Measuring Driving-Related Attitudes Among Older Adults: Psychometric Evidence for the Decisional Balance Scale Across Time and Gender

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Measurement Article

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1Department of Psychology, University of Victoria, British Columbia, Canada. 2Centre on Aging, University of Victoria, British Columbia, Canada. 3School of Exercise Science, Physical and Health Education, University of Victoria, British Columbia, Canada. 4Ottawa Hospital Research Institute, University of Ottawa, Ontario, Canada. 5Monash University Accident Research Centre, Monash University, Clayton, Australia. 6School of Physical & Occupational Therapy, McGill University, Montreal, Québec, Canada. 7Centre de Recherche Interdisciplinaire en Réadaptation du Montréal Métropolitain, Québec, Canada. 8Research Department, Toronto Rehabilitation Institute, University Health Network, Toronto, Ontario, Canada. 9Department of Medicine and Rotman Research Institute, Baycrest Geriatric Health Care Centre, Toronto, Ontario, Canada. 10Department of Medicine and Institute of Health Policy, Management and Evaluation, University of Toronto, Ontario, Canada. 11School of Rehabilitation Science, McMaster University, Hamilton, Ontario, Canada. 12School of Public Health & Health Systems, University of Waterloo, Ontario, Canada. 13Centre for Research on Safe Driving, Lakehead University, Thunder Bay, Ontario, Canada. 14Department of Psychiatry, University of Toronto, Ontario, Canada. 15Faculty of Kinesiology and Recreation Management, University of Manitoba, Winnipeg, Canada.

*Address correspondence to Paweena Sukhawathanakul, MSc, Department of Psychology, University of Victoria, PO Box 1700, STN CSC Victoria, BC V8W 2Y2, Canada. E-mail: paweenas@uvic.ca

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Abstract

Purpose of the study: The Decisional Balance Scale (DBS) was developed to assess older adults’ attitudes related to driving and includes both intrapersonal and interpersonal motivations for driving. This study examined the psychometric properties of the DBS ratings across 3 time points in a sample of 928 older drivers who participated in the Canadian Driving Research Initiative for Vehicular Safety in the Elderly (Candrive).

Design and Methods: Measurement invariance of the DBS was assessed longitudinally and across gender.
Results: Confirmatory factor analyses revealed that a two-factor model (positive and negative attitudes) for both driving beliefs related to the self and other provided a good fit to the data at each time point. Measurement invariance was supported across time and gender. Significant associations between the DBS factor scores and other driving measures (e.g., perceived driving ability and self-regulatory driving practices) provided evidence of convergent validity.

Implications: The DBS appears to be a robust instrument for measuring attitudes toward driving and is recommended for continued use in future research on driving behaviors with older adults.

Key Words: Driving, Beliefs, Older driver, Self-regulatory driving practices

Despite growing concerns about older driver safety due to age-related disorders that may put older adults at increased risk of crashes and other unsafe driving behaviors, considerable evidence has demonstrated that older adults may voluntarily regulate their driving to reduce their risk on the road (Betz & Lowenstein, 2010; Donofrio, D’Ambrosio, Coughlin & Mohyde, 2009; Molnar et al., 2014; O’Connor, Edwards, Small, & Andel, 2012). To provide a greater understanding of what motivates driving self-regulatory practices in older adults, investigations have begun to focus on various social-cognitive processes such as perceived control and optimistic social comparison (Windsor, Anstey & Walker, 2008), confidence and self-efficacy (Gwyther & Holland, 2012; Kostyniuk & Molnar, 2008; Myers, Paradis, & Blanchard, 2008) and attitudes (Jouk et al., 2014; Tuokko, McGee, & Rhodes, 2006; Tuokko et al., 2014), derived from social science behavior change theories.

