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Hip Symptoms, Physical Performance and Health Status in Older Adults with Chronic Low Back Pain: A Preliminary Investigation

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Abstract

Objective—The purposes of this study were to determine: a) if there are differences in the prevalence of clinical hip symptoms between older adults with and without CLBP; and b) whether co-existing hip symptoms are associated with worse physical performance and poorer health-related quality of life (HRQOL).

Design—Case-control study

Setting—Individuals participated in a standardized evaluation in a clinical laboratory.

Patient Sample—Clinical hip symptoms, which are proposed predictors of radiographic hip osteoarthritis according to American College of Rheumatology guidelines, were evaluated in a volunteer sample of 54 community-dwelling older adults, aged 60–85, with CLBP and 54 age- and sex-matched healthy controls.

Intervention—Not applicable.

Main Outcome Measures—Physical performance was measured by the repeated chair rise test and stair climbing test. HRQOL was measured by the Short Form-36 Health Survey.

Results—Hip joint pain, morning stiffness and pain with hip internal rotation were more common among older adults with CLBP ($p < .05$). Participants with CLBP and co-existing hip symptoms had worse physical performance than individuals without CLBP or hip symptoms ($p < .0001$). Additionally, the presence of co-existing hip symptoms was associated with worse HRQOL, particularly in the domains of social functioning, mental health and role limitations due to emotional problems as measured by the SF-36 ($p < .01$).

Conclusions—Given our limited understanding of CLBP among older adults, there is a definitive need to systematically explore co-existing pain conditions that may contribute to worse outcomes. Based on these data, future longitudinal studies should explore whether co-existing hip symptoms are associated with a worse prognosis in older adults with CLBP.

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Keywords

Aging; Low Back Pain; Hip Symptoms; Quality of Life

Chronic low back pain (CLBP) is the most common pain condition in the geriatric population and societal costs are substantial.^{1-3,4} Several large epidemiologic studies have demonstrated that geriatric LBP is independently associated with steeper functional decline.⁵⁻⁷ Given the societal costs, we need to deepen our understanding of this prevalent condition. As noted in the recent Institute of Medicine Report on Pain, there is growing awareness that pain conditions can coexist thus causing greater challenges in the pain management process.⁸ In fact, Maixner et al suggest that “failure to account for the heterogeneous and overlapping nature of most common pain conditions may result in treatment responses of small effect size when treatments are administered to patients with chronic overlapping pain conditions.”⁹ Given our limited understanding of CLBP in older adults, there is a definitive need to explore co-existing pain conditions that may contribute to worse outcomes in this clinical population.

Rehabilitation professionals have often noted a link between hip dysfunction and LBP. Given the regional proximity of the hip and lumbar spine, as well as the overlap in pain distribution patterns between these anatomical locations,¹⁰ there is strong face validity for the exploration of co-existing hip symptoms in individuals with a primary complaint of CLBP. Offierski and McNab originally described hip-spine syndrome as the presence of symptoms due to an abnormal biomechanical relationship between the hip and spine likely related to degenerative pathology in one or both joints.¹¹ Since the original description of hip-spine syndrome, multiple studies have demonstrated that there are linkages between hip impairments/dysfunction and CLBP;¹²⁻¹⁶ but, much more clinical research is needed to elucidate this relationship if we are to identify reasonable approaches to subgroup the heterogeneous, geriatric CLBP population and develop effective treatment approaches.

This study examined differences in the prevalence of clinical hip symptoms between older adults with and without CLBP, using clinical hip symptoms that were proposed predictors of radiographic hip osteoarthritis (OA) according to American College of Rheumatology (ACR) guidelines. We hypothesized that hip joint pain, morning stiffness in the hip that lasts <60 minutes and pain with hip internal rotation (IR) would be associated with the presence of chronic LBP among older adults. We also sought to determine whether the presence of clinical hip symptoms would be associated with worse physical performance and poorer health-related quality of life (HRQOL) among older adults with CLBP.

METHODS

Participants

This secondary analysis included baseline participant data from a sample of community-dwelling, cognitively intact (Folstein Mini-Mental State Exam score ≥ 24) older adults (60–85 years) with and without CLBP. Study participants with CLBP were enrolled in a randomized preliminary trial comparing a trunk muscle training intervention to a passive

rehabilitation intervention¹⁷. Participants without CLBP were also recruited for the purpose of being matched to individuals with CLBP. All participants were recruited from the same community with the same methodology of placing advertisements in retirement communities, health fairs, local senior centers and in local newspapers.

