexisNexis, ProQuest, Health and Psychosocial Instruments, ScienceDirect, MEDLINE, NUCat (with holdings from the Northwestern University Transportation Library), Melvyl (with holdings from the University of California Berkeley Institute for Transportation Studies), TLCat (with holdings from all transportation member libraries), and UM-MIRLYN. Document gathering was facilitated by the U-M's Network of Electronic Resources (see: <http://www.lib.umich.edu/eresources/>), which allows U-M faculty and staff electronic access to these databases as well as dozens of others. The UMTRI library was also a valuable resource; it contains a comprehensive collection of domestic and international transportation literature. A search of appropriate Internet websites was also conducted. Collected articles and information were reviewed for appropriateness and synthesized.

The questionnaire instrument underwent several rounds of review and revision by members of the study team to ensure not only that the content was comprehensive and appropriate (i.e., that the instrument addressed the full set of issues identified as being important to driving self-regulation), but also that the layout was user-friendly, instructions were clear, and the language used was easy to understand. To facilitate this process, input was sought from a

small selected group of older adults on the design of the instrument, through individual and group discussions. The final questionnaire instrument addresses several topics including self-regulatory driving practices; confidence in driving ability; insight into functional declines; and other health and driving-related issues. The questionnaire was designed to take about 30-45 minutes to complete.

Phase 2: Pilot Testing of Questionnaire Instrument

Subject recruitment

Two major subgroups of participants were recruited for the pilot test of the questionnaire instrument – both subgroups were made up of current drivers age 70 and older with a valid driver license. The first subgroup for the study consisted of 105 normally functioning older adults recruited from the general population. Driver history files provided by the Michigan Department of State (MDOS) were used to select a random sample of 1,500 drivers age 70 and older residing in Southeastern Michigan. Permission was received from MDOS to use the driver history files which are housed at UMTRI . Letters were sent to each selected person in the sample inviting them to participate in the study. The letter included a telephone number that interested individuals could call so that a study team member could confirm their eligibility, recruit them into the study if they met eligibility criteria, and schedule a time for them to complete the questionnaire.

The second subgroup consisted of 32 individuals with losses in vision, cognition, or psychomotor ability, as determined through clinical assessment. Participants in this subgroup were recruited from patients of the U-M Turner Geriatric Clinic as well as the U-M Kellogg Eye Center. The Turner Geriatric Clinic provides comprehensive multi-disciplinary assessment and ongoing primary care for older adults. It offers several specialty clinics that specifically target individuals with cognitive and/or psychomotor impairments. Kellogg Eye Center contains a Low Vision and Visual Rehabilitation Clinic as well as a general eye clinic. Collectively, Kellogg Eye Center treats patients with vision loss ranging from mild visual impairment to legal blindness.

Recruitment of participants from the Turner Geriatric Clinic and the Kellogg Eye Center took place through the use of flyers and a project description form provided to physicians/health professionals in the clinics. Recruitment took place in two ways. The first way was that potential participants who learned about the study through the flyer and were interested in participating called the telephone number listed on the flyer and were screened by a study team member to confirm eligibility. If eligible, they were recruited into the study and an appointment was set up for them to complete the questionnaire. The second way was that physicians and other clinicians informed potentially-eligible patients about the study and asked if they were willing to be contacted by a member of the project team to discuss participation in the study. If patients agreed to be contacted, their contact information was forwarded to the project team member who then contacted them to confirm eligibility. If eligible, they were scheduled for questionnaire completion.

The total sample for the study, using both methods of participant recruitment, was 137; 105 from the general population and 32 from the clinic population. This number was considered sufficiently large enough to provide meaningful preliminary results for the pilot study.

Administration of questionnaire

The computer-based questionnaire was administered to study participants, in-person, by a member of the research team. This took place either at UMTRI or the Turner Geriatric Clinic, depending on availability of project team staff and facilities, and preferences of study participants. In either case, administration of the questionnaire instrument occurred in a private setting (i.e., in a room closed off from public areas). After completing a written informed consent, participants immediately completed the questionnaire. They were also asked to briefly provide feedback on the instrument itself and their experience in completing it (e.g., clearness of instructions, understandability of language). Participation in all of the study protocols occurred over one session and lasted from 45 minutes to 1 hour. Each participant was paid \$35 for his or her time at the end of the session.

Statistical design

Data from the pilot test were entered into an electronic database and analyzed using SAS Software. The overall purposes of the analyses were to: 1) summarize study participants' feedback about the questionnaire content and administration; 2) generate a set of univariates that describe the variables of interest; and 3) explore, in a preliminary manner, a number of bivariate relationships including those between self-regulatory practices and other variables of interest including sociodemographic variables (e.g., age, sex), functional impairments, participants' insight into their functional impairment, and driving confidence/comfort.

The univariate analyses involved generating percentage distributions for nominal/ordinal level variables (e.g., sex, age group, whether or not participants avoided various driving circumstances) and means for interval/ratio scale variables (e.g., self ratings of abilities for safe driving, feelings of comfort in various driving circumstances). The bivariate analyses were also based on the level of measurement of each variable of interest and involved examination of participant responses for each questionnaire item by sex (men versus women), recruitment population (general versus clinic), and age group (age 70-79 versus age 80-88) as well as selected variables thought to influence self-regulation (e.g., perceptions of abilities and feelings of comfort). For nominal/ordinal level dependent variables, either the Chi-Square Test or Fisher's Exact Test was used depending on the number of observations in each cell of the contingency table (Chi-Square for contingency tables with at least 5 observations in each cell; otherwise, Fisher's Exact). For interval/ratio scale variables, we used a nonparametric test, the Wilcoxon Signed Rank Test, rather than a t-test to compare group means for each of the variables of interest because several of the variables were not normally distributed or the sample sizes were small (see Cody & Smith, 1997).

Nonparametric methods generally have the additional advantage of being resistant to outliers and other extreme values. We had reasonable expectations that differences between men and women, general and clinic population, and older and younger participants would be in one direction or the other (more or less) depending on the variable of interest. However, to be conservative, we used a two-tailed rather than a one-tailed test for each of the group mean comparisons. For comparing two interval/ratio level variables, we used Spearman Correlations.

Sample characteristics

Characteristics of study participants are shown in Table 1. The majority of participants were age 70-79. The mean age of participants was 76.7 years (SD=4.8; values not shown in table). Participants were about evenly split between men and women. The majority were married and most lived in a residence (home, condo, or apartment) that they owned. Regardless of residence type, most had lived there for more than 5 years. About 10 percent of participants were born outside of the US but all participants had lived in the US for more than 5 years. Collectively, the areas in which participants lived represented a mix of urban, suburban, and rural. The majority of households consisted of the participant and at least one other individual, with over three-quarters of participants reporting that someone else in the household also drove, and over a quarter reporting that others were dependent on them to drive. Most no longer worked outside the home. Household income and education levels covered a broad range, although more than half had a college degree or higher.

Table 1. Characteristics of Study Participants		
	N	%
Age		
70-79	99	72.3
80-88	38	27.7
Total	137	100.0
Sex		
Male	69	50.4
Female	68	49.6
Total	137	100.0
Marital status		
Married	81	59.1
Separated/divorced	23	16.8
Widowed	27	19.7
Single	4	2.9
No response	2	1.5
Total	137	100.0
Residence type		
Own home/condo/apartment	106	77.4
Rent home/condo/apartment	14	10.2
Family member home/condo/apartment	4	2.9
Senior/retirement community – no transportation	6	4.4
Senior/retirement community – transportation	3	2.2
Other	3	2.2
No response	1	0.7
Total	137	100.0
Length of time at current residence		
Less than 1 year	5	3.6
1-5 years	12	8.8

More than 5 years	119	86.9
No response	1	0.7
Total	137	100.0
Country of origin		
US	124	90.5
Other	13	9.5
Total	137	100.0
Length of time in US		
More than 5 years	137	100
Population density		
Urban	51	37.2
Suburban	69	50.4
Rural	16	11.7
No response	1	0.7
Total	137	100.0
Total number in household (including participant)		
One	43	31.4
Two	77	56.2
Three or more	12	8.8
No response	5	3.6
Total	137	100.0
Are there others who depend on you to drive them		
Yes	37	27.0
No	98	71.5
No response	2	1.5
Total	137	100.0
Work outside home for pay		
Full-time	2	1.5
Part-time	8	5.8
Occasional	8	5.8
No	113	82.5
No response	6	4.4
Total	137	100.0
Total household income		
<\$20,000	14	10.2
\$20,000-\$49,999	51	37.2
\$50,000-\$79,999	30	21.9
\$80,000-\$99,999	14	10.2
\$100,000+	15	10.9
No response	13	9.5
Total	137	100.0
Education		
Some high school or less	5	3.7
High school degree or equivalent	23	16.8
Some college or technical	34	24.8
College degree	19	13.9
Some graduate education	14	10.2
Graduate degree or higher	42	30.7
Total	137	100.0

RESULTS

Feedback on questionnaire content and administration

Feedback from study participants about the content and administration of the questionnaire instrument indicated that most found it easy to read and understand, and were satisfied with using a computer to complete it (Table 2). Almost three-quarters reported that given a choice of other options, they preferred to take the questionnaire on the computer, despite the fact that most reported only low or medium levels of experience with computers. The length of the questionnaire was also considered reasonable. Participants' feedback on the questionnaire did not differ by sex (Table 2a), the population they were recruited from (Table 2b), or age group (70-79 and 80-88; Table 2c), with the one exception that the older age group was less satisfied with using the computer (although over 80% reported being satisfied with the computer).

