RESEARCH BRIEF

Relationship Between Driving Habits and Health-Related Quality of Life: AAA LongROAD Study

April 2019

This research brief used data from the AAA Longitudinal Research on Aging Drivers (LongROAD) study to examine driving habits and health-related quality of life (HRQOL) in an older population. The health-related quality of life is important in understanding the mental, social and physical well-being of individuals. The Patient-Reported Outcomes Measurement Information System (PROMIS), which is a validated measuring tool used in the healthcare field to evaluate and monitor physical, mental, and social health in adults and children, was used to measure the human quality of life domains. Results found that driving reduction among older people was associated with increased fatigue and poorer physical functioning. By identifying the association between these driving habits and HRQOL, future driving intervention programs may target individuals sooner to prolong long-term mobility and safe driving practices. This is report number 11 in a series of ongoing LongROAD research.

METHODS

LongROAD is a prospective multisite (San Diego, California; Denver, Colorado; Baltimore, Maryland; Ann Arbor, Michigan; and Cooperstown, New York) cohort study with 2,990 drivers. To be eligible for this study, drivers had to possess a valid driver's license, be between ages 65-79, drive at least once a week and have no significant cognitive impairment. The study collects self-reported and objectively measured data on health, functioning and driving behavior at in-person visits and telephone interviews. Details on the study methods are outlined elsewhere (Li et al., 2017).

Three aspects of driving habits were analyzed: low mileage driving, self-reported driving space and crashes. Low mileage drivers were defined as those who drove fewer than 3,000 kilometers per year (Hakamies-Blomqvist et al., 2002; Langford, Methorst, & Hakamies-Blomqvist, 2006). Each participant's annual driving mileage was calculated using GPS and accelerometer data.

The Driving Habits Questionnaire (DHQ), which obtained data on participants' driving behaviors, measured driving space, which is defined as the distances a participant drove from their immediate neighborhood in the past three months. Participants were asked six dichotomous questions about their driving locations (e.g., immediate and beyond their neighborhood, neighboring and distant towns, outside the state and U.S.). Each affirmative response was coded as 1. A summary score was created ranging from 0 to 6. For this research brief, driving space was scored between 0 and 3 (Owsley, Stalvey, Wells, and Slone, 1999).

The DHQ also recorded the number of crashes a participant self-reported, which were analyzed as zero versus one or more crashes. These self-reported crashes had a moderate agreement with the crash records found in state records of motor vehicle collisions (McGwin, Owsley, & Ball, 1998; Singletary et al, 2017).

The National Institutes of Health (NIH) PROMIS self-report measures were used for the following eight HRQOL domains: depression, anxiety, fatigue, sleep disturbance, pain interference, pain intensity, physical functioning and ability to participate in social activities (see Table 1 for domain descriptions). These domains make up the PROMIS-29 adult profile. (Khanna et al., 2011; Craig et al., 2014).

PROMIS standardizes scores (mostly from the U.S. general population 2000 Census) to a mean of 50. For the symptom-oriented domains (depression, anxiety, fatigue, sleep disturbance, pain interference and pain intensity), a higher score represents worse symptoms. For the function-oriented domains (physical functioning and participation in social roles and activities), a higher score represents better functioning.

Table 1: Eight Health-Related Quality of Life Domain Descriptions

Domain	Survey Items
Depression	In the past 7 days… I felt worthless I felt helpless I felt depressed I felt hopeless
Anxiety	In the past 7 days… I felt fearful I found it hard to focus on anything other than my anxiety My worries overwhelmed me I felt uneasy
Fatigue	During the past 7 days… I felt fatigued I have trouble starting things because I am tired How run-down did you feel on average? How fatigued were you on average?
Sleep Disturbance	In the past 7 days… My sleep quality was In the past 7 days…. My sleep was refreshing I had a problem with my sleep I had difficulty falling asleep
Pain Interference	In the past 7 days… How much did pain interfere with your day-to-day activities? How much did pain interfere with work around the home? How much did pain interfere with your ability to participate in social activities? How much did pain interfere with your household chores?
Pain Intensity	In the past 7 days… How would you rate your pain on average?
Physical Function	Are you able to do chores such as vacuuming or yard work? Are you able to go up and down stairs at a normal pace? Are you able to go for a walk of at least 15 minutes? Are you able to run errands and shop?
Participation in Social Roles & Activities	I have trouble doing all of my regular leisure activities with others I have trouble doing all of the family activities that I want to do I have trouble doing all of my usual work (include work at home) I have trouble doing all of the activities with friends that I want to do

All of the PROMIS-29 adult profile domains were treated as continuous measures. Multiple linear regression models calculated adjusted means for each of the PROMIS-29 outcomes by low mileage, driving space and crashes. Important potential confounders and the standard errors were adjusted for the analyses. Gender, age, education, marital status and driving importance were included on all models. The number of miles driven per week was included in the driving space and crash models but not in the low mileage models.