Participants with CLBP met the following pain criteria: 3/10 pain intensity, occurring 4 days per week, and a minimum duration of 3 months¹⁸. CLBP participants were excluded for the following: a prominent component of radicular pain below the knee, non-mechanical low back pain symptoms, history of lumbar surgery, severely limited mobility (i.e. needed assistive device for household ambulation) or a progressive neurological disorder. Older adults without CLBP were included if they had no LBP at enrollment and were excluded for the following: a history of lumbar surgery, received treatment for LBP in the past 6 months, severely limited mobility or a progressive neurological disorder. All policies and procedures were followed in accordance with the proposal approved by the University of Delaware Institutional Review Board. All participants signed informed consent forms.

For the CLBP group, 211 people were screened, 145 were excluded, and 66 were enrolled. For those without CLBP, 71 people were screened, 14 were excluded, and 57 were enrolled. Participants from the group without CLBP were matched on a case-by-case basis with CLBP participants based on sex and age (± 2 years); ultimately, 54 participants from the group without CLBP were matched to 54 CLBP participants for the final analysis. Matching on age and sex was done to reduce any bias that might be due to the potential impact of these person-level factors on the prevalence of hip symptoms. No differences in age or sex were found between groups suggesting that matching was effective.

Demographics and Self-Ratings

Participants reported their age and sex, while the modified Oswestry Disability Questionnaire (mODQ) was used to measure LBP-related disability. The mODQ is a self-report instrument, which measures perceived functional limitation due to LBP on a 0–100% scale. The numeric pain rating scale was used to measure pain intensity with anchors from 0 (“no pain”) to 10 (“worst possible pain”). Current pain intensity, worst pain intensity in the previous 24 hours, and least pain intensity in the previous 24 hours were all measured using this method, which has shown to be reliable and valid¹⁹. All three ratings were averaged for a composite pain intensity rating. Participants were also asked to self-report whether they had ever been given a radiographic diagnosis of hip OA by a physician.

Clinical Hip Symptoms

We examined hip symptoms that were proposed predictors of radiographic hip OA according to ACR guidelines by Altman et al, including hip joint pain, morning stiffness in the hip that lasts <60 minutes and pain with hip internal rotation (IR).²⁰ Hip joint pain was classified as positive if pain was present in any of the following locations: anterior/groin, lateral or posterior hip. Pain with hip IR was assessed by the examiner placing the patient in prone, internally rotating the hip and querying the participant as to whether this positioning produced hip pain. Although we examined hip symptoms consistent with hip OA, these hip symptoms could also be indicative of other hip diagnoses, i.e. bursitis.

Physical Performance

The Repeated Chair Rise test, a reliable and valid measure, which stresses the axial skeleton and hip joint, was used to measure functional mobility.^{21, 22} From the seated position, the participant was instructed to safely complete five sit-to-stands as fast as possible while keeping their arms folded across their chest. The Repeated Chair Rise test has been shown to predict future limitations in ADLs and falling among older adults.^{21, 22} The stair climbing test (SCT) was used to assess stair negotiation as older adults have rated stairs as one of the top 5 “most difficult” tasks.^{23–25, 26} Participants were timed as they ascended 12 standard steps. Ascent was performed at each person’s self-selected speed and timed to the nearest hundredth of a second with a standard stopwatch. The SCT is able to measure a higher level of function than other performance tests and reduces the possibility of a ceiling effect.

Health Related Quality of Life

Health related quality of life (HRQoL) was measured using the Medical Outcomes Short Form-36 (SF-36), a generic self-administered questionnaire used to examine health in the following eight domains: bodily pain, physical function, role limitations due to physical problems, general health, vitality, social function, role limitations due to social problems and mental health. Scores on each scale were transformed into 0–100 scales with higher scores representing better health status. The psychometric properties of this instrument are well-established for use in multiple populations.^{27, 28}