In so doing, various approaches to the development of self-report measures to assess these constructs have been taken. For example, based on the construct of self-efficacy (derived from the Social Cognitive Theory; Bandura, 1986), the Day and Night Driving Comfort Scales (DCS-D and DCS-N) were developed to assess older adults’ perceived driving confidence (Myers et al., 2008). Ratings on the DCS-D and DCS-N scales have been shown to be related to both self-reported (MacDonald, Myers, & Blanchard, 2008; Myers et al., 2008) and objectively measured self-regulatory driving practices in older drivers (Blanchard & Myers, 2010; Crizzle & Myers, 2013; Myers, Trang, & Crizzle, 2011). The Driving Habits Questionnaire (DHQ) is another commonly used instrument to assess perceived driving behaviors including general driving practices, driving exposure, dependence on other drivers, and driving difficulty (Owsley, Stalvey, Wells, & Sloane, 1999). The DHQ has demonstrated construct validity and test–retest reliability with respect to older adult drivers.

Another measure, the Decisional Balance Scale (DBS) for driving attitudes derived from the Transtheoretical Model of Behavior Change (Prochaska & DiClemente, 1982), was developed to assess positive and negative driving attitudes concerning intrapersonal (i.e., attitudes concerning one’s driving) and interpersonal (i.e., attitudes concerning one’s driving in relation to others) motivations for driving (Tuokko et al., 2006). The DBS was intended to gauge attitudes among older drivers of the general population who are not severely cognitively impaired. The scale reflects the decisional balance process, weighing the pro and con attitudes about a behavior, which is considered paramount to behavior change (Prochaska & Velicer, 1997). Moreover, negative perceptions of the self-in relation to driving restrictions or cessation have been the predominate focus of research on older drivers (Stalvey & Owsley, 2000). However, some studies have found that the perspectives of others (e.g., family members, friends, physician) and subjective norms (e.g., perceived social pressures) may also be important influences associated with older adults’ decisions to restrict or stop driving (Adler & Rottunda, 2006; Lindstrom-Forneri, Tuokko, & Rhodes, 2007; Kowalski et al., 2012). The decisional balance approach extends the literature by considering attitudes that may affect decisions concerning driving behavior based on influences that are both internal (e.g., awareness of one’s declining abilities) and external (e.g., environmental demands imposed by others) to the individual.

Based on these cognitive and motivational components, the DBS comprises four subscales: (a) Proself (positive attitudes concerning one’s driving); (b) Pro-other (positive attitudes concerning one’s driving in relation to others); (c) Consel (negative attitudes concerning one’s driving); and (d) Con-other (negative attitudes concerning one’s driving in relation to others). This measure was piloted with 40 drivers (aged 57–90 years, 63% women) and each subscale was shown to have adequate internal consistency. The findings also showed that individuals who possessed more positive attitudes about how their driving impacted others were less likely to be restricting their driving (measured by self-reported driving frequency), whereas those who held more negative attitudes toward driving were more likely to be actively restricting their driving (Tuokko et al., 2006). Further examination in a larger sample suggested that self-referent attitudes toward driving (i.e., pro/con self) may have a stronger influence on change in self-regulatory practices than attitudes toward driving held in relation to others.
Tuokko et al., 2014). More recently, all subscale scores on this measure have been shown to be related to age, gender, self-reported health status (Tuokko et al., 2013), as well as self-reported regulatory practices of older adults including driving exposure and situational driving frequency and avoidance (Jouk et al., 2014).

To our knowledge, no longitudinal studies of the relationship between attitudes and self-regulatory driving practices have been reported to date. The DBS is one of the instruments included in the Candrive II study, a multicentre prospective cohort study examining the predictive validity of tools for assessing fitness to drive in a cohort of older drivers in seven cities in four Canadian provinces. For valid examination of responsiveness to change, it is important to demonstrate that identical constructs with the same structure are being measured across varying time points. It is also important to establish measurement invariance between groups (e.g., gender) in order to accurately determine that group differences on items or latent variables reflect true differences in levels of the behavior rather than differences in measurement (Horn & McArdle, 1992). Although the DBS has demonstrated adequate internal consistency reliabilities in previous cross-sectional studies (Jouk et al., 2014; Tuokko et al., 2006), measurement invariance testing is needed to further ensure that the subscales are psychometrically equivalent across time in order to accurately assess longitudinal change in these constructs.

The Current Study

The objective of this study was to assess the psychometric properties of the DBS scale and examine its utility in measuring driving-related attitudes across time and gender. Confirmatory factor analysis (CFA) was used to determine the internal consistency of the scale, as well as test the underlying factor structure and measurement equivalence over time and across gender. As psychological or subjective measures are particularly prone to measurement error, CFA provides a mechanism for determining whether the psychometric properties of the scale change across samples or within the same samples by pooling the shared variance across indicators (i.e., items) within each latent construct and attenuating measurement error by estimating unique error variances.

