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**Improvement of Older Driver Safety Through Self Evaluation:
The Development of a Self-Evaluation Instrument**

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16. Abstract <p>This research project was designed to increase safety in the older driver population by developing and testing a self-evaluation instrument. The instrument is intended for drivers who may be starting to experience declines in driving abilities or loss of confidence in certain driving situations. The instrument is designed to give people a source of information about themselves in addition to all of the other cues they are receiving about their current or future driving. The purpose of the instrument is twofold: 1) For those drivers willing and able to assess their own driving abilities, the instrument can give feedback for making good driving decisions by increasing self-awareness and general knowledge (of their driving abilities, medication use, and health status), and by suggesting appropriate driving restrictions and clinical evaluations; and 2) Increase general awareness of age-related declines in driving abilities for generating discussion with peers and within families. This report documents the development and testing of the self-evaluation instrument. Instrument development proceeded in three phases. The first phase involved the development of a framework for the instrument. The second phase involved the selection and development of questions to be asked and feedback to be offered. The last phase involved a evaluation/validation study of the instrument to determine whether or not certain parts of the instrument measured what they were supposed to measure, and to determine, by self-report, whether or not self-awareness was increased. While analysis of the evaluation/validation study data is still underway, preliminary evidence shows that the workbook increased general knowledge and self-awareness and was perceived as a useful tool for generating discussions within the families of older drivers.</p>					
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INTRODUCTION

Older drivers are becoming a significant societal concern; however, the issue of older driver safety is surrounded by a fair amount of confusion and some inappropriate simplistic solutions have been proposed to address it. A recent editorial on traffic safety written by a concerned citizen and published in a local paper illustrates the naivete surrounding the issue of traffic safety and the older driver by suggesting that in order to reduce the motor-vehicle crash rate we simply need to “get old folks off of the road” (Carr, 2000). While increased concern about older drivers may be justified, it is equally important that solutions be well-researched and thoughtful.

It is clear that older people (those 65 years of age and older) are beginning to account for an increasingly greater proportion of the United States (US) population. In 1950, less than 10 percent of the population was over 65 years of age. Today, the percentage is about 13 percent. It has been projected, however, that in about 50 years, the percentage of the population over 65 years of age will be nearly 21 percent (US Department of Commerce, Census Bureau, 1993). In terms of absolute numbers, those over 65 years of age will increase from about 35 million now to about 70 million in 50 years (US Department of Commerce, Census Bureau, 1993). There is also some evidence that after age 65-69, the crash involvement rate by miles driven begins to show a steep increase with increasing age (CA Department of Motor Vehicles, 1994). Even though older drivers self-restrict their driving to times and situations in which they feel safest, they have a high crash rate, per mile driven, compared to drivers in other age groups. At the same time, when crash involvement rates are calculated per number of licensed drivers, the rate for those age 65 and above and is lower than that of any other age group (Transportation Research Board, 1988; Waller, 1991). Unfortunately, for a crash of given dimensions, older people have a higher probability of being seriously injured or killed. That is, older people are more vulnerable to crash-related injury (Massie & Campbell, 1993).

In addition to the obvious ethical concerns associated with “getting old folks off the road,” such a simplistic solution can have other adverse consequences for both older drivers

and society at large. There is building evidence that the ability to drive may be an essential component of an older person's emotional well-being. According to Carp (1988), an important component to well-being is the ability of a person to satisfy those needs that give life an "acceptable and positive quality." These so-called "high-order" needs include social interaction, usefulness, recreation, and religion. Higher-order needs typically cannot be satisfied within the older person's home. Because using public transportation, walking, or relying on family members may be impractical or undesirable for many older people, driving remains the primary mode of transportation for satisfying these needs. When driving ability is reduced, mobility is also reduced, leading to a potential decline in emotional well-being and quality of life. The resulting isolation from loss of driving privileges has been identified as a primary factor in death from all causes in this age group (Kaplan, 1995). This means that taking away an older person's driving privileges will prevent motor-vehicle-related fatalities, but might increase fatalities from other causes in this age group.

This research project was designed to increase safety in the older driver population by developing and testing a self-evaluation instrument. The instrument is intended for drivers who may be starting to experience declines in driving abilities or loss of confidence in certain driving situations. The instrument is designed to give people a source of information about themselves in addition to all of the other cues they are receiving about their current or future driving. The purpose of the instrument is twofold: 1) For those drivers willing and able to assess their own driving abilities, the instrument can give feedback for making good driving decisions by increasing self-awareness and general knowledge (of their driving abilities, medication use, and health status), and by suggesting appropriate driving restrictions and clinical evaluations; and 2) Increase general awareness of age-related declines in driving abilities for generating discussion with peers and within families.

Instrument development proceeded in three phases. The first phase involved the development of a framework for the instrument, including collection of detailed background information. The second phase involved the selection and development of questions to be asked and feedback to be offered. This phase included pilot testing. The last phase involved a validation/evaluation study of the instrument to determine whether or not certain parts of the

instrument measured what they were supposed to measure, and to determine, by self-report, whether or not self-awareness was increased.

DEVELOPMENT OF FRAMEWORK

Development of the framework for the self-evaluation instrument required extensive background work. This background work included a detailed review of the literature, a series of focus groups with older drivers and former drivers, and a panel discussion of experts in older driver abilities and evaluation.

