Psychological Resources and Driving Status: A Study of Current and Former Drivers 55 Years of Age and Older

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RÉSUMÉ

Les ressources psychologiques intérieures peuvent aider les individus à s'adapter aux changements survenant lors du vieillissement. Dans cette étude, nous avons examiné l'effet de variables démographiques, liées à la santé et aux ressources psychologiques intérieures pour expliquer le statut de conduite automobile chez des adultes de 55 ans et plus. L'échantillon de convenance comprenait 222 adultes âgés de 55 à 91 ans (moyenne = 72,20). Les participants ont rempli des questionnaires comportant des mesures associées à la conduite automobile, à l'auto-évaluation de la santé et de ressources psychologiques (p. ex. sentiment de contrôle et sens donné à la vie, locus de contrôle). Des modèles de régression logistique multiple tenant compte de facteurs confondants ont été construits avec comme variable principale le statut de conduite automobile (conducteur actuel ou ancien conducteur). Les anciens conducteurs étaient plus âgés, se déclaraient en moins bonne santé et présentaient davantage de symptômes de dépression. Après avoir contrôlé pour l'âge et l'état de santé, il est ressorti des analyses effectuées que les conducteurs actuels déclaraient ressentir des niveaux plus élevés de contrôle et de sens dans leur vie, et un locus de contrôle plus interne. Ces résultats montrent l'importance de prendre en compte les ressources psychologiques lors d'évaluations pouvant mener à la cessation de la conduite automobile.

ABSTRACT

Psychological resources can help individuals adjust to changes associated with aging. In this study, we examined the effect of demographic, health, and psychological resource variables in explaining driving status among adults 55 years and older. A convenience sample of 222 adults between the ages of 55 and 91 years (mean = 72.20 years) completed questionnaires that included measures of driving status, self-rated health, and psychological resources (e.g., life control, life purpose, and locus of control). Multiple logistic regression models that controlled for confounders were constructed with driver status (i.e., current driver or former driver) as the outcome. Former drivers were older, reported being in poorer health, and reported more depression symptoms. After controlling for age and health, current drivers reported higher levels of life control and life purpose and a more internal locus of control. Results highlight the importance of considering psychological resources when examining driving cessation.

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Older drivers are the fastest growing segment among licensed drivers in Canada, a trend that is expected to continue with the greying of the Canadian population (Canadian Association of Occupational Therapists, 2009). Driving remains a primary means of community mobility among older Canadians, yet, changes in health and functioning associated with the aging process increase the likelihood of driving cessation (Turcotte, 2012). Importantly, on average, men will depend on other forms of transportation for 7 years following driving cessation, whereas women drivers of the same age will be dependent for an average of 10 years (Foley, Heimovitz, Gurainik, & Brock, 2002).

In addition to offering opportunities for community mobility, driving contributes to quality of life and is associated with identity, role, and a sense of freedom (Bauer, Rottunda, & Adler, 2003; Pachana, Jetten, Gustafsson, & Liddle, 2017). It follows that driving cessation is associated with several negative physical and mental health outcomes. A systematic review of 16 studies and meta-analysis of 5 of those studies confirmed associations between driving cessation and negative outcomes related to physical/mental health and social/cognitive functioning (Chihuri et al., 2016). The meta-analysis demonstrated that driving cessation was associated with close to double the odds of depression among older adults (odds ratio = 1.91, 95% confidence interval [CI] = 1.61–2.27) and greater odds of long-term care placement and death (Chihuri et al., 2016).

Driving is a complex task that requires cognitive, sensory, and psychomotor skills (Anstey, Wood, Lord, & Walker, 2005). Research indicates that age-associated changes that affect driving performance begin to emerge by the time an individual reaches 55 years and become more pronounced with age (Persson, 1993). Decreases in vision and functional status, and the prevalence of medical conditions are common aging experiences that are associated with driving cessation (Campbell, Bush, & Hale, 1993; Marottoli et al., 1993). In addition, sociodemographic variables such as age, gender (Campbell et al., 1993; Marottoli et al., 1993), income (Dellinger, Sehgal, Sleet, & Barrett-Connor, 2001; Gilley et al., 1991; Marottoli et al., 1993), and geographic location (Kington, Reuben, Rogowski, & Lillard, 1994) along with confidence in one's own skills (Brayne et al., 2000) are known to influence an individual's decision to stop driving.