CFAs were first conducted to examine whether the items for each of the four subscales loaded onto four distinct latent factors at each of the three time points. Invariance testing was then performed separately on the self and other constructs, each with positive and negative components (see Figure 1). As previous research has suggested that individuals may not weigh negative and positive items equally (Tuokko et al., 2014), we hypothesized that a two-factor model with distinct latent variables may produce a better fitting model than a single factor model. We then tested whether the item factor loadings, intercepts, and error variances, were equivalent across time and gender. Lastly, to illustrate how the scale could be used with other driving measures, we examined bivariate correlations between latent factors of the DBS and measures of perceived driving ability and frequency of driving in (and avoiding) challenging driving situations.

Methods

Participants

Participants (n = 928) were part of a nation-wide prospective driving study (Candrive II). At baseline, participants ranged in age from 70 to 94 years (M = 76.21, SD = 4.85); 62% (n = 577) were men. Almost half (45%) had completed some postsecondary education, 19% had obtained a diploma or a trade/technical certificate beyond high school, 26% completed high school, and 10% did not continue beyond grade school.

Selective attrition was examined by comparing baseline characteristics (T1) of those who left the study 1 year later at T2 (n = 46, 5% attrition; 65% men) and 2 years later at T3 (n = 108, 12% attrition; 65% males) with those who continued. There were no significant differences in age, gender, or education at T2, however, those who did not remain in the study at T3 were older at baseline (M = 77.79, SD = 5.41) than participants who remained in the study (M = 76.01, SD = 4.74), t (926) = -3.39, p = .001. Missing data were handled with full information maximum likelihood estimation procedures that use only available data to produce model estimates.

Procedure

All participants provided written informed consent and underwent annual comprehensive evaluations of their health status, functioning, driving habits, and intentions. Psychosocial scales and measures of driving restrictions were completed at home and returned by mail. Marshall et al. (2013) provides detailed information outlining the procedures.

Measures

Decisional Balance

The DBS scale asks participants to rate their responses on a 5-point scale ranging from “Strongly Agree” to “Strongly Disagree” to statements concerning attitudes towards driving that comprise four subscales, each with seven items. Figure 1 delineates the subscales by positive and negative attitudes relevant for the individual (i.e., self) and how the individual perceives others view their driving (i.e., other). Higher scores on the Pro-self subscale indicate less positive views of their own driving. Higher scores on the Con-self subscale indicate less negative views of their own driving. Higher scores on the Pro-other indicate less positive views of driving in relation to others. Higher scores on the
Con-other indicate less negative attitudes of how others view their driving.

Perceived Driving Ability and Driving Self-regulation
Scores on the Perceived Driving Abilities (PDA) scale were used to examine convergent validity, while scores on the Situational Driving Frequency (SDF), and Situational Driving Avoidance (SDA) scales (MacDonald et al., 2008) were used to assess self-regulatory behaviors. The 15-item PDA scale asks individuals to rate their current driving abilities (e.g., ability to see road signs at a distance, to see vehicles coming up alongside, to make an over the shoulder check, or ability to drive safely) on a 4-point scale as “Poor”, “Fair”, “Good”, or “Very Good.” Scores range from 0 to 45 with higher scores indicating more positive perceptions. The PDA scale has also been shown to have good person and item reliabilities (MacDonald et al., 2008).

The SDF and SDA scales were developed for older adults to assess self-reported practices (frequency and avoidance, respectively) concerning driving in challenging situations such as driving at night and on highways. On the 14-item SDF scale, respondents rated how frequently they engage in challenging driving situations on a 5-point scale ranging from “Never” to “Very Often.” Scores ranged from 0 to 56 with higher scores indicating greater frequency of driving in challenging situations. On the 20-item SDA scale, participants were asked to indicate which challenging situations, if any, they try to avoid. Possible SDA scores range from 0 to 20, with higher scores indicating greater avoidance of challenging situations. Both the SDF and SDA have shown good test–retest reliability with multiple samples (Blanchard & Myers, 2010; MacDonald et al., 2008).

