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Comparing Pain Severity Versus Pain Location in the MOBILIZE Boston Study: Chronic Pain and Lower Extremity Function*

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Background. This study compared measures of chronic pain, for example, number of pain sites and overall pain severity, in relation to lower extremity function in the older population.

Methods. Six hundred older adults (mean age 77.9 years, 64% female) were queried about presence of chronic pain. Number of pain sites was categorized as none, single site, multisite, or widespread. Pain severity was measured in quartiles of the Brief Pain Inventory pain severity subscale. Lower extremity function was assessed by the Short Physical Performance Battery (SPPB), a composite measure of gait speed, balance, and chair stands.

Results. Many older persons reported multisite or widespread pain (40%). Increased pain sites and pain severity were associated with poorer SPPB performance after adjusting for age, sex, height, and weight. With further adjustment for education, comorbid conditions, and depressive symptoms, multisite pain ($p < .001$) and most severe pain ($p < .05$) were associated with poorer SPPB performance, but assessed together in the same model, only the association with multisite/widespread pain remained significant ($p < .01$). When specific joint pain sites were evaluated together, only knee pain was associated with lower SPPB score. Pain severity was independently associated with slower gait, pain location was associated with poorer balance, and chair stands performance was associated with both pain measures.

Conclusions. Although multisite pain rather than pain severity was more strongly associated with overall lower extremity function, differences emerged with specific SPPB subtests. Longitudinal studies are needed to understand risk for lower extremity function decline related to chronic pain characteristics in older adults.

Key Words: Pain—Mobility—Aging—Lower extremity function—Epidemiology.

CHRONIC pain is a major cause of disability in older adults (1–3). Physical function is generally characterized by either self-reported problems or observed physical performance (4). These two types of assessments examine different though related dimensions of function because correlations between these measures are moderate at best (5). Interestingly, performance-based tests of lower extremity function predict adverse events in older persons, such as disability, falls, institutionalization, and death (6–8). Not surprisingly, use of these measures has been advocated as a clinical screening tool (5,7,8).

An increasing number of studies investigate the relationship between pain and lower extremity function in older individuals. Most of these studies show that older adults with chronic pain in selected sites (eg, in the foot, knee, or lower back) show a variety of mobility-related impairments and limitations including decreased balance and gait speed (9–12). However, these results have not been entirely consistent (13). Few studies of older adults have compared specific measures of chronic pain such as number of pain locations or overall pain severity ratings, in relation to lower extremity function, and these studies used only self-reported measures of function (1,3,14). Results of studies investigating the relation between a selected pain characteristic and performance-based lower extremity function in older adults have been inconclusive. Although no significant association was reported, a study of well-functioning older persons found that adults who had back pain along with hip or knee pain had worse lower extremity performance compared with those with back pain alone (15). In a recent study of older community-dwelling Hispanics and non-Hispanic Whites, pain severity was not associated with lower extremity function (16).

Inconsistencies in results may be explained by the use of different study cohorts and variations in pain measurement, for example, pain at selected sites, total number of pain sites,

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or pain severity. Clinical experience suggests that these latter two dimensions, which assess pain in general rather than at specific locations, may be more relevant to lower extremity function in older adults. Measures of pain interference that are sometimes used in clinical settings combine concepts of pain and its impact on function, precluding their use for studies examining the independent effects of pain on mobility in the population. Greater insight into which pain characteristics are associated with specific lower extremity functions may provide crucial information to improve assessment and management of chronic pain and its functional consequences in older adults. Therefore, the primary objective of the present study was to compare two measures of chronic pain, for example, number of pain sites and overall pain severity, in relation to lower extremity function in the older population.

