Measures of Physical Performance Capture the Excess Disability Associated With Hip Pain or Knee Pain in Older Persons

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Background. Hip pain (HP) and knee pain (KP) may specifically affect function and performance; few studies investigate the functional impact of HP or KP in the same population.

Methods. Population-based sample of older individuals living in the Chianti area (Tuscany, Italy) (1998–2000); 1006 persons (564 women and 442 men) were included in this analysis; 11.9% reported HP and 22.4% reported KP in the past 4 weeks. Self-reported disability and lower extremity performance, measured by 400-m walk test and by the short physical performance battery (SPPB, including standing balance, chair raising, and 4-m walk test), were compared in participants reporting HP or KP versus those free of these conditions; the relationship of HP or KP with performance and self-reported disability was studied, adjusting for age, sex, hip or knee flexibility, muscle strength, multiple joint pain, major medical conditions, and depression.

Results. Participants reporting HP were more likely to report disability in shopping, cutting toenails, carrying a shopping bag, and using public transportation; those with KP reported more disability in cutting toenails and carrying a shopping bag. Participants reporting HP or KP had significantly lower SPPB scores. Adjusting by SPPB, pain no longer predicted self-reported disability, except for “HP—carrying a shopping bag.”

Conclusions. In our cohort of older persons, those with HP reported disability in a wider range of activities than those with KP. Physical performance measured by SPPB was impaired in both conditions. Reduced lower extremity performance captures the excess disability associated with either HP or KP.

Key Words: Hip pain—Knee pain—Older persons—Performance—Disability.
Materials and Methods

A detailed description of the InCHIANTI study design is reported elsewhere (8). Briefly, a representative cohort of persons aged 65 or older was selected from the registries of Greve in Chianti (rural area) and Bagno a Ripoli (urban area near Florence) by a multistage sampling method. In 1998, baseline data collection (1998–2000) included a structured home interview, instrumental and laboratory tests, a standardized examination by a geriatrician, and the administration of physical tests by a trained physiotherapist. Of the initial sample (1299 persons enrolled), 17 men and 22 women died or moved away. Among potentially eligible participants, 91.6% (1154/1260) answered to the home interview; 50.0% (632/1260) participated in the physical examination; 87.2% (1096/1260) underwent standardized physical tests; 94.7% (1196/1260) completed the InChianti Health status questionnaire (9). A detailed description of the InCHIANTI study design is reported elsewhere (8). Briefly, a representative cohort of persons aged 65 or older was selected from the registries of Greve in Chianti (rural area) and Bagno a Ripoli (urban area near Florence) by a multistage sampling method. In 1998, baseline data collection (1998–2000) included a structured home interview, instrumental and laboratory tests, a standardized examination by a geriatrician, and the administration of physical tests by a trained physiotherapist. Of the initial sample (1299 persons enrolled), 17 men and 22 women died or moved away. Among potentially eligible participants, 91.6% (1154/1260) answered to the home interview; 50.0% (632/1260) participated in the physical examination; 87.2% (1096/1260) underwent standardized physical tests; 94.7% (1196/1260) completed the InChianti Health status questionnaire (9).

Lower Extremity Performance

The 400-m walk test and the short physical performance battery (SPPB) were used to assess lower extremity physical performance. For the 400-m walk test, participants were invited to walk for 400 m (20 laps of 20 m) as fast as possible to complete the task without stopping. Verbal encouragement to maintain pace was given, and the participant was told the number of laps completed at each lap. Although participants were asked to complete the task at once, a maximum of two standing rests were permitted for less than 2 minutes each. The use of assistive devices (e.g., canes, walkers) was allowed. Participants were excluded from the 400-m walk test if they had any of the following conditions: severe electrocardiographic abnormality, systolic blood pressure more than 180 mmHg, diastolic blood pressure more than 100 mmHg, resting heart rate less than 40 or more than 135 beats per minute, myocardial infarction, episodes of angina in the past 3 months, severe dementia, or poor visual acuity. Total time to perform the test was measured by a photocell-based system, and the mean velocity (meters/second) was used in the analysis (8).