Data Analytic Strategy
MPlus statistical software (Muthén & Muthén, 2012) was used to test the fit of the hypothesized CFA model at T1, T2, and T3. Following established guidelines (Byrne, 2010; Hu & Bentler, 1995; Kline, 2005), model fit was evaluated using the comparative fit indices (CFI), root-mean square error of approximation (RMSEA), and standardized root-mean of the residual (SRMR) that are sensitive to model complexity. CFI values of >0.95 represent an exceptional fitting model and >0.90 indicate reasonable good fit; RMSEA and SRMR values > 0.05 suggest excellent model fit, and values between 0.05 and 0.08 indicate reasonable fit.

Next, tests of invariance were conducted to assess whether components of the DBS factor structure were equivalent across time and for men and women. Residual terms for corresponding indicators were autocorrelated in order to account for nonindependence in our longitudinal data as the same participants were assessed over time.

![Figure 1. Hypothesized model for confirmatory factor analysis of the seven items for (A) pro-self and con-self; (B) pro-other and con-other; e1–14 indicate error terms.](https://academic.oup.com/gerontologist/article-abstract/55/6/1068/2605480)
Hu & Bentler, 1995; at T3); and the baseline, factor correlations between some of the subscales. For example at T3, a significantly poorer fitting model than a two-factor model. Assessing the RMSEA = 0.155; factor structure (e.g., pro-self). Internal consistency reliabilities for the DBS subscales were examined prior to conducting factor analyses. Cronbach's alphas for pro-self (α = 0.84 at T1, α = 0.84 at T2, α = 0.84 at T3); con-self (α = 0.76 at T1, α = 0.76 at T2, α = 0.77 at T3); pro-other (α = 0.70 at T1, α = 0.71 at T2, α = 0.72 at T3); and con-other (α = 0.80 at T1, α = 0.81 at T2, α = 0.83 at T3) were high supporting the appropriateness of factor analysis for these data.

Prior to fitting a two-factor structure model, we fitted a single factor structure to determine which factor structure was a better fitting model. Combining the positive and negative components of the self and other scales into a single factor was a significantly poorer fitting model than a two-factor structure (e.g., self: one-factor model CFI = 0.603, RMSEA = 0.155; other: one-factor model CFI = 0.697, RMSEA = 0.116). We also compared a four-factor structure model with the two-factor model. Assessing the self and other subscales together in a four-factor model was also a significantly poorer fitting model than a two-factor model (CFI = 0.813, RMSEA = 0.091), possibly reflecting the low correlations between some of the subscales. For example at baseline, factor correlations between pro-self and pro-other subscales, and the con-self and con-other subscales, were greater in magnitude (rs = 0.66 and 0.62, respectively) than the correlations between the pro-self and con-other subscales, and the con-self and pro-other subscales (rs = -0.22 and -0.31, respectively). Hence, the two-factor structure models were used in the analyses.

Fit statistics, standardized parameter estimates, and squared multiple correlations for the two-factor model are provided in Tables 1 and 2 for the self and other subscales, respectively. CFA results revealed that the two-factor model for both subscales provided a reasonable fit to the data at each time point. All standardized parameter estimates were significant and squared multiple correlations were adequate, with the exception of the first pro-other item (“My driving does not put others at risk”) and the sixth con-other item (“I experience discrimination because I am an older driver”), where less than 16% of their variabilities were accounted for by the latent factors. Nevertheless, the zero-order correlations between these indicators and the other items on the subscale were all statistically significant across time. Dropping these items from the scales did not contribute to a better fitting model. Thus the two items were retained in the scale. Factor correlations between the latent constructs were also in the expected directions; the pro and con factors of each subscale were negatively correlated at each time point (i.e., less positive attitudes were associated with more negative attitudes).

**Time and Gender Invariance Test Results**

**Time**

Time and gender invariance test results are provided in Table 3. Examination of change in CFI and RMSEA values for both subscales revealed little change (<0.01) across increasingly restrictive levels of invariance testing, suggesting that the constraints imposed did not result in a degradation of fit. However, change in CFI was 0.01 between the strong and strict time invariance models in the other subscales, suggesting that the constraints imposed by strict invariance testing resulted in a degradation of model fit. Nevertheless there was a <0.01 change in RMSEA between the strong and strict time invariance models, suggesting that the most restrictive level of invariance testing can still be upheld. Compared to the CFI, RMSEA “compensates for model complexity” and thus may be a better indicator (Hu & Bentler, 1995, p. 3). Taken together, these findings suggest that the DBS is invariant over time.

