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Aches and Pains: How Do They Affect Transitions From Driving?

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Abstract

Background and Objectives: Chronic pain, which affects more than 1 in 4 middle-aged and older adults, can have profound implications for everyday behaviors like driving. The literature examining it, however, is relatively small and is limited by its reliance on patient populations and its lack of attention to some driving-related behaviors and self-assessments that may signal the start of a transition from driving.

Research Design and Methods: We address these issues using data from an online survey of Floridians aged 50 and older that was conducted between December 2020 and April 2021 and funded by the Florida Department of Transportation (n = 3,832). We ran multivariate regression analyses to examine the association between pain's interference with driving and 5 driving-related outcomes: self-rated driving ability, driving frequency, self-regulated driving, perceived nearness of driving retirement, and planning for driving retirement.

Results: Results indicate that experiencing more pain that interferes with driving is associated with worse self-rated driving ability, more frequent self-regulated driving, and greater planning for driving retirement. It is not associated with driving frequency or with anticipating that driving retirement will occur in the next 5 years.

Discussion and Implications: These findings indicate that greater pain may hasten the transition from driving, along with planning for it. These patterns suggest that pain may increase people's risk of isolation and other negative outcomes that can follow driving retirement; however, pain's effect on planning may reduce these risks. By focusing on transitioning from driving, our study reveals a largely overlooked benefit of reducing pain—It could extend people's years behind the wheel.

Keywords: Later life planning, Pain, Self-perceptions of aging, Subjective age, Transportation

Translational Significance: Although chronic pain is relatively common in middle and later life, we know little about its effect on transitions from driving. Our findings suggest that pain's greater interference with driving predicts worse self-rated driving ability, more self-regulated driving, and greater planning for driving retirement. Our findings point to pain as a risk factor for transitions from driving and the negative outcomes that often follow it—knowledge of which could aid in identifying segments of the population most at risk, extending their driving trajectories through better pain management, and facilitating their transitions to other transportation options.

Although far from inevitable, the experience of chronic pain in middle and later life is not uncommon. More than one in four adults in the United States aged 45 and older report chronic pain, and the effects are often wide-ranging and profound (Zelaya et al., 2020). A study of 15 European countries and Israel revealed that more than a third of respondents with chronic pain indicated that it had limited their ability to walk, engage in social activities, do household chores, exercise, or sleep (Breivik et al., 2006). For others, the pain was even more limiting. Approximately a quarter of those with chronic pain reported that they were no longer able to drive—the import of which is revealed by its many negative sequelae. Inability to drive increases the risk of social isolation, depression, physical and cognitive decline, and even death (e.g., Chihuri et al., 2016; Choi et al., 2013; Edwards, Perkins, et al., 2009; Mezuk & Rebok, 2008; Ragland et al., 2005; Siren et al., 2004). These patterns underscore the importance of understanding how pain affects transitioning from driving.

Although some research examines the association between pain and driving, the literature is relatively small and relies primarily on patient populations that target individuals with chronic pain (e.g., Fan et al., 2012; Redelmeier et al., 2015; Tepper et al., 2019). Prior studies also investigate relatively few driving outcomes, of which the most frequently examined is driving ability, measured either using self-ratings or objective assessments (e.g., Brown et al., 2018; Nilsen et al., 2011; Seward et al., 2021; Veldhuijzen et al., 2006). By showing that greater pain impairs driving ability, these studies suggest that pain hastens transitions from driving—a finding consistent with research revealing that pain is often

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among nondrivers' reported reasons for driving cessation (Breivik et al., 2006; Fan et al., 2012). Although they draw a link between pain and driving cessation, studies have given limited attention to some experiences that may signal the start of a transition from driving, such as less frequent driving and greater avoidance of difficult driving situations, often termed self-regulated driving. In addition, no studies, of which we are aware, have examined the possibility that pain affects predictions about—and planning for—a transition from driving.

Our study extends the literature on pain and driving cessation by focusing on several experiences related to transitioning from driving. It uses data from a large statewide survey of adults aged 50 and older to examine how pain's interference with driving is associated with self-rated driving ability, driving frequency, self-regulated driving, perceived nearness of driving retirement, and planning for driving retirement.

Prior Research on Pain and Driving

Although relatively few studies examine pain's effect on driving, they do find support for it (e.g., Fan et al., 2012; Redelmeier et al., 2015; Seward et al., 2021; Tepper et al., 2019). For example, a survey of 223 patients with chronic pain found that 70% indicated that pain affected their driving (Fan et al., 2012). Moreover, among those who had stopped driving, 56% attributed it to chronic pain. Similarly, an online survey of 307 people with lower back pain revealed that greater pain was associated with more self-reported driving errors and more avoidance of difficult driving situations (Seward et al., 2021). Pain also increases the risk of involvement in a crash, as indicated by a study of fibromyalgia patients, which revealed that their risk was more than double that of the general population (Redelmeier et al., 2015). Consistent with these patterns, a review of studies of migraines' effects on driving performance found that people with a history of migraines were more likely to have experienced a crash and to experience symptoms like dizziness and visual disturbances that could impair driving ability (Tepper et al., 2019).

