The effects of demographics, functioning, and perceptions on the relationship between self-reported and objective measures of driving exposure and patterns among older adults

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\textbf{Abstract}

The exploratory study reported here was intended to examine: how strongly subjectively reported driving avoidance behaviors (commonly referred to as self-regulation) and exposure were related to their objectively measured counterparts and whether it depended on the specific behavior; the extent to which gender and age play a role in the association between subjectively reported driving avoidance behaviors and exposure and their objectively measured counterparts; and the extent to which demographics, health and functioning, driving-related perceptions, and cognition influence the association between subjective and objective driving avoidance behaviors overall. The study used data from the Longitudinal Research on Aging Drivers (LongROAD) study, a multisite, prospective cohort study designed to generate empirical data for understanding the role of medical, behavioral, environmental, and technological factors in driving safety during the process of aging. Objective driving measures were derived from GPS/datalogger data from 2131 LongROAD participants’ vehicles. The corresponding subjective measures came from a comprehensive questionnaire administered to participants at baseline that asked them to report on their driving exposure, patterns, and other aspects of driving. Several other variables used in the analyses came from the comprehensive questionnaire and an in-person clinical assessment administered to participants at baseline. A series of simple linear and logistic models were fitted to examine the relationship between the subjective and objective driving measures of interest, and a multivariable analysis was conducted to examine the potential role of selected factors in the relationship between objective and...
subjective driving avoidance behaviors. Results of the models are presented and overall findings are discussed within the context of the existing research literature.

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1. Introduction

The collection and analysis of data on older adults’ driving exposure and patterns (i.e., how much people drive, as well as when, where, and under what conditions) represents an important first step in understanding the process of driving self-regulation, whereby older adults reduce their exposure to driving conditions considered challenging (e.g., at night, during rush hour, on major highways, or long distances from home) or decrease their overall amount of driving (see Molnar et al., 2015 for a review of this literature). Self-regulation is of particular interest because of its potential to help older drivers compensate for declining driving-related abilities and extend the period over which they can safely drive (Gwyther & Holland, 2012; Wong, Smith, & Sullivan, 2012). However, there is still much we do not understand about the extent to which and conditions under which drivers engage in self-regulation, and the associated safety outcomes (Molnar et al., 2014).

Until recently, most of the available data on self-regulation came from self-reports by older drivers (e.g., Baldock, Mathias, McLean, & Berndt, 2006; DeCarlo, Scilley, Wells, & Owssley, 2003; Sargent-Cox, Windsor, Walker, & Anstey, 2011; Sullivan, Smith, Horswill, & Lurie-Beck, 2011). Although these data can be valuable in understanding driving-related behavior, evidence suggests that older drivers’ self-reports do not always align with actual driving (e.g., Blanchard, Myers, & Porter, 2010; Huebner, Porter, & Marshall, 2006). This has led to concerns about the validity and accuracy of self-reported measures of driving (e.g., Huebner et al., 2006; Staplin, Gish, & Joyce, 2008). For example, Agramunt and colleagues (2017) recently found that older drivers with bilateral cataracts significantly underestimated the number of overall trips, weekend trips, and trips during rush hour, and overestimated overall driving duration, based on a comparison of entries in a travel diary to an in-vehicle monitoring device.

It is possible to examine driving exposure and patterns using low cost global positioning system (GPS) technology to record a vehicle’s location on a continuous basis along with the date and time (e.g., see Grengs, Wang, & Kostyniuk, 2008), facilitating its use in large scale studies. This presents an opportunity to collect and compare objective and subjective data on older adults’ driving patterns and exposure. While there has been some research on this topic (e.g., Blanchard et al., 2010; Huebner et al., 2006; Marshall, Molnar, Man-Son-Hing, Stiell, & Porter, 2007; Molnar et al., 2013; Myers, Trang, & Crizzle, 2011), results have been mixed and most studies were limited to small samples (e.g., 10 or 20). In addition, none looked beyond overall comparisons between objective and subjective measures to identify various factors that might be affecting the relationship or lack of relationship between these measures.

Further research in this area is clearly warranted. In particular, given evidence of gender and age differences in self-regulation, and driving exposure and patterns more generally (e.g., Charlton et al., 2006; Gwyther & Holland, 2012; Kostyniuk & Molnar, 2008; Naumann, Dellinger, & Kresnow, 2011; Sargent-Cox et al., 2011; Unsworth, Wells, Browning, Thoman, & Kendig, 2007), it seems reasonable that these might be useful characteristics to examine in comparing objective and subjective driving measures. For example, studies suggest that women are more likely to avoid challenging driving situations than men, and such avoidance increases with age. Similarly, it could prove fruitful to examine the effects of other factors that have been found to affect self-regulation such as perceived driving ability and comfort, or health and functioning (e.g., see Baldock et al., 2006; Blanchard & Myers, 2010; Molnar & Eby, 2008; Rudman, Friedland, Chipman, & Sciortino, 2006; Siren & Meng, 2013). Finally, as evidence has accumulated that awareness of and insight into declining functional abilities is a necessary first step in driving self-regulation (e.g., Freund, Colgrove, Burke, & McLeod, 2005; Molnar et al., 2015; Owssley, McGwin, Phillips, McNeal, & Stalvey, 2004), it makes sense that cognitive functioning may also play a role in the extent to which individuals’ self-reports of avoidance correspond to their actual driving.

2. Study purpose and aims

The exploratory study reported here was intended to examine: how strongly subjectively reported driving avoidance behaviors and exposure were related to their objectively measured counterparts and whether it depended on the specific behavior; the extent to which gender and age play a role in the association between subjectively reported driving avoidance behaviors and exposure and their objectively measured counterparts; and the extent to which demographics, health and functioning, driving-related perceptions, and cognition influence the association between subjective and objective driving avoidance behaviors overall. We assessed four hypotheses in this study: (1) each objectively measured and subjectively reported driving behavior will be statistically significantly related to each other; (2) women’s subjectively reported driving avoidance behaviors and exposure will be more closely related to their objective behaviors than will men’s; (3) no significant differences will be observed by age in the association between subjective and objective driving avoidance behaviors and exposure, given the limited range of ages of participants in our study; and 4) in the multivariable context, the relationship between subjective and objective driving avoidance behaviors will be significantly stronger among women, participants with no cognitive decline, participants with more health or functioning problems, and those with lower perceived driving ability and comfort. While this study was exploratory in nature, our thinking in developing the last two components of the fourth
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