	N	%
Overall, were the questions easy to read – that is brief and to the point?	135	98.5
Overall, were the questions easy to understand – that is, the wording was clear and the language was appropriate?	122	89.1
Overall, were you satisfied using a computer to complete the questionnaire?	125	91.2
If you had a choice, would you prefer to take this questionnaire as part of a written survey, telephone survey, a verbal interview, or on a computer like you did today?		
Written survey	12	8.8
Telephone survey	5	3.7
Verbal interview	11	8.0
Computer	100	73.0
No preference	9	6.6
How would you describe your level of experience with computers?		
Low	57	41.6
Medium	65	47.5
High	15	11.0
Overall did the length of the survey seem reasonable?	128	93.4

	Men		Women		X ² / Fisher’s Exact Test
	N	%	N	%	
Overall, were the questions easy to read – that is brief and to the point?	68	98.6	67	98.5	NS
Overall, were the questions easy to understand – that is, the wording was clear and the language was appropriate?	62	89.9	60	88.2	NS
Overall, were you satisfied using a computer to complete the questionnaire?	62	89.9	63	92.7	NS
If you had a choice, would you prefer to take this questionnaire as part of a written survey, telephone survey, a verbal interview, or on a computer like you did today?					NS
Written survey	8	11.6	4	5.9	
Telephone survey	2	2.9	3	4.4	
Verbal interview	6	8.7	5	7.4	
Computer	48	69.6	52	76.5	
No preference	5	7.3	4	5.9	
How would you describe your level of experience with computers?					NS
Low	30	43.5	27	39.7	
Medium	32	46.4	33	48.5	
High	7	10.1	8	11.8	
Overall did the length of the survey seem reasonable?	63	91.3	65	95.6	NS

	General Pop.		Clinic Pop.		X ² / Fisher’s Exact Test
	N	%	N	%	
Overall, were the questions easy to read – that is brief and to the point?	103	98.1	32	100.0	NS
Overall, were the questions easy to understand – that is, the wording was clear and the language was appropriate?	96	91.4	26	81.3	NS
Overall, were you satisfied using a computer to complete the questionnaire?	94	89.5	31	96.9	NS
If you had a choice, would you prefer to take this questionnaire as part of a written survey, telephone survey, a verbal interview, or on a computer like you did today?					NS
Written survey	10	9.5	2	6.3	
Telephone survey	3	2.9	2	6.3	
Verbal interview	10	9.5	1	3.1	
Computer	75	71.4	25	78.1	
No preference	7	6.7	2	6.3	
How would you describe your level of experience with computers?					NS
Low	51	48.6	6	18.8	
Medium	42	40.0	23	71.9	
High	12	11.4	3	9.4	
Overall did the length of the survey seem reasonable?	97	92.4	31	96.9	NS

Table 2c. Feedback on Questionnaire Content/Administration from Participants by Age Group: N and Percent for Those Responding “Yes”					
	Age 70-79		Age 80-88		X ² / Fisher’s Exact Test
	N	%	N	%	
Overall, were the questions easy to read – that is brief and to the point?	97	98.0	38	100.0	NS
Overall, were the questions easy to understand – that is, the wording was clear and the language was appropriate?	87	87.9	35	92.1	NS
Overall, were you satisfied using a computer to complete the questionnaire?	94	95.0	31	81.6	p< .05
If you had a choice, would you prefer to take this questionnaire as part of a written survey, telephone survey, a verbal interview, or on a computer like you did today?					
Written survey	7	7.1	5	13.2	NS
Telephone survey	5	5.1	0	0.0	
Verbal interview	5	5.1	6	15.8	
Computer	74	74.8	26	68.4	
No preference	8	8.1	1	2.6	
How would you describe your level of experience with computers?					
Low	38	38.4	19	50.0	NS
Medium	50	50.5	15	39.5	
High	11	11.1	4	10.5	
Overall did the length of the survey seem reasonable?	95	96.0	33	86.8	NS

Driving Frequency

Participants reported driving an average of 5.6 days per week and 89.9 miles per week overall (SD=1.6, 100.5, respectively). For most, this was about the same as 1 year ago (Table 3). Men reported driving more days per week (mean=6.1 for men and 5.2 for women; $p=.0006$) and more miles per week (mean=112.8 for men and 66.3 for women; $p=.0003$). About two-thirds of participants overall reported that their round trips were between 1 and 10 miles; the rest reported round trips of more than 10 miles (Table 3). For most, this was about the same as 1 year ago. Almost everyone reported driving throughout all four seasons of the year. Other than the differences between men and women noted above, there were no differences in driving frequency between men and women (Table 3a), the general and clinic populations (Table 3b), or between participants age 70-79 and age 80-88 (Table 3c).

Table 3. Driving Frequency among Participants Overall		
	N	%
Change in days per week from 1 year ago		
More	6	4.4
Less	19	13.9
About the same	112	81.8
Change in miles per week from 1 year ago		
More	9	6.6
Less	24	17.5
About the same	104	75.9
Miles per round trip		
Less than 1 mile	0	0.0
1-5 miles	31	22.8
6-10	61	44.9
More than 10 miles	44	32.4
Change in miles per round trip from 1 year ago		
Longer	3	2.2
Shorter	17	12.6
About the same	115	85.2
Driving times of the year		
All	132	97.8
All but winter	3	2.2

Table 3a. Driving Frequency among Participants by Sex					
	Men		Women		X ² / Fisher's Exact Test
	N	%	N	%	
Change in days per week from 1 year ago					NS
More	2	2.9	4	5.9	
Less	8	11.6	11	16.2	
About the same	59	85.5	53	77.9	
Change in miles per week from 1 year ago					NS
More	2	2.9	7	10.3	
Less	10	14.5	14	20.6	
About the same	57	82.6	47	69.1	
Miles per round trip					NS
Less than 1 mile	0	0	0	0	
1-5 miles	15	21.7	16	23.9	
6-10	28	40.6	33	49.3	
More than 10 miles	26	37.7	18	26.9	
Change in miles per round trip from 1 year ago					NS
Longer	1	1.5	2	3.0	
Shorter	10	14.5	7	10.6	
About the same	58	84.1	57	86.4	
Driving times of the year					NS
All	68	100	64	95.5	
All but winter	0	0	3	4.5	

Table 3b. Driving Frequency among Participants by Population					
	General Pop.		Clinic Pop.		X ² / Fisher's Exact Test
	N	%	N	%	
Change in days per week from 1 year ago					NS
More	6	5.7	0	0	
Less	13	12.4	6	18.8	
About the same	86	81.9	26	81.3	
Change in miles per week from 1 year ago					NS
More	7	6.7	2	6.3	
Less	18	17.1	6	18.8	
About the same	80	76.2	24	75.0	
Miles per round trip					NS
Less than 1 mile	0	0	0	0	
1-5 miles	22	21.2	9	28.1	
6-10	50	48.1	11	34.4	
More than 10 miles	32	30.8	12	37.5	
Change in miles per round trip from 1 year ago					NS
Longer	3	2.9	0	0	
Shorter	13	12.5	4	12.9	
About the same	88	84.6	27	87.1	
Driving times of the year					NS
All	101	98.1	31	96.9	
All but winter	2	1.9	1	3.1	

Table 3c. Driving Frequency among Participants by Age Group					
	Age 70-79		Age 80-88		X ² / Fisher's Exact Test
	N	%	N	%	
Change in days per week from 1 year ago					NS
More	5	5.1	1	2.6	
Less	15	15.2	4	10.5	
About the same	79	79.8	33	86.8	
Change in miles per week from 1 year ago					NS
More	8	8.1	1	2.6	
Less	19	19.2	5	13.2	
About the same	72	72.7	32	84.2	
Miles per round trip					NS
Less than 1 mile	0	0	0	0	
1-5 miles	22	22.5	9	23.7	
6-10	45	45.9	16	42.1	
More than 10 miles	31	31.6	13	34.2	
Change in miles per round trip from 1 year ago					NS
Longer	2	2.0	1	2.7	
Shorter	15	15.3	2	5.4	
About the same	81	82.7	34	91.9	
Driving times of the year					NS
All	94	96.9	38	100	
All but winter	3	3.1	0	0	

Health and Functioning

Participants rated themselves relatively high in terms of their overall health and functioning, as measured by their ability to walk half a mile and climb 2 flights of stairs (Table 4). There were no differences in ratings by sex (Table 4a), recruitment population (Table 4b), or age group (Table 4c).

	N	Mean	SD
How would you rate the following in general? (with 1 being poor and 7 being excellent)			
Your overall health	136	5.6	1.1
Your ability to walk ½ mile	136	5.9	1.7
Your ability to climb 2 flights of stairs	135	5.7	1.8

	Men		Women		Wilcoxon
	N	Mean	N	Mean	
How would you rate the following in general? (with 1 being poor and 7 being excellent)					
Your overall health	69	5.5	67	5.7	NS
Your ability to walk ½ mile	69	5.9	67	5.8	NS
Your ability to climb 2 flights of stairs	68	5.9	67	5.5	NS

	General Pop.		Clinic Pop.		Wilcoxon
	N	Mean	N	Mean	
How would you rate the following in general? (with 1 being poor and 7 being excellent)					
Your overall health	104	5.7	32	5.4	NS
Your ability to walk ½ mile	104	5.9	32	5.8	NS
Your ability to climb 2 flights of stairs	104	5.8	31	5.5	NS

	Age 70-79		Age 80-88		Wilcoxon
	N	Mean	N	Mean	
How would you rate the following in general? (with 1 being poor and 7 being excellent)					
Your overall health	98	5.7	38	5.5	NS
Your ability to walk ½ mile	98	5.9	38	5.7	NS
Your ability to climb 2 flights of stairs	97	5.7	38	5.7	NS

Safe Driving

Overall, participants rated their abilities for safe driving relatively highly (Table 5). The lowest rating was for the ability to see clearly at night, but even this received a mean rating of 5.2 out of a possible score of 7. Ratings did not differ by sex (Table 5a) or age group (Table 5c). However, participants recruited from the general population rated themselves higher than participants recruited from the clinic population on a number of dimensions including their ability to see clearly during the day, see clearly at night, remember things, and process information, as well as their ability to drive safely compared to others their age and to themselves 5 years ago (Table 5b).