Literature Review

A comprehensive review of the literature was conducted to provide technical background for self-evaluation instrument development. Several topics were investigated. One section of the review, entitled “Abilities Related to Safe Driving,” focused on what effects, if any, aging has on visual perception, cognition, and psychomotor skills, and how these age-related changes in ability may influence safe driving. Another section of the review, entitled “Health Factors,” covered the prevalence of prescription drug use among older adults, the effects of various drug classes on driving ability, and common medical conditions. The review also included a section on “Older Driver Education and Skill Enhancement,” that discussed older driver retraining theories and courses, including course evaluations that have been conducted. The review concluded with a section on “Existing Assessment Instruments,” that identified procedures, instruments, and equipment that have been used to assess older driver abilities. The entire literature review can be found in a separate interim report (see Eby, Trombley, Molnar, & Shope, 1998).

Focus Groups

Focus groups were conducted to help identify issues related to older driver self-evaluation; define concepts; and capture the special emotions and language used by older and former drivers and by their adult children. In addition, the research provided an opportunity to test public reactions to potential policies and programs, and the proposed development of the self-evaluation instrument. The specific objectives of the focus group study were to: assess the perceived changes in driving abilities and behaviors of drivers over time; assess the degree of perceived risk of driving to self and others; determine older drivers’

plans regarding driving in the future; explore older drivers' reactions to testing; and explore older drivers' reactions to the possibility of a driving self-evaluation instrument.

A total of 16 focus group sessions were conducted. Eight were conducted in a suburban/urban area of Michigan and eight were conducted in a rural area. At each of the two locations, four distinct groups of people participated: drivers over 65 years of age who did not share driving responsibility, couples over 65 years of age who shared driving responsibilities, former drivers who had stopped driving within the past 5 years, and adult children who were concerned about the driving abilities of their older parents and/or relatives. Thus, for each location and subject group, there were two focus group sessions conducted.

A local marketing research firm conducted the focus groups for this project and a related project (see Kostyniuk & Shope, 1998). All qualitative research decisions and procedures, including recruitment of subjects, scheduling of groups, locations of groups, and the development of the moderator's guides, were made by the authors in conjunction with the marketing firm staff.

The focus groups were conducted during the month of April 1998, with each focus group ranging in size from 4 to 12 participants. Participants were paid a small honorarium for their time. Overall, 54 suburban/urban and 53 rural older current/former drivers, as well as 19 urban and 18 rural adult children, participated in the various focus groups. The ages of the older current/former drivers ranged from 65 to over 95 years. The ages of the adult children of older drivers ranged from adults in their 20s to those in the 60-to-64-year-old age group. A complete description of the focus group activities and results can be found in a separate interim report (see Shope & Eby, 1998).

Expert Panel

Once the literature review and focus groups were completed, a panel of experts was convened. The purpose of the panel discussion was to utilize panel members' specific knowledge of older adults to help determine what abilities to assess, determine how these abilities are assessed and if they can be self-assessed, discuss what type of feedback should

be given to those older drivers who have self-assessed their driving abilities, and discuss the format and length of the self-assessment instrument. Table 1 shows the list of panel members and their affiliations. Also present were the first three authors of this report.

Table 1: Names and Affiliations of Expert Panel Members.	
Name	Affiliation
Neil Alexander, MD	University of Michigan, Institute of Gerontology/Department of Internal Medicine
Jesse Blatt, PhD	National Highway Transportation Safety Administration
Allen R. Dobbs, PhD	University of Alberta, Centre for Gerontology
Sally K. Guthrie, Pharm.D	University of Michigan, College of Pharmacy
Paula S. Kartje, OT	University of Michigan Hospitals, Occupational Therapy
Lidia P. Kostyniuk, PhD	University of Michigan Transportation Research Institute
Lawrence P. Lonero, MS	Northport Associates
Cynthia Owsley, PhD	University of Alabama, Department of Ophthalmology
Kenneth Stack	General Motors Corp., Safety & Restraints Center
Jane Stutts, PhD	University of North Carolina, Highway Safety Research Center
Patricia F. Waller, PhD	University of Michigan Transportation Research Institute

The meeting took place on September 25, 1998 at the University of Michigan. The meeting started with a welcome and introductions, a project overview, a statement of the research problem, and a presentation of the discussion framework. During the main body of the meeting, the following questions were discussed: What factors are most important for driving and how are they influenced by aging? How are these factors assessed and can evaluation methods be adapted for self-assessment? Should health and medication use be assessed? What feedback should be given to users of the self-evaluation instrument? What length should the instrument be? What is the best format for the instrument? The meeting finished with a wrap-up and summary of the discussions.

Model of Influence on Driving Decisions

Once the background information was collected and synthesized, the next step in the development of the framework for the self-evaluation instrument was the formulation of a general model of influences on driving decisions. As shown in Figure 1, the model we developed has five components. Because disease, poor health, and drug use can have an effect on driving ability, the first component is *health and drug use*. This component refers to the health of the individual (both general health and medical conditions) and any medications or drugs (including alcohol) that he or she is taking. The next component, *driving abilities*, refers to those basic perceptual, cognitive, and psychomotor capabilities needed for driving. Another component is *driving skills*--those skills that need to be acquired in order to properly operate a motor vehicle. Generally, skills are acquired over time through practice. With enough practice, they become somewhat automated. With lack of practice, acquired skills can become extinguished. Another important influence on driving decisions is *driving experiences*. This component refers to incidents, or lack of incidents, that occur while driving (e.g., near-crashes, crashes, tickets, speeding with no consequences). Another component is a person's *cognitive appraisal* of their driving; that is, what a person thinks and feels about their own driving and driving in general (e.g., exultation, fear, confidence, thinking one is a good driver). The outcome of the model is a *driving decision*. Driving decisions are those choices a person makes about his or her own driving including strategic decisions (e.g., deciding when to drive) and tactical decisions (e.g., deciding what speed to drive).