Numerous studies have examined visual, cognitive, and psychomotor abilities, and medical conditions as determinants of driving cessation (e.g., Ball et al., 2006; Kington et al., 1994). For example, Dugan and Lee (2013) examined biopsychosocial risk factors for driving cessation by analyzing six waves of the Health and Retirement Study (HRS) study, including only participants who were 65 years of age and older. Their results showed that risk factors for driving cessation included older age, female gender, minority race, poor cognition, physical limitations, and chronic disease (e.g., diabetes). Other research points to the importance of the transportation and policy environment in determining mobility and driving cessation (Kulikov, 2010; Vivoda, Heeringa, Schulz, Grengs, & Connell, 2016). Yet, psychological resource variables, such as one's life attitudes and sense of control, have been shown to be related to responses to and management of stressful life events (Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000), and may further account for unexplained variance in driver status.

Life attitudes are conceptualized as individual difference variables that foster subjective well-being by means of a person experiencing good psychological functioning (Kafka & Kozma, 2002). Life attitudes include constructs such as death acceptance (i.e., lack of fear or anxiety about death), being in an existential vacuum (i.e., lack of goals), future meaning (i.e., a determination to make one's life meaningful), goal seeking (i.e., a desire to achieve new goals), life control (i.e., freedom to make life choices), life purpose (i.e., fulfillment in life, having goals and a sense of direction from the past, in the present, and toward the future), and will to make meaning (i.e., striving to find meaning in personal existence) (Reker, 2001; Reker & Peacock, 1981).

The locus of control construct is similar to the life control construct with some notable differences. Both constructs refer to people's beliefs about control and expectancies in situations; however, the locus of control construct makes reference to a stable characteristic in examining people's preference for adopting either an internal or an external control approach in life (Rodin, 1986). Moreover, locus of control adds reference to specific factors that affect situations such as luck, fate, or one's own competence and behaviour (Windle & Woods, 2004). On the other hand, the life control construct refers more to a state, as it asks people to report on their experience of control at a specific time in their lives (Reker, Peacock, & Wong, 1987).

Psychological resources have been shown to be associated with coping with changes that can occur with aging (Bjørkløf et al., 2016, 2018). It follows that psychological resource variables may play a role in supporting individuals to adjust to losses associated with age, including loss of driving privileges. With respect to driving, a handful of studies have examined the role of psychological resource variables. For example, through analysis of the Australian Longitudinal Study on Aging, Windsor, Anstey, Butterworth, Luszcz, and Andrews (2007) examined whether driving status, expectancy of

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control, and other covariates could explain changes in depressive scores from baseline to follow-up. Their results indicated that driving cessation was associated with an increase in symptoms of depression, a finding that was partially explained by decreases in the sense of control reported by former drivers. Similarly, Al-Hassani and Alotaibi (2014) conducted a study of 114 community-dwelling older adults 55 years of age and older, and compared drivers and former drivers on a variety of variables including depression symptoms, health, and perceived control. Former drivers were more likely to have higher symptoms of depression and to report greater perceived loss of control over their lives.

Considering that psychological variables are associated with people's reactions to life events, how they manage stress, and the level of well-being that they experience (Taylor et al., 2000) they may also help to explain responses to driving cessation. The purpose of this study was to examine differences between drivers and former drivers in terms of demographic and health variables. In light of the previous literature, it was hypothesized that former drivers would be older, have poorer health, and exhibit more symptoms of depression. We also sought to examine the association between psychological resource variables and driving status among adults 55 years of age and older. In particular, we examined the relationship between life control, life purpose, and locus of control and driving status, after controlling for known covariates.