	N	Mean	SD
How would you rate the following for safe driving? (with 1 being poor and 7 being excellent)			
Your ability to see clearly during the day	134	6.5	0.7
Your ability to see clearly at night	134	5.2	1.5
Your ability to remember things	133	5.7	1.1
Your ability to process information, especially when paying attention to two or more things	133	5.5	1.2
Your upper body strength and flexibility	134	5.8	1.2
Your lower body strength and general mobility	134	5.6	1.3
How would you rate your ability to drive safely compared to...? (with 1 being poor and 7 being excellent)			
Others your age	132	6.2	1.0
Yourself 5 years ago	130	5.9	1.1

	Men		Women		Wilcoxon
	N	Mean	N	Mean	
How would you rate the following for safe driving? (with 1 being poor and 7 being excellent)					
Your ability to see clearly during the day	68	6.5	66	6.5	NS
Your ability to see clearly at night	67	5.3	67	5.1	NS
Your ability to remember things	68	5.7	65	5.7	NS
Your ability to process information, especially when paying attention to two or more things	66	5.5	67	5.5	NS
Your upper body strength and flexibility	67	5.7	67	5.8	NS
Your lower body strength and general mobility	67	5.6	67	5.7	NS
How would you rate your ability to drive safely compared to...? (with 1 being poor and 7 being excellent)					
Others your age	66	6.2	66	6.1	NS
Yourself 5 years ago	65	5.9	65	5.8	NS

Table 5b: Ratings for Safe Driving by Population					
	General Pop.		Clinic Pop.		Wilcoxon
	N	Mean	N	Mean	
How would you rate the following for safe driving? (with 1 being poor and 7 being excellent)					
Your ability to see clearly during the day	102	6.7	32	6.1	p<.0001
Your ability to see clearly at night	103	5.5	31	4.2	p<.0001
Your ability to remember things	103	5.8	30	5.4	p<.05
Your ability to process information, especially when paying attention to two or more things	102	5.7	31	4.9	p<.01
Your upper body strength and flexibility	103	5.8	31	5.8	NS
Your lower body strength and general mobility	103	5.7	31	5.5	NS
How would you rate your ability to drive safely compared to...? (with 1 being poor and 7 being excellent)					
Others your age	101	6.3	31	5.7	p<.05
Yourself 5 years ago	99	6.0	31	5.4	p<.01

Table 5c: Ratings for Safe Driving by Ager Group					
	Age 70-79		Age 80-88		Wilcoxon
	N	Mean	N	Mean	
How would you rate the following for safe driving? (with 1 being poor and 7 being excellent)					
Your ability to see clearly during the day	96	6.5	38	6.5	NS
Your ability to see clearly at night	96	5.1	38	5.2	NS
Your ability to remember things	95	5.7	38	5.6	NS
Your ability to process information, especially when paying attention to two or more things	95	5.6	38	5.2	NS
Your upper body strength and flexibility	96	5.7	38	5.9	NS
Your lower body strength and general mobility	96	5.6	38	5.6	NS
How would you rate your ability to drive safely compared to...? (with 1 being poor and 7 being excellent)					
Others your age	95	6.1	37	6.4	NS
Yourself 5 years ago	94	5.9	36	5.8	NS

Self-Regulatory Practices

Participants were asked about a number of practices related to the four levels of self-regulation of driving discussed earlier (i.e., life-goals, strategic, tactical, and operational). Relatively few participants reported making specific life-goal changes, although a sizable minority reported buying a different car (Table 6). Between a fifth and a quarter of participants reported having reduced either the number of days, trips, or miles per week they

drove, or the length of their trips during the past year. Sizable percentages of participants reported that they try to avoid most of the driving circumstances presented. Participants were most likely to report trying to avoid driving at night in bad weather, driving in bad weather, driving at night, and driving in rush hour. They were least likely to report trying to avoid driving alone. At least a quarter or more of participants reported trying to avoid in-vehicle distractions while driving with over 90% avoiding talking on a cell phone or personal grooming. Three-quarters or more reported planning out their trips, combining trips, and leaving greater distances between their car and the car ahead. Only 6% reported bringing along someone to help them navigate. Very few participants reported having made modifications to their car in the past year to make driving easier. Across all of the self-regulatory practices, there were no differences by sex (Table 6a). However, participants recruited from the general population were considerably less likely than participants recruited from the clinics to report trying to avoid driving at night, in unfamiliar areas, and on the expressway, as well as talking conversationally with passengers (Table 6b). Younger participants were less likely than older participants to report trying to avoid talking conversationally with passengers (Table 6c).

Table 6. Self-Regulatory Practices of Participants Overall: N and Percent for Those Reporting “Yes”		
	N	% of all
Life-goal changes		
During the past year, have you moved to location closer to destinations?	3	2.2
During the past year, have you moved to a place with options for getting around other than driving self?	7	5.2
During the past year, have you bought a different vehicle?	20	14.7
During the past year, have you stopped working?	12	8.9
During the past year, have you changed job in any way?	5	3.7
During the past year, have you made any other changes to regular routine?	28	20.7
Reductions in driving exposure		
During the past year, have you reduced the number of days per week you normally drive?	28	20.6
During the past year, have you reduced the number of trips per week you normally take?	34	25.0
During the past year, have you reduced the number of miles you drive in a normal week?	36	26.5
During the past year, have you reduced the length of your trips?	30	22.2

Avoidance of specific driving circumstances		
Do you try to avoid driving at night?	73	53.7
Do you try to avoid making unprotected left turns across oncoming traffic?	37	27.4
Do you try to avoid driving in bad weather?	89	65.4
Do you try to avoid driving on high-traffic roads?	44	32.4
Do you try to avoid driving in unfamiliar areas?	44	32.4
Do you try to avoid driving alone?	6	4.4
Do you try to avoid driving at night in bad weather?	100	73.5
Do you try to avoid driving in rush hour?	80	58.8
Do you try to avoid driving on the expressway?	25	18.4
Do you try to avoid backing up?	31	22.8
Avoidance of in-vehicle distractions while driving		
While driving, do you try to avoid talking conversationally with passengers?	36	26.5
While driving, do you try to avoid eating?	108	79.4
While driving, do you try to avoid reading a road map?	127	93.4
While driving, do you try to avoid changing the radio stations?	42	30.9
While driving, do you try to avoid talking on a cell phone ?	126	92.7
While driving, do you try to avoid personal grooming?	127	93.4
Planning and wayfinding strategies		
Do you plan your trip ahead of time and write down your route?	92	68.2
Do you make a practice run ahead of time to become familiar with your route?	39	28.9
Do you reduce your overall travel by combining several trips into a single outing?	113	83.1
Do you leave greater distances between your car and the car ahead of you?	108	80.0
Do you bring along a passenger to help you navigate?	12	8.8
Vehicle modifications made during past year		
During the past year, have you added special mirrors to your vehicle to make driving easier?	4	2.9
During the past year, have you added steering knobs to make the steering easier?	3	2.2
During the past year, have you added hand controls to work the brake or the accelerator to make driving easier?	2	1.5
During the past year, have you added sitting position modifications... to make driving easier?	13	9.6
During the past year, have you added an in-vehicle navigation system to help you find your way to make driving easier?	23	16.9

Table 6a. Self-Regulatory Practices of Participants by Sex: N and Percent for Those Reporting “Yes”					
	Men		Women		X ² / Fisher’s Exact Test
	N	% of all	N	% of all	
Life-goal changes					
During the past year, have you moved to location closer to destinations?	0	0	3	4.5	NS
During the past year, have you moved to place with options for getting around other than driving self?	4	5.8	3	4.5	NS
During the past year, have you bought a different vehicle?	14	20.3	6	9.0	NS
During the past year, have you stopped working?	7	10.3	5	7.5	NS
During the past year, have you changed job in any way?	5	7.4	0	0	NS
During the past year, have you made any other changes to regular routine?	13	19.1	15	22.4	NS
Reductions in driving exposure					
During the past year, have you reduced the number of days per week you normally drive?	14	20.3	14	20.9	NS
During the past year, have you reduced the number of trips per week you normally take?	17	24.6	17	25.4	NS
During the past year, have you reduced the number of miles you drive in a normal week?	18	26.1	18	26.9	NS
During the past year, have you reduced the length of your trips?	18	26.5	12	17.9	NS
Avoidance of specific driving circumstances					
Do you try to avoid driving at night?	35	50.7	38	56.7	NS
Do you try to avoid making unprotected left turns across oncoming traffic?	16	23.5	21	31.3	NS
Do you try to avoid driving in bad weather?	44	63.8	45	67.2	NS
Do you try to avoid driving on high-traffic roads?	24	34.8	20	29.9	NS
Do you try to avoid driving in unfamiliar areas?	17	24.6	27	40.3	NS
Do you try to avoid driving alone?	3	4.4	3	4.5	NS
Do you try to avoid driving at night in bad weather?	49	71.0	51	76.1	NS
Do you try to avoid driving in rush hour?	37	53.6	43	64.2	NS
Do you try to avoid driving on the expressway?	11	15.9	14	20.9	NS
Do you try to avoid backing up?	13	18.8	18	26.9	NS
Avoidance of in-vehicle distractions while driving					
While driving, do you try to avoid talking conversationally with passengers?	15	21.7	21	31.3	NS
While driving, do you try to avoid eating?	55	79.7	53	79.1	NS
While driving, do you try to avoid reading a road map?	64	92.8	63	94.0	NS
While driving, do you try to avoid changing the radio stations?	21	30.4	21	31.3	NS
While driving, do you try to avoid talking on a cell phone ?	66	95.7	60	89.6	NS
While driving, do you try to avoid personal grooming?	64	92.8	63	94.0	NS
Planning and wayfinding strategies					
Do you plan your trip ahead of time and write down your route?	42	61.8	50	74.6	NS
Do you make a practice run ahead of time to become familiar with your route?	20	29.4	19	28.4	NS
Do you reduce your overall travel by combining several	55	79.7	58	86.6	NS

trips into a single outing?					
Do you leave greater distances between your car and the car ahead of you?	55	80.9	53	79.1	NS
Do you bring along a passenger to help you navigate?	8	11.6	4	6.0	NS
Vehicle modifications made during past year					
During the past year, have you added special mirrors to your vehicle to make driving easier?	2	2.9	2	3.0	NS
During the past year, have you added steering knobs to make the steering easier?	2	2.9	1	1.5	NS
During the past year, have you added hand controls to work the brake or the accelerator to make driving easier?	0	0	2	3.0	NS
During the past year, have you added sitting position modifications... to make driving easier?	6	8.7	7	10.5	NS
During the past year, have you added an in-vehicle navigation system to help you find your way to make driving easier?	15	21.7	8	11.9	NS

Table 6b. Self-Regulatory Practices of Participants by Population: N and Percent for Those Reporting “Yes”