**Gender**

Examination of CFI and RMSEA values of the gender invariance models (at each restrictive level of invariance testing) for both subscales revealed little change (<0.01), suggesting that the constraints imposed did not result in a degradation of fit. However, change in CFI was 0.026 between the strong and strict gender invariance models in the other subscale, although change in RMSEA was
minimal (<0.01). Taken together, these findings suggest that the DBS is invariant across responses by men and women.

Correlations between DBS Factor Scores, Perceived Driving Abilities and Driving Self-regulation

Table 4 presents correlations between latent factor scores of the DBS subscales and PDA, SDA, and SDF. Correlations between pro-self and all three variables were significant (with the exception of SDA at T1; rs ranged from 0.05 to −0.19). Specifically, individuals who reported having fewer positive views of their own driving had lower perceptions of their driving ability (PDA), were more likely to avoid challenging situations (SDA), and less likely to drive in challenging situations (SDF). Correlations between con-self and the driving outcomes were also significant (rs ranged from 0.33 to 0.60). Individuals who reported fewer negative views of their own driving had greater PDA and SDF scores. Greater con-self was also negatively related to SDA, such that individuals who reported fewer negative views of their own driving were less likely to avoid driving in challenging situations.

Correlations between pro-other and all three measures were significant (rs ranged from 0.08 to −0.28). Specifically, having less positive views of driving in relation to others was associated with lower PDA and SDF, and higher SDA. In contrast, having less negative attitudes views of how others perceives one’s own driving (i.e., greater con-other) was related to greater PDA (rs ranged from 0.41 to 0.45) and SDF (rs = 0.16–0.25), and lower SDA (rs ranged from −0.17 to −0.24).

Discussion

The DBS offers a detailed examination of attitudes related to driving behaviors that acknowledges the influence of both intrapersonal and interpersonal factors. Findings from the CFAs support the theory that older adults weigh positive and negative beliefs about driving in relation to themselves and others when formulating attitudes about
driving. This study also investigated the equivalence of the DBS factor structure across time in groups of men and women. Findings from tests of measurement invariance provide evidence that the DBS can be assessed longitudinally and across gender.

### Invariance across Time and Gender

The DBS was invariant across time and gender at the configural level for both subscales, suggesting that the DBS items tapped similar constructs over a span of 2 years for both men and women. Similarly, the DBS was invariant across time and gender at the weak level, which confirms that the corresponding factor loadings are equivalent. This result implies that the latent factor variances have the same metric across groups, which permits the use of the DBS scores in longitudinal comparisons (Bontempo & Hofer, 2007). The DBS was also invariant at the strong level, indicating that corresponding item intercepts are equivalent across groups. When strong factorial invariance is obtained, comparisons of the observed scores, latent factor means and variances across time and across groups of men and women can be reliably attributed to within- and between-person differences, and not confounded by differences in the scale (Bontempo & Hofer, 2007; Byrne & Stewart, 2006; Widaman et al., 2010).

Finally, results varied by the self and other subscale at the level of strict invariance. Strict factorial invariance was established for the self but not for the other subscale. Therefore group comparisons should be made with caution as the item residual variances (i.e., item uniqueness) may be biased (Bontempo & Hofer, 2007). However, given that strict factorial invariance is a highly constrained model, some researchers have recognized that such level of invariance is difficult to achieve in developmental research (Byrne & Stewart, 2006; Widaman & Reise, 1997), so it is not surprising that strict invariance did not hold. It is possible that error variances vary across time and between groups, making strict invariance difficult to uphold.