Statistical Analysis

Statistical analyses were performed using SPSS 23 (SPSS, Inc. Armonk, NY). Chi-square analysis was used to determine differences in the prevalence of hip symptoms between older adults with and without CLBP. Then, to understand the combined impact of concurrent LBP and hip symptoms on outcomes, we constructed four separate groups by stratifying our samples of older adults with and without CLBP based upon the presence or absence of at least one co-existing hip symptom. After creating these four groups, there were only seven participants included in the group without LBP and at least one hip symptom; therefore, we only analyzed data from the other three subgroups. These subgroups were as follows: (1) individuals without CLBP or any hip symptoms (n=47), (2) individuals with CLBP and no hip symptoms (n=25) or (3) individuals with CLBP and at least one hip symptom (n=29). Multivariate analysis of variance (MANOVA) was performed to test between-group differences in outcomes across the three aforementioned groups. Then, analysis of covariance was used to explore univariate differences in outcomes based on the presence of LBP and coexisting hip symptoms. All models were adjusted for BMI. We also used a post-hoc test with Bonferroni correction for multiple comparisons. Given our small sample sizes and our desire to understand the magnitude of differences between the group with CLBP +hip symptoms and the other two groups, standardized effect sizes were calculated for all outcomes. Effect size was calculated by subtracting the mean value of the co-existing pain group from the mean value of the comparison group and then dividing the difference by the pooled standard deviation of the scores.²⁹

RESULTS

Participants

Participant demographics are provided in table 1. Both groups were matched on age (± 2 years) and sex, but those with CLBP had a higher BMI ($p=.044$). The average pain rating, pain duration and modified Oswestry Disability Index scores indicate that our CLBP group met the inclusion criteria of longstanding, moderately severe, functionally limiting pain.

Prevalence of Hip Symptoms between Older Adults with and without CLBP

Hip joint pain (40.7% vs. 9.3%, $p<.0001$), morning stiffness (29.6% vs. 11.1%, $p=.015$) and pain with hip IR (16.3% vs. 2.4%, $p=.030$) were more common among older adults with CLBP. In fact, 53.7% of all participants with CLBP had at least one hip symptom as compared to only 13% of the pain-free group ($p<.0001$) (figure). Finally, 18.5% of the participants with CLBP reported a radiographic diagnosis of hip OA from their physician compared to 1.9% of the group without LBP ($p=.004$).

Physical Performance and HRQOL Based on Presence of LBP and Hip Symptom

After controlling for BMI, MANOVA indicated a significant overall difference between groups for physical performance ($p=.001$). Follow-up univariate ANCOVAs, as seen in table 2, indicated that older adults with CLBP and co-existing hip symptoms were significantly slower than their pain-free peers during stair ascent and repeated chair rise performance. Standardized effect sizes suggest that the magnitude of differences between the CLBP+hip symptom group is small to medium in comparison to CLBP participants without hip symptoms, but medium to large in comparison to individuals without pain.

In terms of HRQOL, MANOVA indicated a significant overall between-groups difference ($P<.0001$). Per table 3, CLBP, regardless of the presence of co-existing hip symptoms, was associated with worse function in the more physically-oriented domains of the SF-36, including physical function, role limitations due to physical problems, bodily pain, vitality (energy) and general health. Effect size estimates confirm little to no difference between the two CLBP groups in these domains. Whereas, the addition of hip symptoms to CLBP was associated with worse social function, mental health and role limitations due to emotional problems. Standardized effect sizes suggest that the magnitude of differences between CLBP groups is medium to large for the three aforementioned domains.

DISCUSSION

In this study, we demonstrated that hip joint pain, morning stiffness and pain with hip IR were more prevalent among older adults with CLBP. Furthermore, we demonstrated that the presence of hip symptomatology concurrent with CLBP was associated with slower stair ascent time and chair rise performance. Additionally, the presence of coexisting hip symptoms was associated with worse HRQOL in the domains of social functioning, mental health and role limitations due to emotional problems as measured by the SF-36. Further longitudinal work is needed to fully explicate the potential impact of co-existing hip symptoms on the prognosis of older adults with CLBP.

To our knowledge, this is the first study to demonstrate a link between proposed symptomatic indicators of hip OA and CLBP. In this investigation, we found that older adults with CLBP were more likely to present with hip joint pain, morning stiffness that resolves within an hour and painful hip internal rotation than their peers without CLBP. Our prevalence estimate for hip pain of 9.3% in the group without CLBP is in line with national estimates of 7.1% from the Centers for Disease Control, thus suggesting that our pain-free sample is representative of the greater community.⁸ Further, nearly 19% of the CLBP participants reported a radiographic diagnosis of hip OA while only 2% of the pain-free group reported radiographic OA. According to estimates from the Framingham study, the prevalence of symptomatic hip OA is 4.2% in a community-based U.S. sample of older adults aged 50 and above.³⁰ The heightened prevalence of clinical hip symptoms and radiographic hip OA in this preliminary study of older adults with CLBP suggests a need for systematic investigation of the contribution of hip impairments to the presentation of CLBP. Our findings are in line with the regional interdependence model,³¹ which suggests that seemingly unrelated impairments in different anatomical locations may contribute to the patient's primary complaint, as well as the hip-spine syndrome model.¹¹ Offierski and McNab described three potential types of hip-spine syndrome: (1) simple, where either the hip or spine is the primary source of pain; (2) complex, where both the hip and spine are responsible for pain; and (3) secondary, where hip dysfunction due to degenerative pathology directly influences biomechanics of the spine, thus causing LBP.¹¹ Multiple studies have demonstrated a link between hip symptoms and LBP; but, beyond this initial description of the hip-spine subgroups, little empirical work has been done to identify subgroups of CLBP patients with hip symptoms/dysfunction that might impact the prognosis and management of CLBP.