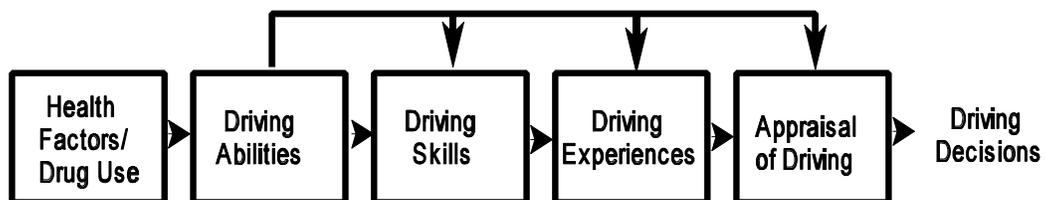


Figure 1: General Model of Influences on Driving.

According to the model, health and drug use factors influence driving by affecting driving abilities. Driving abilities, driving skills, and driving experiences are all interrelated, and all feed into the appraisal-of-driving box. Thus, all three components can influence a person's appraisal of their driving. Because health and drug use exert their effect on driving abilities, the health and drug use component also influences a person's appraisal of their driving. According to the model, driving decisions are the direct outcome of the appraisal. For example, a near-crash while speeding does not cause a person to drive more slowly, rather, the loss of confidence in driving fast following the near-crash leads to the decision to slow down when driving.

When this model is applied to the older driver, we get the model shown in Figure 2. The boxes are the same but additional information is incorporated from the literature review, focus groups, and expert panel on how the influences may change in general with increasing age in adulthood.

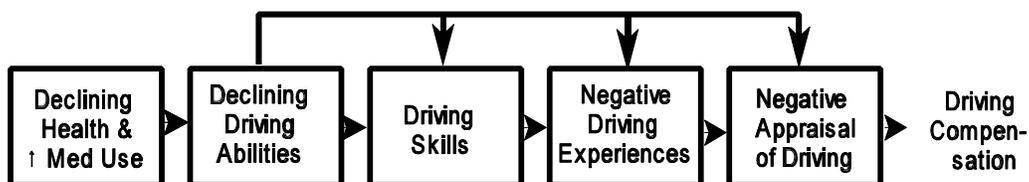


Figure 2: General Model of Influences on Driving Applied to the Older Driver.

As shown in this model, the older driver, in general, begins to experience *declining health and increased medication use* (Eby, et al., 1998). There are several medical conditions that are more common with increased age in adulthood such as arthritis, Alzheimer's disease, cardiac conditions, and stroke. Accordingly, use of medications to treat these conditions is more common in the older adult population. It is also well established that several abilities believed to be related to driving tend to decline in older people. According to the literature review and focus groups, visual changes that occur with age might include: a decrease in the amount of light reaching the retina; an increase in light scatter in the eye;

decreased speed and range of eye movements; decreased sensitivity to light; increased glare recovery time; decreased visual acuity; and a decreased in the useful part of the visual field. Cognitive changes that may occur with age include: decreased ability to divide attention; a decline in selective attention ability; a reduction in processing speed; a decrease in short-term memory capacity; a decline in problem solving ability; and a decline in wayfinding ability. Psychomotor changes that may occur with age include: decreased reaction time; reduced flexibility; reduced coordination; and declines in strength and stamina. When one separates out the effect of declining ability, *driving skills*, per se, do not seem to be affected by aging as long as the person continues to drive (i.e., to practice their skills). Thus, we concluded that driving skills, per se, are not influenced negatively by aging.

Background information suggested that older drivers may begin to experience an increase in the frequency and types of *negative driving experiences* (Eby, et al., 1998; Kostyniuk & Shope, 1998; Shope & Eby, 1998). These types of driving experiences include citations or warnings from a police officer, crashes or near-crashes, honking or gestures from other drivers, getting lost, difficulty reading signs, and difficulty handling the vehicle. Finally, the same studies also showed that older drivers may begin to start to *appraise their driving negatively*, that is they may start losing confidence or feeling distressed about their driving. This negative appraisal of driving, at least under certain circumstances, tends to lead to the decision to engage in *driving compensation* (Eby, et al., 1998; Kostyniuk, Shope, & Molnar, 2000; Kostyniuk, Trombley, & Shope, 1998; Shope & Eby, 1998). Common compensation strategies include: stopping night driving, reducing freeway driving, driving only in familiar areas, planning routes where protected left turns can be made, driving with a co-pilot, and stopping all driving.

Application of Older Driver Model to Self-Evaluation Instrument

Careful review of the influences on older driver decision making led us to conclude that the self-evaluation instrument should have three assessment domains: Health and Medication Use, Driving Abilities, and Experiences/Attitudes/Behaviors. The relationship of the older driver model to the assessment domains is shown in Figure 3. Note that there is no arrow connecting driving skills to an assessment domain. An assessment of driving skills in the self-

evaluation instrument was excluded because there is little evidence that these skills change with age, and it is not possible to self-assess these skills in a self-administered, paper and pencil instrument.