### Table 2. Standardized CFA Coefficients (Squared Multiple Correlations) and Model Fit Statistics for Pro-Other and Con-Other Two Factor Models

<table>
<thead>
<tr>
<th>Measures</th>
<th>Wave</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-other</td>
<td>1. My driving does not put others at risk</td>
<td>0.306 (0.094)</td>
<td>0.255 (0.065)</td>
<td>0.273 (0.075)</td>
</tr>
<tr>
<td></td>
<td>2. Others count on me being able to drive</td>
<td>0.374 (0.140)</td>
<td>0.397 (0.158)</td>
<td>0.385 (0.148)</td>
</tr>
<tr>
<td></td>
<td>3. By driving, I do not have to depend on others</td>
<td>0.474 (0.225)</td>
<td>0.545 (0.297)</td>
<td>0.676 (0.457)</td>
</tr>
<tr>
<td></td>
<td>4. Driving enables me to play an active role in my community</td>
<td>0.679 (0.461)</td>
<td>0.689 (0.475)</td>
<td>0.674 (0.454)</td>
</tr>
<tr>
<td></td>
<td>5. By driving, I can visit with others</td>
<td>0.694 (0.482)</td>
<td>0.720 (0.518)</td>
<td>0.714 (0.510)</td>
</tr>
<tr>
<td></td>
<td>6. By driving, I can support family members and friends</td>
<td>0.590 (0.348)</td>
<td>0.631 (0.398)</td>
<td>0.596 (0.355)</td>
</tr>
<tr>
<td></td>
<td>7. By driving, others do not need to be concerned about me having to walk to places</td>
<td>0.443 (0.196)</td>
<td>0.452 (0.204)</td>
<td>0.435 (0.189)</td>
</tr>
<tr>
<td>Con-other</td>
<td>1. Some people think I should stop driving</td>
<td>0.711 (0.506)</td>
<td>0.689 (0.475)</td>
<td>0.678 (0.460)</td>
</tr>
<tr>
<td></td>
<td>2. My driving a vehicle is becoming more dangerous to others and myself</td>
<td>0.590 (0.348)</td>
<td>0.510 (0.260)</td>
<td>0.643 (0.413)</td>
</tr>
<tr>
<td></td>
<td>3. My driving bothers other people</td>
<td>0.687 (0.472)</td>
<td>0.798 (0.637)</td>
<td>0.740 (0.548)</td>
</tr>
<tr>
<td></td>
<td>4. People think I am ignoring signs that I should be giving up driving</td>
<td>0.745 (0.555)</td>
<td>0.745 (0.555)</td>
<td>0.795 (0.632)</td>
</tr>
<tr>
<td></td>
<td>5. People close to me disapprove of my driving</td>
<td>0.668 (0.446)</td>
<td>0.727 (0.529)</td>
<td>0.734 (0.539)</td>
</tr>
<tr>
<td></td>
<td>6. I experience discrimination because I am an older driver</td>
<td>0.357 (0.127)</td>
<td>0.374 (0.140)</td>
<td>0.396 (0.157)</td>
</tr>
<tr>
<td></td>
<td>7. Other drivers honk at or shout out to me when I am driving</td>
<td>0.530 (0.281)</td>
<td>0.567 (0.321)</td>
<td>0.610 (0.372)</td>
</tr>
<tr>
<td>Model fit statistics</td>
<td></td>
<td>538.668</td>
<td>395.900</td>
<td>406.655</td>
</tr>
<tr>
<td></td>
<td>(\chi^2)</td>
<td>76</td>
<td>76</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>df</td>
<td>0.852</td>
<td>0.902</td>
<td>0.900</td>
</tr>
<tr>
<td></td>
<td>CFI</td>
<td>0.082 (0.075–0.088)</td>
<td>0.069 (0.063–0.076)</td>
<td>0.073 (0.066–0.080)</td>
</tr>
<tr>
<td></td>
<td>RMSEA (CI\textsubscript{90})</td>
<td>0.086</td>
<td>0.080</td>
<td>0.081</td>
</tr>
<tr>
<td></td>
<td>SRMR</td>
<td>−0.452</td>
<td>−0.331</td>
<td>−0.363</td>
</tr>
</tbody>
</table>

Note: All loadings and factor correlations are significant at \(p < .05\).
Associations with Measures of Perceived Ability and Driving Self-Regulation

