

PROBLEMS WITH SLEEP DO NOT PREDICT SELF-REPORTED DRIVING FACTORS AND PERCEPTION IN OLDER DRIVERS: EVIDENCES FROM THE CANDRIVE II PROSPECTIVE COHORT

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Summary: Given that sleep problems and serious motor vehicle collisions are increasingly prevalent in older adults, even minor drowsiness could potentially contribute to driving patterns in older drivers. To date, it is unknown whether less serious problems with sleep influence driving frequency and ability in older adults. We investigated the influence of everyday sleep disturbances on driving practices and driver perceptions in a large cohort of healthy older drivers. Self-reported measures of sleep problems were used to investigate the influence of sleep disturbance on self-reported driving practices and perceived driving abilities. On two measures of self-reported driving outcomes, participants with problems with rated themselves more poorly. However, this relationship disappeared when health and demographic variables were entered prior in hierarchical regression analyses. Our results show that the relationship between sleep problems, driving frequency and perceived abilities is better explained by mediating demographic, health, and cognitive factors.

INTRODUCTION

Approximately 20 to 50% of older adults report having sleep problems (Chen et al., 2011; Lopez-Torres Hidalgo et al., 2011; Vitiello, 1997), compared to roughly 5 to 30% in the general population (Bjorngaard et al., 2011; Ohayon, 2002). In an epidemiological study of 9,000 participants aged 65 and older, the National Institute on Aging found that over half of older adults reported at least one of these complaints as occurring most of the time—trouble falling asleep, waking up, awaking too early, needing to nap and not feeling rested (Foley et al., 1995). It is generally argued that the increase in concurrent medical conditions can produce greater sleep disruption with age, such that sleep complaints common in older adults are often secondary to their comorbidities (Foley et al., 2004).

Despite the awareness of the risks involved, polls of drivers conducted worldwide find that many drivers admit to driving drowsy (*Sleep in America poll*, 2012; Sagaspe et al., 2010; Vanlaar et al., 2008), and older drivers seem to be no different than the other cohorts of drivers. Vaz Fragoso and colleagues found that a large percentage continued to drive regularly despite reporting dissatisfaction with their sleep (Vaz Fragoso et al., 2008). The important question that

remains is whether sleep problems can partly explain changes in driving behaviors seen in older adults.

Most of the research to date on sleep and driving in older adults has focused on sleep disorders, such as obstructive sleep apnea, or other clinically significant sleep problems as indicated by various objective sleep measures (e.g., the Sleep Impairment Index). Nevertheless, the presence of less serious sleep disturbances may still influence driving patterns in older drivers. To our knowledge, the impact of less severe sleep problems on driving in older adults has yet to be fully circumscribed. Indeed, findings remain mixed regarding whether perceived sleepiness is associated with crash risk and impaired driving performance in older drivers (Ellen et al., 2006). For instance, Vaz Fragoso et al (2008) found that older drivers with sleep problems rated their driving ability more poorly, especially concerning night driving. They also found that these individuals had more health issues in general but did not examine whether these issues may have influenced the relationship between sleep problems and self-rated driving. The present study sought to investigate the independent influence of everyday sleep problems on self-reported driving practices and perceived driving abilities in a large cohort of healthy older drivers. Specifically, we examined the contribution of self-reported sleep problems, while controlling for medical conditions, cognitive function, age and of driver characteristics. We hypothesized that even mild sleep problems would be associated with self-reported driving restrictions and poorer driver perceptions of their abilities.

METHOD

Participants

Participants from the Candrive II prospective cohort study were investigated. Candrive II is a Canadian Institutes of Health Research (CIHR)-funded interdisciplinary research team interested in health-related safety and quality-of-life issues pertinent to active older drivers (Marshall et al., 2012). Participants (N = 928, aged 70 or older) were recruited largely through media from seven Canadian cities in four provinces including Toronto, ON, Ottawa, ON, Hamilton, ON, Thunder Bay, ON, Montreal, QC, Winnipeg, MB and Victoria, BC.

Procedures

All participants underwent a comprehensive baseline assessment by trained research staff, which incorporated a variety of measures that can be easily administered in a primary care clinic setting). The assessment included measures of sensory, physical and cognitive functioning, and information about psychosocial factors, health status, and driving habits and behaviors. The baseline assessment required approximately 2.5 to 4 hours to complete. The following analyses pertaining to the present study will only be applied to a subset of the variables collected at baseline.

Measures of interest

Problems with sleep. All participants were asked “Do you have any sleep problems?” with a dichotomous response, yes or no. Although the self-reported declaration of sleep problems is

arguably subjective, previous researchers indicate that self-perception of fatigue in older individuals may be a better predictor of performance decrement over time than objectively measured sleepiness (Philip et al., 2004).

Self-reported driving outcomes. Driving practices were assessed using the Situational Driving Frequency (SDF) and Avoidance (SDA) scales (MacDonald, Myers & Blanchard, 2008). On the SDF, participants are asked how often they drive, on average, in 14 different driving. On the SDA, people are asked “If possible, do you try and avoid any of these driving situations?”, “check all that apply” on a list of 20 situations (e.g., night, dawn or dusk, bad weather conditions in general, etc.) Both scales were developed inductively with older drivers and have shown good internal consistency and test-retest reliability (MacDonald et al., 2008; Blanchard & Myers, 2010). Driver perceptions were assessed using the 15-item Perceived Driving Abilities (PDA) scale, which asks participants to rate various aspects of their abilities (e.g., see road signs at night, make quick driving decisions, etc.) on a 4-point scale (from 0= poor to 3=very good).