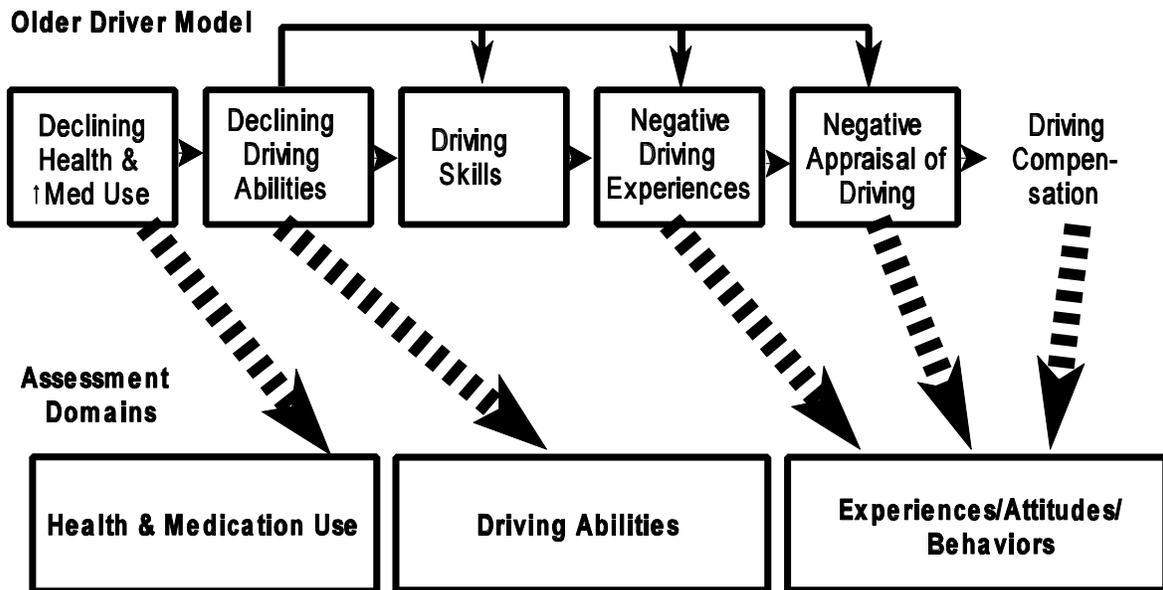
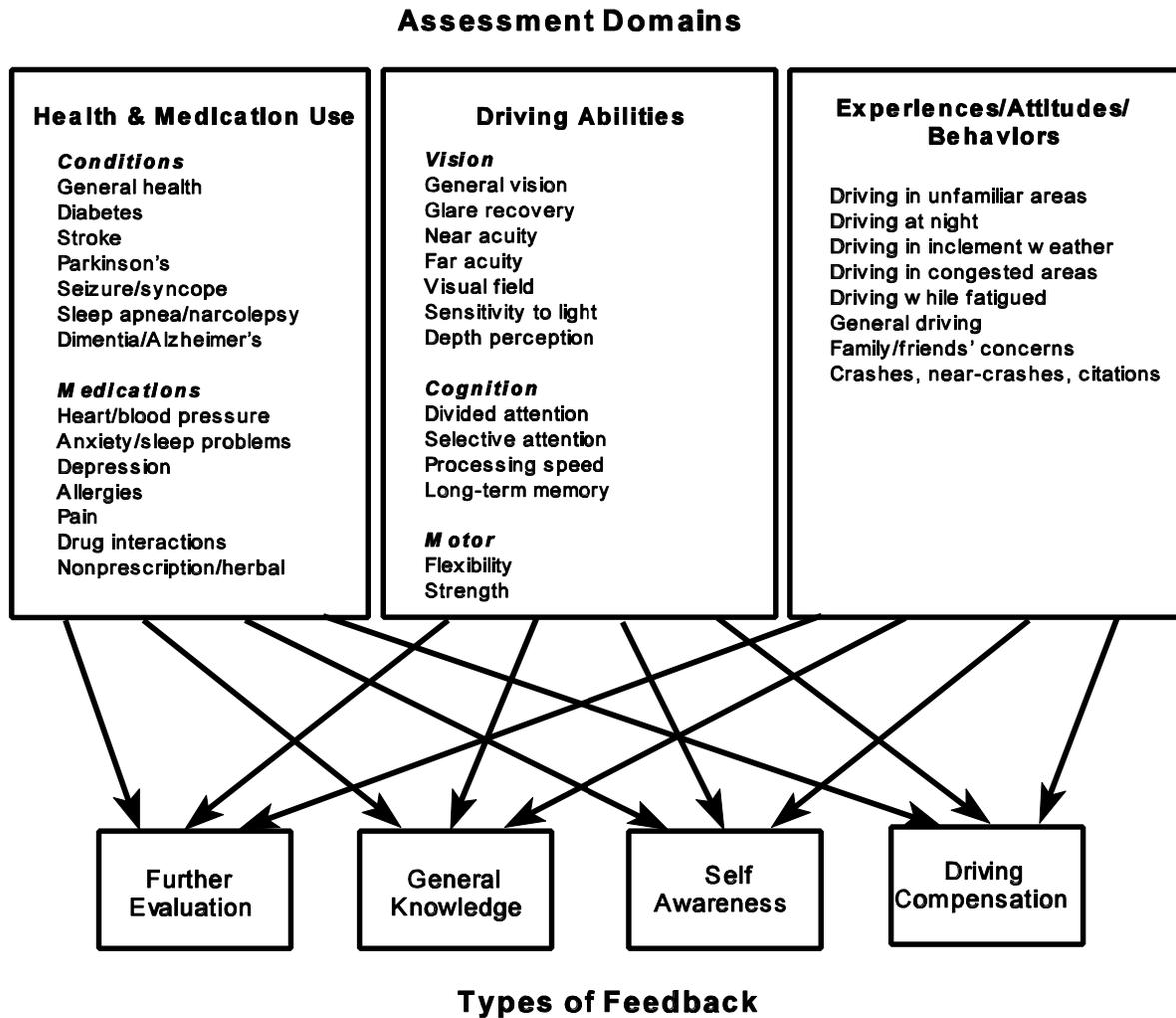


Figure 3. Relationship of Older Driver Model to the Three Assessment Domains in the Self-Evaluation Instrument.