RESULTS

Figure 1 displays seven of the PROMIS-29 adult profile domains and associated scores. The five symptom-oriented domains are indicated in light blue and the two function-oriented domains in dark blue. Pain intensity is analyzed separately from these domains because it has different response categories. For the symptom-oriented domains, a score of 60 is one standard deviation worse than the U.S. population and a score of 40 is one standard deviation better than the population. For example, a high fatigue score indicates higher levels of fatigue. For the domains shown in dark blue, a score of 60 is one standard deviation better than the U.S. general population and a score of 40 is one standard deviation worse than the U.S. population. For example, a high physical functioning score indicates high levels of physical functioning and performance.

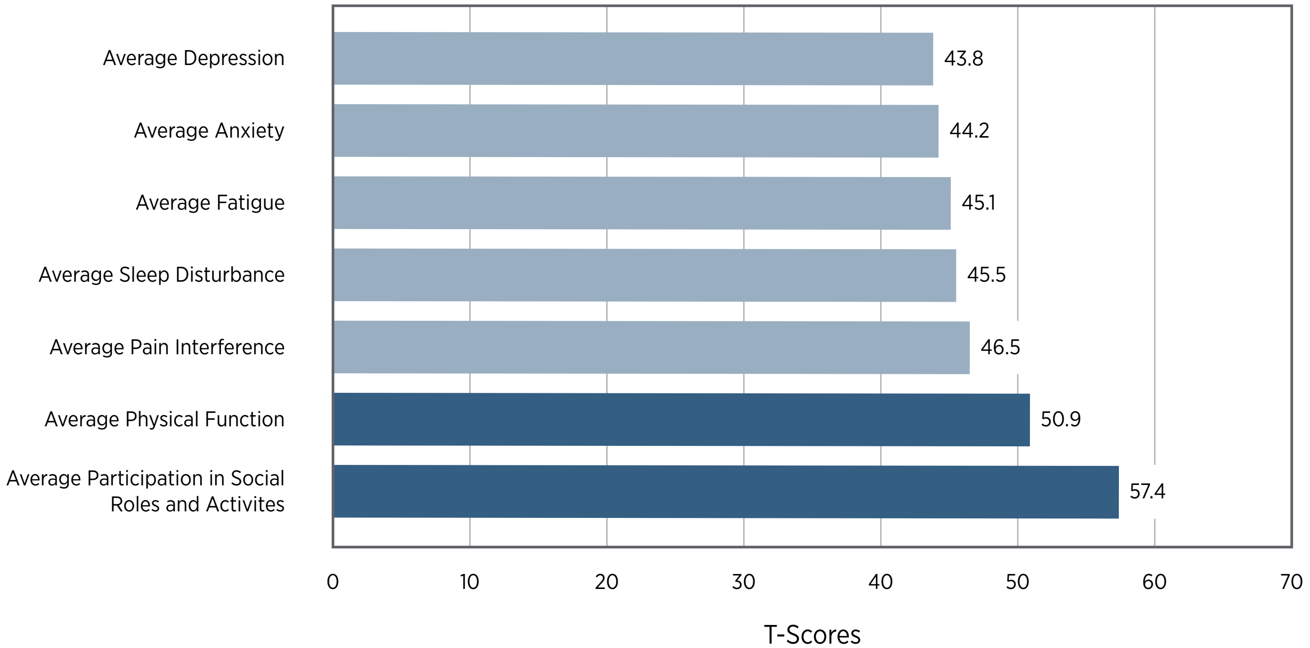

Figure 1: Seven of the PROMIS-29 Profile Domains

