RESEARCH BRIEF

Musculoskeletal Conditions and Related Driving Reduction Among Older Drivers: A LongROAD Study

This research brief utilized data from the Longitudinal Research on Aging Drivers (LongROAD) study to examine the effect of lifetime musculoskeletal condition diagnoses on driving reduction in the past year[1] in an older driver population. Musculoskeletal conditions—such as arthritis, joint pain, and peripheral neuropathies—have been known to impact driving habits, increasing the need for driving restrictions and modifications (Pomidor, 2016). Here, we examined older drivers with musculoskeletal diagnoses to examine reduced driving from those diagnoses. We found that women were slightly more likely to have a musculoskeletal diagnosis and twice as likely to reduce driving as a result. The highest rates of driving reduction were due to hip and knee replacements, while the greatest number of driving reductions were due to joint pain and swelling and arthritis other than rheumatoid arthritis.

METHODS

This study utilized cross-sectional, baseline data from the AAA Foundation LongROAD study, a longitudinal study on aging drivers. LongROAD is a multisite (California, Colorado, Maryland, Michigan, and New York) prospective cohort study designed to collect data on the medical, behavioral, environmental, and vehicle technological factors influencing older adults in driving safely. Participants were eligible if they were 65-79 years old, possessed a valid driver's license, drove at least once per week on average, and had no significant cognitive impairment.

LongROAD collects self-reported and objectively measured information on health status and driving behaviors. Questions analyzed for this study included those regarding health condition diagnoses and driving reduction. Health status questions were based on the National Health and Aging Trend Study questionnaire. Participants were first asked whether they reduced driving because of any health conditions at all in the past 12 months. Then they were asked if they had ever had any of 55 health conditions in their lifetime. For each diagnosis, participants who had reported decreasing driving for any condition were asked if they had reduced driving as a result. Among the 109 total diagnosis categories reported, 20 were musculoskeletal health conditions (i.e. arthritis, joint replacement, osteoporosis, etc.). This analysis examines participants who self-reported having at least one of these musculoskeletal conditions.

RESULTS

Demographics

Overall, among the 2,990 older drivers in the LongROAD study, 2,286 (77%) reported having a musculoskeletal health condition during their lifetime (Table 1). When examining demographic characteristics (Table 2), the number of musculoskeletal diagnoses increased with age: 72% of those aged 65-69 years, 77% of those aged 70-74, and 83% of those aged 75-79 had experienced a musculoskeletal condition diagnosis during their lifetime. Major differences in musculoskeletal diagnosis did not exist based on race, Hispanic ethnicity, or marital status. Those with lower levels of education (less than a bachelor's degree) or who did not own their own home were more likely to have had a musculoskeletal condition (Table 2). Musculoskeletal conditions were also more common among those with an annual income of less than $49,999. Older adults who reported having a musculoskeletal diagnosis during their lifetime were more likely to report driving

[1] LongROAD Baseline data was collected between July, 2015 and April, 2017. Information on past year driving was collected though the LongROAD baseline Driving, Health, and Functioning Questionnaire with the item: "During the past year, have you reduced the amount of driving you do in any way?"

reduction for any health condition in the past year (12.3% versus 7.8%; Table 1). Of the 337 drivers in the LongROAD cohort who reduced driving because of a health condition, 96 (29%) did so due to a musculoskeletal condition. Overall, 4.2% of those with a lifetime musculoskeletal condition reported having reduced driving in the past year because of this diagnosis (Table 2).

Gender

A greater proportion of women, compared with men, reported having had at least one musculoskeletal condition in their lifetime (81% versus 72%; Table 2) and were significantly more likely to report musculoskeletal diagnoses, on average, than men as shown in Figure 1 (mean: 2.42 vs 2.19). Females with a musculoskeletal condition were almost twice as likely to reduce driving in the past 12 months when compared with males with a musculoskeletal condition (5.3% versus 2.8%; Table 2).

Specific Musculoskeletal Conditions

Among those with a lifetime history of at least one musculoskeletal condition, the most common conditions reported were joint pain and swelling (69%) and arthritis other than rheumatoid arthritis (68%) (Table 3). These conditions were also associated with the greatest numbers of driving reductions, with 48 participants reducing driving because of joint pain and swelling and 36 participants doing so because of arthritis other than rheumatoid arthritis. Because these conditions were common, they resulted in low overall rates of related driving reduction (3% and 2.3%, respectively). With regards to the highest rates of driving reduction due to a specific condition, hip replacement caused 8.8% (17 of 194) of older drivers to decrease driving in the past year, while knee replacement caused 8.4% (26 of 309) of older drivers to do so.