Methods

Participants

We recruited community-dwelling adults 55 years of age and older who were currently driving or who had stopped driving within the last 3 years. Participants were recruited through local community, volunteer, and business organizations in Thunder Bay, Ontario, and Winnipeg, Manitoba. Community partners received recruitment posters to post within their local setting; potential participants were invited to contact members of the research team who confirmed their eligibility. Eligible participants had questionnaire packages distributed to them, and participants returned completed questionnaire packages to the research team by mail or in person. Each questionnaire package included an informed consent document, detailing the goals of the study and how participant confidentiality would be maintained. Participants had the option to complete the questionnaire package using an online version; only 22 participants (9.4%) completed the online version. This study received ethical approval from Lakehead University's Research Ethics Board (#1460532).

In total, 222 adults participated in this study. At the time of initial recruitment, participants ages ranged from 55 to 91 years (mean age = 72.20 years, standard deviation [SD] = 8.81). Approximately 55 per cent (54.7%) of participants self-identified as female and 45.3 per cent self-identified as male. Of the 222 participants, 193 (86.9%) were drivers and 29 (13.0%) were former drivers. Given the small number of former drivers relative to active drivers in the study, we were limited to controlling for two covariates in the multivariable models (see Statistical analysis section).

Measures

In addition to basic demographic information (e.g., sex, age, education, living arrangements) and driving status (i.e., current driver *or* former driver), participants completed measures capturing health, locus of control, and life purpose.

Physical and mental health measures

Participants completed a general health questionnaire to describe their health these days (response options were: very good, pretty good, not too good, poor, or very poor; henceforth referred to as *health these days*) and identify chronic health problems (e.g., stroke, arthritis, high blood pressure).

Participants completed the Short Form-12 Health Survey (SF-12) which consists of 12 items measuring health status and assesses both physical and mental health (Ware, Kosinski, & Keller, 1998). There is a separate Physical Component Summary (PCS-12) and a Mental Component Summary (MCS-12), each with its own scale scores. The SF-12 is the abridged version of the 36-Item Short-Form Health Survey (SF-36) and retains the validity, reliability, and responsiveness of the longer version (Brazier, Jones, & Kind, 1993; McHorney, Kosinski, & Ware Jr., 1994). The PCS-12 and the MCS-12 are scored using norm-based methods. Four items (i.e., 1, 8, 9, and 10) are reverse keyed so that a lower score signifies better health. Indicator variables are developed for the item response choice categories. The indicator variables are weighted using regression coefficients from the United States general population and then are aggregated. A constant regression intercept is added to the aggregated PCS-12 and MCS-12 scores and the scores are then standardized to have a mean of 50 and a standard deviation of 10 in the general United States population.

The Activities of Daily Living Questionnaire was administered, consisting of 14 items that assess activities of daily living (ADL) and instrumental activities of daily living (IADL) in order to determine an individual's functional status. ADL include bathing, toileting, continence, dressing, transferring, eating, and walking, whereas IADL include using the phone, self-administration of medications, shopping,

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housework, managing finances, and cooking. The total number of ADL is reported here, with higher scores indicating higher functional status.

Depression was captured through the Geriatric Depression Scale Short Form (GDS-SF), a scale consisting of 15 items assessing depression in older people (McDowell & Newell, 1996; Sheikh & Yesavage, 1986). The GDS-SF is a shortened version of the GDS (Brink et al., 1982). Participants are asked to answer items with reference to how they have felt in the past week. Participants are asked to indicate either "Yes" or "No" to items. Higher scores on the GDS indicate a greater number of depressive symptoms.

Psychological resources

A portion of the Life Attitude Profile (LAP) scale was included. In particular, two of the seven dimensions, life purpose and life control, have been deemed suitable for exploring well-being among older adults and were included in the questionnaire package (Reker et al., 1987). The nine items in the life purpose dimension measure zest for life, satisfaction, and fulfillment. The six items of the life control dimension measure freedom to make life choices. Participants respond to each item with a "Yes", "No", or "Don't Know". With regard to psychometric properties, both dimensions have correlated significantly with other measures such as Shostrom's Personal Orientation Inventory, thereby confirming that the scales have good construct validity (Reker & Peacock, 1981). Internal consistency is good for both life purpose and life control, with Cronbach's α reaching 0.83 and 0.78 respectively (Reker & Peacock, 1981). Test–retest reliability has also been confirmed, with coefficients of 0.83 for life purpose and 0.61 for life control (Reker et al., 1987). Higher scores on both domains are indicative of greater psychological resources.