As depicted in the bottom three boxes of Figure 3, we have labeled the assessment domains, *Health & Medication Use*, *Driving Abilities*, and *Experiences/Attitudes/Behaviors*. The third domain is designed to assess general driving fitness. It includes questions about experiences on the road, family/friends’ concerns about the respondent’s driving, attitudes toward driving under various circumstances, and current driving practices. The first two domains are designed to assess the respondent’s ability levels (vision, cognition, and psychomotor) and medical status (conditions, medication, general health, and physical fitness).

Framework for Questions and Feedback

Figure 4 shows the framework for the self-evaluation instrument. Within each of the assessment domains, several assessment areas are listed. These areas were selected because each is important for safe and effective driving and can be self-assessed in a paper



and pencil format. Several areas that are clearly important for safe driving, such as the reduction of the visual field under divided attention conditions (see Ball, Owsley, Sloane, Roenker, & Brieni, 1993), were not included in the instrument because the area cannot be self-assessed in the format selected for the instrument.

Figure 4: Assessment Domains, Areas of Assessment, and Types of Feedback for the Self-Evaluation Instrument.

In all, 37 assessment areas were selected among the three domains. It was our intent to give users of the self-evaluation instrument detailed feedback for each of these areas by asking users a set of questions and, based upon their responses, recommending that they read feedback when appropriate. As shown in Figure 4, up to four types of feedback were given for each assessment area. One type of feedback was intended to provide recommendations for further evaluation (driving evaluation, vision examination, or medical examination). A second type of feedback was general information to increase knowledge about the assessment area. General knowledge included a description of the area, its prevalence in the older population, and its effect on safe driving. The third type of feedback was intended to increase users' level of self-awareness, for example, by telling them that they might be having a problem in a particular assessment area. The final type of feedback provided recommendations for changing users' driving decisions to maintain safe and effective mobility, that is, suggestions for driving compensation. Where possible, all four types of feedback were included for each assessment area.

SELECTION/DEVELOPMENT OF QUESTIONS AND FEEDBACK

Question Selection/Development

Once the framework for the self-evaluation instrument was finalized, an intensive review of previous questionnaire instruments was conducted. Questionnaire items from a variety of sources were compiled for each assessment area. From this list, specific items for the self-evaluation instrument were chosen for each assessment area, based on how well the question addressed the area and whether the question was appropriate for self-report (American Association of Retired Persons, AARP, 1992; American Automobile Association Foundation for Traffic Safety, 1994; Cornoni-Huntley, Brock, Ostfeld, Taylor, & Wallace, 1986; Haraldsson, Carenfelt, & Tingvall, 1992; Haraldsson, Carenfelt, Diderichsen, Nygren, & Tingvall, 1990; Health and Retirement Study, 1998; Lonerio, et al., 1994; Ontario Ministry of Health, 1990; RAND Health Program, 1996; Reuben, 1993; Stewart, Hays, & Ware 1988; University of Arizona Drachman Institute, 1999; Vision Laboratories of Northwestern University and the University of Calgary, 1999). Most questions were then modified to some extent to ensure clarity and consistency within the instrument. For areas in which too few or no appropriate questions were found, original questions were developed by project staff based upon the literature review and expert opinion.

The preliminary set of questions was pilot tested in two structured group interview sessions. One group was composed of 10 licensed drivers 65-to-74 years of age and the other group was composed of 8 licensed drivers 75 years of age and older. Participants in both groups were paid a small sum for their participation. In each session, participants were asked to answer the set of questions associated with a particular domain and then to comment on several issues including: how they understood certain words, phrases, and questions; appropriateness of questions for the assessment area; appropriateness of language; length; reading level; and any other reactions. This process was repeated for all assessment domains. Based upon the feedback from pilot testing, the questions in the instrument were extensively revised.

Feedback Development

Following the framework shown in Figure 4, feedback for each assessment area was written, based on information from the literature review (Eby, et al. 1998), focus groups, expert panel, project staff's backgrounds, and other sources (see AARP, 1992; AAA Foundation for Traffic Safety, 1994; Austroads Incorporated, 1998; KCET, 1997; Malfetti & Winter, 1987; Staplin, Gish, Decina, Lococo, & McKnight, 1998; University of Arizona Drachman Institute, 1999; Wood 1988). Where possible, all four types of feedback were included. The general format of the feedback was a paragraph that provided a self-awareness statement (e.g., "You may have difficulty with *glare recovery*"), followed by general information regarding the assessment area (e.g., "As we age, our eyes may become more sensitive to glare..."), followed by a set of bulleted items suggesting further evaluation and behavioral compensation strategies (if appropriate).

After the feedback sections were completed, the instrument was formatted so that it would approximate the final version of the self-evaluation instrument and another pilot study was conducted. Again, the pilot study took the form of two structured group interview sessions, using the same age groups as in the earlier pilot study. About one-half of the participants in this pilot test had participated in the first study. In each session, participants worked through an assessment domain and were encouraged to read all of the feedback even if their individual responses did not direct them to the feedback. Participants were asked to discuss the following issues: clarity of feedback; format of questions and feedback; appropriateness of feedback information; difficulty understanding feedback; appropriateness of recommendations; missing recommendations; and other reactions to the questions and feedback. Both the questions and feedback were revised based upon the suggestions of the pilot test participants.

