



## Tactical, strategic, and life-goal self-regulation of driving by older adults: Development and testing of a questionnaire



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### ARTICLE INFO

#### Article history:

Received 25 July 2012

Received in revised form 4 April 2013

Accepted 16 May 2013

Available online 4 June 2013

#### Keywords:

Self-regulatory practices

Mobility

Driving avoidance

Older drivers

### ABSTRACT

**Introduction:** Appropriate self-regulation of driving – that is, adjusting one's driving patterns by driving less or avoiding specific situations considered challenging – shows promise as a strategy for extending safe driving. However, results on the extent of self-regulatory practices among older drivers vary considerably across studies. **Method:** The purpose of this study was to develop and test a questionnaire to measure self-regulation at multiple levels of driver performance and decision making, using a sample of older drivers comprised of individuals with clinically-determined functional impairments, as well as older adults recruited from the general population. **Results:** Results suggest that the questionnaire is a user-friendly instrument for gathering information from older adults about their self-regulatory practices which has good construct validity. Feedback on the questionnaire was positive. Construct validity of the questionnaire was assessed by comparing the recruitment populations along various dimensions on which they might be expected to differ (e.g., self-rated health and functioning, abilities for safe driving, and feelings of driving comfort/safety) and looking for correlations between variables that one would reasonably expect to be correlated. **Conclusions:** Overall, participants rated their general health and functioning, and abilities for safe driving quite highly. However, participants from the clinic population rated themselves lower than participants from the general population on several abilities including seeing clearly during the day and night, remembering things, and processing information. While participants reported high levels of driving comfort and safety for most driving situations, the clinic population reported lower levels of comfort and safety for every driving circumstance except driving alone. High correlations were found between comfort and safety and the absolute mean scores were nearly identical for each driving circumstance. Finally, the clinic population was more likely to report trying to avoid driving at night, in unfamiliar areas, and on the expressway, as well as chatting with passengers. **Impact on the industry:** Results of this pilot work provide insights into the self-regulatory driving process that could eventually inform efforts to extend safe mobility among older adults.

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### 1. Introduction

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 the extent to which individuals experience these declines (Eby, Trombley, Molnar, & Shope, 1998; European Road Safety Observatory, 2006) and the impact of such declines on actual crash risk is not always fully known (Whelan, Langford, Oxley, Koppel, & Charlton, 2006).

Self-regulation has been described as the process of adjusting driving patterns by driving less or intentionally avoiding driving situations considered to be challenging (e.g., D'Ambrosio, Donorfio, Coughlin, Mohyde, & Meyer, 2008). Appropriate self-regulation shows 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 and consider driving 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 et al., 2007; Molnar, Eby, & Dobbs, 2005), and has been associated with increased social isolation (Liddle, McKenna, & Broome, 2004; Ragland, Satariano, & MacLeod, 2004); loss of independence, mobility, and freedom (Adler & Rottunda, 2006; Bauer, Rottunda, & Adler, 2003; Dobbs & Dobbs, 1997); and increased depressive symptoms (Fonda, Wallace, & Herzog, 2001; Marottoli et al., 1997; Ragland, Satariano, & MacLeod, 2005).

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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). However, there is considerable variation across studies with regard to the extent of self-regulation by older drivers and how self-regulation is influenced by a variety of individual, social, and environmental factors. Rates of self-reported avoidance of night driving, for example, vary from 8% (Baldock, Mathias, McLean, & Berndt, 2006) to 25% (Charlton et al., 2006), to 60% (Ruechel & Mann, 2005), to 80% (Ball et al., 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 sex (Charlton et al., 2001; Gwyther & Holland, 2011; Hakamies-Blomqvist & Wahlström, 1998; Kostyniuk & Molnar, 2007, 2008), 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, Stalvey, & Phillips, 2003; Owsley et al., 2004) play a role in self-regulation, these factors are not consistently examined in studies and when they are, their influence on self-regulation is not always supported. For example, older drivers studied longitudinally in Australia reported declines in functional abilities over time but few changes in self-regulatory behaviors (Baldock, Thompson, & Mathias, 2008).