DISCUSSION

A majority of the LongROAD cohort self-reported having experienced at least one musculoskeletal condition in their lifetime, and those with these conditions had reduced their driving notably. For those with musculoskeletal diagnoses, joint pain and swelling and arthritis other than rheumatoid arthritis caused large numbers of participants to reduce driving in the past year, while musculoskeletal surgeries such as hip replacement and knee replacement caused high rates of driving reduction. Additionally, women were more likely than men to report decreased driving because of musculoskeletal conditions.

As found in prior research, musculoskeletal conditions (e.g., arthritis), symptoms (joint pain and swelling) and surgeries (hip and knee replacements) were all associated with driving reduction in this large cohort of older drivers (Braitman & McCartt, 2008; Charlton et al., 2006). Some of these conditions are potentially progressive and chronic, while others are temporary; for example, six weeks of driving reduction is required when recovering from joint replacement surgery (Braitman & McCartt, 2008; Ragland, Satariano, & MacLeod, 2004). One potential confounder in this relationship may be the effect on driving ability of pain medications taken for musculoskeletal conditions. Not only do these medications cause side effects such as dizziness that may cause older adults to decrease driving, this cohort may also be more susceptible to such side effects compared with younger populations (Ray, Gurwitz, Decker, & Kennedy, 1992; Wang & Carr, 2004).

Participant gender greatly influenced the number of people who self-reported driving reduction due to lifetime musculoskeletal condition diagnoses in this older driver cohort. Females were more likely to have a musculoskeletal diagnosis and to consequently reduce driving compared with their male counterparts. This may be because women are more likely to see healthcare providers about potential health problems (and thereby receive a diagnosis) and because they are more likely to decrease their driving, in general, with increasing age (Choi, Adams, & Kahana, 2013; Xu & Borders, 2003). Confidence may also affect driving reduction in older adults of both genders. Low confidence in driving ability, coupled with musculoskeletal condition diagnosis, might cause premature driving reduction for women. Conversely, overconfidence in driving ability and pressure to maintain a traditional provider role might cause men to continue driving (Brabyn, Schneck, Lott, & Haegerström-Portnoy, 2005; Charlton et al., 2006; Marottoli et al., 1993). Because premature driving reduction has been associated with decreased quality of life, clinicians, family members, and traffic safety professionals should account for the role of gender and personality in the process of counseling older adults on driving reduction (Chihuri et al., 2015).

The main limitation in this study is that baseline data only considered lifetime prevalence of musculoskeletal condition diagnosis (i.e., those who ever had a musculoskeletal condition in their lifetime) and driving reduction based on health conditions that occurred more than a year in the

past could not be quantified. We also did not have detailed information about the severity of conditions or the specific physical locations of certain conditions (e.g., left versus right leg), which are factors that may play a part in affecting driving ability. Despite these limitations, this study confirms that some musculoskeletal conditions may cause the older population to decrease driving. Future work with the LongROAD cohort will consider the role of medication on driving reduction and consider how other factors may play a part in reducing older adult mobility.

Simple adjustments to vehicles might overcome some limitations caused by musculoskeletal conditions. For example, thick steering wheels and keyless entry could alleviate the debilitating effects of conditions such as arthritis (http://seniordriving.aaa.com/maintain-mobility-independence/car-buying-maintenance-assistive-accessories/smartfeatures/), and larger mirrors and assistive devices on doors or seats can mitigate limited neck mobility or difficulty entering or exiting the vehicle. Many of these devices can be added to existing vehicles at a low cost, and occupational therapists can assist in training with more complicated devices such as hand controls. CarFit, an educational program through which community workers help older adults to evaluate how well their car fits their physical abilities and needs (http://seniordriving.aaa.com/maintain-mobility-independence/car-buying-maintenance-assistive-accessories/carfit/), also offers promise as it helps older drivers optimize seat and mirror positioning. With appropriate diagnosis and treatment of musculoskeletal conditions, and with appropriate attention to vehicle modifications, healthcare providers, family, and community groups can work together to help keep older adults mobile and independent for as long as possible.