The SPPB score is derived from the performance in three objective tests: usual walking speed over 4 m, five timed repeated chair rises, and standing balance (SB) (12). Each test is scored from 0 to 4, and the sum of three scores gives a total score ranging from 0 to 12 (12 = best). SPPB score has been shown to be associated with higher risk of incident disability and mortality in older persons (13,14). In tests of SB, participants attempted to maintain the side-by-side, semitandem, and tandem positions for 10 seconds and were scored 1 if they could hold the side-by-side but not the full-tandem stand for 10 seconds, 2 if they held the semitandem stand for 10 seconds but were unable to hold the full-tandem stand for more than 2 seconds, 3 if they held the full-tandem stand for 3–9 seconds, and 4 if they held the full-tandem stand for 10 seconds. The 4-m walk test was scored based on quartiles: 1, more than 5.7 seconds (≥0.43 m/second); 2, 4.1–5.6 seconds (0.44–0.60 m/second); 3, 3.2–4.0 seconds (0.61–0.77 m/second); and 4, less than or equal to 3.1 seconds (≥ 0.78 m/second). Participants who could successfully stand up from a chair with their arms folded were asked to stand up and sit down five times as quickly as possible. Scores for the repeated chair stands were based on quartiles: 1, more than 16.7 seconds; 2, 16.6–13.7 seconds; 3, 13.6–11.2 seconds; and 4, less than or equal to 11.1 seconds (15).

Potential Confounders

Hip flexion, extension, extrarotation, adduction, abduction range of motion (ROM), and knee flexion and extension ROM were measured with a goniometer using a standard protocol (16). Lower extremity isometric muscle strength was assessed bilaterally in eight lower extremity muscle groups...
using a handheld dynamometer (Nicholas Manual Muscle Tester; Fred Sammons, Inc., Burr Ridge, IL). All measures of lower extremity muscle strength were highly correlated (Pearson correlation coefficients from .87 to .92) (17). Therefore, right knee extension torque was used in this analysis as a marker of lower extremity muscle strength (6).

The diagnosis of major medical condition was ascertained combining information from medical history, physical examination, laboratory tests, and clinical records by preset algorithms; for our analysis, we included hypertension, peripheral artery diseases, stroke, and cardiovascular disease (8).

Pain in other joints included KP or HP, and foot pain (FP). For HP, participants were asked how often they had experienced BP over the past year; given the high prevalence and the low clinical impact of sporadic BP, participants were considered as having BP if they reported pain from very often to almost always in the past year (6). Participants were also asked if they had experienced FP in the past month. Finally, the Center for Epidemiologic Studies Depression scale (CES-D) was used to investigate on depressive symptoms (18).

**Statistical Analysis**

Data are reported as means ± SD or as percentages. Statistical analysis was performed using the STATA 7.1 software (19) and carried out following a two-step strategy separately for HP and KP. Age- and sex-adjusted associations according to the presence versus absence of HP (or KP) were tested for disability in selected ADLs and in performance tests of lower extremity function using logistic or linear regression models, as appropriate. Subsequently, significant associations of HP or KP with self-reported disability were further adjusted for SPPB to test the hypothesis that the deleterious effects of pain on lower extremity performance explain, in large part, the excess disability found in individuals with HP or KP compared with those free of these conditions. Type I error was set at 0.05.

**RESULTS**

Table 1 summarizes the main characteristics of the study participants according to HP or KP. The WPS and use of drugs were similar for HP and KP (6). Both HP and KP were associated with increased risk of pain in other joints (6): among persons with HP, 84% (103/122) had also pain in another site (KP, BP, or FP), and among those with KP, 69% (157/226) reported pain in at least another site (HP, BP, or FP). Participants with HP or KP were significantly more likely to report one or more falls in the past year than those free of these conditions.

Table 1 shows the association of HP and KP, respectively, with disability in specific ADLs. Independent of age and sex, participants with HP were significantly more likely to report need of help from another person for shopping, cutting toenails, carrying a shopping bag, and using public transportation than those without HP. Participants with KP were significantly more likely to report disability in cutting toenails and in carrying a shopping bag.

Table 2 shows the relationship between HP or KP and physical performance. Walking speed in the 400-m task was not associated with pain in either joint. On the contrary, SPPB scores were significantly lower in participants with HP or KP. Considering SPPB subscores, repeated chair stand and 4-m usual paced walk were significantly impaired in both conditions, whereas SB was significantly more impaired in HP but not in KP.