Further evidence of pain's effect on driving is found in studies that use experimental designs to examine driving performance (e.g., Nilsen et al., 2011; Veldhuijzen et al., 2006). An on-the-road driving test of 14 patients with chronic pain and 14 matched controls found that driving performance, as well as self-assessments of it, was worse in the pain group (Veldhuijzen et al., 2006). Similarly, a driving simulation study comparing 20 chronic pain patients with 20 healthy controls revealed that patients had slower reaction times and were more likely to miss reactions to traffic signs (Nilsen et al., 2011).

Other studies of pain and driving address the use of pain medication. Although exceptions can be found (e.g., Menefee et al., 2004; Nilsen et al., 2011), research has documented the detrimental effects of many common pain medications on driving ability (e.g., Brown et al., 2018; Tepper et al., 2019). For example, in their driving simulation study that included eight participants, Brown et al. (2018) found that pain medication degraded driving performance, with these effects most noticeable at higher speeds and in rural scenarios. The study's implications are underscored by the frequency of driving while under the influence of pain medication. A study of approximately 800 people seeking medical cannabis for pain found that more than half of the sample reported driving within 2 hr of use (Bonar et al., 2019).

Other studies do not directly examine the association between pain and driving, yet they reveal associations that are consistent with this possibility. Many of pain's physical, cognitive, and emotional sequelae affect driving experiences. Pain is associated with higher levels of depression—a factor associated with less frequent driving and a higher risk of driving cessation (e.g., Asse et al., 2014; Hwang & Hong, 2018). Pain also impairs cognitive functioning, which is another risk factor for reduced driving performance and more rapid transitions from driving (e.g., Anstey et al., 2012; Hwang & Hong, 2018; Tepper et al., 2019). In addition, experiencing more pain reduces sleep quality, which lowers driving frequency and ability (Howard et al., 2014; Park et al., 2013; Vaz Fragoso et al., 2013).

Although research has linked pain with driving experiences, this literature is limited by its reliance on relatively small samples, often drawn from patient populations (e.g., Fan et al., 2012; Redelmeier et al., 2015; Tepper et al., 2019). Exceptions, however, can be found. A study of pain's prevalence and impact in a sample of over 4,800 adults in 15 European countries and Israel revealed that among the nearly one in five adults experiencing chronic pain, half of them reported being unable or less able to drive (Breivik et al., 2006). This study, however, focused on documenting pain's prevalence and numerous consequences for daily life rather than examining individual-level predictors of driving experiences, of which pain is one of many. A study that included pain as a predictor of driving was Hwang and Hong's (2018) longitudinal survey of 716 older Korean drivers. This study revealed that although 60% of the sample reported chronic pain, it was not a predictor of driving cessation over the 3 years of the study. As these contradictory findings suggest, more research is needed to determine whether pain hastens driving cessation in the general population.

The use of larger and more diverse samples also would facilitate the examination of pain's association with driving, controlling for the effects of the numerous other factors that influence it. Few of them are examined in the typically smaller scale studies of pain's effect on driving. The broader literature, however, finds that some groups are more likely than others to transition from driving, including women, members of racial and ethnic minority groups, persons of lower socioeconomic status, and those in worse health (e.g., Barrett et al., 2017; Hwang & Hong, 2018). Although receiving much less attention, self-perceptions of aging also are associated with driving behaviors, as revealed by Barrett and Gumber's (2019) study reporting that feeling older increases self-regulated driving. This finding raises questions that have not been examined, including whether age identity influences other behaviors that signal a movement toward driving cessation and whether such behaviors are influenced by other self-perceptions of aging, such as subjective life expectancy. Much like feeling older, anticipating a shorter life expectancy may hasten transitioning from driving.

Larger-scale studies also could examine pain's effect on a wider range of driving outcomes. Compared with driving ability, which is the focus of most studies, other driving outcomes have received less attention, including driving frequency and self-regulated driving—both of which are associated with driving cessation (Edwards et al., 2009; Kowalski et al., 2014). Moreover, an unexplored question is whether

pain affects predictions about—and planning for—transitions from driving. Experiencing more pain may foreshorten anticipated driving careers and accelerate planning for driving retirement.

Our study contributes to this literature in two ways. First, it uses data from a large statewide survey designed to examine the transportation behaviors of adults aged 50 and older. This feature allows an assessment of whether the findings of prior studies, largely drawn from smaller patient populations, extend to the broader population, as well as an examination of whether they are found in analyses that control for a more comprehensive set of factors that influence driving transitions. Second, we examine some driving outcomes that have received limited attention in prior studies, including driving frequency, self-regulated driving, and perceived nearness of—and planning for—driving retirement. We test the hypothesis that greater pain is associated with worse self-rated driving ability, less frequent driving, greater self-regulated driving, greater odds of anticipating driving retirement in the next 5 years, and greater odds of planning for this transition. Figure 1 provides a conceptual model of our analyses. They examine the association between pain and driving-related outcomes, controlling for sociodemographics, health, and self-perceptions of aging.