Methods

Participants

Participants were the first 600 enrollees of the MOBILIZE Boston Study (MBS), a population-based study of novel risk factors for falls in older community-dwelling adults in Boston and surrounding towns. Prospective participants, recruited door to door, were randomly sampled from town lists. Inclusion criteria were the following: (i) aged ≥70 years, (ii) able to speak and read English, and (iii) able to walk independently across a small room (use of walker or cane allowed). Spouses of eligible participants could join the study if they were within 6 months of their 65th birthday or older and met all other eligibility criteria (n = 20). Exclusion criteria were the following: (i) presence of a terminal disease (eg, receiving hospice services, diagnosed metastatic cancer) or (ii) moderate or severe cognitive impairment [score <18 on the Mini-Mental State Examination (17)]. All participants were administered a two-part baseline assessment that included (i) a home interview by a trained research assistant and (ii) a nurse exam at the study clinic at the Hebrew Rehabilitation Center. A detailed description of the study design and methods was published elsewhere (18). Written informed consent was obtained, and study procedures were approved by the institutional review board of the Hebrew Rehabilitation Center.

Pain Measurement and Categorization

Pain location.—Musculoskeletal pain was assessed using questions ascertaining pain in musculoskeletal sites (hand/wrist, shoulder, back, hip, knee, or foot) lasting 3 or more months in the previous year and present in the previous month (2). Responses were categorized into four groups: no pain; single-site pain; more than one pain site ("multisite pain"), but not meeting criteria for "widespread pain"; and the greatest pain category, widespread pain. Classification of widespread pain was based on a modification of the American College of Rheumatology (ACR) criteria: pain above and below the waist, pain on the right and left sides of the body, and axial pain (back or nonanginal chest pain) (19). Because we did not have information on laterality, our classification of widespread pain was based on the presence of upper and lower body pain and axial pain (2).

Pain severity.—Severity of pain was measured by the pain severity subscale of the Brief Pain Inventory (BPI), which has been validated in patients with chronic musculoskeletal conditions (20,21). This instrument, which assesses overall pain severity rather than site-specific ratings, is often recommended for pain assessment in the elderly (22). Participants were asked to rate their pain according to four conditions: (i) worst pain, (ii) least pain, (iii) pain on average, and (iv) pain now, referring to an 11-point numeric rating scale, with 0 indicating no pain and 10 indicating "severe or excruciating pain as bad as you can imagine." The severity score, an average of the four-item ratings, was categorized into quartiles (cut points were <0.3, <2.0, <4.0), with the 4th quartile indicating the most severe pain. We used quartiles for the analysis because the measure was highly skewed with a mean score of 2.42, standard deviation = 2.15, with a range from 0 to 10.

Lower Extremity Function

Short Physical Performance Battery.—Lower extremity function was assessed using the well-validated Short Physical Performance Battery (SPPB; 6,23), which comprises results of three sets of tests: gait speed, standing balance, and repeated chair stands. The SPPB score was calculated from the sum of the scores on the three tests each scored 1–4 (6), which is known to predict disability and hospitalization in older adults (23,24).

Gait speed.—Gait speed (m/s) was assessed by the best of two trials of a timed 4-m usual-pace walk.

Standing balance.—Balance, for the SPPB, was assessed in three 10-second stands: standing with feet touching side by side, semitandem stand with the side of the heel of one foot touching the side of the big toe of the other foot, and full tandem (heel to toe) stand. Standing balance was scored from 1 to 4, based on performance of each test for up to 10 seconds, using established scoring methods published previously (6). In addition, expanding on the SPPB balance component, participants performed a 20-second stand on one leg, based on an approach reported previously (25). This separate score of balance, with increasing level of difficulty, was scored 0–6, using a sum of the following: side by side, held for 10 seconds, one point; semitandem stand held for 10 seconds, one point; tandem stand held for 3–9 seconds, one point, or 10 seconds, two points; one-leg stand held for 3–9 seconds, one point, or 10 seconds, two points.

Repeated chair stands.—Chair stand time (in seconds) was determined as the time required to stand up and down from a chair with the arms folded in front of the chest five times as fast as possible.