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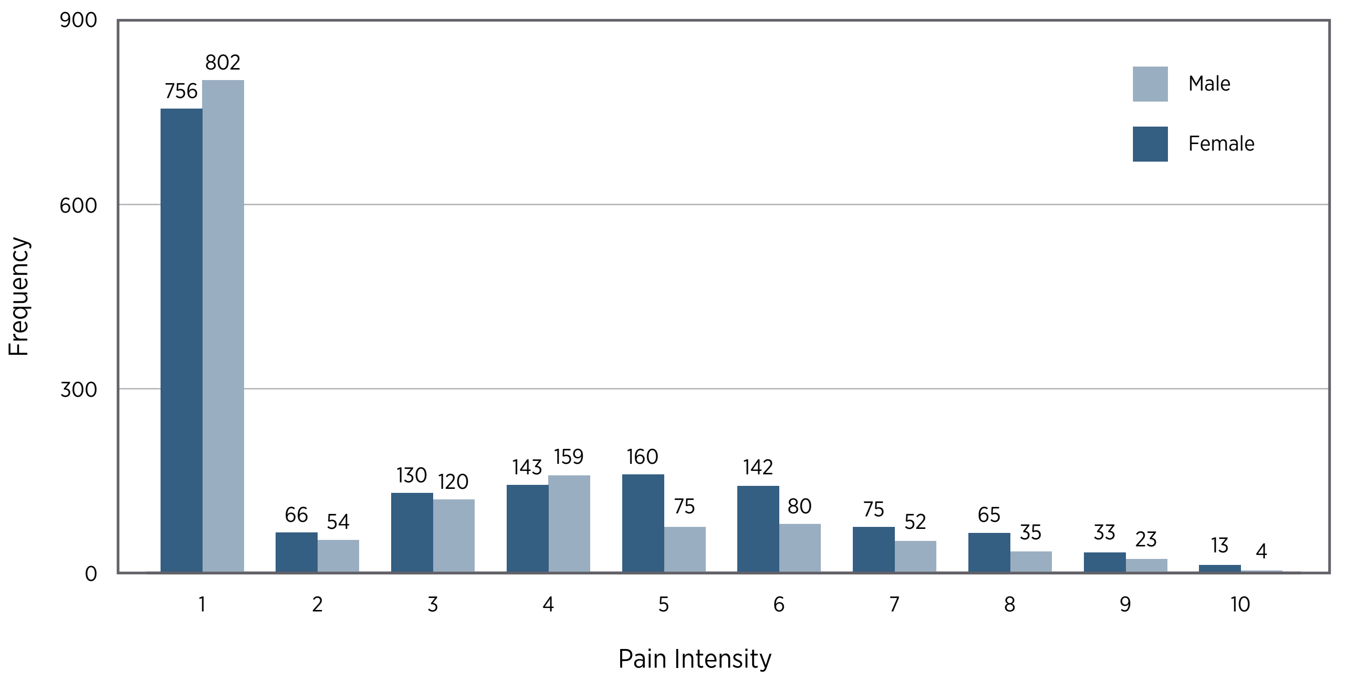

Figure 2: Pain Intensity by Gender

Looking at the results by demographics, we see pain intensity stratified by gender in Figure 2. Females had a significantly higher pain intensity score than males. For example, 13 females experienced a pain intensity of 10, whereas only four males experienced the same amount of pain intensity.

Models were run on all HRQOL domains with respect to low mileage status, driving space and crashes; however, only significant results are presented herein.

Crashes

Figure 3 shows that participants with one or more crashes had a higher adjusted mean for pain intensity (2.22, n=320) compared with those who self-reported no crashes (1.86, n=2471; P=0.0064).

Figure 4 shows participants with one or more crashes had a higher adjusted mean for pain interference, indicating a higher level of pain (47.8, n=320) compared with those who did not self-report any crashes (46.3, n=2460; P= 0.0275).