	General Pop.		Clinic Pop.		X ² / Fisher’s Exact Test
	N	% of all	N	% of all	
Life-goal changes					
During the past year, have you moved to location closer to destinations?	3	2.9	0	0	NS
During the past year, have you moved to place with options for getting around other than driving self?	4	3.9	3	9.4	NS
During the past year, have you bought a different vehicle?	15	14.4	5	15.6	NS
During the past year, have you stopped working?	11	10.7	1	3.1	NS
During the past year, have you changed job in any way?	4	3.9	1	3.1	NS
During the past year, have you made any other changes to regular routine?	18	17.5	10	31.3	NS
Reductions in driving exposure					
During the past year, have you reduced the number of days per week you normally drive?	22	21.2	6	18.8	NS
During the past year, have you reduced the number of trips per week you normally take?	25	24.0	9	28.1	NS
During the past year, have you reduced the number of miles you drive in a normal week?	27	26.0	9	28.1	NS
During the past year, have you reduced the length of your trips?	26	25.2	4	12.5	NS
Avoidance of specific driving circumstances					
Do you try to avoid driving at night?	49	47.1	24	75.0	p<.01
Do you try to avoid making unprotected left turns across oncoming traffic?	24	23.3	13	40.6	NS
Do you try to avoid driving in bad weather?	64	61.5	25	78.1	NS
Do you try to avoid driving on high-traffic roads?	30	28.9	14	43.8	NS
Do you try to avoid driving in unfamiliar areas?	28	26.9	16	50.0	p<.05
Do you try to avoid driving alone?	5	4.8	1	3.1	NS
Do you try to avoid driving at night in bad weather?	73	70.2	27	84.4	NS
Do you try to avoid driving in rush hour?	57	54.8	23	71.9	NS

Do you try to avoid driving on the expressway?	13	12.5	12	37.5	p<.01
Do you try to avoid backing up?	21	20.2	10	31.3	NS
Avoidance of in-vehicle distractions while driving					
While driving, do you try to avoid talking conversationally with passengers?	21	20.2	15	46.9	p<.01
While driving, do you try to avoid eating?	82	78.9	26	81.3	NS
While driving, do you try to avoid reading a road map?	98	94.2	29	90.6	NS
While driving, do you try to avoid changing the radio stations?	35	33.7	7	21.9	NS
While driving, do you try to avoid talking on a cell phone ?	98	94.2	28	87.5	NS
While driving, do you try to avoid personal grooming?	97	93.3	30	93.8	NS
Planning and wayfinding strategies					
Do you plan your trip ahead of time and write down your route?	69	67.0	23	71.9	NS
Do you make a practice run ahead of time to become familiar with your route?	30	29.1	9	28.1	NS
Do you reduce your overall travel by combining several trips into a single outing?	87	83.7	26	81.3	NS
Do you leave greater distances between your car and the car ahead of you?	83	80.6	25	78.1	NS
Do you bring along a passenger to help you navigate?	8	7.7	4	12.5	NS
Vehicle modifications made during past year					
During the past year, have you added special mirrors to your vehicle to make driving easier?	3	2.9	1	3.1	NS
During the past year, have you added steering knobs to make the steering easier?	3	2.9	0	0	NS
During the past year, have you added hand controls to work the brake or the accelerator to make driving easier?	0	0	2	6.3	NS
During the past year, have you added sitting position modifications... to make driving easier?	10	9.6	3	9.4	NS
During the past year, have you added an in-vehicle navigation system to help you find your way to make driving easier?	17	16.4	6	18.8	NS

**Table 6c. Self-Regulatory Practices of Participants by Age Group:
N and Percent for Those Reporting “Yes”**

	Age 70-79		Age 80-88		X ² / Fisher’s Exact Test
	N	% of all	N	% of all	
Life-goal changes					
During the past year, have you moved to location closer to destinations?	1	1.0	2	5.3	NS
During the past year, have you moved to place with options for getting around other than driving self?	4	4.1	3	7.9	NS
During the past year, have you bought a different vehicle?	15	15.3	5	13.2	NS
During the past year, have you stopped working?	10	10.3	2	5.3	NS
During the past year, have you changed job in any way?	5	5.2	0	0.0	NS
During the past year, have you made any other changes to regular routine?	20	20.6	8	21.1	NS

Reductions in driving exposure					
During the past year, have you reduced the number of days per week you normally drive?	22	22.5	6	15.8	NS
During the past year, have you reduced the number of trips per week you normally take?	28	28.6	6	15.8	NS
During the past year, have you reduced the number of miles you drive in a normal week?	30	30.6	6	15.8	NS
During the past year, have you reduced the length of your trips?	27	27.8	3	7.9	p<.05
Avoidance of specific driving circumstances					
Do you try to avoid driving at night?	51	52.0	22	57.9	NS
Do you try to avoid making unprotected left turns across oncoming traffic?	26	26.5	11	29.7	NS
Do you try to avoid driving in bad weather?	62	63.3	27	71.1	NS
Do you try to avoid driving on high-traffic roads?	35	35.7	9	23.7	NS
Do you try to avoid driving in unfamiliar areas?	30	30.6	14	36.8	NS
Do you try to avoid driving alone?	5	5.1	1	2.6	NS
Do you try to avoid driving at night in bad weather?	71	72.5	29	76.3	NS
Do you try to avoid driving in rush hour?	58	59.2	22	57.9	NS
Do you try to avoid driving on the expressway?	18	18.4	7	18.4	NS
Do you try to avoid backing up?	24	24.5	7	18.4	NS
Avoidance of in-vehicle distractions while driving					
While driving, do you try to avoid talking conversationally with passengers?	21	21.4	15	39.5	p<.05
While driving, do you try to avoid eating?	80	81.6	28	73.7	NS
While driving, do you try to avoid reading a road map?	93	94.9	34	89.5	NS
While driving, do you try to avoid changing the radio stations?	32	32.7	10	26.3	NS
While driving, do you try to avoid talking on a cell phone ?	90	91.8	36	94.7	NS
While driving, do you try to avoid personal grooming?	92	93.9	35	92.1	NS
Planning and wayfinding strategies					
Do you plan your trip ahead of time and write down your route?	67	69.1	25	65.8	NS
Do you make a practice run ahead of time to become familiar with your route?	27	27.8	12	31.6	NS
Do you reduce your overall travel by combining several trips into a single outing?	84	85.7	29	76.3	NS
Do you leave greater distances between your car and the car ahead of you?	76	78.4	32	84.2	NS
Do you bring along a passenger to help you navigate?	10	10.2	2	5.3	NS
Vehicle modifications made during past year					
During the past year, have you added special mirrors to your vehicle to make driving easier?	2	2.0	2	5.3	NS
During the past year, have you added steering knobs to make the steering easier?	3	3.1	0	0	NS
During the past year, have you added hand controls to work the brake or the accelerator to make driving easier?	2	2.0	0	0	NS
During the past year, have you added sitting position modifications... to make driving easier?	10	10.2	3	7.9	NS
During the past year, have you added an in-vehicle navigation system to help you find your way to make driving easier?	18	18.4	5	13.2	NS

To further examine self-regulation, participants were presented with a series of scenarios related to driving under specific circumstances and asked how often they had modified their driving plans during the past year because of those circumstances. Mean responses are presented in Table 7 for participants overall. Participants were more likely to modify their driving plans when the roads were snowy, they wanted to save gas, there was heavy traffic, or they were concerned about their ability to see clearly at night. There were no differences by sex (Table 7a) or age group (Table 7c) with the exception that participants age 70-79 were more likely than participants age 80-88 to have modified their driving plans to save gas. Participants recruited from the general population were less likely to have modified their driving plans than participants recruited from the clinic populations for several of the driving scenarios, including when the most direct route to their destination required driving on the expressway, driving in heavy traffic, or making unprotected left turns, and when they were concerned about their ability to see clearly during the day or at night (Table 7b).

Table 7. Modification to Driving Plans of Participants Overall			
	N	Mean	SD
With 1 being never and 7 being always....			
When the roads were snowy, how often did that fact alone make you modify your driving plans?	132	4.5	2.0
When the roads were wet, how often did that fact alone make you modify your driving plans?	137	2.6	2.1
When the most direct route to your destination required driving on the expressway, how often did that fact alone make you take an alternate route?	133	2.0	1.7
When the most direct route to your destination required driving in heavy traffic, how often did that fact alone make you take an alternate route?	133	2.9	1.9
When the most direct route to your destination required making unprotected left turns across oncoming traffic, how often did that fact alone make you modify your driving plans?	133	2.2	1.9
When the roads were safe and the weather was good, how often did your desire to save gas, and that fact alone, make you modify your driving plans?	136	3.1	2.2
When the roads were safe and the weather was good, how often did your desire to save on the wear and tear of your vehicle, and that fact alone, make you modify your driving plans?	135	1.9	1.8
When the roads were safe and the weather was good, how often did your concern about possible problems with your ability to see clearly during the day make you modify your driving plans?	132	1.3	1.2

When the roads were safe and the weather was good, how often did your concern about possible problems with your ability to see clearly at night make you modify your driving plans?	135	2.9	2.3
When the roads were safe and the weather was good, how often did your concern about your ability to remember things make you modify your driving plans?	135	1.2	0.6
When the roads were safe and the weather was good, how often did your concern about your ability to process information, especially when you have to pay attention to two or more things at the same time, make you modify your driving plans?	131	1.4	1.2
When the roads were safe and the weather was good, how often did your concern about possible problems with your upper body strength and flexibility, including your neck, arms, and hands, make you modify your driving plans?	135	1.2	0.8
When the roads were safe and the weather was good, how often did your concern about possible problems with your lower body strength and mobility, including your legs and feet, make you modify your driving plans?	132	1.1	0.7

Table 7a. Modification to Driving Plans by Sex

	Men		Women		Wilcoxon
	N	Mean	N	Mean	
With 1 being never and 7 being always....					
When the roads were snowy, how often did that fact alone make you modify your driving plans?	66	4.6	66	4.3	NS
When the roads were wet, how often did that fact alone make you modify your driving plans?	69	2.9	68	2.3	NS
When the most direct route to your destination required driving on the expressway, how often did that fact alone make you take an alternate route?	66	1.8	67	2.1	NS
When the most direct route to your destination required driving in heavy traffic, how often did that fact alone make you take an alternate route?	67	2.9	66	2.9	NS
When the most direct route to your destination required making unprotected left turns across oncoming traffic, how often did that fact alone make you modify your driving plans?	66	2.4	67	2.0	NS
When the roads were safe and the weather was good, how often did your desire to save gas, and that fact alone, make you modify your driving plans?	68	2.7	68	3.4	NS
When the roads were safe and the weather was good, how often did your desire to save on the wear and tear of your vehicle, and that fact alone, make you modify your driving plans?	68	1.9	67	1.9	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your ability to see clearly during the day make you modify your driving plans?	67	1.3	65	1.3	NS
When the roads were safe and the weather was good, how often did your concern about possible problems	68	2.8	67	3.0	NS

with your ability to see clearly at night make you modify your driving plans?					
When the roads were safe and the weather was good, how often did your concern about your ability to remember things make you modify your driving plans?	68	1.2	67	1.1	NS
When the roads were safe and the weather was good, how often did your concern about your ability to process information, especially when you have to pay attention to two or more things at the same time, make you modify your driving plans?	67	1.6	64	1.3	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your upper body strength and flexibility, including your neck, arms, and hands, make you modify your driving plans?	68	1.2	67	1.1	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your lower body strength and mobility, including your legs and feet, make you modify your driving plans?	67	1.2	65	1.1	NS