The Internal-External Locus of Control Scale (LOC) (Rotter, 1966) assesses a person's generalized expectancies for internal versus external control of reinforcement, and consists of 29 items (Rotter, 1966). An internal locus of control signifies a belief that outcomes are contingent on actions, with the opposite being true for an external locus of control (Lefcourt, 1991). The scale has adequate internal consistency, with a coefficient of 0.70 (Kuder–Richardson) and adequate test–retest reliability with a coefficient of 0.72 after 1 month (Rotter, 1966). Higher scores indicate greater external control.

Statistical Analysis

All analyses were conducted using SPSS (Version 25). Drivers and former drivers were first compared on relevant variables. Quantitative variables were analyzed using independent samples *t* tests, and categorical variables were analyzed using χ^2 tests of independence. For ordinal categorical variables (income and health these days), the χ^2 test for linear-by-linear association was calculated. Given the discrepancy in sample size between drivers (n = 193) and former drivers (n = 29), unequal variance t tests are reported here; in cases in which the variances are not equal across groups and the group sizes differ, Student's t test can be biased leading to poor statistical conclusions (Delacre, Lakens, & Leys, 2017). To examine the relationship between psychological resource variables and driver status, after controlling for known covariates, three multiple logistic regression models were estimated. Each model included age in years, health these days, and one psychological resource variable. In particular, Model 1 also included life control, Model 2 also include life purpose, and Model 3 also included locus of control. In this study, the number of events (i.e., participants who reporting being former drivers) was 29. To reduce the risk producing over-fitted models[1], we chose to include only two known covariates of driving status: age (e.g., Foley et al., 2002) and health (Freeman, Gange, Munoz, & West, 2006). Using this approach, the models had 9.7 events-per-variable (EPV), and although still considered liberal (Babyak, 2004), it allowed us to examine the effect of psychological resource factors while still accounting for factors already known to explain driving status while reducing the risk of over-fitting.

Results

Current versus Former Drivers

A description of the sample comparing drivers and former drivers are presented in Table 1. Former drivers were older (mean difference of 5.8 years), had lower levels of education, and were more likely to live alone. Former drivers had lower total ADL scores (t = –2.56, p = 0.015), a greater number of depression symptoms (t = 3.48, p = 0.002), more health conditions (t = 4.57, p < .001), and poorer health these days (χ^2 = 10.63, p < 0.001). Former drivers showed poorer scores on the SF-12 Physical Health subscale (t = –4.45, p < 0.001) but no difference between groups was observed on the SF-12 Mental health subscale (t = –0.89, p = 0.379).

In terms of psychological resource variables, former drivers showed lower levels of life control (t = –3.70, p = 0.001) and life purpose (t = –2.28, p = 0.029), subscales of the life attitude profile. Former drivers also showed higher scores on the Locus of Control scale, suggesting that, relative to current drivers, former drivers have a more external locus of control.

Multivariable Models and Psychological Resources

Table 2 shows the results of a series of multiple logistic regressions treating driver status as the outcome

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Table 1: Comparisons between drivers and former drivers at baseline

