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Brief Report

Foot Pain and Mobility Limitations in Older Adults: The Framingham Foot Study

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Background. Foot pain is very common in the general population and has been shown to have a detrimental impact on health-related quality of life. This is of particular concern in older people as it may affect activities of daily living and exacerbate problems with balance and gait. The objective of this study is to evaluate the independent relationships between foot pain and mobility limitation in a population of community-dwelling older adults.

Methods. Population-based cross-sectional study. Participants (n = 1,544) from the Framingham Foot Study (2002–2008) were assessed for physical performance. Foot pain was documented using the question "On most days, do you have pain, aching, or stiffness in either foot?" Mobility limitation was assessed using the Short Physical Performance Battery, dichotomized using 1–9 as an indicator of mobility limitation and 10–12 as no mobility limitation.

Results. Foot pain was reported by 19% of men and 25% of women. After adjusting for age, obesity, smoking status, and depression, foot pain was significantly associated with mobility limitation in both men (odds ratio = 2.00, 95% confidence interval 1.14 – 3.50; p = .016) and women (odds ratio = 1.59, 95% confidence interval 1.03 – 2.46; p = .037).

Conclusion. In our study of older adults from the Framingham Foot Study, foot pain was associated with an increased odds of having mobility limitation in both men and women. Clinicians should consider assessment of foot pain in general examinations of older adults who are at risk of mobility limitation.

Key Words: Aging—Foot—Mobility limitation—Pain—Short Physical Performance Battery—Cohort study.

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FOOT pain is very common in the general population, affecting 24% of people over the age of 45 years (1). Foot pain has been shown to have a detrimental impact on health-related quality of life across a spectrum of age groups (2), but is a particular concern in older people, due to its association with difficulty performing activities of daily living (3–6), problems with balance and gait (7), and an increased risk of falls (8,9). As a consequence, older people account for the largest proportion of primary care consultations for foot disorders (10).

Previous studies investigating the relationship between foot pain and mobility have focused primarily on self-reported limitations (4–6), despite possible biases in reporting. However, foot symptoms have also been found to be associated with impaired performance on a range of performance-based assessments of mobility, including level walking (3,6,7,11), stair ascent and descent (7), rising from a chair (11), and a range of balance tests (7). Comparisons are difficult to make with these studies as a range of different measurement approaches have been used. Furthermore, most studies involving performance-based assessments have been undertaken in relatively small samples.

In response to these limitations, the objective of this study was to examine the relationships between foot pain and mobility limitation in a large population-based sample of older men and women using the well-validated Short Physical Performance Battery (SPPB), a performance-based assessment of lower extremity function composed of tests of static balance, walking speed, and rising out of a chair (12). The SPPB has been extensively validated and has been found to be predictive of incident disability (13), nursing

home admission (14), hospitalization (15), and mortality (16). We hypothesized that older men and women with foot pain would be more likely to score poorly on the SPPB than those without foot pain and that this association would be independent of age, obesity, smoking status, and depression.

Methods

Participants

The Framingham Foot Study (FFS) cohort was derived from members of the Framingham Study Original Cohort and the Framingham Offspring Cohort. The Framingham Study Original Cohort was formed in 1948 from a two-third sample ($N = 5,209$) of the town of Framingham, MA, in order to study risk factors for heart disease (17). This cohort has been followed biennially since that time. The Framingham Offspring cohort, formed in 1972, consists of adult offspring who had a parent in the Original Cohort and the spouses of the offspring ($N = 5,124$) (18). This group has been followed every 4 years since cohort inception to study familial risk factors for heart disease. Participants from both Framingham cohorts were invited to participate in the FFS between 2002 and 2008. Of these, FFS data (physical examination of the foot with accompanying questionnaire) were collected from 264 Original and 1,315 Offspring cohort members at either the scheduled or the call-back Framingham clinic examination. Other data collected as part of the routinely scheduled exam included participant characteristics (eg, height, weight, smoking history, and depression) and performance measures (SPPB). Participants who had complete FFS data (including information on foot pain), physical performance measures, and covariates were included in this analysis. The FFS was approved by the institutional review board at Hebrew SeniorLife, and informed consent was obtained from all participants.

Assessment of Foot Pain

All participants were ambulatory and cognitively intact (as indicated by a Mini-Mental State Exam score > 24(19)) to identify qualified study participants who would be able to give symptom information about their feet. Generalized foot pain was determined using the following National Health and Nutrition Examination Survey–based query about foot pain: "On most days, do you have pain, aching, or stiffness in either of your feet?" Possible responses were no; yes, left foot only; yes, right foot only; yes, both feet; yes, not sure what side; and unknown. For this analysis, responses were collapsed into two groups: (i) yes, pain in one or both feet and (ii) no, no pain in either foot.