Table 7b. Modification to Driving Plans by Population

	General Pop.		Clinic Pop.		Wilcoxon
	N	(Mean)	N	Mean	
With 1 being never and 7 being always....					
When the roads were snowy, how often did that fact alone make you modify your driving plans?	101	4.3	31	5.1	NS
When the roads were wet, how often did that fact alone make you modify your driving plans?	105	2.6	32	2.7	NS
When the most direct route to your destination required driving on the expressway, how often did that fact alone make you take an alternate route?	103	1.7	30	3.0	p<.001
When the most direct route to your destination required driving in heavy traffic, how often did that fact alone make you take an alternate route?	102	2.6	31	3.7	p<.01
When the most direct route to your destination required making unprotected left turns across oncoming traffic, how often did that fact alone make you modify your driving plans?	102	1.8	31	3.3	p<.001
When the roads were safe and the weather was good, how often did your desire to save gas, and that fact alone, make you modify your driving plans?	104	3.0	32	3.4	NS
When the roads were safe and the weather was good, how often did your desire to save on the wear and tear of your vehicle, and that fact alone, make you modify your driving plans?	103	1.9	32	2.0	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your ability to see clearly during the day make you modify your driving plans?	102	1.2	30	1.7	p<.05
When the roads were safe and the weather was good, how often did your concern about possible problems with your ability to see clearly at night make you modify your driving plans?	104	2.5	31	4.3	p<.001

When the roads were safe and the weather was good, how often did your concern about your ability to remember things make you modify your driving plans?	104	1.1	31	1.3	NS
When the roads were safe and the weather was good, how often did your concern about your ability to process information, especially when you have to pay attention to two or more things at the same time, make you modify your driving plans?	100	1.4	31	1.6	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your upper body strength and flexibility, including your neck, arms, and hands, make you modify your driving plans?	103	1.1	32	1.4	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your lower body strength and mobility, including your legs and feet, make you modify your driving plans?	102	1.1	30	1.3	NS

Table 7c. Modification to Driving Plans by Age Group

	Age 70-79		Age 80-88		Wilcoxon
	N	Mean	N	Mean	
With 1 being never and 7 being always....					
When the roads were snowy, how often did that fact alone make you modify your driving plans?	96	4.3	36	4.8	NS
When the roads were wet, how often did that fact alone make you modify your driving plans?	99	2.5	38	2.9	NS
When the most direct route to your destination required driving on the expressway, how often did that fact alone make you take an alternate route?	97	2.1	36	1.8	NS
When the most direct route to your destination required driving in heavy traffic, how often did that fact alone make you take an alternate route?	95	2.9	38	2.8	NS
When the most direct route to your destination required making unprotected left turns across oncoming traffic, how often did that fact alone make you modify your driving plans?	96	2.3	37	1.9	NS
When the roads were safe and the weather was good, how often did your desire to save gas, and that fact alone, make you modify your driving plans?	98	3.4	38	2.3	p<.01
When the roads were safe and the weather was good, how often did your desire to save on the wear and tear of your vehicle, and that fact alone, make you modify your driving plans?	97	1.9	38	1.8	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your ability to see clearly during the day make you modify your driving plans?	96	1.2	36	1.5	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your ability to see clearly at night make you modify your driving plans?	98	3.0	37	2.6	NS

When the roads were safe and the weather was good, how often did your concern about your ability to remember things make you modify your driving plans?	97	1.2	38	1.1	NS
When the roads were safe and the weather was good, how often did your concern about your ability to process information, especially when you have to pay attention to two or more things at the same time, make you modify your driving plans?	93	1.4	38	1.4	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your upper body strength and flexibility, including your neck, arms, and hands, make you modify your driving plans?	97	1.1	38	1.3	NS
When the roads were safe and the weather was good, how often did your concern about possible problems with your lower body strength and mobility, including your legs and feet, make you modify your driving plans?	94	1.2	38	1.1	NS

Life-goal preferences and activities

Participants were asked a series of questions intended to get at their life-goal preferences and activities; that is, those factors related to what participants are like and how they live their day-to-day lives. Participants reported high levels of enjoyment of driving (Table 8). Both driving in the present and the continuation of driving were accorded high importance. Participants expressed high levels of confidence that they could safely drive to places they need to go. Ratings of the importance of individual activities varied, with spending time with family and friends receiving the highest rating. Several activities were considered less important by men than women, including shopping, volunteer work/community service, social activities, and time with family and friends (Table 8a). Participants age 70-79 considered shopping and driving, in general, to be less important than their older counterparts (Table 8c). The only difference between the general and clinic populations was that the former were more confident about safely driving to places they need to go (Table 8b).

	N	Mean	SD
With 1 being not at all and 7 being completely....			
How much do you enjoy driving?	133	5.9	1.4
How important is driving to you?	135	6.4	1.1
How important is it to you that you continue driving?	133	6.6	1.0
How confident are you that you can safely drive to places you need to go?	130	6.7	0.8
How actively involved in the community would you consider yourself?	136	4.6	1.7
How important are the following activities to you... shopping?	136	5.3	1.9
How important are the following activities to you... volunteer work/community service?	134	4.3	2.1
How important are the following activities to you... social activities?	133	5.3	1.7
How important are the following activities to you... exercise and recreational activities?	135	5.5	1.8
How important are the following activities to you... time with family and friends?	134	6.5	0.9

	Men		Women		Wilcoxon
	N	Mean	N	Women	
With 1 being not at all and 7 being completely....					
How much do you enjoy driving?	66	6.2	67	5.6	NS
How important is driving to you?	69	6.5	66	6.4	NS
How important is it to you that you continue driving?	67	6.7	66	6.5	NS
How confident are you that you can safely drive to places you need to go?	64	6.8	66	6.6	NS
How actively involved in the community would you consider yourself?	68	4.4	68	4.8	NS
How important are the following activities to you... shopping?	69	4.9	67	5.7	p<.05
How important are the following activities to you... volunteer work/community service?	67	3.9	67	4.7	p<.05
How important are the following activities to you... social activities?	67	4.9	66	5.7	p<.01
How important are the following activities to you... exercise and recreational activities?	68	5.6	67	5.4	NS
How important are the following activities to you... time with family and friends?	68	6.4	66	6.6	p<.05

Table 8b. Life-goal Preferences and Activities by Population					
	General Pop.		Clinic Pop.		Wilcoxon
	N	Mean	N	Mean	
With 1 being not at all and 7 being completely....					
How much do you enjoy driving?	102	6.0	31	5.6	NS
How important is driving to you?	103	6.4	32	6.5	NS
How important is it to you that you continue driving?	101	6.6	32	6.6	NS
How confident are you that you can safely drive to places you need to go?	100	6.8	30	6.4	p<.01
How actively involved in the community would you consider yourself?	104	4.6	32	4.6	NS
How important are the following activities to you... shopping?	104	5.2	32	5.7	NS
How important are the following activities to you... volunteer work/community service?	102	4.2	32	4.4	NS
How important are the following activities to you... social activities?	102	5.3	31	5.4	NS
How important are the following activities to you... exercise and recreational activities?	103	5.5	32	5.3	NS
How important are the following activities to you... time with family and friends?	104	6.6	30	6.2	NS

Table 8c. Life-goal Preferences and Activities by Age Group					
	Age 70-79		Age 80-88		Wilcoxon
	N	Mean	N	Mean	
With 1 being not at all and 7 being completely....					
How much do you enjoy driving?	95	5.8	38	6.1	NS
How important is driving to you?	97	6.3	38	6.7	p<.05
How important is it to you that you continue driving?	95	6.5	38	6.8	p<.05
How confident are you that you can safely drive to places you need to go?	93	6.7	37	6.8	NS
How actively involved in the community would you consider yourself?	98	4.8	38	4.1	NS
How important are the following activities to you... shopping?	98	5.1	38	5.8	p<.05
How important are the following activities to you... volunteer work/community service?	96	4.4	38	3.8	NS
How important are the following activities to you... social activities?	97	5.3	36	5.2	NS
How important are the following activities to you... exercise and recreational activities?	97	5.6	38	5.2	NS
How important are the following activities to you... time with family and friends?	97	6.4	37	6.6	NS

Feelings of Driving Comfort

Participants were asked about their feelings of comfort in a number of driving circumstances. Overall, participants were most comfortable driving alone and least comfortable driving at night in bad weather (Table 9). There were several differences by sex, with men reporting being more comfortable driving on high traffic roads, in unfamiliar areas, at night in bad weather, in rush hour, on the expressway, and backing up (Table 9a). Participants recruited from the general population reported being more comfortable than participants recruited from the clinic population for every driving circumstance presented except driving alone (Table 9b). There were no differences between the younger and older age groups (Table 9c).