Interestingly, the additional risk of disability and reduced lower extremity performance conferred by HP or KP alone were not significantly lower than those conferred by reporting pain in both joints (Table 4).

The relationship between HP or KP and disability is shown in Table 5. Models are presented adjusted only for age and sex; adjusted for age, sex, and SPPB score; and fully adjusted for multiple potential confounders, including age, gender, SPPB score, hip or knee flexibility, lower extremity muscle strength, CES-D score, pain in other joints, and presence of major clinical conditions. The age- and sex-adjusted associations “HP or KP—cutting toenails,” “HP—going shopping,” and “HP—using public transportation”
were substantially attenuated and no longer significant after adjustment for SPPB. On the contrary, introducing SPPB as a covariate did not affect the relationship “HP—carrying a shopping bag” that remained statistically significant. In the fully adjusted model, which included measures of specific joint flexibility, lower extremity muscle strength, reports of pain in other joints, major medical conditions, and depression, the relationship “HP—carrying a shopping bag” was further attenuated and became no longer significant.

Finally, we repeated the fully adjusted analysis separately for the hip and the knee, considering the three components of the SPPB rather than the SPPB score. The final model for the hip identified a set of variables independently related to task-specific disability, whereas the association with HP was lost for all tasks. Independent predictors of disability in “cutting toenails” were age (p = .000), limiting medical conditions (p = .023), hip flexion ROM (p = .002), SB (p = .000), and 4-m walk test (p = .011), whereas the association with repeated chair stand was not significant (p = .186). For “going shopping,” age (p = .005), limiting medical conditions (p = .023), repeated chair stand (p = .000), and 4-m walk test (p = .002) were significantly related to disability, whereas the association with balance was not significant (p = .246). Independent predictors of disability in “using public transportation” included age (p = .000), depression (p = .025), hip extrarotation ROM (p = .013), repeated chair stand (p = .009), 4-m walk test (p = .005), and balance (p = .029). For “carrying a shopping bag,” age (p = .001), female gender (p = .020), limiting medical conditions (p = .000), depression (p = .027), pain in other joints (p = .006), hip extrarotation ROM (p = .0024), repeated chair stand (p = .000), and 4-m walk test (p = .003) were significantly related to disability, whereas SB was not (p = .103).

Table 3. Lower Extremity Performance Measures Among InCHIANTI Study Participants Aged 65 and Older According to the Presence vs Absence of HP or KP (n = 1006)

<table>
<thead>
<tr>
<th></th>
<th>HP</th>
<th>KP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking speed 400 m (m/sec) (M ± SD)</td>
<td>1.3 ± 0.6</td>
<td>1.2 ± 0.4</td>
</tr>
<tr>
<td>SPPB score (M ± SD)</td>
<td>8.7 ± 3.3</td>
<td>8.9 ± 3.1</td>
</tr>
<tr>
<td>4 m usual paced walk (score) (M ± SD)</td>
<td>3.1 ± 1.0</td>
<td>3.2 ± 1.1</td>
</tr>
<tr>
<td>Repeated chair stand (score) (M ± SD)</td>
<td>2.6 ± 1.4</td>
<td>2.6 ± 1.4</td>
</tr>
<tr>
<td>Standing balance (score) (M ± SD)</td>
<td>3.0 ± 1.4</td>
<td>3.1 ± 1.3</td>
</tr>
</tbody>
</table>

Notes: HP = hip pain; KP = knee pain; SPPB = short physical performance battery.
* Age and sex adjusted.
As to the knee, the final model identified a set of variables independently related to task-specific disability, whereas the association with KP was also lost for all tasks. For “cutting toenails,” age ($p = .000$), limiting medical conditions ($p = .022$), knee flexion ROM ($p = .026$), knee extension ROM ($p = .045$), SB ($p = .000$), and 4-m walk test ($p = .001$) were

### Table 4. Self-reported Disability and Lower Extremity Performance Measures in Participants with Both HP and KP vs Participants With HP Only and vs Participants With KP Only