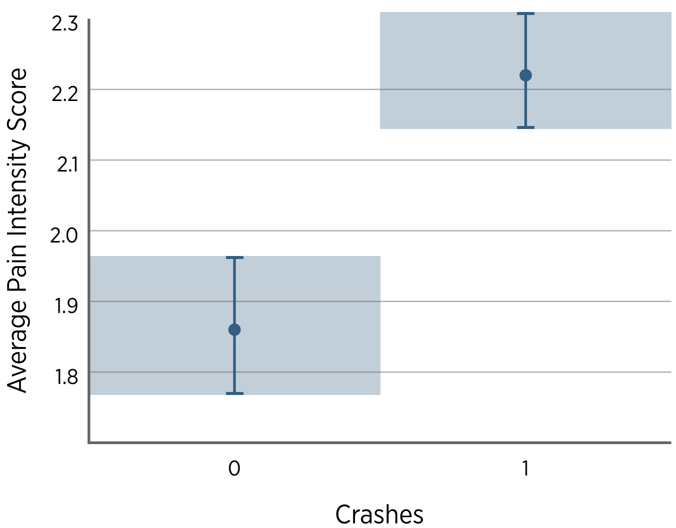

Figure 3: Average Pain Intensity Score and 95% Confidence Interval by Crashes

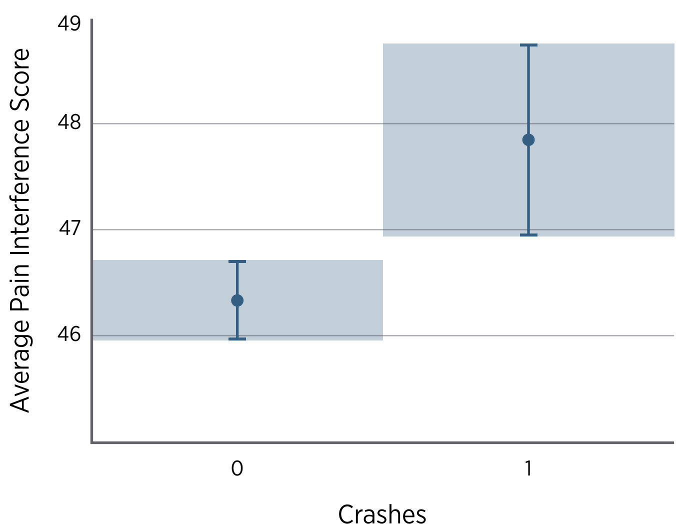

Figure 4: Average Pain Interference Score and 95% Confidence Interval by Crashes

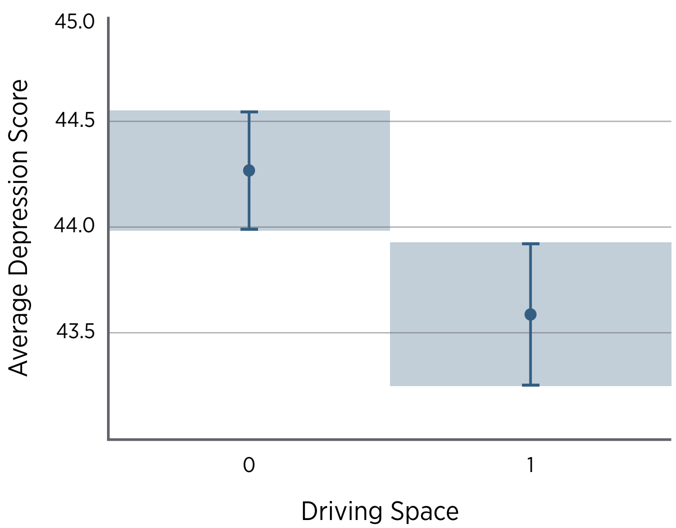

Figure 5: Average Depression Score and 95% Confidence Interval by Crashes

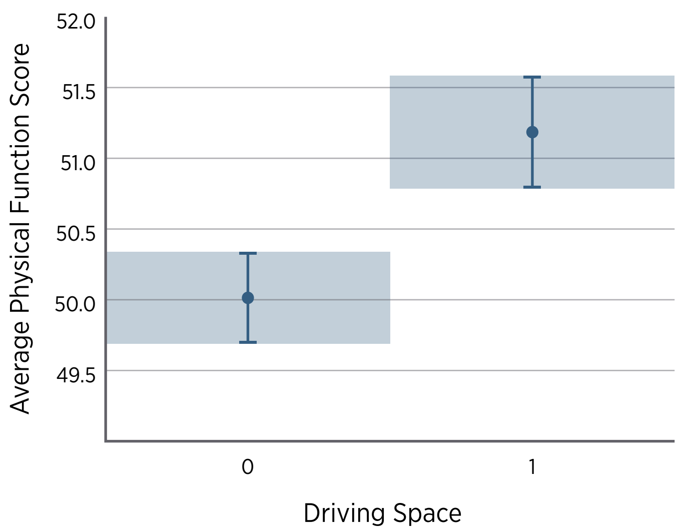

Figure 6: Average Physical Function Score and 95% Confidence Interval by Crashes

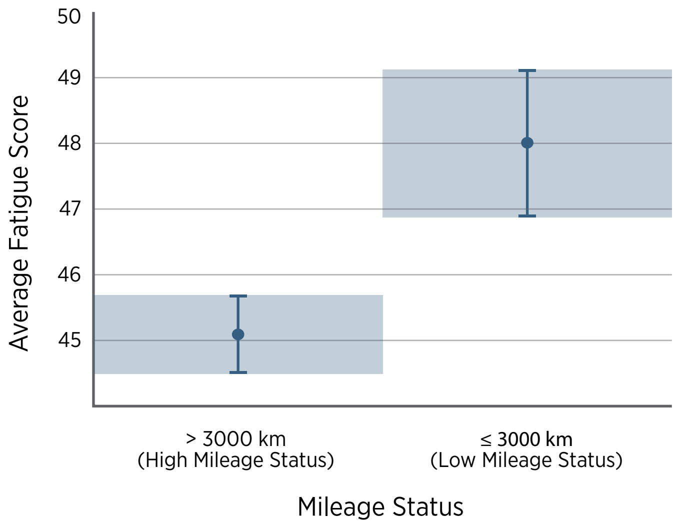

Figure 7: Average Fatigue Score and 95% Confidence Interval by Crashes

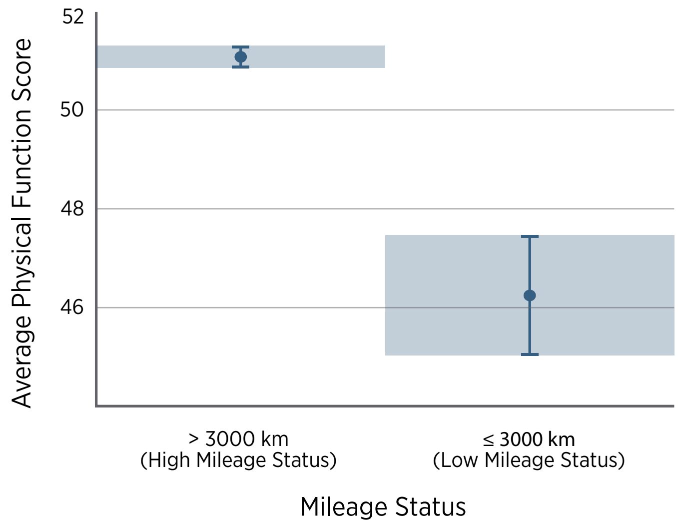

Figure 8: Physical Function Score and 95% Confidence Interval by Crashes

Driving Space

Results in Figure 5 indicate participants with less driving space had a higher adjusted mean for depression (44.3, n=626), experiencing more depressive symptoms in comparison with participants who self-reported more driving space (43.6, n=2173; P=0.0492).

Figure 6 shows participants with less driving space had a lower adjusted mean for physical function (49.9, n=622), meaning worse physical functioning, compared with those who self-reported more driving space (51.2, n=2160; P=0.0284).

Low Mileage

Figure 7 shows that participants with low-mileage driver status had a higher adjusted mean for fatigue (48.0, n=47; P=0.0218) compared with those who drove more miles (45.1, n=2637; P=0.0007).

Finally, Figure 8 shows that participants with low-mileage driver status had a lower adjusted mean for physical function (46.2, n=45) compared with those who drove more miles (51.1, n=2622; P=0.0007).

DISCUSSION

Certain driving habits (low mileage, less driving space and involvement in more crashes) were associated with participants experiencing less physical functioning and more pain, fatigue and depressive symptoms. However, there were only two relationships that were both statistically and large enough to be meaningful: fatigue and physical functioning and fatigue and low mileage (Yost et al, 2011; Lee et al, 2017).

Older drivers who drive less than their counterparts were more likely to report increased fatigue and decreased physical functioning. These results are valuable because previous research has found certain driving habits (such driving less frequently, fewer miles, and or distances) to be associated with mental health. Here we see that physical functioning measures are even more strongly associated with driving habits. This highlights the importance of older drivers maintaining good physical health and getting proper sleep in order to maintain their mobility. When signs of fatigue and poor physical functioning are identified, it is important to intervene with the older driver to make improvements in these areas associated with driving habits that may eventually lead to driving cessation.

A limitation of the study is the self-reporting nature on two out of the three driving habits (driving space and involvement in crashes). For example, participants could fail to recall the exact number of crashes they experienced within the previous one-year period or may recall only major crashes. Furthermore, using baseline measures of HRQOL and driving space limits our ability to determine the causal effects of driving habits on HRQOL. In the future, the LongROAD longitudinal data will be used to determine if driving cessation leads to a decline in HRQOL.

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