	N	Mean	SD
How comfortable do you feel in the following situations? (with 1 being not at all and 7 being completely)			
Driving at night	133	4.6	2.0
Making unprotected left turns across oncoming traffic	132	5.4	1.8
Driving in bad weather (rain, snow, fog, etc.)	131	4.6	1.8
Driving on high traffic roads	132	5.3	1.7
Driving in unfamiliar areas	134	4.9	1.8
Driving alone	131	6.5	0.8
Driving at night in bad weather	133	4.0	2.0
Driving in rush hour traffic	133	5.2	1.7
Driving on the expressway	132	5.8	1.7
Backing up	130	5.7	1.5

	Men		Women		Wilcoxon
	N	Mean	N	Mean	
How comfortable do you feel in the following situations? (with 1 being not at all and 7 being completely)					
Driving at night	66	4.9	67	4.4	NS
Making unprotected left turns across oncoming traffic	66	5.5	66	5.2	NS
Driving in bad weather (rain, snow, fog, etc.)	65	4.8	66	4.4	NS
Driving on high traffic roads	66	5.6	66	5.0	p<.05
Driving in unfamiliar areas	67	5.3	67	4.5	p<.05
Driving alone	66	6.6	65	6.5	NS
Driving at night in bad weather	66	4.4	67	3.6	p<.05
Driving in rush hour traffic	66	5.5	67	4.9	p<.05
Driving on the expressway	66	6.2	66	5.3	p<.01
Backing up	66	6.1	64	5.4	p<.05

Table 9b. Feelings of Driving Comfort by Population					
	General Pop.		Clinic Pop.		Wilcoxon
	N	Mean	N	Mean	
How comfortable do you feel in the following situations? (with 1 being not at all and 7 being completely)					
Driving at night	102	5.1	31	3.1	p<.0001
Making unprotected left turns across oncoming traffic	101	5.6	31	4.7	p<.01
Driving in bad weather (rain, snow, fog, etc.)	101	4.8	30	3.7	p<.01
Driving on high traffic roads	102	5.6	30	4.1	p<.0001
Driving in unfamiliar areas	103	5.2	31	4.0	p<.01
Driving alone	100	6.5	31	6.5	NS
Driving at night in bad weather	102	4.4	31	2.6	p<.0001
Driving in rush hour traffic	102	5.5	31	4.2	p=.001
Driving on the expressway	101	6.1	31	4.5	p<.0001
Backing up	101	6.0	29	4.7	p<.0001

Table 9c. Feelings of Driving Comfort by Age Group					
	Age 70-79		Age 80-88		Wilcoxon
	N	Mean	N	Mean	
How comfortable do you feel in the following situations? (with 1 being not at all and 7 being completely)					
Driving at night	96	4.7	37	4.5	NS
Making unprotected left turns across oncoming traffic	96	5.4	36	5.4	NS
Driving in bad weather (rain, snow, fog, etc.)	95	4.6	36	4.6	NS
Driving on high traffic roads	96	5.2	36	5.5	NS
Driving in unfamiliar areas	97	5.0	37	4.8	NS
Driving alone	94	6.5	37	6.6	NS
Driving at night in bad weather	97	4.1	36	3.9	NS
Driving in rush hour traffic	97	5.1	36	5.4	NS
Driving on the expressway	96	5.7	36	6.0	NS
Backing up	96	5.6	34	6.1	NS

Feelings of Driving Safety

Participants were also asked about their feelings of safety for the same set of driving circumstances presented in the previous set of analyses, to examine whether perceptions of comfort and safety had the same associations for participants. Safety related to the risk of getting in a crash, while comfort related to how at ease participants felt in specific driving situations. Participant responses were generally similar to those for feelings of comfort (Tables 10, 10a, 10b, 10c). However, while men and women differed on several dimensions of driving comfort, the only gender difference for safety was for driving in unfamiliar areas, with women reporting feeling less safe. Spearman correlations between comfort and safety

for each of the driving circumstances were generated and yielded statistically significant and high (although not perfect) correlations for each driving circumstance (Table 11).

	N	Mean	SD
How safe do you feel in the following situations, in terms of your risk of getting in a crash? (with 1 being not at all and 7 being completely)			
Driving at night	128	4.7	2.0
Making unprotected left turns across oncoming traffic	129	5.2	1.7
Driving in bad weather (rain, snow, fog, etc.)	127	4.3	1.8
Driving on high traffic roads	128	5.1	1.8
Driving in unfamiliar areas	125	5.0	1.7
Driving alone	132	6.2	1.3
Driving at night in bad weather	129	4.1	1.9
Driving in rush hour traffic	128	5.2	1.7
Driving on the expressway	131	5.5	1.8
Backing up	128	5.5	1.7

	Men		Women		Wilcoxon
	N	Mean	N	Mean	
How safe do you feel in the following situations, in terms of your risk of getting in a crash? (with 1 being not at all and 7 being completely)					
Driving at night	61	4.9	67	4.5	NS
Making unprotected left turns across oncoming traffic	62	5.3	67	5.0	NS
Driving in bad weather (rain, snow, fog, etc.)	61	4.5	66	4.1	NS
Driving on high traffic roads	62	5.4	66	4.9	NS
Driving in unfamiliar areas	61	5.3	64	4.7	p<.05
Driving alone	65	6.1	67	6.2	NS
Driving at night in bad weather	63	4.3	66	4.0	NS
Driving in rush hour traffic	64	5.3	64	5.0	NS
Driving on the expressway	64	5.8	67	5.2	NS
Backing up	62	5.8	66	5.3	NS

Table 10b. Feelings of Driving Safety by Population					
	General Pop.		Clinic Pop.		Wilcoxon
	N	Mean	N	Mean	
How safe do you feel in the following situations, in terms of your risk of getting in a crash? (with 1 being not at all and 7 being completely)					
Driving at night	97	5.2	31	3.3	p<.0001
Making unprotected left turns across oncoming traffic	97	5.3	32	4.6	p<.05
Driving in bad weather (rain, snow, fog, etc.)	95	4.5	32	3.4	p<.01
Driving on high traffic roads	96	5.5	32	4.1	p<.001
Driving in unfamiliar areas	93	5.3	32	4.2	p<.01
Driving alone	100	6.2	32	6.3	NS
Driving at night in bad weather	98	4.4	31	3.0	p<.001
Driving in rush hour traffic	97	5.4	31	4.3	p<.01
Driving on the expressway	99	5.7	32	4.7	p<.01
Backing up	98	5.8	30	4.8	p<.05

Table 10c. Feelings of Driving Safety by Age Group					
	Age 70-79		Age 80-88		Wilcoxon
	N	Mean	N	Mean	
How safe do you feel in the following situations, in terms of your risk of getting in a crash? (with 1 being not at all and 7 being completely)					
Driving at night	93	4.8	35	4.5	NS
Making unprotected left turns across oncoming traffic	95	5.1	34	5.2	NS
Driving in bad weather (rain, snow, fog, etc.)	93	4.2	34	4.4	NS
Driving on high traffic roads	94	5.1	34	5.3	NS
Driving in unfamiliar areas	92	5.1	33	4.8	NS
Driving alone	96	6.1	36	6.3	NS
Driving at night in bad weather	95	4.1	34	4.0	NS
Driving in rush hour traffic	94	5.2	34	5.1	NS
Driving on the expressway	96	5.4	35	5.7	NS
Backing up	94	5.5	34	5.7	NS

Table 11. Spearman Correlations between Feelings of Comfort and Feelings of Safety			
	N	Correlation Coefficient	P-Value
Feelings of Comfort/Feelings of Safety			
Driving at night	127	.81	p<.0001
Making unprotected left turns across oncoming traffic	126	.76	p<.0001
Driving in bad weather (rain, snow, fog, etc.)	122	.71	p<.0001
Driving on high traffic roads	125	.71	p<.0001
Driving in unfamiliar areas	123	.72	p<.0001
Driving alone	127	.67	p<.0001
Driving at night in bad weather	127	.82	p<.0001
Driving in rush hour traffic	126	.78	p<.0001
Driving on the expressway	128	.82	p<.0001
Backing up	123	.76	p<.0001

Ability to Self-Regulate

We were also interested in whether participants considered themselves able to self-regulate their driving if they wanted to do so. Large proportions of participants reported being able to self-regulate their driving across the various driving circumstances (Table 12). The only two driving circumstances for which less than three-quarters of participants reported being able to avoid were driving alone and backing up. There were no differences by sex (Table 12a), population (Table 12b), or age group (Table 12c).

Table 12. Ability of Participants to Self-Regulate Overall: N and Percent for Those Responding “Yes”		
	N	% of all
If you wanted to avoid....could you do it?		
Driving at night	120	87.6
Making unprotected left turns across oncoming traffic	122	89.1
Driving in bad weather (rain, snow, fog, etc.)	127	92.7
Driving on high traffic roads	119	86.7
Driving in unfamiliar areas	119	87.5
Driving alone	101	73.7
Driving at night in bad weather	129	94.2
Driving in rush hour traffic	127	92.7
Driving on the expressway	116	84.7
Backing up	74	54.8

Table 12a. Ability of Participants to Self-Regulate by Sex: N and Percent for Those Responding “Yes”					
	Men		Women		X ² / Fisher’s Exact Test
	N	% of all	N	% of all	
If you wanted to avoid....could you do it?					
Driving at night	60	87.0	60	88.2	NS
Making unprotected left turns across oncoming traffic	64	92.8	58	85.3	NS
Driving in bad weather (rain, snow, fog, etc.)	66	95.7	61	89.7	NS
Driving on high traffic roads	58	84.1	61	89.7	NS
Driving in unfamiliar areas	60	87.0	59	88.1	NS
Driving alone	54	78.3	47	69.1	NS
Driving at night in bad weather	67	97.1	62	91.2	NS
Driving in rush hour traffic	63	91.3	64	94.1	NS
Driving on the expressway	55	79.7	61	89.7	NS
Backing up	34	49.3	40	60.6	NS

Table 12b. Ability of Participants to Self-Regulate by Population: N and Percent for Those Responding “Yes”					
	General Pop.		Clinical Pop.		X ² / Fisher’s Exact Test
	N	% of all	N	% of all	
If you wanted to avoid....could you do it?					
Driving at night	91	86.7	29	90.6	NS
Making unprotected left turns across oncoming traffic	94	89.5	28	87.5	NS
Driving in bad weather (rain, snow, fog, etc.)	96	91.4	31	96.9	NS
Driving on high traffic roads	89	84.8	30	93.8	NS
Driving in unfamiliar areas	92	88.5	27	84.4	NS
Driving alone	80	76.2	21	65.6	NS
Driving at night in bad weather	98	93.3	31	96.9	NS
Driving in rush hour traffic	95	90.5	32	100.0	NS
Driving on the expressway	92	87.6	24	75.0	NS
Backing up	54	51.9	20	64.5	NS

Table 12c. Ability of Participants to Self-Regulate by Age Group: N and Percent for Those Responding “Yes”					
	Age 70-79		Age 80-88		X ² / Fisher’s Exact Test
	N	% of all	N	% of all	
If you wanted to avoid....could you do it?					
Driving at night	85	85.9	35	92.1	NS
Making unprotected left turns across oncoming traffic	87	87.9	35	92.1	NS
Driving in bad weather (rain, snow, fog, etc.)	92	92.9	35	92.1	NS
Driving on high traffic roads	86	86.9	33	86.8	NS
Driving in unfamiliar areas	84	85.7	35	92.1	NS
Driving alone	69	69.7	32	84.2	NS
Driving at night in bad weather	95	96.0	34	89.5	NS
Driving in rush hour traffic	90	90.4	37	97.4	NS
Driving on the expressway	84	84.9	32	84.2	NS
Backing up	50	51.0	24	64.9	NS

Associations between Feelings of Comfort/Safety and Avoidance of Specific Driving Situations

To explore possible associations between feelings of comfort/safety and self-regulation, we compared, for each of the specific driving circumstances of interest, the mean comfort/safety scores of participants who tried to avoid that specific driving circumstance with the mean comfort/safety scores of participants who did not try to avoid that situation. For every driving circumstance, driving avoidance was associated with both comfort and safety; that is, in every case, those participants who tried to avoid a driving circumstance reported being less comfortable and less safe with that situation (Tables 13 and 14).