Demographic and Health Characteristics

Demographic characteristics included age, sex, race, and education (<12, 12–15, >15 years). Body mass index was calculated as measured weight in kilograms divided by height in meters squared.

Comorbidity.—Participants were asked if a physician had told them that they had heart disease (myocardial infarction, atrial fibrillation, pacemaker, angina, or congestive heart failure), diabetes, asthma/lung disease, and stroke. Presence of depressive symptomatology was determined based on the Hopkins Revision of the Center for Epidemiologic Studies–Depression scale (CES-D) (26,27). Hand and knee osteoarthritis were determined by ACR clinical criteria assessed by research nurses during the clinic examination (28). Presence of joint stiffness was determined by a series of joint (hand, hip, knee) and back-specific questions regarding presence of stiffness upon arising most mornings. Presence of any joint stiffness was categorized as no stiffness, stiffness at one site, stiffness at more than or equal to two sites.

Statistics

Descriptive statistics were used to examine sociodemographic and health characteristics according to number of pain sites. Linear trends across pain groups were determined using chi-square tests (1 *df*). General linear models were constructed to estimate marginal means for the SPPB, gait speed, standing balance score, and chair stand time each adjusted for age, sex, height, and weight, by (i) categories of pain locations and (ii) pain severity categories. There were several persons ($n = 62$) who were unable to complete the repeated chair stands and consequently were not included in the chair stands models. Multivariate linear regression analyses were performed with the lower extremity function tests as dependent variables and pain location (Model 1) or pain severity (Model 2) as the independent variables using a series of models, adjusting for age, sex, race, education, self-reported chronic conditions (heart disease, diabetes, asthma, and stroke), and depressive symptoms (CES-D). The final models included both pain location groups *and* pain severity groups (Model 3). No major outliers were detected in any of the models. There was no evidence that inclusion of correlated variables weakened our models; for example, SPPB Model 1 ($R^2 = .28$), Model 2 ($R^2 = .27$), and Model 3 ($R^2 = .28$) were each intact.

In addition, separate linear regression models were run to determine the association between specific pain sites and lower extremity function (SPPB). Beta coefficients and standard errors from the models are presented. Presence of osteoarthritis was evaluated but not included in the models we presented because it was determined by clinical criteria that included pain in the definition. In view of the reported relationship between lower extremity function and cognition (12), MMSE score was included in separate analyses as well. Data were analyzed using SPSS Version 15 (SPSS, Inc., Chicago, IL).

Because the results were almost identical for the multisite and widespread pain groups and also because of the smaller number of participants in the widespread pain group ($n = 88$), we grouped the multisite and widespread pain categories for the multivariate modeling.

Results

Average age of the 600 participants was 77.9 years (range 64–97 years). Characteristics of participants according to pain location categories are presented in Table 1. The majority of participants (63%) reported one or more pain sites; 23.3% had a single pain site, 25.0% had multisite pain but did not fulfill criteria for widespread pain, and 14.7% had widespread pain. Persons with more pain sites and persons with the worst pain had poorer SPPB performance (Table 2). Exploration of the relationship between stiffness and lower extremity function revealed that there was a significant relationship between multisite stiffness and performance on the SPPB (data not shown). However, this relationship diminished after adjustment for pain location, which remained significantly associated with SPPB performance.

Both multisite/widespread pain and the highest quartile of pain severity were significantly associated with poorer SPPB performance ($p < .001$ and $p = .010$, respectively; Table 3). However, when we included both pain location and pain severity categories in the same model, only multisite/widespread pain continued to be significantly associated with SPPB score ($p = .004$). Adjusting for MMSE score did not change the results in any of the models (data not shown). After adjustment for hand and knee osteoarthritis, associations between SPPB performance and pain characteristics were lessened to some degree but remained significant (data not shown). When we observed separately at each of the selected pain sites, they were nearly all significantly associated with poorer lower extremity function (Table 4). However, when all the pain sites were included in the same model, only knee pain remained significantly associated with SPPB score (Table 4).