Data and Methods

Data

We used data from an online survey of over 4,200 Floridians aged 50 and older that was conducted between December 2020 and April 2021 and funded by the Florida Department of Transportation's Safe Mobility for Life Coalition (SMFLC) whose mission is to increase aging road users' safety, access, and mobility and to eliminate fatalities and reduce serious injuries. The survey was designed to examine middle-aged and older Floridians' transportation-related attitudes and behaviors, with the timing of the survey yielding a picture of them at the start of the coronavirus disease 2019 (COVID-19) pandemic. The sample includes respondents from 62 of Florida's 67 counties. Information about the survey, along with a link to take it, was distributed via the listservs and e-newsletters of SMFLC, AARP Florida, and Florida's Osher Lifelong Learning Institutes. It also was distributed to the Florida State University Institute for Successful Longevity's registry of older adults interested in participating in research.

The analytic sample was limited to those who had valid data on all five dependent variables. As only 10% of the sample were missing on these variables, this limitation yielded 3,832 respondents. With the exception of income, on which 24% of respondents had missing data, values on independent variables were missing for fewer than 5% of respondents. Missing values on independent variables were imputed using multivariate normal imputation (Acock, 2016). Analysis of the coefficients' variance inflation factors, all of which were less than two, revealed no multicollinearity issues (with the exception of age-squared, which was correlated with age).

Measures

We examined five driving-related behaviors. Three measures related to current behavior and assessments of one's ability: self-rated driving ability, driving frequency, and self-regulated

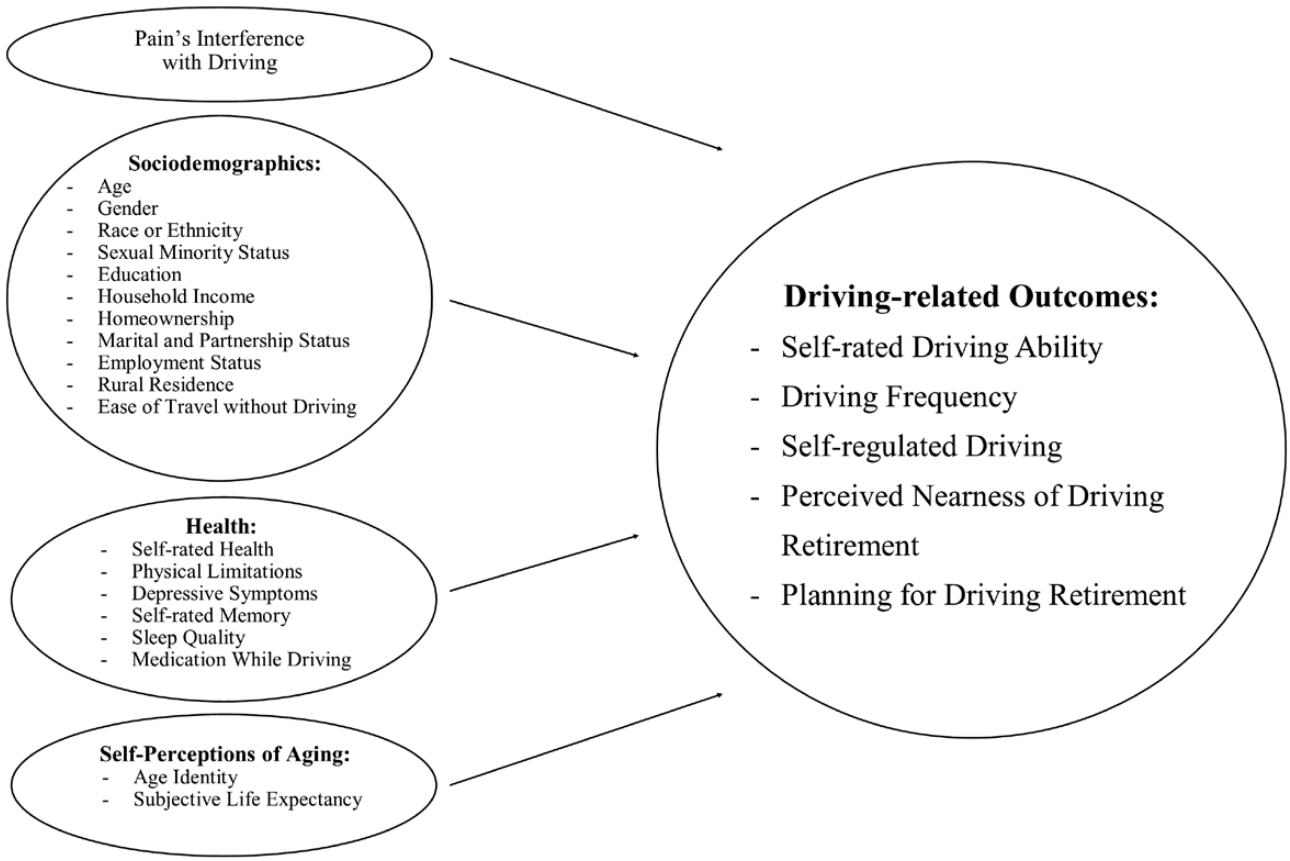

Figure 1. Conceptual model.

driving. Two measures focused on the future—perceived nearness of driving retirement and having planned for this transition.