Assessment of Mobility Limitations

Mobility limitations were assessed using the SPPB (12). The SPPB is a measure of lower extremity function, which comprises tests of static balance, walking speed, and rising out of a chair. For static balance, participants were asked to stand on their feet in a side-by-side position, a semitandem position (ie, with the heel of one foot beside the big toe of the other foot), and a full tandem position (ie, with the heel of one foot directly in front of the other foot) for 10 seconds each. Participants were given a score of 1 if they could hold a side-by-side position for 10 seconds but were unable to hold a semitandem position for 10 seconds, a score of 2 if they could hold a semitandem position for 10 seconds but were unable to hold a full tandem position for more than 2 seconds, a score of 3 if they could stand in the full tandem position for 3–9 seconds, and a score of 4 if they could stand in the full tandem position for 10 seconds. Walking speed was measured over a distance of 4 m. The time of the faster of two trials was used and scored as follows: >8.7 seconds, a score of 1; 6.21–8.7 seconds, a score of 2; 4.82–6.20 seconds, a score of 3; and <4.82 seconds, a score of 4 (12). Rising out of a chair was assessed with the participants' arms folded across their chests. If they successfully rose from the chair, they were asked to repeat this five times as quickly as possible while being timed. Scoring was as follows: ≥16.7 seconds, a score of 1; 13.7–16.6 seconds, a score of 2; 11.2–13.6 seconds, a score of 3; and ≤11.1 seconds, a score of 4 (12).

A summary performance score was created by adding the scores for each of the three tests. Lower extremity physical limitations with the SPPB were categorized as follows: 0–3, severe limitations; 4–6, moderate limitations; 7–9, mild limitations; and 10–12, minimal to no limitations (20). The validity of these categories in predicting incident disability, nursing home admission, hospitalization, and mortality has previously been established (13–16). For the purpose of our analysis, these categories were dichotomized, with scores from 0 to 9 (severe to mild limitations) representing mobility limitations and scores from 10 to 12 (minimal to no limitations) representing no mobility limitations. We also examined the SPPB as a continuous score.

Covariates

Covariates in our analyses included age, sex, obesity, smoking status, and depressive symptoms. Age in years at the time of examination was recorded. Weight was measured using a standardized balance beam and recorded to the nearest half pound. Height (without shoes) was measured using a calibrated stadiometer and recorded to the nearest one-quarter inch. Weight and height measures were used to determine body mass index (in kg/m^2), and obesity (yes/no) was defined as ≥30 kg/m^2. A participant's smoking status was assessed via questionnaire as a regular smoker in the last year (yes/no). Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression scale (CES-D). The CES-D comprises 20 questions relating to feelings over the past week, documented as rarely (score = 0), some or a little of the time (score = 1), occasionally or a

moderate amount of the time (score = 2), or most or all of the time (score = 3). The summed CES-D score ranges from 0 to 60, with higher scores indicating more severe depressive symptoms (21). Smoking (22,23) and depressive symptoms (24,25) have previously been shown to be associated with lower extremity pain and mobility impairment, so these factors can therefore be considered to be confounding variables when evaluating the relationship between foot pain and mobility.

Statistical Analysis

Because sex is a strong confounder for both foot pain and mobility and a possible effect modifier, all analyses were performed as sex specific. Descriptive statistics were generated separately for men and women as *M* and *SD* or percentages, where appropriate. Sex-specific multivariable logistic models were used to calculate odds ratios and 95% confidence intervals for the association between foot pain (yes/no) and presence of mobility limitation (yes/no), adjusting for age, obesity, current smoking status, and CES-D score. Our a priori hypotheses were based upon the dichotomous variables. All analyses were conducted using the SAS statistical analysis package, version 9.1 (SAS Institute, Cary, NC).