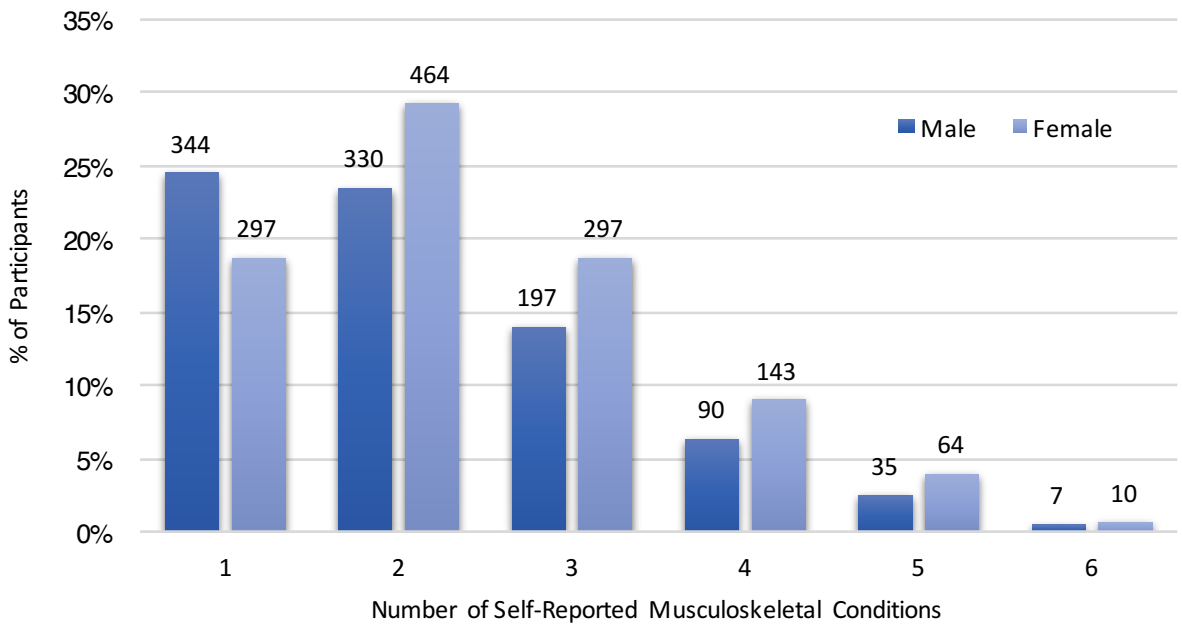

Figure 1. Number of lifetime self-reported musculoskeletal conditions per participant, by gender

Note: Participants with seven or eight total musculoskeletal conditions were not included due to low percentages.

Table 1. Demographic characteristics, by self-reported driving reduction for any health condition in the past 12 months, for the total LongROAD population (n=2990)

Characteristic		Total population		Reduced driving for any health condition(s) in past year				
		Total		Yes		No		*p*
		n	%	n	%	n	%	
Total		**2990**	**100**	**337**	**11.3**	**2657**	**88.7**	**--**
Age	*65 to 69*	1243	41.6	138	11.1	1105	88.9	0.86
	70 to 74	1037	34.7	115	11.1	922	88.9	
	75 to 79	710	23.7	84	11.8	626	88.2	
Gender	*Male*	1404	47.0	112	8.0	1292	92.0	**<0.001**
	Female	1586	53.0	225	14.2	1361	85.8	
Race/Ethnicity	*White*	2616	87.5	291	11.1	2325	88.9	0.48
	Black	213	7.1	22	10.3	191	89.7	
	Asian	72	2.4	11	15.3	61	84.7	
	Other	76	2.5	10	13.2	66	86.8	
	Don't Know/Refused/NA	13	0.4	3	23.1	10	76.9	
Hispanic	*Yes*	83	2.8	17	20.5	66	79.5	**0.01**
	No	2794	93.4	310	11.1	2484	88.9	
Education Level	*Some College or less*	864	28.9	97	11.2	767	88.8	0.83
	Bachelor's	896	30.0	106	11.8	790	88.2	
	Master's degree and higher	1221	40.8	134	11.0	1087	89.0	
Living Situation	*Owned Home*	2599	86.9	290	11.2	2309	88.8	0.56
	Rented Home	275	9.2	37	13.5	238	86.5	
	With Family Member	60	2.0	5	8.3	55	91.7	
	Other	53	1.8	5	9.4	48	90.6	
Marital Status	*Married or living with a partner*	1974	66.0	215	10.9	1759	89.1	0.38
	Other	986	33.0	118	12.0	868	88.0	
Income	*<$49,999*	775	25.9	106	13.7	669	86.3	**0.02**
	$50,000–$79,999	719	24.0	69	9.6	650	90.4	
	$80,000–$99,999	431	14.4	57	13.2	374	86.8	
	>$100,000	959	35.7	95	9.9	864	90.1	
Self-Reported Musculoskeletal Condition	*Yes*	2286	76.5	282	12.3	2004	87.7	**<0.001**
	No	704	23.5	55	7.8	649	92.2	

Table 2. Demographic characteristics, by self-reported driving reduction for any health condition in the past 12 months, for those with a lifetime diagnosis of a musculoskeletal condition (n=2286)