Table 13. Comparison of Mean Comfort Scores for Specific Driving Situations by Whether Participants Reported Trying to Avoid Those Driving Circumstances					
	Participants who try to avoid driving situation		Participants who do not try to avoid driving situation		Wilcoxon
	N	Mean	N	Mean	
Specific driving situation avoided or not avoided relative to feelings of comfort for that driving situation					
Driving at night	70	3.3	62	6.2	p<.0001
Making unprotected left turns across oncoming traffic	35	4.0	96	5.9	p<.0001
Driving in bad weather (rain, snow, fog, etc.)	85	4.0	45	5.6	p<.0001
Driving on high traffic roads	41	4.2	90	5.8	p<.0001
Driving in unfamiliar areas	42	3.5	91	5.6	p<.0001
Driving alone	6	4.8	124	6.6	p<.001
Driving at night in bad weather	97	3.3	35	6.0	p<.0001
Driving in rush hour traffic	79	4.6	53	6.1	p<.0001
Driving on the expressway	25	3.4	106	6.3	p<.0001
Backing up	30	3.9	90	6.3	p<.0001

Table 14. Comparison of Mean Safety Scores for Specific Driving Situations by Whether Participants Reported Trying to Avoid Those Driving Circumstances					
	Participants who try to avoid driving situation		Participants who do not try to avoid driving situation		Wilcoxon
	N	Mean	N	Mean	
Specific driving situation avoided or not avoided relative to feelings of safety for that driving situation					
Driving at night	69	3.6	58	6.0	p<.0001
Making unprotected left turns across oncoming traffic	35	4.1	93	5.5	p<.0001
Driving in bad weather (rain, snow, fog, etc.)	81	3.9	45	5.0	p<.001
Driving on high traffic roads	41	4.3	86	5.5	p<.001
Driving in unfamiliar areas	41	4.0	83	5.5	p<.0001
Driving alone	6	4.8	125	6.2	p<.01
Driving at night in bad weather	93	3.6	35	5.5	p<.0001
Driving in rush hour traffic	74	4.7	53	5.7	p<.001
Driving on the expressway	25	3.4	105	6.0	p<.0001
Backing up	29	3.9	98	6.0	p<.0001

DISCUSSION AND SUMMARY

This project developed and pilot tested a questionnaire designed to examine the nature and extent of self-regulation by older drivers, and the factors that influence the broad array of self-regulatory practices related to life-goals changes, general reductions in driving exposure, avoidance of specific driving circumstances, avoidance of in-vehicle distractions while driving, planning and wayfinding strategies, and vehicle modifications. Results indicate that overall, participants reported few life-goals changes with the exception of buying a different vehicle in the past year. Between a fifth and a quarter of participants reported having reduced the number of days, trips, or miles per week, or the length of their trips during the past year. At the strategic level, sizable numbers of participants reported that they try to avoid a variety of specific driving circumstances. Most notably, over half of participants tried to avoid driving at night or in rush hour traffic, two-thirds tried to avoid driving in bad weather, and close to three-quarters tried to avoid driving at night in bad weather. Other driving circumstances including making unprotected left turns, driving on high traffic roads, and driving in unfamiliar areas were also avoided by close to one third or more of participants. Many planned out their trips ahead of time or reduced overall travel by combining trips. However, very few reported having made modifications to their vehicles during the past year to make driving easier. At the tactical level, a majority of participants tried to avoid in-vehicle distractions with the exception of changing radio stations, and most try to leave more room between their cars and the cars ahead of them.

Few differences in these self-regulatory practices were found between men and women, or between younger and older participants. However, participants recruited from the clinic population were more likely than those recruited from the general population to report trying to avoid driving at night, in unfamiliar areas, and on the expressway, and talking conversationally with passengers. In addition, when self-regulation was assessed another way (by asking how often participants had modified their driving plans in the context of various scenarios), participants from the clinic population were more likely to report having modified their driving plans when the most direct route to their destination required driving on the expressway, in heavy traffic, or making unprotected left turns. It may be that we did not find more differences by sex or age group because of the generally high level of

functioning among our sample. Overall, participants rated their general health and functioning, as well as various abilities for safe driving quite highly. On a scale of 1-7 with 1 being poor and 7 being excellent, the lowest overall mean score for any one ability was 5.1 (the ability to see clearly at night). Self-reported abilities did not differ by sex or age group. However, participants from the clinic population did rate themselves lower than participants from the general population on several abilities including seeing clearly during the day and at night, remembering things, and processing information. It is not surprising that no differences were found between the groups on the psychomotor abilities as most of the participants from the clinic population came from either the vision clinics or cognitive disorders clinics, rather than the movement disorder clinics at the university.

The study also investigated life-goal preferences and activities. We found that nearly all participants rated driving as enjoyable and important, with no differences by sex or population. Older participants, however, rated the importance of driving higher than younger participants. Participants also rated highly the importance of various quality-of-life activities, such as community involvement, recreation, and spending time with friends/family. In general, women rated these activities as more important than did men. There were few differences by age group or population.

Two concepts for reporting feelings toward driving in certain circumstances were investigated: feelings of comfort and feelings of safety. In general, participants reported high levels of comfort and safety for most circumstances, except for driving at night in bad weather (4.0 for comfort, 4.1 for safety). Analyses showed very high correlations among the two concepts overall and the absolute mean scores were nearly identical. Participants from the clinic population reported lower comfort and safety than participants from the general population for every driving circumstance except driving alone. These lower ratings translated into a greater likelihood of reported avoidance behavior but only for certain driving circumstances as noted above. The biggest differences between ratings of comfort and safety were found in the analyses by gender. Women reported lower comfort than men for many driving circumstances (driving on high-traffic roads, in unfamiliar areas, at night in bad weather, in rush hour traffic, on the expressway, and backing up) but this did not

translate into their reporting more avoidance of these circumstances. In addition, for safety, the only driving circumstance for which women reported a lower rating than men was for driving in unfamiliar areas. Younger and older participants did not differ in their responses for either comfort or safety. Further investigation of the relationship between feelings of comfort/safety and self-regulation is clearly warranted, although our findings suggest that, the two concepts may be interchangeable, except, notably, when comfort and safety ratings are compared among men and women.

We also investigated participants' perceived ability to self-regulate driving if they wanted to do so. Overall, a large majority of participants reported that they could avoid nearly every driving situation we investigated, except for backing up. There were no differences by sex, age, or population on these measures.

Finally, we were interested in determining the respective roles of comfort and safety while driving in certain circumstances and self-reported avoidance of those situations. We found that both driving comfort and safety were highly related to driving avoidance. In other words, if participants did not feel comfortable or did not feel safe driving in certain situations, they also reported that they avoided those situations. The result relative to comfort supports previous work showing that driving self-regulation is based at least partially on perceived comfort while driving (e.g., Myers, Paradis, & Blanchard, 2008).

Feedback on the computer-based questionnaire instrument was positive, with most participants considering the questions easy to read and understand (98.5% and 89.1%, respectively) and finding the length to be reasonable (93.4%). Most (91.2%) were satisfied with the computer format, despite the fact that only 11.0% described their level experience with computers as high. Older participants were less satisfied with the computer format, although satisfaction was still high (81.6%). Overall, almost three-quarters of participants reported that if given a choice, they would prefer to take the questionnaire on a computer.

The study has some limitations. Although the general population portion of the sample was recruited from an initial random sample of licensed older drivers in Southeastern Michigan,

participants still had to choose to contact the study team to enroll if eligible, and were therefore self selected. All participants from the clinic population were self selected into the study, sometimes after initially being approached by their physicians. Furthermore, recruiting participants from the clinic population who met the eligibility criteria of being at least age 70 and still driving proved to be much more challenging than expected and the final number of participants (32) was too small to allow us to separate out participants with visual, cognitive, and psychomotor impairments for analysis. Instead, we had to combine all types of impairment (visual, cognitive, and psychomotor) for comparisons with the general population. Our sample was highly educated and primarily White, non-Hispanic (although specific racial and ethnic information was not included in the questionnaire), limiting our ability to make comparisons with the larger population. Because this was a pilot test of the questionnaire instrument, the analyses were necessarily exploratory and descriptive in nature. In future follow-up work building on this project, multivariate methods should be used to statistically describe the relationships among functional impairments and other variables, to self-regulatory practices. In particular, factor analysis methods would be useful in reducing the myriad of variables represented by the questions in our instrument to a smaller number of broad concepts to help us better understand the complex process of self-regulation.