Results

Of the 1,579 original cohort and offspring participants in the FFS, 1,544 participants (655 men and 889 women) had complete foot pain and physical performance and data (Table 1). Data were missing for CES-D in 34 participants and for smoking in 6 participants. The mean age of the participants was 71 years, and women comprised 58% of the sample population. Of the 1,544 participants, 346 (22%) reported foot pain aching or stiffness in either of their feet on most days (19% of men and 25% of women). Foot pain was significantly associated with mobility limitations in men (age-adjusted odds ratio = 2.07, 95% confidence interval 1.19 – 3.60; p = .010) and women (age-adjusted odds ratio = 1.71, 95% confidence interval 1.12 – 2.60; p = .013). Table 2 shows the multivariable logistic regression model for associations with mobility limitations in men and women. Even after adjusting for age, obesity, smoking, and CES-D score, foot pain remained significantly associated with mobility limitations in both men (odds ratio = 2.00, 95% confidence interval 1.14 – 3.50; p = .016) and women (odds ratio = 1.59, 95% confidence interval 1.03 – 2.46; p = .037). In our study, when linear regression was used to identify factors associated with the total SPPB score as a continuous variable, very similar results were obtained.

Table 1. Characteristics of Men and Women in the Framingham Foot Study (2002–2008) With Completed Foot Examination and Physical Performance Assessments

Characteristic	Men (n = 655)	Women (n = 889)
Age, $M \pm SD$ y	71.0 ± 10.9	71.1 ± 11.9
Body mass index, $M \pm SD$ kg/m^2	28.7 ± 4.5	27.4 ± 5.6
Body mass index category, n(%)		
<25.0	139 (21.2)	332 (37.4)
25.0–30.0	295 (45.0)	314 (35.3)
30.0–35.0	164 (25.0)	171 (19.2)
>35.0	57 (8.7)	72 (8.1)
Regular smoker, n(%)	48 (7.3)	76 (8.6)
Center for Epidemiologic Studies Depression Scale, $M \pm SD$	4.6 ± 5.8	6.4 ± 7.4
Short Physical Performance Battery category, n(%)		
Minimal limitations (score = 10 to 12)	522 (79.7)	674 (75.8)
Mild limitations (score = 7 to 9)	99 (15.1)	120 (13.5)
Moderate limitations (score = 4 to 6)	19 (2.9)	52 (5.9)
Severe limitations (score = 1 to 3)	15 (2.3)	43 (4.8)
Foot pain, n(%)	122 (18.6)	224 (25.2)

Table 2. Associations of Mobility Limitations With Foot Pain and Major Risk Factors in the Men and Women in the Framingham Foot Study (2002–2008). Odds Ratios (95% Confidence Intervals) Shown.*

	Men (n = 655)	p	Women (n = 889)	p
Foot pain	2.00 (1.14–3.50)	.016	1.59 (1.03–2.46)	.037
Age	1.17 (1.14–1.21)	<.001	1.18 (1.15–1.21)	<.001
Obese (body mass index > 30 kg/m^2)	1.22 (0.73–2.04)	.447	1.46 (0.93–2.27)	.097
Regular smoker	3.84 (1.65–8.96)	.002	2.39 (1.16–4.92)	.018
Center for Epidemiologic Studies Depression scale	1.05 (1.01–1.08)	.023	1.06 (1.03–1.08)	<.001

*Mobility limitations dichotomized as Short Physical Performance Battery ≤ or > 9.

Discussion

The objective of this study was to evaluate the independent relationships between foot pain and mobility limitations in a population of community-dwelling older adults who participated in the FFS (2002–2008). Our findings indicate that foot pain is highly prevalent in this population, with 19% of men and 25% of women reporting foot pain, aching, or stiffness on most days in the last month. Foot pain was independently associated with mobility limitations in both men and women, as evidenced by poorer performances on the SPPB.

Despite differences in sample characteristics and variable definitions used to define foot symptoms, the prevalence of foot pain in our study is similar to previous reports in the literature, with prevalence estimates ranging from 20% to 42% in people aged 65 years and older (3,11,25,26). The higher prevalence of foot pain in women reported here is also a consistent finding in the literature (2,3,27). Although this may simply reflect the general tendency for women to report pain more than men (28), it is also possible that there are foot-specific explanations for this difference, such as the higher prevalence of structural foot disorders, for example,

hallux valgus, in women (29) and the detrimental effects of women's footwear (30).

Foot pain was significantly associated with poor performance on the SPPB after adjusting for age, obesity, smoking status, and depressive symptoms in men and in women. The SPPB comprises tests of static balance, walking speed, and rising out of a chair—functional tasks that require the maintenance of stability and controlled transfer of bodyweight. Given that the foot is the only direct source of contact with the ground when executing such tasks, it is plausible that the presence of foot pain could impair balance, resulting in a more cautious, and therefore slower, performance. This explanation is consistent with previous studies reporting impaired balance performance in older people with foot pain (7) and with laboratory studies in which experimentally induced plantar foot pain has been shown to increase postural sway (31). Similar findings were recently reported by Golightly and coworkers (6) who noted that obese individuals with foot pain had impaired performances in chair stands and walking speed (two components of the SPPB) in a population-based sample of 2,589 individuals.