Self-rated driving ability is measured using a mean scale (α = 0.95) of 17 items asking respondents to rate their ability to perform the following tasks: drive in your local area, drive in unfamiliar areas, drive at night, drive with other people in the car, drive in heavy traffic, merge with traffic, turn left across oncoming traffic, see signs at a distance, see pavement lines at night, avoid hitting curbs and medians, see vehicles coming up beside you, quickly spot pedestrians stepping out from between parked cars, move your foot quickly from the gas to the brake pedal, make an over-the-shoulder check, get in and out of your car, reverse or back up, and make quick driving decisions. Responses ranged from poor (coded 1) to excellent (coded 5).

Driving frequency is measured using responses to the following question: "In the past month, how often did you use each of the following ways of getting from place to place? Driving yourself." Responses were never (coded 1), once (coded 2), two or three times (coded 3), about once a week (coded 4), several times a week (coded 5), and at least once a day (coded 6).

Self-regulated driving was measured using a mean scale (α = 0.85) composed of responses to eight questions. They asked respondents how often they avoided each of the following driving situations: at night, in bad weather, on trips lasting more than 2 hr (one-way), on unfamiliar routes, on high-traffic roads, at peak hours, on two-lane highways, and alone. Responses were never (coded 1), rarely (coded 2), sometimes (coded 3), often (coded 4), or always (coded 5).

Perceived nearness of driving retirement was measured using responses to the following question: "If you were to guess, when do you think you will stop driving completely?" Responses were in the next year, in the next 5 years, in the next 10 years, in the next 20 years, more than 20 years from now, or it will never happen. To capture perceived nearness of this event, a dichotomous variable was created with responses in the next year or next 5 years coded 1, and all others coded 0. Models examining a more proximate transition—in the next year—were not run because less than 1% of the sample indicated this response.

Planning for driving retirement was measured using responses to the following question: "Thinking about the future, how much have you planned for a time when you can no longer drive safely?" Responses were none, a little, some, or a lot. We examine a dichotomous variable coded 1 for any planning and 0 for none.

Pain's interference with driving is measured using responses to the following question: "In the past month, how much did physical pain interfere with your ability to drive?" Responses were not at all (coded 1), a little (coded 2), some (coded 3), or a lot (coded 4).

All models include several sociodemographic variables. *Age* is a continuous variable that ranges from 50 to 96. Age-squared is included to control for possible nonlinear associations between age and driving. *Gender* is measured using a variable coded 0 for men and 1 for women. *Sexual minority* was measured using a variable coded 0 for those identifying as heterosexual or straight and 1 for those identifying as lesbian, gay, bisexual, or something else. *Race and ethnicity* are captured using a set of four dichotomous variables: Non-Hispanic White (reference category), non-Hispanic Black, Hispanic, and other race or ethnicity. *Education*, which was relatively high in the sample, is measured using a dichotomous variable coded 1 for those with at least a college degree and 0 for all others. *Household income* (in $10,000 units) ranges from $10,000 to $200,000 or more. *Homeownership* is indicated by a dichotomous variable coded 1 for those who own their homes and 0 for renters and all others. *Married/partnered* is a dichotomous variable coded 1 for those who are married or currently living with a partner and 0 for all others. *Employed* is a dichotomous variable coded 1 for those who are employed full- or part-time and 0 for all others. *Rural* is coded 1 for those living in counties designated as rural by the Florida Department of Transportation and 0 for all others. We also include a control for individuals' access to driving alternatives (e.g., public transit and rides from family), which can influence transitions from driving. *Ease of travel without driving* is drawn from responses to an item asking how easy it would be for the respondent to get to the places they need or want to go if they were no longer able to drive. Responses range from not at all easy (coded 1) to very easy (coded 4).

Other control variables include six measures capturing aspects of health. *Self-rated health* ranges from poor (coded 1) to excellent (coded 5). *Physical limitations* are a count of up to seven tasks that participants reported being unable to do. The tasks were as follows: walking a quarter of a mile; walking up 10 stairs without resting; stooping, crouching, or kneeling; lifting or carrying something as heavy as 10 pounds; walking from one room to another on the same level; standing from an armless chair; and getting in or out of bed. *Depressive symptoms* indicate how often in the past week respondents felt sad or depressed, ranging from never or hardly ever (coded 1) to often (coded 4). *Self-rated memory* indicates how often in the past week respondents felt that memory problems interfered with their daily activities, ranging from never or hardly ever (coded 1) to often (coded 4). *Sleep quality* indicates how respondents rate their overall sleep quality during the past month, ranging from very bad (coded 1) to very good (coded 4). *Medication while driving* indicates how often respondents drive after taking medication that could affect driving ability, ranging from never (coded 1) to always (coded 5).