<table>
<thead>
<tr>
<th></th>
<th>HP + KP ($n = 72$)</th>
<th>HP Only ($n = 48$)</th>
<th>KP Only ($n = 153$)</th>
<th>HP + KP vs HP Only, $p^*$</th>
<th>HP + KP vs KP Only, $p^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-reported disability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Personal care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washing hands and face (%)</td>
<td>27.4</td>
<td>20.4</td>
<td>13.1</td>
<td>.529</td>
<td>.227</td>
</tr>
<tr>
<td>Taking a bath (%)</td>
<td>95.9</td>
<td>14.6</td>
<td>10.4</td>
<td>.980</td>
<td>.613</td>
</tr>
<tr>
<td>Dressing or undressing (%)</td>
<td>54.9</td>
<td>61.2</td>
<td>58.8</td>
<td>.646</td>
<td>.589</td>
</tr>
<tr>
<td>Eating (%)</td>
<td>0</td>
<td>20.4</td>
<td>0</td>
<td>.705</td>
<td>n.a.</td>
</tr>
<tr>
<td>Using the toilet (%)</td>
<td>27.4</td>
<td>40.8</td>
<td>19.6</td>
<td>.737</td>
<td>.576</td>
</tr>
<tr>
<td>Cutting toenails (%)</td>
<td>35.2</td>
<td>26.5</td>
<td>27.0</td>
<td>.064</td>
<td>.048</td>
</tr>
<tr>
<td><strong>Mobility</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Going to or rising from bed (%)</td>
<td>27.4</td>
<td>40.8</td>
<td>45.7</td>
<td>.897</td>
<td>.717</td>
</tr>
<tr>
<td>Indoor mobility (%)</td>
<td>27.4</td>
<td>20.4</td>
<td>5.2</td>
<td>.761</td>
<td>.576</td>
</tr>
<tr>
<td>Outdoor mobility (%)</td>
<td>68.5</td>
<td>16.3</td>
<td>78.4</td>
<td>.594</td>
<td>.747</td>
</tr>
<tr>
<td>Climbing or descending stairs (%)</td>
<td>54.8</td>
<td>10.2</td>
<td>78.4</td>
<td>.858</td>
<td>.833</td>
</tr>
<tr>
<td>Walking 400 m (%)</td>
<td>82.2</td>
<td>20.4</td>
<td>91.5</td>
<td>.352</td>
<td>.803</td>
</tr>
<tr>
<td>Going shopping (%)</td>
<td>12.7</td>
<td>22.3</td>
<td>13.2</td>
<td>.501</td>
<td>.549</td>
</tr>
<tr>
<td>Using public transport (%)</td>
<td>24.6</td>
<td>25.0</td>
<td>21.0</td>
<td>.483</td>
<td>.238</td>
</tr>
<tr>
<td><strong>Housekeeping and IADL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light household chores (%)</td>
<td>43.5</td>
<td>10.4</td>
<td>93.9</td>
<td>.799</td>
<td>.782</td>
</tr>
<tr>
<td>Heavy household chores (%)</td>
<td>17.1</td>
<td>28.9</td>
<td>23.1</td>
<td>.618</td>
<td>.917</td>
</tr>
<tr>
<td>Arms overhead (%)</td>
<td>13.7</td>
<td>0</td>
<td>26.1</td>
<td>.999</td>
<td>.714</td>
</tr>
<tr>
<td>Manual dexterity (%)</td>
<td>68.5</td>
<td>61.2</td>
<td>65.3</td>
<td>.707</td>
<td>.462</td>
</tr>
<tr>
<td>Carrying shopping bag (%)</td>
<td>28.8</td>
<td>28.6</td>
<td>19.7</td>
<td>.733</td>
<td>.033</td>
</tr>
<tr>
<td>Laundry (%)</td>
<td>86.9</td>
<td>11.1</td>
<td>12.9</td>
<td>.475</td>
<td>.938</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>400-m walk (m/sec) ($M \pm SD$)</td>
<td>1.2 ± 0.5</td>
<td>1.4 ± 0.7</td>
<td>1.2 ± 0.4</td>
<td>.277</td>
<td>.867</td>
</tr>
<tr>
<td>SPPB (score) ($M \pm SD$)</td>
<td>8.9 ± 3.2</td>
<td>8.5 ± 3.5</td>
<td>9.0 ± 3.4</td>
<td>.342</td>
<td>.279</td>
</tr>
<tr>
<td>4 m usual paced walk (score) ($M \pm SD$)</td>
<td>3.1 ± 1.0</td>
<td>3.1 ± 1.1</td>
<td>3.2 ± 1.1</td>
<td>.487</td>
<td>.121</td>
</tr>
<tr>
<td>Repeated chair stand (score) ($M \pm SD$)</td>
<td>2.6 ± 1.5</td>
<td>2.7 ± 1.4</td>
<td>2.7 ± 1.4</td>
<td>.329</td>
<td>.359</td>
</tr>
<tr>
<td>Standing balance (score) ($M \pm SD$)</td>
<td>3.2 ± 1.3</td>
<td>2.7 ± 1.5</td>
<td>3.1 ± 1.4</td>
<td>.154</td>
<td>.778</td>
</tr>
</tbody>
</table>