The Self-Evaluation Instrument

Once the questions and feedback were finalized a complete self-evaluation instrument was created. The entire instrument, published separately as an interim report (Eby, Molnar, & Shope, 2000), can be found in Appendix A. The instrument, entitled the *Driving Decisions Workbook* is divided into three general sections. The first section is an introduction. Included

in this section is a brief discussion of older person mobility and the need for self-awareness in making good driving decisions, instructions on how to complete the workbook, and a discussion of how the workbook might be used in the future and in facilitating discussions within families.

The second section includes the questions and feedback and comprises the main body of the *Driving Decisions Workbook*. This section is divided into five parts. The first part is called *On The Road* and corresponds to the *Experiences/Attitudes/Behaviors* assessment domain. The next three sections are called *Seeing*, *Thinking*, and *Getting Around* which refer to the vision, cognition, and psychomotor parts of the *Driving Abilities* assessment domain. The fifth section is called *Health* which coincides with the *Health & Medication Use* assessment domain. Each of the 37 assessment areas have a unique page in this section of the workbook. For each assessment area, the left side of the page contains one to six questions for that assessment area and the right side of the page contains the feedback for the area. All of the questions are multiple choice. Beneath some of the possible responses for each question is a line that connects the indicated responses with the feedback. If the person selects that response, they are instructed to follow the arrow over to the feedback, indicating that the feedback may be appropriate for them.

The last section of the *Driving Decisions Workbook* is a *Question and Answer (Q & A)* discussion. This section was included in the workbook so that we could provide feedback that was more general than the person would get based upon any single assessment area. We chose the Q & A format as a convenient means for conveying this information. The Q & A section covers the following areas: General driving safety; how to use the information from the workbook to optimize a visit with a doctor; where and how to get a driving evaluation done; mobility options; planning for effective mobility in the future; and how to use the workbook with someone else who may be experiencing driving difficulties.

Analysis of the readability showed that the *Driving Decisions Workbook* is written at the Flesch-Kincaid 8th grade reading level. When the health-related terms, such as the names

of drugs and conditions, and the names of defined concepts, such as *glare recovery*, are removed, the readability analysis showed a 7th grade reading level.

EVALUATION/VALIDATION OF INSTRUMENT

The final phase of the project was a validation/evaluation study of the *Driving Decisions Workbook*. The study purposes were to: 1) determine if the instrument increases self-awareness and general knowledge of age-related declines in driving abilities and is perceived as useful; and 2) determine the extent to which the questions in the instrument accurately identify selected ability and driving problems.

Method

Subjects

Subjects were recruited from the University of Michigan Claude D. Pepper Older Americans Independence Center, and postings at local retirement communities, senior centers, and supermarkets. Two age groups of subjects were recruited: 65-to-74 years of age and 75 years of age and older. All subjects were in possession of a valid driver license.

Ninety-nine subjects participated for pay. Subject ages ranged from 65 to 90 years of age with a mean age of 74.6 years. Forty-four percent of subjects were male. Fifty-five subjects were in the 65-to-74-year-old age group (mean age 70.2) and 49 percent were male. Forty-four subjects were in the 75-and-older age group (mean age 80.2) and 39 percent were male.

Design

Four measures were used for comparison with responses on the *Driving Decisions Workbook*. The first was a short questionnaire survey designed to determine self-reported increases in self-awareness and general knowledge, and perceived usefulness of the instrument. The survey also gathered demographic and current driving information. The second measure was the *Mini Mental State Exam* (MMSE; Folstein, Folstein, & McHugh, 1975). This 11-item, 30 point dementia-screening exam is administered and scored by an experimenter. The exam assesses cognitive function in five domains: general orientation; learning and memory; attention; language; and spatial relationships. A third measure was the

Gross Impairment Screening Battery (GRIMPS; Staplin, Lococo, Stewart, & Decina, 1999). GRIMPS is a collection of several tests of cognitive, perceptual, and psychomotor ability that are believed to be important for safe driving. These tests include a rapid pace walk, rapid foot tapping, lifting arms over head, head/neck rotation, the Motor Free Visual Perception test (MVPT), visual scanning test, and Trail Making A and B. Cued and delayed recall are also part of GRIMPS, but were not administered because the identical items were administered as part of the MMSE. A full description of each of these tests can be found elsewhere (Staplin, et al., 1999).

The fourth measure was a short standardized driving course. This on-road course was developed by project staff following published recommendations (Staplin, et al., 1999). The 7-mile course featured 28 structured maneuvers at specific locations, each with a fixed number of possible errors and objective scoring criteria. Table 2 shows each type of maneuver, its frequency, and a description. For each maneuver, the examiner scored several aspects of the maneuver, such as proper use of signal, proper search, and path too wide, using scoring criteria established prior to the study. On a separate section of the score sheet was a list of critical driving errors as suggested in Staplin et al. (1999). These were errors that, if committed, provided important information about the driver's competency, but were not scorable using the scoring element for a specific maneuver or they occurred between maneuvers. The critical driving errors listed were: examiner intervention, object struck, inappropriate reaction to a school bus, inappropriate reaction to an emergency vehicle, drove over/up curb/sidewalk, drove in oncoming traffic lane, inappropriate speed, missed turn, and illegal maneuver. At the end of the course the experimenter asked subjects how familiar they were with the roads included on the course and the experimenter rated subjects' apparent confidence while driving.