Models also include two measures of self-perceptions of aging that are likely to influence driving experiences: age identity and subjective life expectancy. *Age identity* uses responses (in years) to the following question: "Sometimes people feel younger or older than their actual age. How old do you feel?" It is measured as the difference between chronological age and the age respondents feel, with higher values indicating older identities. *Subjective life expectancy* is measured using responses (in years) to the following question: "If you were to guess, to what age do you think you'll live?"

Methods

Ordinary least squares (OLS) and logistic regression were used in the multivariate analyses. OLS regression was used to examine the association between pain's interference with driving and the driving-related outcomes with underlying structures that are continuous, including self-rated driving ability, driving frequency, and self-regulated driving. Logistic regression was used to examine the association between pain's interference with driving and the driving-related outcomes that were measured using dichotomous

variables, including perceived nearness of driving retirement and planning for driving retirement. For each outcome, one model is presented, which regresses the driving outcome on pain's interference with driving and the control variables, including sociodemographics, health, and self-perceptions of aging.

Results

Table 1 reports the means and standard deviations of all variables used in analyses. Results indicate that respondents rate their driving ability favorably, with the average rating indicating "very good." Respondents drive, on average, several times a week and rarely self-regulate their driving. Approximately 7% anticipate retiring from driving in the next 5 years, and 48% have planned, to some degree, for this transition. Levels of pain's interference with driving were low, with the average rating indicating that pain had interfered "not at all" with respondents' driving. The sample averaged 69 years of age, over half of the sample were women, 85% were non-Hispanic White, and 95% identified as heterosexual. The socioeconomic status of respondents was high, as indicated by the observation that three-quarters had at least a college degree, household income averaged $83,000, and 87% were homeowners. Approximately

Table 1. Descriptive Statistics of Respondents From Florida's Aging Road User Survey, 2020–2021 (n = 3,832)

Variable	Description	Range	Mean (*SD*)	%
Self-rated driving ability	Mean scale of 17 items asking respondents' ability to perform specific driving behaviors; responses from 1 (poor) to 5 (excellent)	1 to 5	4.07 (0.66)	
Driving frequency	Respondents' report of how often they have driven in the past month; responses from 1 (never) to 6 (at least once a day)	1 to 6	4.94 (1.01)	
Self-regulated driving	Mean scale of eight items asking how often they avoided specific driving situations; responses from 1 (never) to 5 (always)	1 to 5	2.30 (0.82)	
Perceived nearness of driving retirement	1 = respondent anticipates they will stop driving completely either in the next year or next 5 years; 0 = they predict stopping in the next 10 years, in the next 20 years, or it will never happen	0,1		7.13
Planning for driving retirement	1 = respondent reports they have planned a little, some, or a lot for a time when they can no longer drive safely; 0 = they report planning none	0,1		48.38
Pain's interference with driving	Respondents' report of how much physical pain interfered with ability to drive in past month; responses from 1 (not at all) to 4 (a lot)	1 to 4	1.13 (0.45)	
Age	In years	50 to 96	69.40 (8.15)	
Woman	1 = respondent identifies as a woman; 0 = respondent identifies as a man	0,1		55.57
Non-Hispanic White	1 = respondent identifies as non-Hispanic White; 0 = all others	0,1		84.94
Non-Hispanic Black	1 = respondent identifies as non-Hispanic Black; 0 = all others	0,1		3.92
Hispanic	1 = respondent identifies as Hispanic; 0 = all others	0,1		5.13
Other race or ethnicity	1 = respondent identifies as other race or ethnicity; 0 = all others	0,1		6.26
Sexual minority	1 = respondent identifies as lesbian, gay, bisexual, or something else; 0 = respondent identifies as heterosexual or straight	0,1		4.43
College graduate	1 = respondent reports completing a college or higher degree; 0 = all others	0,1		74.68
Household income	In $10,000	1 to 20	8.47 (5.10)	
Homeowner	1 = respondent owns home; 0 = all others	0,1		86.59
Married/partnered	1 = respondent is married or partnered; 0 = all others	0,1		61.04
Employed	1 = respondent is employed full- or part-time; 0 = all others	0,1		25.52
Rural resident	1 = respondent lives in county designated as rural by Florida Department of Transportation; 0 = all others	0,1		7.52
Ease of travel without driving	Respondents' report of how easy it would be to get to the places they need or want to go if they were no longer able to drive; responses from 1 (not at all easy) to 4 (very easy)	1 to 4	1.84 (0.98)	
Self-rated health	Respondents' rating of their health; responses from 1 (poor) to 5 (excellent)	1 to 5	3.66 (0.90)	
Physical limitations	Count of up to seven tasks respondents reported being unable to do (e.g., standing up from armless chair)	0 to 7	1.34 (1.73)	
Depressive symptoms	Respondents' report of how often in past week they felt sad or depressed; responses from 1 (never or hardly ever) to 4 (often)	1 to 4	1.52 (0.79)	
Self-rated memory	Respondents' report of how often in the past week they felt that memory problems interfered with their daily activities; responses from 1 (never or hardly ever) to 4 (often)	1 to 4	1.21 (0.50)	
Sleep quality	Respondents' rating of their overall sleep quality during the past month; responses from 1 (very bad) to 4 (very good)	1 to 4	3.08 (0.69)	
Medication while driving	Respondents' report of how often they drive after taking medication that could affect driving ability; responses from 1 (never) to 5 (always)	1 to 5	1.13 (0.44)	
Age identity	Difference between chronological age and the age respondents report feeling; in years, with higher values indicating older identities	–70 to 80	–11.63 (10.55)	
Subjective life expectancy	Respondents' guess as to the age to which they will live; in years	55 to 150	89.40 (7.85)	

Note: *SD* = standard deviation.