Significant concurrent and longitudinal latent factor correlations with perceived driving ability (PDA) and frequency of driving in and avoiding challenging situations (SDF and SDA) demonstrate the utility of the DBS in assessing relationships between driving-related attitudes and other driving outcomes. Individuals who held fewer positive attitudes about driving in relation to the self and others had lower perceptions of their driving ability (PDA),...
providing evidence for convergent validity. Individuals who held fewer positive attitudes were also more likely to report that they avoid driving in challenging situations (SDA), and less likely to drive in challenging situations (SDF). In contrast, individuals who reported fewer negative attitudes of their own driving and in relation to others had higher PDA and SDF scores, and lower SDA scores. Notably, correlations between the negative attitudes (i.e., the cons) and three driving measures were generally larger than the positive attitudes (i.e., the pros), possibly reflecting the salience of negative attitudes over positive ones. The magnitude and direction of these latent factor correlations are consistent with cross-sectional associations previously reported by Tuokko et al. (2006) and Jouk et al. (2014).

Taken together, these findings suggest that driving-related attitudes consisting of both intra- and interpersonal motivational components may have implications on driving self-regulatory behaviors. As older adults tend to adopt more self-regulatory practices as they age (D’Ambrosio, Donorfio, Coughlin, Mohyde, & Meyer, 2008; Donorfio, D’Ambrosio, Coughlin, & Mohyde, 2008), it will be important to understand how changes in attitudes may facilitate or deter self-regulatory driving practices. Results of this study support further use of the DBS in assessing attitudes longitudinally. Future research is needed to understand the underlying mechanisms between driving attitudes and self-regulatory driving practices, as well as how these mechanisms change over time.

Limitations
The voluntary nature of the sample and the study selection criteria may limit the generalizability of the findings. Because eligible participants must not have medical conditions that would impair their driving at baseline, the sample comprised mainly of relatively healthy, active older drivers aged 70 years and older which may not be representative of typical drivers in this age group. Although the DBS was intended to measure driving-related attitudes among older adults who are not medically at-risk, it is possible that, used in conjunction with other measures of cognition, it may prove useful in the evaluation of individuals who have medical conditions that may impact insight and judgment of their driving ability.

Measures of self-regulatory driving practices used in this study were limited to self-reports. Although the SDF and SDA scales have good psychometric properties and provide an indication of self-regulation, studies have shown that older adults may drive more in challenging situations and avoid such situations less than they report (Blanchard, Myers, & Porter, 2010; Crizzle, Myers, & Almeida, 2013). Future examinations of their associations with objective driving measures (e.g., mileage-driven) may yield different information about how attitudes shape driving practices. Despite these limitations, our study demonstrates that the DBS is a robust instrument for measuring attitudes toward driving. Continued use of this scale in future studies is warranted to better understand self-regulatory behaviors in older adults including decisions to quit driving in various samples of older adults including those with disorders of cognition. The decisional balance approach suggests that both internal and external influences may affect decisions concerning driving behaviors, which can help inform intervention targets aimed at encouraging older adults to regulate their driving. In addition to attitudes related to the self, our findings indicate that one’s perception of driving in relation to others can also play a role in motivations for driving. Acknowledging that older adults’ needs to continue driving or their apprehensions about driving are a function of both intra- and interpersonal factors can help researchers, policy makers, and practitioners understand the processes that influence readiness to change. Attitudes towards driving likely act as important mediators between driving behaviors and personal factors such as health conditions or cognitive function (Lindstrom-Forneri, Tuokko, Garrett, & Molnar, 2010). Future research is needed to determine the attitudes and self-regulatory driving practices of at-risk older drivers who may lack awareness of their driving abilities.

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References
Blanchard, R. A., Myers, A. M., & Porter, M. M. (2010). Correspondence between self-reported and objective measures of
driving exposure and patterns in older drivers. Accident Analysis & Prevention, 42, 523–529. doi:10.1016/j.aap.2009.09.018


Byrne, B. M. (2010). Structural equation modeling with AMOS: Basic concepts, applications, and programming (2nd ed.). New York: Guilford Press.


Tuokko, H., Myers, A., Jouk, A., Marshall, S., Man-Son-Hing, M., Porter, M. M., ... & Vrkljan, B. (2013). Associations between...
age, gender, psychosocial and health characteristics in the Candrive II study cohort. Accident Analysis & Prevention, 61, 267–271. doi:10.1016/j.aap.2013.02.036