Persons with more pain sites showed slower gait speed and worse balance and chair stands performance (Table 2). According to the pain severity classification, persons with the worst pain showed slower gait speed and worse chair stands performance but did not show worse balance performance (Table 2). After adjusting for age, sex, race, education, self-reported chronic conditions, and depressive symptoms, the highest quartile of pain severity, but not pain

Table 1. Participant Characteristics According to Pain Location Categories

Characteristic*	All Participants (N = 600), N (%)	No Pain (N = 222), N (%)	Single-Site Pain (N = 140), N (%)	Multisite Pain (N = 150), N (%)	Widespread Pain (N = 88), N (%)	p†
Age, y						.443
65–74	197 (32.8)	74 (33.3)	44 (31.4)	53 (35.5)	26 (29.5)	
75–84	323 (53.8)	122 (55.0)	77 (55.0)	77 (51.3)	47 (53.4)	
85	80 (13.3)	26 (11.7)	19 (13.6)	20 (13.3)	15 (17.0)	
Gender						.032
Male	215 (35.8)	90 (40.5)	52 (37.1)	46 (30.7)	27 (30.7)	
Female	385 (64.2)	132 (59.5)	88 (62.9)	104 (69.3)	61 (69.3)	
Race						.547
White	467 (78.0)	174 (78.4)	112 (80.0)	117 (78.0)	64 (73.6)	
Black	99 (16.5)	37 (16.7)	19 (13.6)	24 (16.0)	19 (21.8)	
Other	33 (5.5)	11 (5.0)	9 (6.4)	9 (6.0)	4 (4.6)	
BMI						.001
<25	196 (33.4)	86 (39.6)	46 (33.6)	43 (28.9)	21 (25.3)	
25–29	239 (40.8)	85 (39.2)	56 (40.9)	67 (45.0)	31 (37.3)	
≥30	151 (25.8)	46 (21.2)	35 (25.5)	39 (26.2)	31 (37.3)	
Education, y						<.001
<12	65 (10.8)	15 (6.8)	14 (10.0)	19 (12.7)	17 (19.3)	
12–15	266 (44.3)	95 (42.8)	59 (42.1)	69 (46.0)	43 (48.9)	
>15	269 (44.8)	112 (50.5)	67 (47.9)	62 (41.3)	28 (31.8)	
Heart disease	244 (40.7)	79 (35.6)	57 (40.7)	68 (45.3)	40 (45.5)	.041
Diabetes	108 (18.0)	34 (15.3)	28 (20.0)	23 (15.3)	23 (26.1)	.111
Lung disease	99 (16.5)	22 (9.9)	18 (12.9)	39 (26.0)	20 (22.7)	<.001
Stroke	64 (10.7)	21 (9.5)	12 (8.6)	18 (12.0)	13 (14.8)	.147
Depressive symptoms	45 (7.5)	11 (5.0)	8 (5.7)	18 (12.0)	8 (9.1)	.030
Hand OA	102 (17.0)	10 (4.5)	17 (12.1)	39 (26.0)	36 (40.9)	<.001
Knee OA	146 (24.3)	13 (5.9)	30 (21.4)	63 (42.0)	40 (45.5)	<.001

Notes: BMI = body mass index; OA = osteoarthritis.
*Columns total to 100%, except for comorbid conditions, where the percent without the condition is not shown.
†Test for linear trend across categories of pain locations.

location, was significantly associated with gait speed (p = .001); this association was essentially unchanged when we added pain location to the model (Table 3). Multisite/widespread pain was associated with poorer performance on the balance tests (p = .026); the relationship persisted after adjustment for pain severity. Pain severity was not significantly associated with balance performance. Multisite/widespread pain and the highest quartiles of pain severity were both associated with chair stands performance (p = .007 and p = .002, respectively), but only the highest quartile of pain severity remained significantly associated with chair stands performance when we added both pain