The lack of conclusive results in this area is due in large measure to considerable differences across studies in terms of how self-regulation is defined and measured, the characteristics of study subjects (e.g., age, 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 (e.g., insight into functional declines and confidence in driving ability), as well as, in some cases, the failure to control for confounding variables. In addition, most studies on self-regulation have limited their measures to a narrow set of driving situations such as not driving at night, not driving on the freeway, and so forth. Important questions remain about the extent to which and the conditions under which older adults do self-regulate their driving. There is a need for a more comprehensive, theoretically-informed, and uniform approach to investigating self-regulation by older drivers that encompasses 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.

## 2. Study background

The study reported here is part of a larger program of research at the University of Michigan Transportation Research Institute (UMTRI), investigating: the nature and extent of self-regulation by older drivers; how self-regulation is influenced by various individual, social, and environmental factors; and how self-reports of self-regulatory practices compare with objective data on driving patterns and behaviors. Self-regulation is conceptualized as occurring at three levels of driver performance and decision making: tactical, strategic, and life-goal, thus extending the research focus beyond the narrow set of driving circumstances typically examined in studies of self-regulation.

The tactical and strategic levels come from Michon's hierarchical model for driving skills and control (Michon, 1985). The strategic level encompasses the general planning stage of a trip, with most decisions taking place before the trip even begins (Smiley, 2004). Strategic self-regulatory practices include reductions in the overall amount of driving that drivers do, avoidance of specific driving circumstances that drivers consider to be challenging (e.g., at night or

on the freeway), and strategies for planning routes. The tactical level has to do with the actual maneuvers drivers make in traffic at any given time. Tactical self-regulatory practices include avoiding distractions inside the vehicle while driving, and modifying driving maneuvers in traffic relative to vehicle speed and distance between vehicles. Michon's model also included an operational level that has to do with the details of driving that are largely automated; however, driver actions at the operational level are not included here as they are generally not amenable to conscious manipulation.

The life-goal level (a term coined by Eby et al., 2009) builds on work by Keskinen and others on young drivers (e.g., Keskinen, 1996, 2007; Keskinen, Hatakka, Laapotti, Katila, & Peraaho, 2004; Laapotti & Keskinen, 2004) focusing on drivers' general motives and attitudes in life and how they interact with drivers' skills to affect driving. The premise underlying the life-goal level is that factors related to what individuals are like and how they live day-to-day (e.g., group affiliation and personality traits such as self-control) also affect approaches to driving and specific driving behaviors (Berg, 2006). Life-goal self-regulatory practices include broader decisions such as what type of vehicle to buy or where to live in relation to driving destinations. This level has direct applicability to older drivers and the decisions they make because it is often these larger motives, tendencies, and social relationships that influence individual goals and the context of driving. In addition, the greatest opportunity for self-regulation of driving is at the higher levels of decision making; that is the strategic and life-goal levels. For example, at the life-goal level, safety is often an important consideration in the vehicle purchase decision (Eby & Molnar, 2012).

The purpose of this study was to develop and test a questionnaire to measure, in a comprehensive manner, the self-reported tactical, strategic, and life-goal self-regulatory practices employed by older drivers. Specific aims of the study were to: (a) develop a computer-based questionnaire that can be used in the United States and elsewhere to study self-regulation; (b) recruit a sample of older drivers in Michigan comprised of individuals with clinically-determined functional impairments in vision, cognition, or psychomotor ability, as well as older adults recruited from the general population; and (c) pilot test the questionnaire with participants in the sample to assess its ease of use and understandability, as well as its construct validity.

## 3. Methods

This study took place in two phases: the first phase involved developing the questionnaire instrument and the second phase involved pilot testing it 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. Fuller details on the study can be found in Molnar, Eby, Roberts, St.Louis, and Langford (2009).

### 3.1. Questionnaire development

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 naturalistic driving database containing driving data for 26 drivers age 60–70 (LeBlanc et al., 2006) to identify common driving circumstances that might be included in the questionnaire. The questionnaire instrument underwent several rounds of review and revision by members of the study team to ensure 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), and that the layout was user-friendly, instructions were clear, and the language used was easy to understand. To facilitate

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