61% were married, 25% were employed, and 8% lived in a rural county. Views of their ease of travel if they were no longer able to drive averaged "a little easy." Respondents tended to rate their health favorably. Self-rated health averaged "very good," physical limitations averaged one, depressive symptoms averaged "occasionally," memory problems interfered with daily activities "occasionally," and sleep quality averaged "good." Participants tended to report never driving after taking medication that could affect driving ability. They also reported feeling approximately 12 years younger than their actual age and anticipated a life expectancy of approximately 89 years.

Table 2 reports the results of regression analyses examining the association between pain's interference with driving and each driving outcome. The results indicate that pain is significantly associated with three of the outcomes. Reporting greater interference of pain with driving predicts worse self-rated driving ability, more self-regulated driving, and higher odds of planning for driving retirement. In contrast, it is not associated with driving frequency or with predicting that driving retirement will occur in the next five years.

The results reveal that age, gender, and race and ethnicity are associated with driving outcomes. Compared with men, women rate their driving ability less favorably, drive less often, engage in more self-regulated driving, and have higher odds of anticipating driving retirement in the next 5 years, as well as higher odds of planning for driving retirement. Older ages are associated with greater odds of planning for driving retirement. They also are associated with weaker relationships between age and self-regulated driving, as well as between age and anticipating driving retirement in the next 5 years. Respondents identifying as non-Hispanic Black or Hispanic reported more frequent avoidance of difficult driving situations. Compared with respondents identifying as heterosexual, those with other sexual identities have higher odds of anticipating driving retirement in the next 5 years.

Other sociodemographic variables also are associated with driving outcomes. Higher education predicts more frequent driving but worse self-rated driving ability. Higher income predicts better self-rated driving ability, more frequent driving, and less self-regulated driving. Being a homeowner is associated with more frequent driving, less self-regulated driving, and lower odds of anticipating driving retirement in the next 5 years and planning for it. Respondents who are married or partnered drive less often than those who are single. Respondents who are employed drive more often and engage in less self-regulated driving than do unemployed

Table 2. Regression of Driving-Related Outcomes on Pain

Variable	Self-rated driving ability[a]	Driving frequency[a]	Self-regulated driving[a]	Perceived nearness of driving retirement[b]	Planning for driving retirement[b]
Pain's interference with driving	−0.08 (0.02)***	−0.06 (0.04)	0.07 (0.03)*	1.23 (0.20)	1.20 (0.10)*
Age	−0.01 (0.01)	−0.02 (0.02)	−0.03 (0.02)†	0.94 (0.16)	1.12 (0.06)*
Age^2	−0.00 (0.00)	0.00 (0.00)	0.00 (0.00)*	1.00 (0.00)*	1.00 (0.00)
Woman	−0.27 (0.02)***	−0.30 (0.03)***	0.38 (0.03)***	2.86 (0.55)***	1.36 (0.10)***
Non-Hispanic Black[c]	−0.05 (0.05)	0.08 (0.08)	0.35 (0.07)***	2.19 (0.89)†	1.08 (0.20)
Hispanic[c]	0.01 (0.04)	0.01 (0.07)	0.19 (0.06)***	1.77 (0.76)	1.31 (0.21)†
Other[c]	0.01 (0.04)	−0.04 (0.06)	0.03 (0.05)	1.62 (0.58)	1.09 (0.16)
Sexual minority	0.01 (0.05)	−0.07 (0.08)	−0.04 (0.06)	2.09 (0.75)*	1.04 (0.18)
College graduate	−0.08 (0.02)***	0.08 (0.04)*	−0.02 (0.03)	1.05 (0.21)	1.09 (0.09)
Household income	0.01 (0.00)**	0.01 (0.00)*	−0.01 (0.00)**	0.99 (0.03)	0.99 (0.01)
Homeowner	0.04 (0.03)	0.10 (0.05)*	−0.10 (0.04)*	0.67 (0.15)†	0.75 (0.08)**
Married/partnered	−0.00 (0.02)	−0.10 (0.04)**	0.00 (0.03)	0.90 (0.17)	0.90 (0.07)
Employed	0.01 (0.03)	0.42 (0.04)***	−0.16 (0.04)***	0.67 (0.21)	1.06 (0.10)
Rural resident	−0.08 (0.04)*	0.12 (0.06)*	−0.01 (0.05)	0.36 (0.15)*	1.03 (0.13)
Ease of travel without driving	0.03 (0.01)***	−0.09 (0.02)***	−0.02 (0.01)	1.45 (0.12)***	1.37 (0.05)***
Self-rated health	0.18 (0.01)***	0.12 (0.02)***	−0.06 (0.02)***	0.84 (0.10)	0.92 (0.05)†
Physical limitations	−0.01 (0.01)	−0.03 (0.01)*	0.05 (0.01)***	1.14 (0.06)*	1.08 (0.03)**
Depressive symptoms	−0.00 (0.01)	−0.01 (0.02)	0.01 (0.02)	0.96 (0.10)	0.88 (0.04)**
Self-rated memory	−0.12 (0.02)***	−0.05 (0.03)	0.10 (0.03)***	1.53 (0.21)**	1.11 (0.08)
Sleep quality	0.09 (0.01)***	0.01 (0.02)	−0.04 (0.02)†	0.91 (0.11)	1.03 (0.05)
Medication while driving	−0.12 (0.03)***	0.01 (0.05)	0.04 (0.04)	0.95 (0.23)	0.87 (0.10)
Age identity	−0.01 (0.00)***	−0.00 (0.00)**	0.00 (0.00)*	1.01 (0.01)	1.00 (0.00)
Subjective life expectancy	−0.00 (0.00)	−0.00 (0.00)	−0.00 (0.00)	0.82 (0.17)***	0.99 (0.00)*
Adjusted R^2	0.24	0.12	0.16	0.44[d]	0.06[d]