Table 2. Physical Performance According to Pain Categories

Pain Location	No Pain, Mean ± *SE*	Single-Site Pain, Mean ± *SE*	Multisite Pain, Mean ± *SE*	Widespread Pain, Mean ± *SE*	Trend,* p Value
Performance tests‡					
SPPB	10.0 ± 0.15	9.9 ± 0.19	9.0 ± 0.18	9.0 ± 0.24	<.001
Gait speed (m/s)	0.98 ± 0.02	0.96 ± 0.02	0.94 ± 0.02	0.91 ± 0.03	.006
Balance test§	4.6 ± 0.10	4.6 ± 0.13	4.1 ± 0.12	4.0 ± 0.16	<.001
Chair stands (s)	12.1 ± 0.26	12.19 ± 0.33	13.47 ± 0.33	13.15 ± 0.45	.001
Pain Severity†	1st Quartile, Mean ± *SE*	2nd Quartile, Mean ± *SE*	3rd Quartile, Mean ± *SE*	4th Quartile, Mean ± *SE*	Trend,* p Value
Performance tests‡					
SPPB	9.9 ± 0.19	10.0 ± 0.18	9.6 ± 0.18	8.8 ± 0.19	<.001
Gait speed (m/s)	0.98 ± 0.02	1.00 ± 0.02	0.97 ± 0.02	0.86 ± 0.02	<.001
Balance test§	4.4 ± 0.13	4.7 ± 0.12	4.4 ± 0.12	4.2 ± 0.12	.073
Chair stands (s)	12.03 ± 0.33	12.27 ± 0.31	12.38 ± 3.12	13.81 ± 0.34	<.001

Notes: SPPB = Short Physical Performance Battery.
*Test for linear trend.
†Pain severity cut points are <0.3, <2.0, <4.0.
‡Estimated marginal means adjusted for age, sex, height, and weight.
§Balance test was a composite rating based on four timed balance tests.

Table 3. Multivariable Linear Regression Coefficients for Association Between Pain Location and Pain Severity With Physical Performance Measures

	Model 1, Beta (*SE*)	Model 2, Beta (*SE*)	Model 3, Beta (*SE*)
SPPB			
Location			
No pain	—		—
One pain site	0.01 (0.23)		0.02 (0.24)
Multisite/ widespread pain	−0.73 (0.21)***		−0.67 (0.23)**
Pain severity			
Lowest quartile		—	—
Quartile 2		−0.04 (0.25)	0.10 (0.26)
Quartile 3		−0.17 (0.25)	0.12 (0.28)
Highest quartile		−0.69 (0.27)*	−0.35 (0.29)
Gait speed (m/s)			
Location			
No pain	—		—
One pain site	−0.02 (0.02)		−0.01 (0.03)
Multisite/ widespread pain	−0.04 (0.02)		−0.02 (0.02)
Pain severity			
Lowest quartile		—	—
Quartile 2		0.01 (0.03)	0.01 (0.03)
Quartile 3		−0.01 (0.03)	0.01 (0.03)
Highest quartile		−0.09 (0.03)**	−0.08 (0.03)**
Balance			
Location			
No pain	—		—
One pain site	0.12 (0.15)		0.05 (0.16)
Multisite/ widespread pain	−0.30 (0.14)*		−0.39 (0.15)*
Pain severity			
Lowest quartile		—	—
Quartile 2		0.24 (0.17)	0.32 (0.17)
Quartile 3		0.09 (0.17)	0.25 (0.18)
Highest quartile		0.01 (0.18)	0.21 (0.19)
Chair stands (s)			
Location			
No pain	—		—
One pain site	−0.03 (0.41)		−0.10 (0.42)
Multisite/ widespread pain	0.99 (0.37)**		0.80 (0.42)
Pain severity			
Lowest quartile		—	—
Quartile 2		0.32 (0.44)	0.17 (0.45)
Quartile 3		0.17 (0.45)	−0.15 (0.49)
Highest quartile		1.50 (0.48)**	1.12 (0.52)*

Notes: Model 1 presents the mean effects for pain location adjusted for age, sex, height, weight, race, education, depressive symptoms, and self-reported comorbid conditions: heart disease, diabetes, asthma, and stroke. Model 2 presents the mean effects for pain severity adjusted for the same variables. Model 3 presents mean effects for pain location and pain severity adjusted for the same variables. SPPB = Short Physical Performance Battery.