Characteristic		Total population			Reduced driving for any health condition(s) in past year				*p*
		Total			Yes		No		
		n	%[a]	%[b]	n	%	n	%	
Total		**2286**			**96**	**4.2**	**2190**	**95.8**	--
Age	*65 to 69*	894	39.1	71.9	38	4.3	856	95.7	0.77
	70 to 74	801	35.0	77.2	36	4.5	765	95.5	
	75 to 79	591	25.9	83.2	22	3.7	569	96.3	
Gender	*Male*	1008	44.1	71.8	28	2.8	980	97.2	0.00
	Female	1278	55.9	80.6	68	5.3	1210	94.7	
Race/Ethnicity	*White*	2019	88.3	77.2	88	4.4	1931	95.6	0.21
	Black	154	6.7	72.3	3	1.9	151	98.1	
	Asian	49	2.1	68.1	2	4.1	47	95.9	
	Other	54	2.4	71.1	0	0.0	54	100.0	
	Don't Know/Refused/NA	10	0.4	76.9	3	30.0	7	70.0	
Hispanic	*Yes*	60	2.6	72.3	5	8.3	55	91.7	0.23
	No	2154	94.2	77.1	86	4.0	2068	96.0	
Education Level	*Some College or less*	673	29.4	77.9	25	3.7	648	96.3	0.44
	Bachelor's	682	29.8	76.1	26	3.8	656	96.2	
	Master's degree and higher	926	40.5	75.8	45	4.9	881	95.1	
Living Situation	*Owned Home*	1977	86.5	76.1	82	4.1	1895	95.9	0.54
	Rented Home	212	9.3	77.1	12	5.7	200	94.3	
	With Family Member	49	2.1	81.7	1	2.0	48	98.0	
	Other	46	2.0	86.8	1	2.2	45	97.8	
Marital Status	*Married or living with a partner*	1500	65.6	76.0	66	4.4	1434	95.6	0.60
	Other	764	33.4	77.5	30	3.9	734	96.1	
Annual Income	*<$49,999*	629	27.5	81.2	31	4.9	598	95.1	0.73
	$50,000–$79,999	531	23.2	73.9	19	3.6	512	96.4	
	$80,000–$99,999	331	14.5	76.8	14	4.2	317	95.8	
	>$100,000	710	31.1	74.0	30	4.2	680	95.8	

[a] Proportion of people with a lifetime diagnosis of a musculoskeletal condition within a demographic category, among all persons with a musculoskeletal condition (n=2286)
[b] Proportion of total population with a lifetime diagnosis of a musculoskeletal condition within a demographic category, among all persons with a certain demographic characteristic

Table 3. Self-reported health conditions and related decreases in driving among those with the condition and among all who had reduced driving for any condition

Specific musculoskeletal diagnoses	Lifetime diagnosis		Decreased driving in past 12 months			
	Total		Yes		No	
	n	%[a]	n	%[b]	n	%
Deep vein thrombosis	110	4.8	3	2.7	107	97.3
Degenerative bone/joint disease	12	0.5	0	0.0	12	100.0
Edema	3	0.1	0	0.0	3	100.0
Fracture of the hip or forearm	217	9.5	8	3.7	209	96.3
Gout	239	11.0	3	1.3	236	98.7
Hip replacement	194	8.5	17	8.8	177	91.2
Joint pain or joint swelling	1583	69.0	48	3.0	1535	97.0
Knee problem	9	0.4	0	0.0	9	100.0
Knee replacement	309	14.0	26	8.4	283	91.6
Lymphedema	3	0.1	0	0.0	3	100.0
Neck/back problem	72	3.1	0	0.0	72	100.0
Osteoporosis	453	20.0	3	0.7	450	99.3
Peripheral artery surgery	30	1.3	2	6.7	28	93.3
Peripheral neuropathy	249	11.0	5	2.0	244	98.0
Rheumatoid arthritis	147	6.4	2	1.4	145	98.6
Shoulder Problem	26	1.1	0	0.0	26	100.0
Other arthritis	1555	68	36	2.3	1519	97.7
Other lower extremity problem	22	1.0	0	0.0	22	100.0
Other upper extremity problem	35	1.5	0	0.0	35	100.0
Other musculoskeletal problem	30	1.3	1	3.3	29	96.7

[a] Proportion of people with a lifetime diagnosis of a specific musculoskeletal condition within a demographic category, among all persons with a musculoskeletal condition (n=2286)
[b] Proportion of people that have decreased driving in the past 12 months due to each musculoskeletal condition, among those that had reduced their driving due to any health condition (n=337).

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