REFERENCES

- Adler, G. & Rottunda, S. (2006). Older adults' perspectives on driving cessation. *Journal of Aging Studies*, **20**, 227-235.
- Baldock, M.R.J., Mathias, J.L., McLean, A.J., & Berndt, A. (2006). Self-regulation of driving and its relationship to driving ability among older adults. *Accident Analysis & Prevention*, **38**, 1038-1045.
- 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 & Prevention*, **30**, 313-322.
- Bauer, M.J., Rottunda, S., & Adler, G. (2003). Older women and driving cessation. *Qualitative Social Work*, **2**, 309-325.
- Berg, H.Y. (2006). Reducing crashes and injuries among young drivers: What kind of prevention should we be focusing on? *Injury Prevention*, **12(Suppl)**, i15-i18.
- Carp, F.M. (1988). Significance of mobility for the well-being of the elderly. In *Transportation in an Aging Society: Improving Mobility and Safety of Older Persons, Volume 2*. Washington, DC: National Academy Press.
- Charlton, J.L., Oxley, J., Fildes, B., Oxley, P., Newstead, S., Koppel, S., & O'Hare, M. (2006). Characteristics of older drivers who adopt self-regulatory driving behaviors. *Transportation Research Part F*, **9**, 363-373.
- 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.
- Cody, R.P. & Smith, J.K. (1997). *Applied Statistics and SAS Programming Language*. Upper Saddle River, NJ: Prentice Hall.
- Department of Transport. (2001). *Older Drivers: A Literature Review*. London, UK: Department of Transport.
- Dickerson, A.E., Molnar, L.J., Eby, D.W., Adler, G., Bédard, M., Berg-Weger, M., Classen, S., Foley, D., Horowitz, A., Kerschner, H., Page, O., Silverstein, N.M., Staplin, L., & Trujillo, L. (2007). Transportation and aging: A research agenda for advancing safe mobility. *The Gerontologist*, **47**, 578 - 590.
- Dobbs, B.M. & Dobbs, A.R. (1997). *De-Licensing: Mobility and Related Consequences for the Patient and Family Members*. Paper presented at the Transportation Research Board Seventy-Sixth Annual Meeting, Washington, DC.
- Eby, D.W. & Molnar, L.J. (2005). Self-screening by older drivers. *Public Policy and Aging Report*, **15(2)**, 18-20.
- Eby, D.W., Molnar, L.J., Kartje, P.S. (in press). *Maintaining Safe Mobility in an Aging Society*. Boca Raton, FL: Taylor and Francis Group, LLC.
- Eby, D.W., Molnar, L.J., Kartje, P., St Louis, R., Parow, J.E., Vivoda, J.M., & Neumeyer, A. (in press). *Older Adult Self-Screening Based on Health Concerns*. Washington, DC: US Department of Transportation.
- Eby, D.W., Molnar, L.J., Shope, J.T., Vivoda, J.M., & Fordyce, T.A. (2003). Improving older driver knowledge and awareness through self-assessment: The *Driving Decisions Workbook*. *Journal of Safety Research*, **34**, 371-381.

- Eby, D.W., Trombley, D., Molnar, L.J., & Shope, J.T. (1998). *The Assessment of Older Driver's Capabilities: A Review of the Literature*. (Report No. UMTRI-98-24). Ann Arbor, MI: University of Michigan Transportation Research Institute.
- Eisenhandler, S.A. (1990). The asphalt identikit: Old age and the driver's license. *International Journal of Aging and Human Development*, **30**, 1-14.
- European Road Safety Observatory. (2006). *Older Drivers*. URL: <http://www.erso.eu>.
- Fonda, S.J., Wallace, R.B., & Herzog, A.R. (2001). Changes in driving patterns and worsening depressive symptoms among older adults. *Journal of Gerontology Series B: Psychological Sciences and Social Sciences*, **56**, S343-S351.
- Freund, B., Colgrove, L.A., Burke, B.L., & McLeod, R. (2005). Self-rated driving performance among elderly drivers referred for driving evaluation. *Accident Analysis & Prevention*, **37**, 613-618
- Gregersen, N.P. & Berg, H.Y. (1994). Lifestyle and accidents among young drivers. *Accident Analysis & Prevention*, **26**, 297-303.
- Hakamies-Blomqvist, L. & Wahlström, B. (1998). Why do older drivers give up driving? *Accident Analysis & Prevention*, **30**, 305-312.
- [Hatakka](#), M. (1998). Novice drivers' risk- and self-evaluations [in Finnish]. Turun yliopiston julkaisu Painosalama Oy, Turku.
- Hatakka, M., Keskinen, E., Gregersen, N.P., Glad, A., & Hernetkoski, K. (2002). From control of the vehicle to personal self-control: Broadening the perspectives to driver education. *Transportation Research Part F*, **5**, 201-215.
- Janke, M.K. (1994). *Age-Related Disabilities that May Impair Driving and their Assessment: Literature Review*. (Report No. RSS-94-156). Sacramento, CA: California Department of Motor Vehicles.
- Jessor, R. (1987). Problem-behavior theory, psychosocial development, and adolescent problem drinking. *Addiction*, **82**, 331-342.
- Kaplan, G.A. (1995). Where do shared pathways lead? Some reflections on a research agenda. *Psychosomatic Medicine*, **57**, 208-212.
- Keskinen, E. (1996). Why do young drivers have more accidents? Junge Fahrer Und Fahrerinnen. Referate der Esten Interdisziplinären Fachkonferenz 12–14 Dezember 1994 in Köln. Berichte der Bundesanstalt für Strassenwesen. Mensch und Sicherheit, Heft M 52.
- Keskinen, E. (2007). What is GDE all about and what it is not. In W. Henriksson, T. Stenlund, A. Sundstrom, & M. Wiberg (Eds.), *Proceedings from The GDE-Model as a Guide in Driver Training and Testing*. Umea, Sweden: Umea University.
- Keskinen, E., Hatakka, M., Laapotti, S., Katila, A., & Peraaho, M. (2004). Driver behavior as a hierarchical system. In T. Rothengatter & R.D. Huguenin (Eds), *Traffic and Transport Psychology: Theory and Application: Proceedings of the ICTTP 2000*. New York, NY: Elsevier.
- Kostyniuk, L.P. & Molnar, L.J. (2005). Driving self-restriction among older adults: Health, age, and sex effects. *The Gerontologist: Special Issue*, **45**, 143.
- Kostyniuk, L.P. & Molnar, L.J. (2007). Self regulation of driving by older women. *Transportation Research Board 86th Annual Meeting Final Program*. Washington DC: Transportation Research Board.
- Kostyniuk, L.P & Molnar, L.J. (2008). Driving self-restriction among older adults: Health, age, and sex effects. *Accident Analysis & Prevention*, **40**, 1576-1580.

- Laapotti, S. & Keskinen, E. (2004). Has the difference in accident patterns between male and female drivers changed between 1984 and 2000? *Accident Analysis & Prevention*, **36**, 577-584.
- Liddle, J., McKenna, K., & Broome, K. (2004). *Older Road Users: From Driving Cessation to Safe Transportation*. Brisbane, Australia: University of Queensland.
- Marottoli, R.A., Mendes de Leon, C.F., Glass, T.A., Williams, C.S., Cooney, L.M. Jr., Berkman, L.F., & Tinetti, M.E. (1997). Driving cessation and increased depressive symptoms: prospective evidence from the New Haven EPESE. Established populations for epidemiologic studies of the elderly. *Journal of the American Geriatrics Society*, **45**, 202-206.
- Michon, J.A. (1979). Dealing with danger: Report of the European Commission MRC workshop on physiology and psychological factors in performance under hazardous conditions (Report No. VK 79-01). Gieten, The Netherlands: Traffic Research Center, University of Groningen.
- Michon, J.A. (1985). A critical view of driver behavior models: What do we know, what should we do? In *Human Behavior and Traffic Safety, Proceedings of a General Motors Symposium on Human Behavior and Traffic Safety*. New York, NY: Plenum Press.
- Molnar, L.J. & Eby, D.W. (2008). The relationship between self-regulation and driving-related abilities in older drivers: An exploratory study. *Traffic Injury Prevention*, **9**, 314-319.
- Molnar, L.J. & Eby, D.W. (2009). Getting around: Meeting the boomers' mobility needs. In *Boomer or Bust? The New Political Economy of Aging*. R. Houston (Ed). Westport, CT: Praeger Publishing.
- Molnar, L.J., Eby, D.W., & Dobbs, B.M. (2005). Policy recommendations to the White House Conference on Aging Solutions Forum. *Public Policy & Aging Report*, **15(2)**, 24-27.
- Molnar, L.J., Eby, D.W., & Miller, L.L. (2003). *Promising Approaches for Enhancing Elderly Mobility*. Ann Arbor, MI: University of Michigan Transportation Research Institute.
- Molnar, L.J., Eby, D.W., St. Louis, R.M., & Neumeyer, A.L. (2007). *Promising Approaches for Promoting Lifelong Community Mobility*. Washington, DC: AARP.
- Myers, A.M., Paradis, J.A., & Blanchard, R.A. (2008). Conceptualizing and measuring confidence in older drivers: Development of the day and night driving comfort scales. *Archives of Physical Medicine and Rehabilitation*, **89**, 630-640.
- Owsley, C., McGwin, G., Mays, A., Joiner, W., DeCarlo, D.K., & McNeal, S. (2004). Is glaucoma associated with motor vehicle collision involvement and driving avoidance? *Investigative Ophthalmology & Visual Science*, **45**, 1123.
- Owsley, C., Stalvey, B.T., & Phillips, J.M. (2003). The efficacy of an educational intervention in promoting self-regulation among high-risk older drivers. *Accident Analysis & Prevention*, **35**, 393-400.
- Ragland, D., Satariano, W.A., & MacLeod, K. E. (2004). Reasons given by older people for limitation or avoidance of driving. *The Gerontologist*, **44**, 237-244.
- Ragland, D.R., Satariano, W.A., & MacLeod, K.E. (2005). Driving cessation and depressive symptoms. *Journal of Gerontology: Medical Sciences*, **60A**, 399-403.

- Ruechel, S. & Mann, W.C. (2005). Self-regulation of driving by older persons. *Physical & Occupational Therapy in Geriatrics*, **23**, 91-101.
- Schulze, H. (1990). *Lifestyle, Leisure Style and Traffic Behaviours of Young Drivers*. (Report No. VTI-364). Linköping, Sweden: Swedish Road and Traffic Research Institute.
- Smiley, A. (2004). Adaptive strategies of older persons. In *Transportation in an Aging Society: A Decade of Experience*. Washington, DC: Transportation Research Board.
- Stalvey, B.T. & Owsley, C. (2003). The development and efficacy of a theory-based educational curriculum to promote self-regulation among high-risk older drivers. *Health Promotion Practice*, **4**, 109-119.
- Summala, H. (1996). Accident risk and driver behaviour. *Safety Science*, **22**, 103-117.
- Whelan, M., Langford, J., Oxley, J., Koppel, S. & Charlton, J. (2006). *The Elderly and Mobility: A Review of the Literature* (Report No. 255). Victoria, Australia: Monash University Accident Research Centre.