*p Value of regression coefficient <.05; **p value of regression coefficient <.01; ***p value of regression coefficient <.001.

location and pain severity in the same model (p = .032). After adjustment for hand and knee osteoarthritis, associations between the three SPPB components and chronic pain measures were somewhat lessened but remained significant in all models, except for the association between balance and pain location, which diminished (data not shown). There were no material differences in the variances explained (R^2) between pain location versus pain severity models (data not shown).

Table 4. Multivariable Linear Regression Coefficients for Association Between Separate Pain Sites With Performance on the Short Physical Performance Battery

	Model 1, Beta (*SE*)	Model 2, Beta (*SE*)
Back pain	−.43 (0.20)*	−.10 (0.22)
Shoulder pain	−.28 (0.23)	.02 (0.24)
Hand pain	−.19 (0.21)	.21 (0.22)
Hip pain	−.67 (0.24)**	−.49 (0.25)
Knee pain	−.87 (0.19)***	−.79 (0.20)***
Foot pain	−.61 (0.22)**	−.43 (0.22)

Notes: Model 1 shows six different models for the specific pain sites separately. Model 2 shows all the specific pain sites in one model. Models adjusted for age, sex, height, weight, race, education, depressive symptoms, and self-reported comorbid conditions: heart disease, diabetes, asthma, and stroke.

*p Value of regression coefficient <.05; **p value of regression coefficient <.01; ***p value of regression coefficient <.001.

Discussion

This is one of the first studies to report on the relationship between summary measures of pain location and pain severity and lower extremity function measured by physical performance testing in a population of older persons. Results show that presence of multisite pain was associated with about a 1-point difference in SPPB performance compared with persons reporting no pain. A recent longitudinal study found that a change of one point in the SPPB score was clinically meaningful in a community-dwelling older adult population (29). Similarly, the differences we observed across groups in gait speed were also in the clinically meaningful range (29). However, our observed cross-sectional differences may not compare directly with longitudinal changes reported by Perera and colleagues (29). Our findings are in contrast to findings from previous studies that focused on selected pain sites (back and lower extremity pain) or studied an already disabled population. Those studies did not report consistent findings in the relationships between chronic pain and lower extremity function (15,30,31). With respect to pain severity, our study shows that the highest quartile of pain severity was significantly associated with SPPB performance, but when pain locations and pain severity were included in the same model, only presence of multisite or widespread pain remained significantly associated with lower extremity function.

We also found that of all the different pain sites, knee pain was the only site independently associated with SPPB performance. Most studies of pain and lower extremity function in older adults have focused on single-site pain such as knee or back pain and have not accounted for pain in multiple other joints (11,32,33). However, our results show that most older people who experience pain report *multisite* pain, consistent with a number of studies from the United Kingdom (14,34,35). Therefore, site-specific analyses may be missing a key element of chronic pain in older

people. It can be argued that multisite pain may be an important measure in the clinical setting, even more so than pain severity or site-specific pain.