*Notes: HP = hip pain; KP = knee pain; n.a. = not applicable; SPPB = short physical performance battery.

*Age and sex adjusted.

### Table 5. Task-Specific Disability in HP and KP Adjusted for Age and Sex, Further Adjusted for SPPB Score, and Further Adjusted for Multiple Potential Confounders

<table>
<thead>
<tr>
<th></th>
<th>HP</th>
<th>KP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>$p$</td>
</tr>
<tr>
<td><strong>Shopping</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted for age and sex</td>
<td>2.0 (1.1–3.6)</td>
<td>.023</td>
</tr>
<tr>
<td>Adjusted for age, sex, and SPPB score</td>
<td>1.2 (0.6–2.3)</td>
<td>.652</td>
</tr>
<tr>
<td>Fully adjusted model*</td>
<td>2.3 (0.8–6.8)</td>
<td>.125</td>
</tr>
<tr>
<td>Using public transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted for age and sex</td>
<td>1.6 (1.0–2.5)</td>
<td>.047</td>
</tr>
<tr>
<td>Adjusted for age, sex, and SPPB score</td>
<td>1.1 (0.4–2.7)</td>
<td>.838</td>
</tr>
<tr>
<td>Fully adjusted model*</td>
<td>1.2 (0.5–2.7)</td>
<td>.637</td>
</tr>
<tr>
<td>Carrying shopping bags</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted for age and sex</td>
<td>2.7 (1.6–4.4)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Adjusted for age, sex, and SPPB score</td>
<td>2.7 (1.5–4.8)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Fully adjusted model*</td>
<td>2.0 (0.9–4.3)</td>
<td>.067</td>
</tr>
<tr>
<td>Cutting toenails</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted for age and sex</td>
<td>2.1 (1.3–3.4)</td>
<td>.002</td>
</tr>
<tr>
<td>Adjusted for age, sex, and SPPB score</td>
<td>1.7 (1.0–3.0)</td>
<td>.065</td>
</tr>
<tr>
<td>Fully adjusted model*</td>
<td>2.1 (0.8–5.3)</td>
<td>.113</td>
</tr>
</tbody>
</table>

*Notes: HP = hip pain; KP = knee pain; OR = odds ratio; SPPB = short physical performance battery.

*The fully adjusted model also included age, sex, SPPB, hip or knee flexibility, lower extremity muscle strength (knee extension torque), pain in other joints, medical conditions (chronic heart failure, coronary artery disease, stroke, and peripheral artery disease), and depression (Center for Epidemiologic Studies-Depression scale score).
We also found that only participants affected by HP reported excess disability in shopping and using public transportation. These differences in disability reports between KP and HP were somewhat surprising since pain characteristics, such as average WOMAC total score, average pain intensity, and percentage of participants reporting morning stiffness, were quite similar in participants affected by KP or HP, and, for both conditions, the activities that elicited more severe pain were climbing or descending stairs and walking (6). On the other hand, we did not investigate on pain frequency that may be relevant to this issue. In the literature, patients with hip OA tend to report poorer physical function and role than those with knee OA (29), and hip but not knee OA was associated with ADL disability in an Italian elderly cohort (30). Furthermore, in the Framingham study, previous hip fracture was associated with more disability in instrumental ADLs than knee OA (31).