Control variables. Demographic (age, gender) and health information (self-reported chronic conditions referred below as number of medical conditions, Body Mass Index [BMI], depression and medication list) were included to describe their mediating effect in the statistical analysis models. The inclusion of the above variables is justified by the known influence of one’s lifestyle and health-related factors on sleep as well as on driving (e.g., Verster et al., 2004; Barrash et al., 2010; Leproust et al., 2008). Participants’ cognitive functioning scores (MoCA) were also included as a control.

RESULTS

Table 1 presents demographics, health, medication use, mood, and cognitive functioning between older drivers with self-reported sleep problems ($N = 194$) and those without ($N = 668$). The two groups had similar BMI scores, MoCA scores, and were of similar age. The comparison of anticholinergic use between those with no sleep problems and those with sleep problems was significant, (1.0 vs. 3.1%, $\chi^2 = 4.31$, $p = 0.05$). A larger proportion of older drivers without sleep problems were male (63.6% versus 36.4% of females; $\chi^2 = 11.49$, $p < 0.05$), whereas the gender frequencies of older drivers with sleep problems were evenly distributed (50.0% male, 50.0% female; $\chi^2 = 10.57$, $p > 0.05$). Table 1 also shows that, on average, older drivers without sleep problems had significantly fewer chronic medical conditions ($M(SD) = 7.0(3.32)$ versus $8.5(3.64)$, $t(834) = 5.52$, $p < 0.05$), were significantly more likely to be using benzodiazepines (6.4% versus 20.3%, $\chi^2 = 33.20$, $p < 0.05$), and to have depression scores greater than 5 (1.3% versus 4.2%, $\chi^2 = 6.10$, $p < 0.05$). Participants with self-reported sleep problems also scored significantly lower on the SDF, $t(844) = 2.90$, $p < .01$; and PDA $t(846) = 4.26$, $p < .01$ scales compared to those without self-reported sleep problems. No significant difference between groups was found for the SDA. In order to assess whether the observed differences remain after controlling for demographic and health related variables, hierarchical regressions analyses were conducted for each one of the driving variables.

Hierarchical regressions were run independently on all three scales. In each analysis, the control variables were entered first. For SDF, control variables explained 13% of the variance when entered at step 1. For SDA, the contribution of the same variables was 8 % at Step 1. In both

cases, entering sleep problems at step 2 had absolutely no effect on the model. For PDA, control variables explained 7% of the variance at step 1 and the inclusion of sleep problems at Step 2 was significant but contributed for only 1% of the variance.

DISCUSSION

This study examined the relationship between self-reported sleep problems and driving practices and driver perceptions in a large cohort of older drivers. Group comparisons between those who reported having problems with sleep and those who did not revealed a significant difference on SDF and PDA. Older drivers with sleep problems reported lower driving frequency and lower self-perceived ability in comparison to older drivers who did not report problems with sleep. After controlling for a number of variables that could potentially influence the relationship between sleep and driving (age, gender, BMI, cognitive functioning, number of current medical conditions, medication use, and depression), self-reported sleep problems did not predict SDF nor SDA, and only explained 1% of the variance on PDA. These results demonstrate that everyday sleep problems or lack thereof does not significantly influence self-reported driving patterns or perceived driving abilities in older drivers. Our findings demonstrate that subclinical sleep problems have little to no influence on driving practices and abilities as reported by the older driver.

Table 1. Demographics, health, and cognitive functioning of older drivers with/without sleep problems based on self-reporting (yes/no)

Characteristics	No Sleep Problems (Self-reported)			Sleep Problems (Self-reported)			<i>t</i>	χ^2
	N	Participant N (%)	<i>M</i> (SD)	N	Participant N (%)	<i>M</i> (SD)		
Age	668		76.4 (4.9)	194		76.02 (4.8)	.90	
Gender	668			192				10.57***
Male		424 (63.5)			98 (50.5)			
Female		244 (36.5)			96 (49.5)			
Number of Chronic Conditions	668		7.0 (3.3)	194		8.5 (3.6)	5.37***	
Body Mass Index	665		27.2 (4.9)	194		26.9 (4.1)	0.82	
MoCA Scores	666		25.9(2.5)	194		26.2(2.2)	1.61	
>26		286(2.9)			91(46.9)			
<26		380(57.1)			103(53.1)			
Medication Use								
Anticholinergics	668			192				4.23*
Yes		7 (1.0)			6 (3.1)			
No		661 (99.0)			188 (96.9)			
Benzodiazepines	668			192				32.62***
Yes		43 (6.4)			39 (20.1)			
No		625 (93.6)			155 (79.7)			
Geriatric Depression Scale (GDS)	668			194				5.99*
GDS Score ≤ 5		659 (98.7)			186 (95.9)			
GDS Score > 5		9 (1.3)			8 (4.1)			
SDF	656		35.57(7.47)	190		33.80(7.08)	2.90**	
SDA	657		5.26(4.11)	191		5.71(4.15)	1.33	
SDA	657		36.34(6.01)	191		34.21(6.27)	4.26***	

Note. *M* = Mean; *SD* = Standard Deviation; * $p < 0.05$; ** $p < 0.01$; *** $p \leq 0.001$

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