Variable Type	Drivers (*n*=193) Mean (SD) or %	Former Drivers (*n*=29) Mean (SD) or %	*t* or χ^2(*df*), *p*
Demographic			
Age (Years)	71.44 (8.59) Range: 55–91	77.28 (8.74) Range: 59–88	t(36.61)=3.62, p=0.002
Sex			
Female	54.4%	55.2%	χ^2(1)=0.01, p=0.938
Education (Total years)	14.09 (3.47) Range: 6–24	12.28 (4.20) Range: 5–23	t(33.99)=–2.22, p=0.033
Income			χ^2(1)=5.32, p=0.021
≥$81,000	6.2%	0.0%	
$51,000 – $80,999	26.4%	17.2%	
$21,000 – $50,999	53.4%	55.2%	
≤$20,999	14.0%	27.6%	
Lives alone	34.8%	69.0%	χ^2(1)=12.25, p<0.001
Health			
Total ADL	24.76 (3.04) Range: 14–26	22.90 (3.74) Range: 15–26	t(33.83)=–2.56, p=0.015
GDS	1.80 (2.41) Range: 0–13	4.33 (3.46) Range: 0–13	t(26)=3.48, p=0.002
Health these days			χ^2(1)=10.63, p<0.001
Very good (1)			
Pretty good (2)	32.6%	6.9%	
Not too good (3)	53.9%	65.5%	
Poor (4)			
Very poor (5)	11.9%	20.7%	
	1.0%	3.4%	
	0.5%	3.4%	
SF-12 (Physical)	45.78 (9.95) Range: 19–65	36.94 (9.98) Range: 17–57	t(36.86)=–4.45, p<0.001
SF-12 (Mental)	53.88 (7.81) Range: 21–70	52.02 (10.84) Range: 22–69	t(32.52)=–0.89, p=0.379
Total # of Health Conditions	3.40 (2.69) Range: 0–14	6.00 (2.87) Range: 0–11	t(35.77)=4.57, p<0.001
Psychological resources			
Life Control	10.35 (2.40) Range: 2–12	9.24 (2.44) Range: 4–12	t(36.75)=–2.28, p=0.029
Life Purpose	13.65 (3.13) Range: 3–16	10.21 (4.86) Range: 1–16	t(31.63)=–3.70, p=0.001
Locus of Control	7.77 (3.75) Range: 0–20	9.67 (4.48) Range: 0–18	t(31.41)=2.09, p=0.045

Note. SD = standard deviation; ADL = activities of daily living.

variable. Models 1 and 2 included the Life Control and Life Purpose subscales of the LAP, respectively. Model 1 reached statistical significance as did the life control variable in the model. Life Control contributed significantly to the fit of the model explaining driver status, over and above age and health. Greater scores on life control were associated with lower odds of being a former driver. Model 2, also statistically significant, shows that life purpose enhanced the fit of the model explaining driver status, after controlling for age and health. Higher Life Purpose scores were associated with lower odds of being a former driver. Model 3 was statistically significant; the addition of locus of control enhanced the model fit and showed that a more internal locus of control was associated with lower odds of being a former driver. Across all three models, higher age was associated with higher odds of being a former driver. In Models 1 and 3, poorer health was associated with higher odds of being a former driver.

Discussion

We sought to examine differences between former drivers and current drivers on demographic variables. In addition, we examined the extent to which psychological resource variables of life control, life purpose, and locus of control were associated with driving status after controlling for age and health. The study participants were a convenience sample of Canadian adults 55 years of age and older.

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Table 2: Logistic regression models predicting driving status

Variable	Model 1 B	SE	Wald χ^2	p	OR (95% CI)	Model 2 B	SE	Wald χ^2	p	OR (95% CI)	Model 3 B	SE	Wald χ^2	p	OR (95% CI)
Constant	−8.41					−6.85					−11.03				
Age (years)	0.09	0.026	11.80	0.001	1.09 (1.04–1.15)	0.09	0.026	10.66	0.001	1.08 (1.03–1.15)	0.08	0.027	9.57	0.002	1.09 (1.03–1.14)
Health	0.80	0.297	7.39	0.007	2.22 (1.25–3.95)	0.53	0.302	3.07	0.080	1.70 (0.94–3.06)	0.80	0.295	7.36	0.007	2.23 (1.25–4.00)
Life control	−0.185	0.081	5.16	0.023	0.831 (0.71–0.98)	–	–	–	–	–	–	–	–	–	–
Life purpose	–	–	–	–	–	−0.197	0.055	12.64	<0.001	0.821 (0.074–0.92)	–	–	–	–	–
Locus of control	–	–	–	–	–	–	–	–	–	–	0.15	0.058	6.82	0.009	1.16 (1.04–1.30)
BIC			153.39					150.56					154.77		
AIC			139.83					137.19					141.27		
Model fit			$\chi^2 = 25.89$, $df = 3$, $p < 0.001$					$\chi^2 = 34.26$, $df = 3$, $p < 0.001$					$\chi^2 = 23.71$, $df = 3$, $p < 0.001$		

Note. Some participants were excluded from the models because of missing data. Model 1 with life control included 29 non-drivers and 190 drivers; Model 2 with life purpose included 29 non-drivers and 190 drivers; and Model 3 with locus of control included 27 non-drivers and 189 drivers.