Our data demonstrates that older adults with CLBP and co-existing hip symptoms were slower in their performance of stair ascent and repeated chair rise compared to their pain-free peers. It is interesting to note that while the presence of CLBP alone was associated with incrementally worse performance, it appears that the addition of hip symptoms to the CLBP was the primary driver of significantly worse performance. The effect size of .53 for comparison of chair rise performance between the two CLBP groups would be considered medium-sized. To provide context, the average time to perform the chair rise assessment was 14.7 seconds for older adults (average age of 69 years) with CLBP+hip symptoms; whereas, in a typical 70–79 year old, community-dwelling adult, any performance time greater than 12.6 seconds would be considered worse than average.³² Given that poor performances in stair negotiation and chair rise are predictive of functional decline in older adults,^{33–35} we should pay special attention to the management strategies used in the subgroup of older adults with CLBP and concomitant hip symptoms so that function is a key outcome of interest for the clinician and patient.

Consistent with our performance data, we also see that older adults with CLBP and coexisting hip symptoms have worse HRQOL profiles. CLBP with or without hip symptoms was associated with worse HRQOL in the domains of physical function, role limitations due to physical problems, bodily pain, general health and vitality; in these domains, there was generally very little difference between the two CLBP groups. When examining the SF-36 domains more linked to overall mental health status, a different pattern emerged. For the

social function and mental health domains, there was no difference between pain-free older adults and those with CLBP alone; however, there was a significant difference between the CLBP+hip symptom group and the pain-free group on these domains. And, only in the case of role limitations due to emotional problems do we see a statistically significant difference between the two CLBP groups; role limitations are significantly worse for individuals with the addition of hip symptoms. Further, we see medium-sized effects when comparing the two CLBP groups on social function and mental health. So, why do we see worse mental health profiles for individuals with CLBP and co-existing hip symptoms? One must consider that complaints of symptoms in both the lower back and hip would classify these individuals as having multisite pain. Multisite and widespread pain in older adults has been associated with anxiety, depression, sleep disturbances and greater comorbidity burden;^{36–38} all of which could have a negative impact on mental health status. It is also important to consider the potential impact of the additional mental health burden in this subgroup of CLBP patients. Since social interaction in late life is directly linked to fewer depressive symptoms and longer survival,³⁹ social function should be taken into consideration during treatment planning for this subgroup of CLBP patients.

Study Limitations

Due to the cross-sectional nature of the study, we cannot draw any conclusions about causal links between presence of hip symptoms and the development of CLBP; nor can we determine a causal link between presence of hip symptoms in this CLBP sample and onset of poor physical performance or HRQOL. Although we cannot causally link the co-existence of CLBP and hip symptoms with the poor outcomes in this cross-sectional study, we do know that the poor performance seen in the CLBP+hip symptom group places them at additional risk for functional decline and other negative sequelae as compared to their pain-free peers. Our findings relative to the prevalence of self-reported radiographic hip OA must be considered with some caution as there is potential for recall bias. Additionally, we are unable to determine at this time whether the CLBP and the hip pain are two truly distinct pain conditions or whether pain in one location is manifesting as pain in the other location. Future studies will need to be done to make this distinction. Finally, the small sample size was a limitation in detecting significant differences between the CLBP participants with and without hip symptoms; we were also unable to determine the impact of just hip symptoms alone on outcomes due to the small number of participants without CLBP who had hip symptoms. Future large scale studies are needed to explore the impact of hip symptoms on function and HRQOL in older adults with CLBP.