We then explored the relationship between HP or KP and our chosen set of performance measures. In our sample, both HP and KP were significantly associated with lower SPPB scores, whereas neither condition was associated with different walking speed in the 400-m task. This finding was not totally unexpected. Indeed, both measures investigate lower mobility performance, but the 400-m walk test was designed to test fitness and aerobic capacity and may have been affected by a wide variety of clinical factors other than joint pain, such as conditions affecting endurance and exercise tolerance (32). In fact, the 400-m walk test has showed only moderate correlation to SPPB, with the strongest relationship with the 4-m walk test (33). However, the two measures are not identical: it has been argued that the ability to walk over a short distance (a typical mobility task) implies partially different requirements than that of prolonged self-paced walking, eventually with the aid of an assistive device (33), and we believe that this may explain the apparently contradictory finding of HP or KP being significantly related to the 4-m walk test but not to the 400-m test in our study cohort. On the other hand, the association of either HP or KP with the SPPB was expected and particularly interesting since many studies have shown that low SPPB scores in older persons predict multiple adverse health outcomes, including incident ADL disability, nursing home admission, and mortality (15,17). Indeed, recent evidence suggests that chronic pain, per se, is associated with a risk of reduced physical performance that may be reverted with pain relief (34).

Interestingly, but in contrast with previous literature, we found that the level of lower extremity performance deterioration was not significantly better in person, with only HP or KP compared with persons with pain in both joints (35). This discrepancy is difficult to explain and may suggest the existence of a threshold beyond which the excess risk of disability is not increased. On the other hand, we must acknowledge that subdividing our cohort in four subgroups (HP or KP alone, pain in both joints, and no pain in either HP or KP) led to relatively small numbers of participants per group, thus reducing the statistical power of this specific analysis.

Exploring the single three components of the SPPB, we found that performance in 4-m walking and rising from a chair were significantly impaired in persons with HP as well as in those with KP, whereas SB was significantly impaired...
in participants with HP but not in those with KP. This difference may be explained by the specific characteristics of postural control in the elderly people (9); in younger individuals, “ankle strategy,” that is activating ankle muscles first as an anticipatory adjustment to stabilize posture, is preferentially used to respond to external balance perturbations, whereas elderly people generally adopt a “hip strategy,” which may reasonably be impaired in the presence of HP. In a cohort of persons aged 55 and older, impaired balance was independently associated with poor lower extremity strength and HP (36) and impaired control of the trunk and hip movements during postural adjustments (particularly the ability to initiate and control a hip strategy) may also explain reduced balance in elders with HP (37). These findings suggest that HP of whatever cause, rather than hip structural changes “per se,” may influence balance control, possibly by pain-induced reflex inhibition of the thigh and gluteal muscles, and this mechanism may be particularly relevant to older persons who preferably use hip rather than ankle strategy to maintain balance. Indeed, HP may lead to loss of hip extension with anterior shift of the center of gravity (38), and in older persons with hip OA, reduced lower extremity performance was associated with increased activity aimed at controlling balance, measured as increased center point of force velocity (39), and with frequent near-falls (40). From the clinical point of view, our findings suggest that routine testing and eventual treatment of balance problems may be particularly relevant to older patients with HP.

When we introduced the SPPB score into the analysis of the relationship between joint pain and self-reported disability in specific tasks, we found the relationship between disability and either HP or KP was attenuated and no longer significant, except for disability in “carrying a shopping bag” that remained significantly related to HP. A previous analysis on the same cohort of the relationship between disability reported by persons with BP and their lower extremity physical performance showed similar findings: measures of physical performance could modulate disability in specific activities associated to BP, again with the exception of carrying a shopping bag (7). In the fully adjusted model, this relationship was attenuated and no more significant, suggesting that other key factors play a relevant role in this association, including joint flexibility and, possibly, weight bearing–related pain increase.