SE = standard error; OR = odds ratio; CI = confidence interval; BIC = Bayesian Information Criterion; AIC = Akaike's Information Criterion. When comparing models, smaller BIC and AIC values indicate better fit.

The results indicate that former drivers were older and reported being in poorer health than current drivers. In addition, former drivers reported a greater number of depression symptoms than current drivers. Group differences in age may also reflect other effects such as differences in health status. With age, declines in functional ability and increases in the number of medical problems can occur, which interferes with a person's ability to drive (Campbell et al., 1993). These findings are consistent with the literature, which indicates that older drivers may cease driving for health reasons (Campbell et al., 1993; Marottoli et al., 1993) and that driving cessation may be followed by further declines in physical health (Edwards, Lunsman, Perkins, Rebok, & Roth, 2009). Similarly, research indicates that former drivers are more likely to be depressed than current drivers. (Chihuri et al., 2016; Ragland, Satariano, & MacLeod, 2005).

The results also showed differences on psychological variables as a function of driving status. Higher scores on life control and life purpose were associated with lower odds of being a former driver, after controlling for age and health. There was also a significant association between locus of control and driver status in the multivariable models such that a more internal locus of control was associated with higher odds of being a current driver. Psychological resources refer to the coping styles that people use to deal with the negative environmental effects that they experience (Lachman & Weaver, 1998). Evidence suggests that psychological resources are positively associated with good mental and physical health (Taylor et al., 2000). When it comes to driving cessation, it may be that psychological resource variables enable a longer driving career through their health promotion effects. For example, an internal health locus of control is a belief that one's health status is influenced by one's own behaviour, and is associated with positive outcomes such as increased physical activity, health help-seeking behaviours, and better physical health (Carlisle-Frank, 1991; Helmer, Krämer, & Mikolajczyk, 2012). Better health is a factor that appears to extend the driving career of older people. Retchin and Anapolle (1993) suggested that improvements in functional status and a general shift towards adopting healthier and more active lifestyles will extend the driving career of many older people. Alternatively, it is plausible that participants with an internal locus of control are less likely to relinquish driving, because it affords them greater control.

Although the results presented here demonstrate the potential importance of psychological resources in explaining driving status, this study is not without its limitations. First, we were limited in the number of explanatory variables within the multiple logistic regressions, given that only 29 former drivers participated in this study and there was a risk of over-fitting

the models. Even the approach we used of including one psychological resource variable at a time across a series of three models, a practice Babyak (2004) called *multiple testing of confounders*, is known to produce over-fitted models, and therefore, the results must be interpreted cautiously, recognizing this limitation. In addition, the cross-sectional nature of this study precludes discussion of a causal relationship between psychological resources and driving cessation. On the one hand, it is possible that psychological resources extend the driving lifespan. On the other hand, it is equally possible that higher psychological resources are a consequence of older people continuing to drive. For example, some authors note that that a driver's licence gives people a sense of independence and control in their lives (Adler & Rottunda, 2006; Eisenhandler, 1990; Liddle & McKenna, 2003; Whitehead, Howie, & Lovell, 2006). Whitehead et al. (2006) demonstrated that driver's licence cancellation was a deeply traumatic and shocking experience. Driving had been a normal and accepted part of life, and cancellation of their driver's licences meant the loss of their independence and sense of control. Further examination of trajectories of driving cessation and health is needed to help elucidate the direction of relationships between these variables.

This study contributes to our understanding of the factors associated with driving cessation. In addition to age and health status, psychological resources contributed to the multivariable models explaining driver status. Given the potential importance of psychological resource variables in explaining driving status, research studies on the process of stopping driving should consider including measures such as life control, life purpose, and locus of control.

Note

[1] An over-fitted logistic regression model contains more explanatory variables than can be justified by the number of events. A common rule of thumb suggests that one should have at least 10–15 events per variable. Over-fitted models may lead to overly optimistic results that do not correspond to real relationships in the populations and therefore cannot be replicated.

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