The instruction for each maneuver were created following recommendations in a National Highway Traffic Safety Administration (NHTSA) report (Staplin, et al., 1999). The use of street names was avoided except for the undirected travel in which the driver was asked to find a well-marked street. Mention of the types of traffic control devices was avoided. The instructions were maneuver-based and followed the general format of first telling the driver

where to make the maneuver (e.g., “At the next intersection...”) followed by the type of maneuver (e.g., “...when the way is clear, please turn left”). No instructions were given for making maneuvers that were required prior to an instructed maneuver. For example, if a lane change was required prior to making a left turn, the driver was expected to make the preparatory lane-change maneuver without prompting. Completion of the course required about 15 minutes.

Table 2: Maneuvers Composing the Driving Course		
Maneuver	Freq.	Description
Controlled Right Turn	2	Right turn at an intersection controlled by a yield or stop sign where the driver must yield or stop
Controlled Left Turn	2	Left turn at an intersection controlled by a yield or stop sign where the driver must yield or stop
Uncontrolled Right Turn	3	Right at an intersection or driveway that is not controlled in the direction that the driver was originally traveling
Uncontrolled Left Turn	2	Left at an intersection or driveway that is not controlled in the direction that the driver was originally traveling
Protected Right Turn	3	Right turn at an intersection controlled by a traffic signal where the driver must stop or proceed according to the signal
Protected Left Turn	2	Left turn at an intersection controlled by a traffic signal where the driver must stop or proceed according to the signal
Controlled Through	3	Continue straight after a stop or yield
Protected Through	1	Continue straight at an intersection according to traffic light instructions
Straight	3	Driver proceeds straight along a roadway
Lane Change	4	A change in lanes either to the left or to the right in preparation for a required turn
Curve Negotiation	1	Bend or curve in the road, not at an intersection, requiring a reduction of speed to safely negotiate
Undirected Travel	1	Driver finds street and makes turn without directions from experimenter
Backing Up	1	Backing out of the parking space

Procedures

The study was conducted at the University of Michigan Transportation Research Institute (UMTRI). Upon arriving at UMTRI, participants were brought to a reception area where they showed their valid driver license and vehicle insurance to an experimenter. Those without a valid driver license or valid vehicle insurance were not allowed to participate. Subjects completed informed consent forms and were given an overview of the tasks that they would complete in the following 1.5 to 2 hour period.

The first task was completion of the *Driving Decisions Workbook*. Subjects were instructed to circle the best answer for each question and to read the feedback if they were so inclined. Following the workbook, subjects completed the short questionnaire. After the questionnaire, subjects were taken by another experimenter to a laboratory, in which the procedures that compose GRIMPS were conducted, followed by administration of the MMSE. Feedback on subjects' performance was provided upon request.

Once the laboratory testing was completed, subjects were met by a third experimenter who took them to their vehicle in the parking area of UMTRI. Instructions for the driving course were given. Once questions were answered, the driving course task was started. At the end of the driving course, subjects were paid and given a debriefing form that explained the study. At the request of subjects, feedback about performance on the driving course was provided. This feedback related only to what had occurred without providing suggestions regarding future driving; for example, *you did not leave enough room when you changed lanes on Plymouth Road*, rather than, *you should not drive in heavy traffic*. Subjects who asked for general feedback on their driving were told that the experimenter was not a licensed driving evaluator and they may want to consider a professional evaluation if they were concerned. Subjects were then given names of organizations that could perform such an evaluation.

All three experimenters who conducted and scored the driving course trained together until they achieved an interobserver reliability of at least 85 percent on all maneuvers. A

cellular phone was carried with each experimenter in case of a problem on the driving course. If at any time an experimenter felt that the driving course should be terminated because of safety concerns, he or she was instructed to have the subject pull over, call another experimenter for a ride back to UMTRI, and then pay, debrief, and give feedback to the subject. This procedure did not need to be utilized during the study.

During days of poor weather, subjects were rescheduled if possible. If not possible, subjects completed all tasks except the driving course, which was rescheduled on a day with better weather. These subjects completed the driving course within one week of participating in the other tasks. Six subjects could not be rescheduled for the driving portion of the study for various reasons. One subject was excluded from participating in the driving course based upon a very poor performance on the GRIMPS and MMSE procedures. Thus, we have driving data for 92 of the 99 people who participated.

Results

As discussed previously, the study had two purposes. The first was to determine if the instrument increased self-awareness and general knowledge of age-related declines in driving abilities and was perceived as useful. The second purpose was to determine the extent to which the questions in the instrument accurately identified selected ability and driving problems (validation).

Duration

The length of time required for each respondent to complete the workbook, including reading the instructions, was measured. The mean duration and standard deviation (in minutes) by overall, sex, and age group are shown in Table 3. As can be seen in this table, respondents needed about 30 minutes to complete the workbook, with little difference between men and women. There was about a seven-minute difference between the youngest and oldest age groups, showing that older respondents need more time than younger respondents to complete the workbook.