Notes: Data from Florida's Aging Road User Survey, 2020–2021; n = 3,832.
[a]Ordinary least squares (OLS) regression, with unstandardized coefficients (standard errors) reported.
[b]Logistic regression, with odds ratios (standard errors) reported.
[c]Non-Hispanic White = reference group.
[d]Pseudo R-squared.
†$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$.

respondents. Compared with respondents in urban or suburban counties, those in rural counties rate their driving ability less favorably, drive more often, and are less likely to anticipate stopping driving soon. Respondents perceiving greater ease of travel if they were no longer able to drive, compared with those perceiving less ease, rate their driving ability more favorably, drive less often, and are more likely to anticipate retiring from driving in the next 5 years and to have planned for it.

The results also indicate that health is associated with driving outcomes. Better self-rated health predicts better self-rated driving ability, more frequent driving, and less self-regulated driving. Having more physical limitations is associated with less frequent driving, more self-regulated driving, and higher odds of anticipating driving retirement in the next 5 years and planning for it. Having more depressive symptoms is associated with lower odds of planning for driving retirement. Having worse self-rated memory is associated with worse self-rated driving ability, more self-regulated driving, and higher odds of anticipating driving retirement in the next 5 years, while having worse sleep quality predicts worse self-rated driving ability. Reporting more frequent use of medication while driving is associated with worse self-rated driving ability.

The results reveal another set of factors that predict transitioning from driving: self-perceptions of aging. Feeling older is associated with worse self-rated driving ability, less frequent driving, and more self-regulated driving. While these outcomes are not associated with subjective life expectancy, others are—namely, those focused on the future rather than the present. Anticipating a longer life expectancy is associated with lower odds of anticipating driving retirement in the next 5 years and lower odds of planning for this transition.

Discussion

Although pain's association with various driving outcomes has been reported in prior studies, their reliance on relatively small samples—often drawn from patient populations—leaves unclear whether the findings generalize to the broader population. Moreover, their neglect of some driving outcomes yields an incomplete picture of how pain may influence transitioning from driving. Addressing these issues, we used data from a survey of over 3,800 Floridians aged 50 and older and examined a wide range of driving outcomes that are relevant to driving cessation.

Our study provides further evidence that experiencing pain hastens transitions from driving. Consistent with smaller scale studies (e.g., Nilsen et al., 2011; Seward et al., 2021; Veldhuijzen et al., 2006), we found that pain's greater interference with driving predicted worse self-rated driving ability. It also predicted greater avoidance of difficult driving situations. This finding parallels that of the only other study of pain, of which we are aware, that examined this driving outcome—Seward and colleagues' (2021) study of over 300 adults with lower back pain. In contrast with our findings for driving ability and self-regulated driving, those for driving frequency reveal that it is not associated with pain. These findings raise the possibility that pain may set in motion a transition from driving that first manifests as worse perceptions of driving ability and withdrawals from difficult driving situations, rather than reductions in driving frequency; however, an examination of this possibility awaits studies employing panel data.

Our study further contributes to the literature by examining pain's association with previously unexplored outcomes that are relevant to transitions from driving—namely, individuals' perceived timing of driving retirement, as well as their planning for it. We found that pain's greater interference with driving was not associated with anticipating that driving retirement would occur in the next 5 years; however, it did predict greater planning for this event. Considered alongside our other results related to pain, these finding suggests that although pain may accelerate the transition from driving—and increase the risks of isolation and other negative sequelae (e.g., Chihuri et al., 2016; Choi et al., 2013)—its effect on planning may reduce these risks. Further research is needed, however, to explore this possibility by examining how pain influences the specific driving retirement plans that are made and whether they do, in fact, ease the transition for this population.