An unexpected finding of this study was that the association between foot pain and SPPB performance was stronger in men than in women, despite previous studies indicating that older women are more likely to report that bodily pain interferes with their daily activities (32). This may be because older women are more likely to report widespread pain, which is defined as axial pain in addition to pain in at least two sections of each of two contralateral quadrants of the body (32). As we did not consider the presence of widespread pain in our model, it is possible that foot pain made a relatively smaller contribution to mobility limitation in women who also had pain in several other body regions.

The strengths of this study are the large, population-based sample and statistical adjustment for several potential confounding variables. However, our findings need to be interpreted in the context of three key limitations. Firstly, our participants had relatively high levels of physical functioning, with only 20% of men and 24% of women being classified as having mild to severe limitation according to the SPPB. Although the SPPB was initially developed for use in community-dwelling samples such as ours, it may have a ceiling effect in high functioning individuals. Therefore, more physically demanding tests, such as the 400-m walk test (33), may have provided greater discrimination between those with and without foot symptoms. Secondly, for this analysis, we considered foot pain as a simple dichotomous variable although it is likely that the severity of foot symptoms may influence performance on the SPPB. Finally, other factors may influence both foot pain and mobility, such as foot or ankle surgery, pain elsewhere, or neurological problems. The prevalence of previous foot or ankle surgery is quite low in the Framingham Study participants (as it is not clinically based or a sample of patients), so we could not examine this factor. Similarly, neurological problems related to the feet are not common in this population-based sample. Certainly, pain elsewhere in the lower extremities could affect mobility, but we were particularly interested in focusing on foot pain as relevant to population concerns and to understanding by persons in the population.

Conclusion

Older people who report foot pain, aching, or stiffness are more likely to have mobility limitation, as evidenced by lower scores on the SPPB. This association is independent of age, obesity, cigarette smoking, and depressive symptoms, suggesting that interventions that decrease foot pain may have beneficial effects on physical performance in community-dwelling older people. Clinicians should therefore consider assessment of foot pain in general examinations of older people who are at risk of mobility limitation.

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Conflict of Interest

The authors have no conflicts of interest to report.

References

1. Thomas MJ, Roddy E, Zhang W, Menz HB, Hannan MT, Peat GM. The population prevalence of foot and ankle pain in middle and old age: a systematic review. *Pain*. 2011;152:2870–2880.
2. Hill CL, Gill TK, Menz HB, Taylor AW. Prevalence and correlates of foot pain in a population-based study: the North West Adelaide health study. *J Foot Ankle Res*. 2008;1:2.
3. Benvenuti F, Ferrucci L, Guralnik JM, Gangemi S, Baroni A. Foot pain and disability in older persons: an epidemiologic survey. *J Am Geriatr Soc*. 1995;43:479–484.
4. Bowling A, Grundy E. Activities of daily living: changes in functional ability in three samples of elderly and very elderly people. *Age Ageing*. 1997;26:107–114.
5. Keysor JJ, Dunn JE, Link CL, Badlissi F, Felson DT. Are foot disorders associated with functional limitation and disability among community-dwelling older adults? *J Aging Health*. 2005;17:734–752.