Category	Mean	SD
Overall	30.5	11.8
Men	31.1	11.5
Women	30.1	12.1
65-74	27.5	10.0
75-up	34.3	12.9

Self Awareness/General Knowledge

The questionnaire included seven yes/no questions designed to assess whether or not the workbook changed respondents' self-awareness or general knowledge. The percentage of respondents answering "yes" to each question by overall, sex, and age group is shown in Table 4. As shown in this table, about three-fourths of respondents indicated that the workbook made them more aware of changes that can affect their driving. There was little difference by sex or age group. Among all respondents, about 14 percent indicated that they discovered a change in themselves that they had not been aware of before completing the workbook. Women and the younger age group were more likely to answer "yes" to this question than men or those in the older age group. Nearly all respondents, regardless of sex or age group, thought that the workbook served as a useful reminder of things that they already knew and nearly all sometimes read the feedback even though their answers did not direct them to the feedback. About 40 percent of respondents indicated that completion of the workbook made them think more about the possibility of taking a driving refresher course. Both women and those in the older age group were more likely to answer "yes" to this question than men or those in the younger age group. Slightly more than one-third of respondents reported that they will be more likely to have a doctor check their vision, cognition, or psychomotor abilities after completing the workbook. Women and those in the older age group more frequently indicated "yes" to this question than men or those in the younger age group.

Question	Overall	Men	Women	65-74	75-up
Did the workbook make you more aware of changes that can affect your driving?	76.5	77.3	75.9	76.4	76.7
Did you discover any changes in yourself that you had not been aware of before?	14.1	11.4	16.4	16.4	11.4
Did some of the feedback serve as a useful reminder of things that you already knew?	96.9	97.7	96.4	94.6	100
Even if your answers to questions in the workbook did not point to the feedback, did you sometimes read the feedback just because you were curious?	99.0	97.7	100	100	97.7
Now that you have completed the workbook, are you planning to make any changes in the way you drive?	23.7	11.6	33.3	22.2	25.6
Did completing the workbook make you think more about the possibility of taking a driving refresher course or how such a course might benefit you?	41.4	36.4	45.5	36.4	47.7
Now that you have completed the workbook, do you think you will be more likely to have a doctor check your seeing, thinking, or movement abilities?	35.7	30.2	40.0	31.5	40.9

Usefulness

The questionnaire included three yes/no questions and one scale question designed to assess self-reported workbook usefulness. The percentage of respondents answering “yes” to the first three questions and the percentage of respondents selecting each possible answer for the fourth question by overall, sex, and age group is shown in Table 5. Nearly three-fourths of respondents indicated that they would use the workbook in the future if it were made available. Women were much more likely than men to indicate that they would use the workbook again in the future. Nearly all respondents, regardless of sex or age group, reported that they would recommend the workbook to older friends or family members who drive. All respondents indicated that the workbook could be useful for helping older adults talk about driving concerns with their families. Finally, when asked to indicate the overall usefulness of the workbook on a four-point scale, about one-half of respondents indicated that the workbook was “very useful” while another 40 percent indicated that it was “somewhat useful.” No respondent indicated that the workbook was “not at all useful.” Women and respondents in

the younger age group gave higher usefulness ratings than men or respondents in the older age group.

Question	Overall	Men	Women	65-74	75-up
If it were publically available, would you be likely to use the workbook in the future?	72.4	67.4	76.4	72.2	72.7
Would you recommend the workbook to older adult friends or family members who drive?	96.9	95.5	98.2	94.6	100
Do you think that the workbook could be useful for helping older adults talk about driving concerns with their families?	100	100	100	100	100
Overall, how would you rate the usefulness of the workbook?					
Very	53.5	43.2	61.8	52.7	54.6
Somewhat	40.4	52.3	30.9	43.6	36.4
A Little	6.1	4.6	7.3	3.6	9.1
Not at All	0.0	0.0	0.0	0.0	0.0

Validation

This section of the study was designed to determine the extent to which the questions in the instrument accurately identified selected abilities and driving problems. Validation will be based upon a comparison of answers on the workbook with results from GRIMPS, MMSE, and the driving course. As of this writing, we are in the early stages of these analyses.

DISCUSSION

This report documents the development and testing of a self-evaluation instrument for use by older drivers. The instrument is intended for drivers who may be starting to experience declines in driving abilities or loss of confidence in certain driving situations. The instrument is designed to give people information about themselves in addition to all of the other cues they are receiving about their current or future driving. The purpose of the instrument is twofold: 1) For those drivers willing and able to assess their own driving abilities, the instrument can give feedback for making good driving decisions by increasing self-awareness and general knowledge (of their driving abilities, medication use, and health status), and by suggesting appropriate driving restrictions and clinical evaluations; and 2) Increase general awareness of age-related declines in driving abilities for generating discussion with peers and within families.

While the data from the evaluation/validation study are still under analysis, the preliminary results are quite promising. By self-report, the instrument increased general knowledge in nearly all respondents. In addition, the results showed that self-awareness was also increased in many respondents. About 14 percent indicated that they discovered a change in their abilities that they were unaware of before completing the workbook. This percentage is surprisingly high considering the fact that only a subset of respondents would be expected to be experiencing a decline in ability, and of those people, only a subset would be previously unaware of the decline. Another indication of increased self-awareness in a large number of respondents is found in the analysis of self-reported future behaviors. About one-quarter reported that they were planning to change the way they drove, about one-third reported they were now more likely to see a doctor about some declining ability, and about 40 percent were now considering a driving refresher course. All three results show that, at least by self-report, respondents discovered things about themselves and their driving that they either did not think about much or were unaware of before completing the workbook. Thus, the preliminary results suggest that the instrument has been successful in achieving its first purpose.

The preliminary results also show that the *Driving Decisions Workbook* may be utilized according to the second purpose. All respondents indicated that the workbook could be useful for helping older adults talk about driving concerns with their families. In addition, the most frequent spontaneous comment made by respondents while completing the workbook related to using the workbook within a family.

In conclusion, preliminary analyses show the potential benefits of the *Driving Decision Workbook*. Further analysis of the questionnaire data and data in the validation portion of the study is continuing over the next several months. Final results will be reported subsequently.

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