Our findings on the association between pain and driving are underscored by their derivation from models that control for a wider range of factors than included in prior studies—a feature that not only strengthens our conclusions but also yields insight on other factors influencing transitions from driving, including self-perceptions of aging. Consistent with one of the few studies of self-perceptions of aging's effects on driving (Barrett & Gumber, 2019), we found that feeling older predicts more self-regulated driving. By examining other outcomes, our study reveals age identity's associations with other aspects of driving. We found that feeling older also predicts less frequent driving and worse self-rated driving ability. Age identity did not predict anticipating or planning for driving retirement—although those outcomes were associated with forecasting a shorter life expectancy. In short, we found that age identity is associated with driving experiences and assessments focused on the present, while subjective life expectancy is associated with those focused on the future—an observation that highlights the importance of considering self-perceptions of aging with different temporal frames of reference, as their effects may vary (Barrett & Barbee, 2022).

Our study also extends the understanding of driving transitions by examining variation by sexual identity—a factor largely neglected in this literature. On most driving-related outcomes we examined, we found no evidence that individuals identifying as sexual minorities differed from those identifying as heterosexual. They were, however, more likely to anticipate retiring from driving in the next 5 years—although no more likely to plan for it. These findings not only highlight the importance of examining the barriers to later life planning that this population faces but also illustrate the value of incorporating a consideration of sexual identity in studies of later life driving.

Suggesting directions for further research on pain and driving are the questions that our study did not examine, including those centering on issues of causality and timing. Our use of cross-sectional rather than panel data leaves unexamined the possibility of reverse causation, as the driving behaviors and perceptions we examined may influence experiences or reports of pain's interference with driving. Although it is possible that our findings reflect driving's effect on pain, we find it somewhat unlikely. We draw this prediction from studies of driving's effect on pain (e.g., Chen et al., 2004; Plouvier et al., 2009). Often conducted using samples of professional drivers,

such as taxi drivers, these studies tend to find that more frequent driving predicts greater pain. This finding, however, runs counter to our observation that greater pain is not associated with driving frequency. Panel studies are needed to clarify the processes underlying the association between pain and driving—both of which are likely to change over time. Our study suggests that pain's interference with driving leads to a gradual withdrawal from driving that involves viewing one's driving ability less favorably, avoiding difficult driving situations, and planning for driving retirement, but further studies are required to pinpoint the timing of these changes, along with their relationship to complete cessation from driving.

Studies also could give greater attention to variation in the experience of pain. Our study focused on reports of pain's interference with driving, leaving unexplored the issue of how pain duration, intensity, or location may affect transitions from driving. Knee pain, for example, may be especially important to examine. It is the second most common location of pain, after back pain (Breivik et al., 2006)—and one that is particularly exacerbated by driving (Chen et al., 2004). Also receiving limited attention in our study are pain management strategies' effects on transitions from driving. Although our models include a control for medication use while driving, it does not refer specifically to its use for pain. Moreover, other pain management strategies, such as physical therapy, yoga, and relaxation techniques, are unexamined but could influence the pace of transitioning from driving. Another direction for research centers on various psychological responses to pain, including pain catastrophizing, cognitive intrusion by pain, and affective responses like fear, anger, and irritability—all of which are associated with driving outcomes that could pave the way to driving cessation, such as driving avoidance (Seward et al., 2021).

Suggesting further research directions are features of our data that may limit our study's generalizability. The sample underrepresents individuals of lower socioeconomic status and those living in rural areas—groups for whom lack of access to other transportation options may be especially important determinants of transitions from driving. Our study controlled for individuals' perceptions of ease of travel in the absence of driving and found that it was associated with all but one of the driving outcomes; however, questions remain about the generalizability of the study's conclusions to the broader population or to other states. Other questions are raised by the timing of our data collection, which occurred near the end of the first year of the COVID-19 pandemic. Although some of the transportation changes that occurred in the pandemic's early weeks and months, including the decline in driving, are likely to have reversed by the time of our data collection, we are not able to determine how the pandemic may have influenced the driving outcomes we examined—or reports of pain. Suggesting another direction for research is our study's reliance on single-item measures that were found to be significant predictors of driving outcomes. These measures include not only pain's interference with driving but also medication use while driving, depressive symptoms, self-rated memory, sleep quality, age identity, and subjective life expectancy. Our findings suggest the utility of further examinations of these associations, using measures that more thoroughly capture these constructs.

By lending further support to studies linking pain to driving cessation, our findings have relevance to transportation and health care policies. They point to pain as a risk factor for transitions from driving and the negative outcomes that often follow it—knowledge of which could aid in identifying segments of the population most at risk and facilitating their transitions to other transportation options. Transportation-related aging programs, for example, could include self-assessed pain among the other factors, such as living arrangements and health status, that are used to identify individuals most likely to transition from driving or to experience isolation following it. These groups could be provided with resources to help with transportation planning, such as information on ride services and workshops that allow them to try out driving alternatives in advance of their need for them. Our findings also have implications for health care provision, as they underscore the importance of achieving better management of chronic pain. By focusing on transitioning from driving, our study reveals a largely overlooked benefit of reducing pain—It could extend people's years behind the wheel.

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Conflict of Interest

None declared.

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