6. Golightly YM, Hannan MT, Shi XA, Helmick CG, Renner JB, Jordan JM. Association of foot symptoms with self-reported and performance-based measures of physical function: the Johnston County osteoarthritis project. *Arthritis Care Res (Hoboken)*. 2011;63: 654–659.
7. Menz HB, Lord SR. Foot pain impairs balance and functional ability in community-dwelling older people. *J Am Podiatr Med Assoc*. 2001;91:222–229.
8. Menz HB, Morris ME, Lord SR. Foot and ankle risk factors for falls in older people: a prospective study. *J Gerontol A Biol Sci Med Sci*. 2006;61:866–870.
9. Mickle KJ, Munro BJ, Lord SR, Menz HB, Steele JR. Foot pain, plantar pressures, and falls in older people: a prospective study. *J Am Geriatr Soc*. 2010;58:1936–1940.
10. Menz HB, Jordan KP, Roddy E, Croft PR. Characteristics of primary care consultations for musculoskeletal foot and ankle problems in the UK. *Rheumatology (Oxford)*. 2010;49:1391–1398.
11. Leveille SG, Guralnik JM, Ferrucci L, Hirsch R, Simonsick E, Hochberg MC. Foot pain and disability in older women. *Am J Epidemiol*. 1998;148:657–665.
12. Guralnik JM, Simonsick EM, Ferrucci L, et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. *J Gerontol*. 1994;49:M85–M94.
13. Vasunilashorn S, Coppin AK, Patel KV, et al. Use of the Short Physical Performance Battery Score to predict loss of ability to walk 400 meters: analysis from the InCHIANTI study. *J Gerontol A Biol Sci Med Sci*. 2009;64:223–229.
14. Quadri P, Tettamanti M, Bernasconi S, Trento F, Loew F. Lower limb function as predictor of falls and loss of mobility with social repercussions one year after discharge among elderly inpatients. *Aging Clin Exp Res*. 2005;17:82–89.
15. Penninx BW, Ferrucci L, Leveille SG, Rantanen T, Pahor M, Guralnik JM. Lower extremity performance in nondisabled older persons as a predictor of subsequent hospitalization. *J Gerontol A Biol Sci Med Sci*. 2000;55:M691–M697.
16. Rolland Y, Lauwers-Cances V, Cesari M, Vellas B, Pahor M, Grandjean H. Physical performance measures as predictors of mortality in a cohort of community-dwelling older French women. *Eur J Epidemiol*. 2006;21:113–122.
17. Dawber TR, Meadors GF, Moore FE Jr. Epidemiological approaches to heart disease: the Framingham Study. *Am J Public Health Nations Health*. 1951;41:279–281.
18. Feinleib M, Kannel WB, Garrison RJ, McNamara PM, Castelli WP. The Framingham Offspring Study. Design and preliminary data. *Prev Med*. 1975;4:518–525.
19. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. 1975;12:189–198.
20. Guralnik JM, Ferrucci L, Simonsick EM, Salive ME, Wallace RB. Lower-extremity function in persons over the age of 70 years as a predictor of subsequent disability. *N Engl J Med*. 1995;332:556–561.
21. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas*. 1977;1:385–401.
22. Boshuizen HC VJ, Broersen JP, Weel AN. Do smokers get more back pain? *Spine.* 1993;18:35–40.
23. Mitchell MD, Mannino DM, Steinke DT, Kryscio RJ, Bush HM, Crofford LJ. Association of smoking and chronic pain syndromes in Kentucky women. *J Pain*. 2011;12:892–899.
24. Barr ELM, Browning C, Lord SR, Menz HB, Kendig H. Foot and leg problems are important determinants of functional status in community dwelling older people. *Disabil Rehabil*. 2005;27:917–923.
25. Menz HB, Tiedemann A, Kwan MM, Plumb K, Lord SR. Foot pain in community-dwelling older people: an evaluation of the Manchester Foot Pain and Disability Index. *Rheumatology (Oxford)*. 2006;45:863–867.
26. Badlissi F, Dunn JE, Link CL, Keysor JJ, McKinlay JB, Felson DT. Foot musculoskeletal disorders, pain, and foot-related functional limitation in older persons. *J Am Geriatr Soc*. 2005;53:1029–1033.
27. Roddy E, Muller S, Thomas E. Onset and persistence of disabling foot pain in community-dwelling older adults over a 3-year period: a prospective cohort study. *J Gerontol A Biol Sci Med Sci*. 2011;66: 474–480.
28. Unruh AM. Gender variations in clinical pain experience. *Pain*. 1996;65:123–167.
29. Nix S, Smith M, Vicenzino B. Prevalence of hallux valgus in the general population: a systematic review and meta-analysis. *J Foot Ankle Res*. 2010;3:21.
30. Menz HB, Morris ME. Footwear characteristics and foot problems in older people. *Gerontology*. 2005;51:346–351.
31. Pradels A, Pradon D, Vuillerme N. Effects of experimentally induced pain of the plantar soles on centre of foot pressure displacements during unperturbed upright stance. *Clin Biomech (Bristol, Avon)*. 2011;26:424–428.
32. Thomas E, Peat G, Harris L, Wilkie R, Croft PR. The prevalence of pain and pain interference in a general population of older adults: cross-sectional findings from the North Staffordshire Osteoarthritis Project (NorStOP). *Pain*. 2004;110:361–368.
33. Sayers SP, Guralnik JM, Newman AB, Brach JS, Fielding RA. Concordance and discordance between two measures of lower extremity function: 400 meter self-paced walk and SPPB. *Aging Clin Exp Res*. 2006;18:100–106.