CONCLUSIONS

Our results demonstrate that clinical hip symptoms, thought to be indicative of hip OA, are more prevalent in older adults with CLBP; and these hip symptoms are associated with worse physical performance and HRQOL profiles. From a clinical perspective, these hip symptoms may need to be addressed in older adults with CLBP to improve physical performance and HRQOL. For example, Weiner and colleagues have put forth an expert-based treatment algorithm which addresses older adults with CLBP who may have hip osteoarthritis.⁴⁰ Future longitudinal studies confirming our findings are needed, as well as

longitudinal intervention studies designed to address both the hip and lumbar spine in this geriatric CLBP population.

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Abbreviations

BMI	body mass index
CLBP	chronic low back pain
HRQOL	health-related quality of life
mODQ	modified Oswestry Disability Questionnaire
OA	osteoarthritis
SF-36	Short Form-36 Health Survey

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Figure 1.
Prevalence of Hip Symptoms based on CLBP Status

Table 1

Participant Characteristics

Characteristics	CLBP (n=54)	No CLBP (n=54)
Age, yrs	69.3 (6.7)	71.1 (6.8)
Female sex, n (%)	37 (68)	37 (68)
BMI, kg/m ²	29.1 (5.6) *	27.0 (4.8)
White race, n (%)	51 (94.4)	49 (90.7)
Mini Mental State Exam (0–30)	28.2 (1.4)	28.1 (1.6)
LBP Duration, months	34.9 (3.9)	-
Average Pain Intensity (0–10)	3.4 (1.6)	-
Oswestry LBP Questionnaire (0–100)	33.9 (10.9)	-

Data represent mean and SD unless otherwise noted.

* p<.05

Table 2
Between-group differences for physical performance in older adults with and without CLBP

Performance	CLBP and Hip Symptom Status				Overall p-value
	Group 1: No LBP/Hip Symptoms N=47	Group 2: CLBP + No Hip Symptoms N=25	Group 3: CLBP + Hip Symptoms N=29	Effect Size: Group 3 vs. Group 2	
Mean (95%CI)				Effect Size: Group 3 vs. Group 1	
Stair Ascent (s)	5.93 (5.34, 6.51)	6.92 (6.11, 7.74)	7.44 (6.69, 8.20)	.72	.25
Chair Rise (s)	8.98 (7.52, 10.45)	11.76 (9.71, 13.81)	14.70 (12.80, 16.60)	1.03	.53

[^] Post-hoc Bonferroni Correction: Group 1 vs. 3, $P < .01$

Effect Size= Mean time for CLBP+Hip Symptoms minus mean time for comparison group/Pooled SD

Table 3

Between-group differences for HRQOL in older adults with and without CLBP

SF-36 Domains	CLBP and Hip Symptom Status				
	Group 1: No LBP/Hip Symptoms N=47	Group 2: CLBP + No Hip Symptoms N=25	Group 3: CLBP + Hip Symptoms N=29	Effect Size: Group 3 vs. Group 1	Effect Size: Group 3 vs. Group 2
Mean (95%CI)					Overall p-value
Physical Function	93.7 (88.5, 98.9)	67.2 (60.2, 74.2)	63.9 (57.2, 70.6)	1.32	.14
Role--Physical	96.1 (86.7, 100.5)	60.0 (47.4, 72.6)	49.1 (36.9, 61.7)	1.24	.29
Bodily Pain	91.7 (87.5, 95.8)	49.5 (43.9, 55.0)	46.1 (40.8, 51.4)	1.75	.13
General Health	83.6 (78.6, 88.5)	66.6 (60.0, 73.2)	67.6 (61.3, 73.9)	.87	.05
Vitality	75.0 (69.8, 80.2)	54.8 (47.9, 61.7)	53.5 (46.9, 60.2)	1.06	.06
Social Function	95.6 (90.7, 100.5)	88.5 (81.9, 95.1)	80.1 (73.8, 86.4)	.88	.48
Role-- Emotional	96.3 (89.8, 99.8)	97.4 (88.7, 100.5)	77.8 (69.4, 86.1)	.80	.84
Mental Health	85.1 (80.6, 89.5)	81.1 (75.2, 87.1)	73.6 (67.9, 79.4)	.73	.48

* Post-hoc Bonferroni Correction: Group 1 vs. Groups 2 and 3, $P < .0001$ # Post-hoc Bonferroni Correction: Group 1 and 2 vs. 3, $P < .01$ ^ Post-hoc Bonferroni Correction: Group 1 vs. 3, $P < .01$

Effect Size= Mean score for CLBP+Hip Symptoms minus score for comparison group/Pooled SD