Since we found an impairment in SB associated with HP but not with KP, we had hypothesized that SB would be particularly relevant to the higher risk of disability reported only by persons with HP in the tasks of “going shopping” and “using public transportation.” On the contrary, when we performed an exploratory analysis, we found that all three test scores were independently related to disability in all activities considered, except “going shopping” and “carrying a shopping bag,” where were not related to SB, and “cutting toenails,” which was not related to repeated chair stand. Although a comprehensive analysis of the determinants of disability in this population goes far beyond the aims of this study, in this exploratory analysis, we also noticed that specific ROM impairment was independently associated to disability in all tasks except for “going shopping” for the hip and for “using public transportation” for the knee. Thus, joint-specific flexibility was an independent factor attenuating the relationship between HP or KP and task-specific disability, whereas the general measure of lower extremity strength we used in the fully adjusted model (knee extension torque) was not an independent predictor of task-specific disability, probably because it was not sufficiently specific.

Disability in older persons is a multidimensional construct, and the relevance of reduced performance to task-specific disability was somehow expected (34,41). Recently, a Finnish study shows that in hip OA, performance measures are better predictors of physical function than pain (42). However, beyond these results, our findings suggest that lower extremity performance measures—SPPB score—can almost completely capture the excess disability associated with either HP or KP. Furthermore, SPPB score was significantly related to task-specific disability independent not only of age, sex, reported pain in other joints, depression, and major medical conditions but also of impairments in lower extremity strength and in flexibility of the painful joint. As previously underlined by Guccione, “the pathway from disease to disability is not inexorable. At each junction, . . . proper medical care and timely rehabilitation can eliminate or blunt the impact of disease on impairment, of impairment on function limitations and of function limitations on disability” (43). Thus, including the SPPB in the assessment of patients with lower extremity pain reporting disability and expanding the focus of their rehabilitation plan from specific joint treatment to balance and mobility training may substantially improve their functional outcome.

This study has several limitations. First, our data did not utilize the OMERACT–OARSI criteria (44). While the standard questions to assess HP or KP investigate on frequent pain in the past month (pain on most days of the month), we enquired about pain anytime in the month, thus relying on a somewhat broader and probably less specific criterion. Furthermore, we assessed pain severity but not pain frequency. As to pain management, we verified that in our cohort, both HP and KP were associated with higher reports of NSAIDs and analgesic intake in the previous 2 weeks (6), but we did not ask about the interference of medication intake on pain frequency or intensity. Furthermore, if the proportion of participants with HP or KP reporting drug intake was significantly higher compared with those without pain, it was much lower than that reported in studies performed in the United States or in the United Kingdom (1,21). These data probably reflect different views regarding drug prescription and intake, both from the practitioner’s and from the patient’s perspective that may be relevant to
actual pain management and pain functional impact, but we
did not investigate these issues in our analysis. Another
limitation of our study is that the question investigating HP
and KP did not record neither the affected side nor whether
the joint involvement was bilateral, and this may have at-
tenuated the associations of joint pain with measures of
physical performance and function. Finally, based on the
data collected, we cannot exclude the possibility of radiated
pain or radicular pain, although we could verify a specific
joint-related ROM impairment associated with joint pain in
our cohort (6).

In conclusion, we found that in our sample, HP and KP
were associated with higher reports of limitations in several
physically demanding abilities, such as cutting toenails,
carrying a shopping bag, and, only for HP, shopping and
using public transportation. Neither HP nor KP was associ-
ated with impairment in the 400-m walk test. Either condi-
tion was associated with lower SPPB scores, although SB
was impaired in HP but not in KP. Except for disability in
carrying a shopping bag in those with HP, reduced perfor-
ance in the SPPB modulated the relationship between
task-specific disability and joint pain in our population, in-
dependently of other potentially confounding factors in-
cluding specific joint flexibility and lower extremity muscle
strength. From a clinical perspective, these results suggest
that the clinical assessment of patients with HP or KP should
be completed with an evaluation of their lower extremity
performance and that widening the focus of rehabilitation
from specific joint impairment to mobility and balance may
substantially modify the trajectory from lower extremity
pain to disability.

FUNDING
The InCHIANTI study was supported as a “targeted project” (ICS 110.1
RS97.71) by the Italian Ministry of Health, by the National Institute on
Aging (Contracts N01-AH-961413 and N01-AH-821336 and Contracts
263 MD 9164 13 and 263 MD 821336) of the National Institutes of Health
in the United States, and in part by the Intramural Research Program,
National Institute on Aging, National Institutes of Health, United States.

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