In the MBS population, elders who had multisite pain demonstrated poorer standing balance. Few studies have examined the relationship between chronic pain severity or number of pain sites and balance in older adults. In the Health ABC study, more severe back pain was independently associated with poorer scores on balance tests, but other sites of pain were not examined (32). In another report, knee pain severity was inversely correlated with balance performance in older adults, but this relationship was dependent on ankle strength (36). Our findings suggest that in older adults, there may be multiple pathways through which pain may influence balance and lower extremity function in general. Persons experiencing pain may move their muscles in such a way to minimize the sensation of pain, thus compromising lower extremity function (37). It is also possible that multisite pain may be distracting, thus interfering with balance and contributing to a compensatory slowing of lower extremity function in general. Pain is known to have a strong attentional component (38) and distracting factors during walking, for instance performing a dual-task, limit lower extremity function in older adults (39). Limitations in lower extremity function caused by distraction by pain could potentially lead to falls. Indeed, widespread musculoskeletal pain contributed to falls in older women with disabilities (40).

With respect to chair stands performance, both pain location and the highest quartile of pain severity were associated with poorer chair stands performance, but when adjusting for both, only the association with pain severity remained significant. The variance that was explained by these models was relatively limited compared with models of other performance tests (data not shown), which may be explained by the missing values on this test; more people with pain did not perform the chair stands. In other words, the repeated chair stands test is more burdensome than simple gait and balance tests for older persons. Thus, persons with symptomatic musculoskeletal or cardiovascular conditions were generally less likely to perform the test, possibly explaining the somewhat lower variability in the measure across pain groups.

In contrast to overall mobility function and standing balance, our results showed that pain severity has a stronger association with individual tests of gait speed and chair stands than does pain location. Previously, pain severity was associated with gait speed in old-old community-dwelling adults and older women with disabilities (33,41). It is noteworthy that the association found in the present study between pain severity and gait speed was only significant for the highest quartile of pain severity. There may be a threshold of pain severity, beyond which lower extremity function is significantly affected. The highest quartile of pain severity in our population was based on a cut point of 4 or higher on the average of the four BPI 0–10 severity ratings. In general, pain rated as 4 or higher on a single-item rating of pain intensity is interpreted as moderate or severe pain. Because the BPI scale consists of pain ratings under four conditions, it is not directly comparable with a single-item rating that is often used in clinical settings. However, further studies are needed to determine whether there is a threshold effect of pain severity on mobility function, a factor that could have important clinical implications for the management of pain. As noted previously (15), it is possible that even modest pain relief could lead to significant changes in lower extremity function, particularly among persons who have moderate or severe pain.

Our measure of pain severity, the BPI subscale, is a measure of *overall* pain severity, not accounting for varying pain severity across multiple pain sites. It is possible that a person could have severe pain at one site and have the same BPI severity score as a person with severe pain in multiple sites. Given that most older persons who have chronic pain report pain in multiple sites, a summary assessment of pain severity may have some limitations in older adults, even though the BPI specifically is currently recommended in guidelines for pain assessment in older patients (22). Nonetheless, our findings suggest that the BPI severity measure is generally comparable with pain location assessment for their respective impact on lower extremity mobility in the older population.

There are some limitations of this study that should be mentioned. First, the cross-sectional design of the present study precludes inferences on causal relationships between pain and lower extremity function. Whether increased pain sites and/or pain severity actually lead to lower extremity limitations should be addressed in future longitudinal studies. Second, we may not have adequately accounted for the influence of comorbidity because our assessment of comorbid conditions was based on self-report. Last, other factors such as medication use, self-efficacy related to mobility, and aspects of executive function may have influenced the observed relationships, but it was beyond the scope of this study to examine the many possible mediators of the pain–function relationship. Future studies could examine these and other factors that would provide a better understanding of the pathway from chronic pain to limitations in lower extremity function.

In conclusion, presence of multisite pain is associated with poorer lower extremity mobility performance on the SPPB cross-sectionally in the MBS population. However, pain severity, more so than pain locations, was associated with poorer performance in the individual tests of gait speed and repeated chair stands. These provocative findings demonstrate the need for further investigation into measures of pain characteristics that pose the greatest hazards to daily functioning of older adults. Longitudinal research is essential to inform clinical care of the many older adults who live with chronic multisite pain.

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